Local Markets and Systems: Hospital Consolidations in Metropolitan Areas

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Objective. This study examines the formation of local hospital systems (LHSs) in urban markets by the end of 1992. We argue that a primary reason why hospitals join LHSs is to achieve improved positions of market power relative to threatening rivals.
Data Sources/Data Collection. The study draws from a unique database of LHSs located in and around metropolitan statistical areas (MSAs). Data were obtained from the 1991 AