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Factors Affecting Supply and Use of Services

Agency and Market Area Factors Affecting Home Health Agency Supply Changes

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Objective. To use the natural experiment created by the Medicare interim payment system (IPS) to study supply change behavior of home health agencies (HHAs) in local market areas.

Data Sources. One hundred percent Medicare home health claims for 1996 and 1999, linked with Medicare Provider of Service and Denominator files, and the Area Resource File.

Study Design. Medicare home health care (HHC) claims data were used to distinguish HHAs that changed the local market supply of Medicare HHC by their market exit or by significant expansion or contraction of their geographic service area between 1996 and 1999 from other HHAs. Multinomial logit models were estimated to analyze how characteristics of agencies and the market areas in which they served were associated with these different agency-level supply changes.

Principal Findings. Changes in local HHA supply stemming from geographic service area expansions and contractions rivaled those owing to agency closures and market entries. Agencies at greater risk of closure and service area contraction tended to be smaller, newer, freestanding agencies, operating with more visit-intensive practice styles in markets with more competitor agencies. Except for having much less visit-intensive practice styles, similar attributes characterized agencies that increased local supply through service area expansion.

Conclusions. Supply changes by HHAs largely reflected rational market responses by agencies to significant changes in financial incentives associated with the Medicare IPS. Recently certified agencies were among the most dynamic providers. Supply changes were more likely among agencies operating in more competitive market environments.

Key Words. Home health care, Medicare, geographic service area, supply behavior

The Balanced Budget Act (BBA) of 1997 mandated the development of a Medicare prospective payment system (PPS) for reimbursing home health agencies (HHAs) and the immediate implementation of an interim payment

system (IPS) to contain the rapid growth of Medicare home health care (HHC) expenditures until a PPS could be implemented. Two of the more prominent changes that took place after the Medicare IPS was implemented in October 1997 were a drop in Medicare's HHC expenditures by nearly 50 percent, and widespread agency closures that reduced the national supply of Medicare-certified HHAs by about 25 percent (GAO 1999; Office of the Inspector General 2000). These dramatic changes prompted concerns from advocates and the home health industry about the potential impact of agency closures on access to home health services by Medicare beneficiaries.

While documenting substantial changes in the supply of Medicare HHAs and the heavy geographic concentration of agency closures in several Southwestern states, early investigations concluded that these agency closures did not produce a shortage of Medicare HHAs, and that beneficiaries' access to services was not generally affected (GAO 1999; OIG 2000). Later empirical research showed that while Medicare HHC utilization rates sharply fell, rates of decrease were not that much greater among beneficiaries in states with the highest prevalence of agency closures, or among "high cost" Medicare HHC user subgroups (Komisar 2002; Liu, Long, and Dowling 2003; McCall et al. 2003).

The Medicare IPS was short-lived, being replaced by an episode-based PPS for Medicare HHAs in October 2000. It nevertheless represents a large "natural experiment" that elicited unexpectedly sharp decreases in both agency supply and Medicare HHC utilization rates. While considerable public attention was given to the vast number of agency closures that occurred (GAO 1999; OIG 2000), relatively little research has sought to understand why some agencies closed and others did not, or potential associations between agency-level characteristics and the supply-side changes made by surviving agencies that may have potentially allowed some agencies to avoid market exit. The natural experiment created by the IPS presents an opportunity to gain some important insights about factors that influenced agency-level market supply behavior in response to the reimbursement shocks created by the IPS.

While Medicare HHC utilization rates declined in all 50 states between 1996 and 1999 (GAO 2000) these aggregate data do not show the substantial

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variability in Medicare service volume changes among individual HHAs between those same years. For example, our study data show that among 6,924 HHAs that actively served Medicare beneficiaries in both 1996 and 1999, about 31 percent of them served more beneficiary users in 1999 than in 1996. Moreover, about 16 percent of these survivor agencies increased total Medicare visits between 1996 and 1999. These data are not at all suggestive of a uniform supply response to the IPS among agencies that did not close.

In addition to market exit, in this study we consider service delivery changes made by surviving agencies that resulted in significant changes in their geographic service areas as forms of agency-level supply response. An agency can increase local supply by expanding its delivery of visits to patients living in previously unserved areas, and contract local supply by discontinuing the service delivery to patients in areas it currently serves. Medicare HHA supply change can also occur without any change in an HHA's geographic service area. However, there is an important fundamental geographic basis for the policy concerns that arose after the many HHA closures that followed the IPS. When a Medicare HHA closes or contracts its geographic service area, the potential adverse impacts upon beneficiary access should be spatially concentrated in those places 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.

We are unaware of any studies to date that have sought to explain why Medicare HHC utilization rates did not decline much more sharply in areas where numerous agency closures occurred relative to other areas. We can conjecture that beneficiaries were not affected much because some nearby agencies likely expanded their geographic service areas and possibly some new agencies may have entered those market areas. However, we cannot explain the apparent modest utilization impacts associated with the many agency closures without empirical evidence showing that HHAs actually made changes in their geographic service areas in markets where substantial reductions in Medicare HHA supply occurred. In this research, we undertake the first step toward a fuller understanding of the agency supply changes that followed the IPS by actually measuring geographic supply contraction and expansion among surviving Medicare HHAs after implementation of the IPS. Furthermore, we investigate agency-level and market area factors associated with expansion, contraction, and market exit after the IPS.

BACKGROUND

Beginning in the late 1980s, spending on Medicare's home health benefit grew rapidly with spending increasing by an average of 28.2 percent annually between 1988 and 1997 (GAO 1999). This growth has been attributed primarily to a loosening of beneficiary 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, and Wallack 1999; McCall et al. 2001), as well as some states' Medicare maximization policies that took advantage of more liberal Medicare guidelines to cover some of the costs of dually eligibles (GAO 1998).

After nearly a decade of very rapid growth in Medicare HHC expenditures several administrative and legislative efforts together contributed to a dramatic decline in Medicare HHC expenditures between 1996 and 1999. These efforts included major changes in the way Medicare paid HHAs to promote efficient service delivery, increased scrutiny on agency billing practices to deter fraud, and some modifications to Medicare's home health benefit and participatory requirements for agencies (National Health Policy Forum 1999). The cornerstone of these efforts was the BBA of 1997 that required that cost-based reimbursement for Medicare HHAs be replaced with a PPS, and that an IPS be implemented to slow Medicare HHC expenditures until a PPS could be implemented (MedPAC 2000).

Under the IPS per-visit cost limits were lowered and aggregate per-beneficiary cost limits were imposed as financial incentives for agencies to reduce their costs per Medicare user. These two changes were expected to reduce revenues to most HHAs by 15–22 percent below the pre-IPS amounts (Hahn 1998). Between October 1997 and January 1999, 1,436 HHAs closed, either voluntarily or involuntarily, and only 175 HHAs entered the market nationwide. About 40 percent of the closed agencies were located in the states of Louisiana, Oklahoma, and Texas (GAO 1999). Medicare HHC expenditures plummeted from about $17 billion in 1996 to $8 billion in 1999.

The huge national decline in Medicare HHC expenditures and widespread agency closures were not fully anticipated by policymakers. Congressional Budget Office (CBO) revised projections of Medicare HHC spending reductions associated with home health provisions in the BBA of 1997 exceeded original projections by nearly a factor of four. While these revisions were attributed to several factors, including antifraud activities, more stringent claims review, and sequential billing policies, the CBO also initially antici-

pated that HHAs would generally respond to IPS by increasing Medicare admissions, offsetting some of the expected savings to Medicare (National Health Policy Forum 1999). This anticipation proved to be incorrect.

Very little research to date has examined the supply behavior of HHAs. A study of national and regional patterns of HHA market entries and exits during the 1980s indicated there was considerable volatility in agency supply over the decade, with numerous market entries and exits, particularly among proprietary agencies (Scalzi et al. 1994). The GAO (1999) made bivariate comparisons of the attributes of agencies that did and did not close after the IPS. Closed HHAs were more likely to be smaller, proprietary, freestanding, Medicare-certified for less than 5 years, located in urban areas, and providing more visits per beneficiary than agencies that did not close (GAO 1999).

Changes in Medicare HHC Payments under the IPS

Before the IPS, Medicare reimbursed HHAs at the lower of an agency's average reasonable costs per visit or a national cost-limit set at 112 percent of the average cost per visit of freestanding HHAs. Under the IPS the average per-visit cost limit was lowered to 105 percent of the national median agency cost per visit. The IPS further capped an agency's annual average Medicare payments per beneficiary at the lower of its actual reasonable costs per beneficiary and a per-beneficiary cost limit that was partially based on its historical costs. For established agencies with a 12-month cost report ending in fiscal year (FY) 1994, the per-beneficiary cost limit was set at 98 percent of a blended average of: (1) the agency's per-beneficiary costs in FY 1994 updated for inflation (weighted at 75 percent), and (2) the per-beneficiary costs of agencies in the same census division (weighted at 25 percent). The per-beneficiary cost limit for newer HHAs was set at the national median of agency average per-patient costs.

Many of these design features of the IPS immediately placed some HHAs at a greater disadvantage than others. HHAs with higher base year unit costs, those delivering more visits per beneficiary, and those that experienced more rapid increases in costs per beneficiary since the 1994 base year used for establishing cost limits, were likely to face greater fiscal pressures than other agencies (GAO 1998). However, the primary binding constraint on reimbursement for most HHAs was expected to be the per-beneficiary cost limit (Lewin Group 1998). How well an agency fared was likely to hinge on its ability to reduce per-beneficiary costs. Aside from reducing its operating costs,

an HHA could lower its per-beneficiary costs by some combination of the following strategies: discharging a patient when the per-beneficiary limit was reached, scaling back on visits made to most or all patients, reducing admissions of high-cost beneficiaries, and expanding admissions of low-cost beneficiaries (Bishop, Kerwin, and Wallack 1999).

Analytic Strategy

The IPS introduced strong incentives for agencies to reduce their operating costs, to scale back visits to patients generally, and perhaps most important, to attain a balanced mix of high-cost and low-cost patients to keep its costs per beneficiary below IPS limits. Economic theory would suggest that less efficient agencies should contract their local service to Medicare beneficiaries and possibly exit the market altogether. More efficient agencies should strive to expand their local service to Medicare beneficiaries. Although changes in beneficiaries served and visits per beneficiary are obvious indicators of agency-level supply response, these measures can only be employed to analyze the supply responses of the select subset of survivor agencies able to avoid market exit. An analysis distinguishing surviving and closed agencies would make no distinction among survivor agencies that expanded or contracted local supply without employing arbitrary assumptions about how large a change in Medicare service is necessary for classifying HHAs as expanding or contracting local supply.

Our analytic strategy entails using observed changes in an HHA's geographic service area to indicate deliberate local market area supply expansion or contraction by agencies that did not close. When a market exit occurs, an agency is no longer willing to serve Medicare beneficiaries over its entire service area. A new market entrant willingly provides visits to beneficiaries in its new geographic service area. Under this line of reasoning, HHAs that significantly contract or expand their geographic service area may be viewed as *partial* market exits or entries in the sense that they reflect changes in these agencies' willingness to serve beneficiaries in some parts of the larger local market area in which they operate.

There is anecdotal evidence that some agencies decreased or discontinued service in a portion of their geographic service areas after the IPS by closing branches or subunits. While a number of branch closures were likely motivated by BBA of 1997 provisions requiring that Medicare payments be based on the location where HHC services are received, eliminating financial incentives for agencies based in higher-wage index areas to operate branches

or subunits in lower-wage index areas, these closures nevertheless represent deliberate agency decisions to decrease or discontinue service in places where it was no longer profitable or, perhaps, profitable enough. Some HHAs without branches or subunits are likely to have made similar deliberate decisions to decrease or discontinue service in portions of their service areas where service demand was marginal, or where per-visit labor costs were greater, or where lower wage index adjustments made it less profitable to serve.

Our study data suggest that a significant minority of HHAs expanded their volume of Medicare admissions after the IPS as originally anticipated by the CBO. Rather than solely competing with other agencies for additional Medicare patients within their immediate geographic service areas, some HHAs may have deliberately sought to serve new areas as a means of increasing the potential population base from which they could draw Medicare patients. Other HHAs may have expanded their service areas as a response to gaps in local supply arising from other agency closings, and others may have expanded their service areas to improve their competitive standing in their local market area and overall bottom line. While the motivations driving HHA service area expansions cannot be ascertained with our study data, we identify distinctive agency and market area factors associated with these supply changes.

Our analytic strategy using geographic service area changes to indicate local HHA supply change will not distinguish HHAs that increased or decreased their capacity to deliver visits after the IPS, but that did not make any significant changes that affected their geographic service area during the 1996–1999 period. While this may be a potential limitation, our strategy nevertheless allows us to simultaneously analyze market exit, supply contraction, and supply expansion as distinct forms of supply response without having to arbitrarily define how large a change in Medicare service volume or nurse staffing level had to be in order for an HHA to be classified as increasing or decreasing its local supply.[1]

Data and Methods

Data Sources

Complete 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 precedes the IPS and the Medicare PPS was initiated after 1999. Medicare Provider of Service (POS) files for 1996

and 1999 were used to determine Medicare certification status and organizational attributes of agencies. Medicare Denominator File (MDF) data from 1996 were aggregated to produce Medicare beneficiary population counts. The 2000 Area Resource File (ARF) was used to specify selected long-term care supply variables for the multivariate analysis.

Study Sample

The study sample is comprised of Medicare-certified HHAs that actively served Medicare beneficiaries in 1996. Active service is conservatively defined as the presence of Medicare visit claims to more than 20 different beneficiaries over a year. There were 958 HHAs, accounting for 0.22 percent of total Medicare HHA visits in 1996 that were excluded under this criterion, leaving 9,164 HHAs in the sample.

Classification of Medicare HHA Supply Changes

Geographic service areas were first delineated for each active HHA in 1996 and/or 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 et al. 1987; Slifkin, Ricketts, and Howard 1996). For each HHA, zip codes comprising its service area in 1996 and 1999 were then classified into separate categories based on whether the zip code was served in either 1996 or 1999, or both years. Counts of beneficiaries served in these categories were then aggregated to the HHA level to produce four measures of total beneficiaries served: (1) beneficiaries from zip codes served in both 1996 and 1999; (2) beneficiaries from zip codes served in 1996 but no longer served in 1999; (3) beneficiaries from zip codes served in both 1996 and 1999, and (4) beneficiaries from zip codes newly served in 1999.

Each of the 7,021 HHAs that actively served beneficiaries in both 1996 and 1999 were then classified as having an expanded, contracted, changed, or stable geographic service area based on the relative volume of beneficiaries served in dropped, added, and continuously served zip codes. As most HHAs discontinued service to some zip codes and/or added service to other zip codes between 1996 and 1999, our aim was to distinguish only those HHAs with service area changes large enough to be of practical significance. Details about the classification methodology are contained in the Electronic Appendix (supplementary material).

All active HHAs in 1996 were assigned to one of four mutually exclusive supply change outcome categories. *Market exit* includes Medicare-certified HHAs that were active in 1996 with no Medicare claims in 1999. *Service area contraction* includes certified HHAs with some Medicare claims in both years that either contracted their geographic service area between 1996 and 1999, or served so few beneficiaries to be considered inactive in 1999. *Service area expansion* includes certified HHAs with some Medicare claims in both years that either expanded their geographic service between 1996 and 1999, or served so few beneficiaries to be considered inactive in 1996. *Service area stable* is comprised of HHAs that were active in both years whose geographic service areas were unchanged between 1996 and 1996. It also includes a small number of HHAs ($n = 342$) with modest changes in their geographic service areas that could not be classified as either expanding or contracting.

Variable Specification

Multinomial logistic regression analysis was used to identify agency-level and market area-level factors associated with geographic supply change outcomes of 9,061 active HHAs in 1996 with complete data on all variables. Table 1 contains definitions for all variables specified in the model.

Agency Attributes. As for-profit HHAs exhibit more intensive practice styles, with more visits and higher costs per patient (Goldberg and Schmitz 1994), the per-beneficiary limit of the IPS may have imposed a greater burden on them relative to voluntary not-for-profit and government HHAs. The higher prevalence of both market entries and exits by for-profit HHAs in the past suggests they would respond more quickly to financial pressures and opportunities associated with the IPS than not-for-profit and government agencies (Scalzi et al. 1994). Government and facility-based HHAs may be less dependent on Medicare revenue than other agencies owing to alternative sources of revenue. Some government HHAs may receive subsidies, and hospitals and nursing facilities operating a facility-based HHA will have alternative sources of patient revenue from institutional care. Hospital-based HHAs have also historically treated patients with shorter episodes of care (Goldberg and Schmitz 1994) and are likely to be better-positioned to control the mix of beneficiaries served than freestanding agencies (Bishop, Kerwin, and Wallack 1999).

While the GAO (1999) found that for-profit HHAs were disproportionately overrepresented among market exits relative to government and

Table 1: Variable Definitions and Descriptive Statistics ($n = 9{,}061$)

Variable	*Definition*	*Source*	*Mean*	*SD*
Ownership status and setting				
Proprietary hospital-based	Yes = 1, No = 0	POS	0.049	0.218
Nonproprietary hospital-based	Yes = 1, No = 0	POS	0.184	0.388
Government hospital-based	Yes = 1, No = 0	POS	0.065	0.247
Government freestanding	Yes = 1, No = 0	POS	0.081	0.273
Proprietary freestanding	Yes = 1, No = 0	POS	0.495	0.500
Nonproprietary freestanding (reference)	Yes = 1, No = 0	POS	0.124	0.330
Organizational structure				
Branches and subunits	A count of branches and/or subunits operated by the HHA in 1996	POS	0.602	1.839
Medicare program tenure				
Medicare program tenure	Years of Medicare program certification as of January 1, 1996	POS	9.028	9.064
Recent market entrant	Medicare program certification before January 10, 1993, otherwise = 0	POS	0.326	0.469
Medicare service delivery attributes				
Beneficiaries served	Total Medicare beneficiaries (in 100s) served by the HHA with 1+ visits in 1996	Claims	4.400	7.948
Visits per beneficiary served relative to agency limit	Average visits (in 10s) per beneficiary served in 1996 minus (a) HHA average in census division for established agencies, or (b) national HHA median for newer HHAs	Claims	0.961	4.180

Medicare HHC demand attributes				
Medicare market demand size	Medicare beneficiaries 75 years and older (in 10,000) in market area 1996	MDF	6.893	10.402
Medicare market demand density	Medicare beneficiaries 75 years and older (in 100s) per square mile in market area 1996	MDF, ARF	0.276	1.020
Medicare HHC market area attributes				
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 are served by the HHA	Claims	6.674	11.085
Other LTC supply indicators				
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

POS, Medicare Provider of Service file; ARF, Area Resource File; Claims, 100% Medicare HHA claims data; MDF, Medicare Denominator File; HHA, home health agencies; LTC, long-term care.

voluntary not-for-profits, facility-based status and ownership status effects can be potentially confounded since very few proprietary HHAs are facility-based. Ownership and facility-based status are combined together to form the following organizational categories: for-profit and facility-based, for-profit and freestanding, not-for-profit and facility-based, not-for-profit and freestanding, government and facility-based, and government and freestanding. Categorical dummy variables were specified with not-for-profit freestanding HHAs serving as the omitted reference category. Proprietary organizations are expected to be more likely than not-for-profit organizations to exit and to contract their service areas, and less likely to expand their service areas. Facility-based agencies are expected to be less likely than freestanding ones to exit, contract, and expand their service areas.

Before 1997 it was common for some HHAs in high wage index areas to set up branches or semi-autonomous subunits for delivery of services in lower-wage index locations to enhance their Medicare reimbursements. In addition to BBA of 1997 changes requiring that wage-index adjustments be based on the location where a service is delivered, changes in Medicare participation rules in 1997 also clarified that branches had to be located sufficiently close to the parent organization so that the parent organization could effectively manage the operation without independent Medicare certification (GAO 1999). As a consequence of these changes, HHAs operating subunits and/or branches in 1996 are expected to be more likely to exit and contract their geographic service areas. The expected effect of subunits and branches on service area expansion is uncertain, however, since organizational infrastructure associated with branches or subunits may facilitate service area expansion.

As IPS per-beneficiary payment limits were based on the national median per beneficiary costs for newer Medicare HHAs without a full 1997 fiscal year cost report, they were likely to be more stringent for recent market entrants than for established HHAs with limits that were partially based on their own historical costs (Lewin Group 1999; National Health Policy Forum 1999). HHAs of longer Medicare program tenure should be more likely to have achieved administrative and operational efficiencies compared with HHAs of shorter tenure, agencies with longer tenure should be less likely to contract their service area and exit the market. A separate dummy variable was specified to distinguish "newer agencies" with Medicare certification dates after the start of the 1994 fiscal year.

We used agency-level Medicare visit data for 1996 to construct a proxy variable to indicate the stringency of the IPS per-beneficiary limit for individual HHAs. First, average Medicare visits per beneficiary in 1996 were computed

for each HHA. While they are not equivalent to an agency's per-beneficiary costs, they should be fairly highly correlated with them, and they should reflect the visit intensity of an agency's service style and/or its patient case mix. For each established agency, a "visit-based per-beneficiary limit" was then calculated as a blended average of the agency's own average visits per beneficiary (75 percent) and the mean average visits per beneficiary among HHAs in its census division (25 percent). For newer agencies, this visit per beneficiary limit was set at the national median of HHA visits per beneficiary in 1996. Each HHA's relevant visit per-beneficiary limit was then subtracted from its 1996 visits per beneficiary yielding a difference showing how much an HHA's average visits per beneficiary in 1996 differed from its visit per-beneficiary limit. HHAs that provided more visits per beneficiary in 1996 than their limit should be more likely to exit and contract their service areas, and less likely to expand their service areas.

Finally, total beneficiary users served in 1996 was specified as an indicator of agency size with respect to the Medicare program. Larger HHAs have historically served patients with more intensive visits and longer episodes (Goldberg and Schmitz 1994). While this would suggest that IPS per beneficiary cost limits are likely to be more stringent for larger agencies because of higher costs per patient, this disadvantage may be offset by better technology for patient monitoring, and a larger patient volume for balancing high-cost and low-cost patients (Lewin Group 1999). Smaller agencies are likely to have more difficulty in balancing per-patient costs since the effects of an unexpected high-cost outlier patient on average costs will be spread over fewer patients. However, the expected effect of agency size on service area expansion is uncertain. To the extent that service area expansion provides the means for smaller HHAs to expand their Medicare patient volume sufficiently to help balance per beneficiary costs, smaller HHAs may have greater incentive to expand their service area to reduce risks of market exit.

Market Area Attributes. Two variables were specified as indicators of the level of Medicare HHC demand from residents of an agency's competitive market area, as measured by county-based health service market areas (HSMAs) developed by Makuc et al. (1991). The size of an HHA's potential Medicare market was specified in terms of the population of Medicare beneficiaries 75 or more years old living within the HSMA containing an HHA's 1996 service area. Weighted averages of HSMA data were employed when an HHA served beneficiaries from more than one HSMA.

As travel costs should impede the delivery of HHC visits to distant patients, a demand density variable was specified to distinguish HHAs operating in more or less densely populated market areas. 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.

An individual agency's decision to expand or contract its service area is likely to be conditioned by the decisions of competitor HHAs. Modeling the micro-competitive behavior of individual agencies is extremely difficult, however. Not only is it difficult to identify specific HHAs that actually compete with an agency, but also market density and market concentration measures derived from data on such competitors may be endogenous and correlated with a number of unobservable demand and cost shocks in the local market area. Although the competitive behavior of hospitals has been studied for many years, there is still disagreement about how competition should be measured (Sohn 2002). As the HHC literature provides no guidance on this issue, we follow the traditional approach of Stigler and Sherwin (1985) and others by measuring competition as a geographic market area attribute. A market density measure, a count of active HHAs with service areas within the same HSMAs served by an HHA in 1996, was specified as an indicator of competitive market structure. HHAs serving patients in market areas with more competitors should be more likely to exit or contract their service areas and less likely to expand their service areas than HHAs serving in market areas with fewer competitor agencies. An HHA's market share of total Medicare beneficiaries receiving visits in 1996 within the HSMA it serves was additionally specified as a separate indicator of the HHA's competitive position *relative* to other agencies serving patients in the same market area. HHAs with relatively larger market shares should be more able to maintain stable geographic service areas given their more dominant market presence. 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 be more likely to respond strategically to the IPS seeking to increase Medicare users by expanding service in areas where service was discontinued by other agencies.

To the extent that their services are substitutable for Medicare HHC visits, other sources of postacute care (PAC) and long-term care (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. 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, a set of state-level fixed effects dummy variables were specified to capture unspecified residual influences associated with factors such as state Medicaid payment systems.

Empirical Results

The top portion of Table 2 displays the distribution of 9,164 HHAs among the four Medicare HHA supply change categories defined earlier. New market entrant HHAs, defined as active HHAs in 1999 with no Medicare claims in 1996, are included in a separate column to account for all active Medicare-certified HHAs in 1999. While these HHA supply changes portray an HHA industry with large declines in supply after the IPS, they also suggest supply expansion and contraction by surviving HHAs of a magnitude that rivals the supply decreases associated with the many agency closures that received so much public attention. Whereas HHAs that closed between 1996 and 1999 served about 13.9 percent of the nearly 4 million total Medicare users served in 1996, about 8.6 percent of Medicare users in 1996 were served by HHAs that subsequently reduced local supply by contracting their pre-IPS geographic service areas. Furthermore, market entrants and HHAs that expanded their geographic service areas together served more than 16 percent of the nearly 3 million total Medicare users in 1999.

The assignments of HHAs to service area expansion and contraction categories exhibit a high degree of face validity with respect to changes in geographic patterns of service delivery. Among HHAs classified as contracting their service areas, about 36.3 percent of total beneficiaries served in 1996 lived in zip codes that were no longer served by these HHAs in 1999, and only 3.2 percent of beneficiaries served in 1999 by these HHAs lived in zip codes that were not previously served in 1996. The mean distance between the zip codes of agencies and beneficiaries served declined by 4.7 miles among HHAs that contracted their service areas. HHAs that expanded their geographic service areas exhibit a reciprocal pattern to this one. Whereas only 2.5 percent of all beneficiaries served by these HHAs in 1996 lived in zip codes that were not served in 1999, 39.2 percent of beneficiaries served in 1999 lived in zip codes that were not previously served. Mean distance traveled to Medicare users among these HHAs increased by about 5.6 miles. Among HHAs with relatively stable geographic service areas, few beneficiary users lived in zip codes that were either dropped from (3.7 percent) or added to (4.7 percent)

Table 2: Agency-Level Service Attributes by Medicare HHA Supply Change Category 1996–1999

	HHA Supply Change Category 1996–1999						
Variable	*Market Exit*	*Service Area Contraction*	*Service Area Expansion*	*Service Area Stable*	*New Market Entrant*	*Total 1996*	*Total 1999*
Beneficiary service attributes							
Number of HHAs	2,143	1,027	942	5,052	870	9,164	7,891
Percentage of total 1996	23.4	11.2	10.3	55.1			
Percentage of total 1999		13.0	11.9	64.0	11.0		
Medicare beneficiaries served 1996	558,493	343,651	167,120	2,925,699		3,994,963	
Beneficiary users as a percentage of total 1996	14.0	8.6	4.2	73.2		100.0	
Beneficiaries served in 1996 in dropped zip codes	558,493	124,851	4,122	106,803		794,269	
Beneficiaries of dropped zip codes as percentage of total 1996	100.0	36.3	2.5	3.7		19.9	
Medicare beneficiaries served 1999		99,163	362,048	2,403,016	131,585		2,995,812
Beneficiary users as a percentage of total 1999		3.3	12.1	80.2	4.4		100.0
Beneficiaries served in 1999 in added zip codes		3,200	142,054	116,591	131,585		393,430
Beneficiaries of added zip codes as percentage of total 1999		3.2	39.2	4.7	100.0		13.1
Travel distance attributes*							
Mean distance from HHA to beneficiary in miles 1996		20.9	12.9	10.9			

Mean distance from HHA to beneficiary in miles 1999	16.3	18.5	10.9
Mean change in distance in miles	– 4.7	5.6	0.0
Medicare service attributes			
Mean beneficiaries served 1996	504	243	581
Mean beneficiaries served 1999	161	493	478
Percentage of HHAs with increase in Medicare users	1.5	92.9	26.3
Mean percentage change in beneficiaries served	– 64.2	258.0	– 8.9
Mean total Medicare visits 1996	41,132	17,891	35,056
Mean total Medicare visits 1999	6,331	22,129	17,271
Percentage of HHAs with increase in Medicare visits	0.8	61.4	9.8
Mean percentage change in total Medicare visits	– 80.8	193.0	– 38.8
Mean visits per Medicare user 1996	93	94	72
Mean visits per Medicare user 1999	35	50	38
Percentage of HHAs with a decline in visits per user	94.6	86.3	94.5
Mean percentage change in visits per Medicare user (%)	– 54.2	– 32.9	– 39.2

Continued

Table 2: *Continued*

Variable	*Market Exit*	*HHA Supply Change Category 1996–1999*					
		Service Area Contraction	*Service Area Expansion*	*Service Area Stable*	*New Market Entrant*	*Total 1996*	*Total 1999*
HHA staffing levels[†]							
Mean RN FTEs 1996		17.98	7.93	17.43			
Mean RN FTEs 1999		10.36	11.25	15.33			
Mean change in RN FTEs 1996–1999 (%)		− 42.4	41.9	− 12.0			
Mean CNA FTEs 1996		18.9	7.88	17.14			
Mean CNA FTEs 1999		11.9	9.55	12.78			
Mean change in CNA FTEs 1996–1999 (%)		− 37.0	21.2	− 25.4			

Notes:

*Only HHAs that were active in both 1996 and 1999 were used in computations of mean distance traveled and Medicare service attributes ($n = 6{,}251$). Distance is measured as straight-line distance between centroids of agency and beneficiary residence zip codes.

[†]Only active HHAs with staffing data for both 1996 and 1999 were used in computations of mean staffing levels ($n = 6{,}203$). FTE staff include employees and contract nonemployees.

HHA, home health agencies; RN, registered nurse; FTE, full-time equivalent.

Table 3: Multinomial Logit Model Results for HHA Supply Change Outcomes 1996–1999 ($n = 9{,}061$)

	Contract Service Area/Stable Service Area			*Expand Service Area/Stable Service Area*			*Market Exit/Stable Service Area*		
*Variables**	*OR*[†]	*t*	*p Value*	*OR*	*t*	*p Value*	*OR*	*t*	*p Value*
Ownership status and setting									
Proprietary hospital-based	1.12	0.57	.571	0.31	− 4.31	<.001	1.13	0.83	.407
Nonproprietary hospital-based	0.36	− 5.83	<.001	0.43	− 4.92	<.001	0.30	− 9.51	<.001
Government hospital-based	0.30	− 4.95	<.001	0.22	− 6.29	<.001	0.11	− 10.28	<.001
Government freestanding	1.29	1.32	.186	0.21	− 5.13	<.001	0.56	− 3.44	.001
Proprietary freestanding	1.33	2.10	.036	0.99	− 0.08	.934	0.89	− 1.12	.263
Organizational structure									
Branches and subunits	1.18	6.99	<.001	0.97	− 0.52	.601	1.11	4.62	<.001
Medicare program tenure									
Medicare program tenure	0.97	− 4.00	<.001	1.00	0.07	.946	0.98	− 3.50	<.001
Recent market entrant	0.74	− 2.72	.007	3.24	9.63	<.001	1.13	1.42	.155
Medicare service delivery attributes									
Beneficiaries served (100s)	0.97	− 3.05	.002	0.87	− 6.81	<.001	0.94	− 6.02	<.001
Visits per beneficiary served—agency limit (10s)	1.05	4.50	<.001	0.91	− 7.51	<.001	1.05	5.88	<.001
Medicare HHC demand attributes									
Medicare market demand size (10,000s)	0.99	− 1.18	.237	1.01	1.06	.288	0.98	− 2.56	.010
Medicare market demand density (100s/mi^2)	1.09	1.84	.066	1.11	2.75	.006	0.98	− 0.29	.772
Medicare HHC market structure attributes									
Active medicare HHAs (10s)	1.03	2.80	.005	1.01	0.49	.625	1.02	2.80	.005
Market share of beneficiaries served (%)	0.92	− 8.62	<.001	0.96	− 3.79	<.001	0.95	− 8.05	<.001

Continued

Table 3: *Continued*

	Contract Service Area/Stable Service Area			*Expand Service Area/Stable Service Area*			*Market Exit/Stable Service Area*		
*Variables**	*OR*[†]	*t*	*p Value*	*OR*	*t*	*p Value*	*OR*	*t*	*p Value*
Other LTC supply indicators									
Nursing home bed supply (per 100 capita)	0.98	−1.14	.252	1.00	−0.15	.883	1.03	2.07	.039
Chronic disease and LTC hospitals	0.77	−1.98	.048	1.23	1.32	.188	1.24	2.14	.032
Log likelihood = −8,562.73									
Pseudo-R^2 = 0.1687									

Notes:

*State-level fixed effect dummy variables were also specified as additional control variables.

[†]OR, odds ratio for (supply change outcome/stable market area).

LTC, long-term care; HHA, home health agencies.

their service areas, respectively, between 1996 and 1999, and there was no change in mean service distance traveled.

The lower portion of Table 2 contains Medicare service and agency staffing level data for a subset of HHAs that actively served Medicare beneficiaries in both 1996 and 1999. On average, HHAs with stable geographic service areas decreased their Medicare visits (− 38.8 percent), Medicare users (− 8.9 percent), and visits per user (− 39.2 percent) between 1996 and 1999. They also reduced their full-time equivalent (FTE) employee and contract staff levels of registered nurses (RNs) and certified nurse aids (CNAs) by 12 percent and 25.4 percent, respectively. While HHAs that contracted or expanded their service areas similarly reduced their Medicare visits per user by − 33 percent and − 54 percent, respectively, the data suggest their lower visit rates were attained differently. More than 98 percent of HHAs that contracted their service areas served fewer Medicare users in 1999 than in 1996, decreasing their total Medicare visits (− 80.8 percent), users served (− 64.2 percent), RN staffing (− 42 percent), and CNA staffing (− 37 percent) much more than HHAs with stable service areas. On the other hand, nearly 93 percent of HHAs that expanded their service areas served more Medicare users in 1999 than in 1996, increasing total Medicare visits (+193 percent), users served (+258 percent), RN staffing (+41.9 percent), and CNA staffing (+21.2 percent) over the same time period. These data suggest that our geographic service area change classifications distinguish HHAs exhibiting different supply changes after the IPS.

Multivariate Results

Table 3 contains our multinomial logit model empirical results with parameter estimates reported as odds ratio (OR) transformations to facilitate interpretation of the results. As four alternative supply change outcomes were specified, there are three sets of estimated coefficients for each independent variable specified in the model. All OR estimates are interpreted with respect to the common reference outcome of "stable service area."

Agency Attributes. The estimated coefficients for the organizational variables indicate interaction effects between facility-based status and ownership status. Nonproprietary and government hospital-based HHAs were least likely among agency types to exhibit any significant geographic supply change after the IPS. The estimated OR suggest that their odds of service area contraction, service area expansion, and market exit were all between 57 and 89 percent

lower than that of otherwise similar nonproprietary freestanding HHAs. Proprietary hospital-based HHAs were similar to other hospital-based HHAs only in their low odds of service area expansion (OR = 0.31) relative to nonproprietary freestanding HHAs. Proprietary hospital-based HHAs were more likely to contract their service areas and exit the market relative to otherwise similar hospital-based HHAs. With the exception of those that were government-owned, freestanding HHAs were much more likely than their hospital-based counterparts to either expand or contract their service area or close. Interestingly, in contrast to the bivariate results of the GAO (1999) our multivariate results suggest that among freestanding HHAs, proprietary agencies did not exhibit greater odds of market exit than their nonproprietary counterparts. The only significant difference between proprietary and nonproprietary freestanding agencies was a 33 percent greater odds of contracting their service areas among proprietary HHAs.

HHAs with geographically dispersed organizational structures comprised of multiple branches and/or subunits were more likely to have contracted their service area (OR = 1.18) and to have closed (OR = 1.11), than their counterparts with few branches or subunits in 1996. For example, the expected odds of service area contraction 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. While recent market entrant HHAs were less likely to contract (OR = 0.74) and much more likely to expand their service areas (OR = 3.24) than otherwise similar established HHAs, there was no significant difference with respect to market exit when other factors are controlled for. The very large odds of service area expansion among newer HHAs is particularly interesting given that their IPS per-beneficiary cost limits were generally viewed as more stringent than for established agencies. While in some instances such service area expansion may simply reflect the planned behavior of some HHAs already in a start-up growth phase when the IPS was implemented, the more stringent IPS per-beneficiary cost limits introduced an additional financial incentive for new agencies generally to expand their volume of Medicare users to potentially avoid a likely larger financial loss via an immediate market exit. Newer agencies may also be more conducive to making operational changes compared with more established HHAs that may have had difficulty adjusting their pre-IPS oriented operations to the IPS. Additional years of Medicare program tenure were otherwise associated with decreased odds of both service area contraction and market exit. For each

additional year of certification, the odds of service area contraction and market exit are both decreased by 2–3 percent.

Larger HHAs serving more Medicare beneficiaries in 1996 were more likely to maintain stable service areas than smaller agencies. The odds of an HHA contracting its service area, or closing altogether are decreased by 3 and 6 percent, respectively, for each 100 additional beneficiaries served in 1996. The greater stability of larger agencies may be attributable not only to greater efficiency, but also to having a larger patient volume for balancing high-cost and low-cost patients to keep per patient costs below IPS limits. Smaller HHAs were found to be more likely to expand their service areas. The odds of service area expansion are suggested to decrease by 13 percent for each 100 additional beneficiaries served in 1996. Smaller agencies should have had a greater incentive to expand their service areas to increase Medicare patient volume, thereby reducing their vulnerability of per patient costs to high-cost outlier patients. However, service area expansion by some smaller agencies may reflect planned growth to attain a more efficient scale of operation.

Finally, IPS per-beneficiary limits appear to have influenced HHA supply decisions in the manner expected by economic theory. HHAs providing more visits per beneficiary in 1996 relative to other agencies in their region were at greater risk of closure and service area contraction, and were less likely to expand their service area, than otherwise similar HHAs providing fewer visits per beneficiary. The odds of service area contraction and closure are both suggested to increase by nearly 5 percent, and the odds of service area expansion to decrease by 9 percent, for every 10 visits higher was an agency's average visits per beneficiary in 1996 relative to its "per-visit limit" based on the average rate among agencies in its census division, or the national median rate for new agencies.

HHA supply changes appear to be modestly influenced by the size and density of Medicare market HHC demand. The odds of market exit are suggested to decrease by 2 percent for each additional 10,000 older Medicare beneficiaries comprising the population of the HSMA in which an agency operated. The odds of an HHA expanding its service area are suggested to increase by nearly 11 percent for each additional 100 resident Medicare beneficiaries aged 75 years or more per square mile in their market area.

An HHA's risks of closure and service area contraction appear to be influenced in the same way by the presence of competitor HHAs in its market area. The odds of service area contraction and market exit were both increased by roughly 2–3 percent for each additional 10 HHAs operating in an agency's local market area. An HHA's relative competitive standing in its

market area, as reflected by its beneficiary market share in 1996, appears to have also influenced its supply response. HHAs with greater Medicare beneficiary market shares in their market area were not only less likely to contract their service area (OR = 0.92) or exit the market (OR = 0.95), but they were also less likely to expand their service area (OR = 0.96). The greater likelihood of service area expansion among HHAs with smaller local beneficiary market shares may reflect efficient agencies expanding their Medicare patient volumes and competitive market position.

Mixed empirical results were found regarding the influence of the supply of alternative PAC and LTC resources on HHA supply changes. Consistent with expectations, HHAs were at greater risk of closure in market areas with greater nursing home bed supply (OR = 1.03) and more LTC and chronic disease hospitals (OR = 1.24). While the odds of service area expansion were not associated with greater local market area supplies of PAC and LTC resources, in contrast to expectations, HHAs in such markets had lower odds of contracting their service areas (OR = 0.77).

Finally, while not reported in Table 3, a likelihood ratio test performed on the group of state-level fixed effect dummy variables indicated significant unspecified state-level effects affecting agencies' supply change outcomes ($p < .01$). However, there were no notable patterns in these OR estimates.

DISCUSSION

The home health industry has been characterized as being comprised of small and unsophisticated agencies, many of which lacked the technical capacity to properly respond to the financial incentives introduced by the IPS (Bishop, Kerwin, and Wallack 1999). However, our multivariate empirical analysis suggests that the supply changes of individual agencies after the IPS largely reflected rational economic responses by agencies to the significant changes in the financial incentives of their payment system. After the introduction of IPS per-beneficiary cost limits, agencies with much higher visits per Medicare beneficiary in 1996 relative to other HHAs in their region were more likely to contract their service area or close, and were much less likely to expand their service areas. HHAs operating branches or subunits were more likely to close or contract their service areas, presumably in large part owing to BBA of 1997 changes in application of wage index adjustments.

At the same time, our results suggest that agency supply changes after the IPS were conditioned by a number of agency and market area factors. Recently certified agencies, for example, were among the most dynamic providers. We infer from our results that such agencies were very flexible in their response to Medicare payment policies and market conditions. Because recently certified agencies tended to have higher than average costs per case before the IPS, they were more likely to exit the Medicare program or contract their service areas. We speculate that "older" agencies might have been more integrated in the community and would be more reluctant to exit the program totally. On the other hand, newer agencies were also much more likely than their older counterparts to expand their service areas. Among some of the more efficient smaller agencies that were recently certified, service area expansion may have been a way to enhance their prospects of meeting Medicare IPS per patient cost limits through a greater volume of patients. Finally, our results suggest that more competitive market environments spurred HHA supply responses, increasing the likelihood of service area expansion, contraction, and market exit.

Some of our multivariate analysis findings clarify the influence of certain agency characteristics. For example, past research has interpreted the much higher rates of market entry and exit among proprietary HHAs as evidence that they are more responsive to Medicare policy changes (Scalzi et al. 1994). In contrast to GAO's (1999) bivariate analysis findings, our multivariate results suggest that proprietary ownership only increased the risk of closure among facility-based agencies. The noted higher rate of market exit among proprietary HHAs after the IPS may be more attributable to the much greater tendency of proprietary agencies to be freestanding rather than facility-based, and the higher risk of closure among freestanding HHAs, than to differential supply response among proprietary HHAs. Our results suggest that nonproprietary freestanding HHAs are just as responsive to changes in Medicare policy as their freestanding proprietary counterparts.

Our empirical findings suggest that many of the same factors similarly influenced the risks of agency closure and service area contraction, lending support to our premise that service area contractions reflect partial market exits. Agencies at greater risk of closure and service area contraction tended to be smaller, freestanding agencies, with very few years of Medicare program tenure. Agencies with subunits or branches, those providing more visits per Medicare user relative to other agencies in their region, and those operating in market areas with more competitor agencies were also at greater risk of

closure or service area contraction. It is interesting that many of the factors that increased the likelihood of market exit and service area contraction did not decrease the likelihood of service area expansion. Similar to agencies that contracted their service areas, HHAs that expanded their service areas also tended to be smaller, freestanding, recently Medicare-certified HHAs operating in more competitive market areas with smaller Medicare market shares.

Given the significant overlap in agency and market area correlates of service area contraction and expansion, what factors distinguish these two subgroups of agencies exhibiting very different supply responses? A comparison of sample means for agency attributes suggests that they differed most on three agency attributes. Relative to agencies that contracted their service areas, HHAs that expanded their geographic service areas on average, were much smaller (181 versus 335 Medicare users per year in 1996), had fewer years of Medicare certification (4.4 versus 7.4 years), and most importantly, had much lower per-beneficiary visit rates in 1996 relative to other agencies in their region. Whereas 1996 Medicare visit rates of HHAs that contracted their service area on average exceeded their "visit per-beneficiary limit" by 17.5 visits per beneficiary, HHAs that expanded their service areas exceed their visit limit by only 5.8 visits per beneficiary. Considering that HHAs that did not change their service areas exceeded their visit limit by an average of 2.1 visits per beneficiary, HHAs that expanded their services were probably less constrained by IPS per-beneficiary cost limits, which may have afforded them more options to adapt to the new payment system. Also, the advantage noted for HHAs that provided fewer visits per beneficiary in 1996, gives some credence to the widespread belief regarding overutilization in the HHA industry that precipitated the BBA.

The similar market area correlates of service area expansion and contraction also hint that the geographic distributions of these HHAs may substantially overlap. It is possible that many of the HHAs that expanded their service area were opportunistic, and did so in places previously served by HHAs that contracted supply. To the extent that this sort of supply expansion was prevalent it may partially explain why researchers have not found much greater declines in Medicare HHC utilizations rates in areas with high prevalence rates of agency closures.

While our empirical analysis of agency-level supply changes after the IPS has imparted some new empirical insights about HHA market behaviors, the insights that can be gained solely from secondary administrative and claims data are limited. Furthermore, we were unable to model the

potentially complex competitive reactions of individual agencies to the supply changes of nearby competitors. Organizational theorists have long advanced typologies of strategies that firms pursue in adapting to significant changes in their market environments (Porter 1980). Application of organization theory to HHAs may further increase our understanding of agency market behavior and responses to major Medicare policy changes (Westbrook 1997).

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NOTE

1. However, this may not be a serious limitation. Nearly all agencies (93 percent) reduced visits per beneficiary between 1996 and 1999 regardless of whether they contracted, expanded, or maintained a stable geographic service area. Few of the contracting HHAs (<2 percent) increased beneficiaries served, and few of the expanding HHAs (7 percent) decreased beneficiaries served. There was greater heterogeneity among HHAs with stable service areas. However, the percentage change in beneficiaries served among HHAs with stable service areas was generally much smaller than for expanding or contracting HHAs. Less than 7 percent of HHAs with stable service area decreased or increased beneficiaries served (in percentage terms) by more than the respective median values among contracting and expanding HHAs.

REFERENCES

Bishop, C. E., J. Kerwin, and S. Wallack. 1999. "The Medicare Home Health Benefit: Implications of Recent Payment Changes." *Care Management Journals* 1 (3): 1–7.

Garnick, D., H. Luft, J. Robinson, and J. Tetreault. 1987. "Appropriate Measures of Hospital Service Areas." *Health Services Research* 22: 69–89.

General Accounting Office (GAO). 1998. *Medicare Home Health Benefit: Impact of the Interim Payment System and Agency Closures of Access to Services (HEHS-98-238).* Washington, DC: General Accounting Office.

———. 1999. *Medicare Home Health Agencies: Closures Continue, with Little Evidence Beneficiary Access Is Impaired (HEHS-99-120).* Washington, DC: General Accounting Office.

———. 2000. *Medicare Home Health Care: Prospective Payment System Could Reverse Recent Declines in Spending (HEHS-00-176).* Washington, DC: General Accounting Office.

Goldberg, H., and R. Schmitz. 1994. "Contemplating Home Health PPS: Current Patters of Medicare Service Use." *Health Care Financing Review* 16 (1): 109–30.

Hahn, A. 1998. "Payment Reform Will Shift Home Health Agency Valuation Parameters." *Healthcare Financial Management* 52 (12): 31–4.

Komisar, H. 2002. "Rolling Back Medicare Home Health." *Health Care Financing Review* 24 (2): 33–55.

Lewin Group. 1998. *Implications of the Medicare Home Health Interim Payment System of the 1997 Balanced Budget Act.* Washington, DC: National Association for Home Care.

Liu, K., S. Long, and Dowling. 2003. "Medicare Interim Payment System's Impact on Medicare Home Health Utilization." *Health Care Financing Review* 25 (1): 81–97.

Makuc, D., B. Haglund, D. Ingram, J. Kleinman, and J. Feldman. 1991. *Health Service Areas for the United States, Series 2: No.112. Vital and Health Statistics.* Available at www.cdc.gov/nchs/howto/sitepubs.htm

McCall, N., H. L. Komisar, and A. Petersons. 2001. "Medicare Home Health before and after the BBA." *Health Affairs* 20 (3): 189–98.

McCall, N., A. Petersons, S. Moore, and J. Korb. 2003. "Utilization of Home Health Services before and after the Balanced Budget Act of 1997: What Were the Initial Effects." *Health Services Research* 38 (1, part I): 85–106.

Medicare Payment Advisory Commission. 2000. *Report to the Congress: Medicare Payment Policy.*

National Health Policy Forum. 1999. *Access to Home Services under Medicares's Interim Payment System.* Issue Brief no. 774. Washington, DC: The George Washington University.

Office of Inspector General (OIG). 2000. "Medicare Beneficiary Access to Home Health Agencies: 2000 (OEI-02-00-00320)." U.S. Department of Health and Human Services, Online. Available at http://www.dhhs.gov/progorg/oei

Porter, M. 1980. *Competitive Strategy.* New York: The Free Press.

Scalzi, C., J. Zinn, M. Guilfoyle, and S. Perdue. 1994. "Medicare-Certified Home Health Services: National and Regional Supply in the 1980s." *American Journal of Public Health* 84 (10): 1646–8.

Slifkin, R., T. Ricketts, and H. Howard. 1996. "Potential Effects of Managed Competition in Rural Areas." *Health Care Financing Review* 17 (4): 143–56.

Stigler, G. J., and R. A. Sherwin. 1985. "The Extent of Market." *Journal of Law and Economics* 28: 555–85.

Sohn, M. 2002. "A Relational Aapproach to Measuring Competition among Hospitals." *Health Services Research* 37 (2): 457–82.

Westbrook, K. 1997. "Assessing the Strategy-Performance Paradigm: Implications for Organizational Adaption in Discontinuous Environments for Home Health Care Providers." *Health Marketing Quarterly* 14 (4): 27–44.

SUPPLEMENTARY MATERIAL

The following supplementary material for this article is available online:

APPENDIX. Classifying HHA Service Area Changes.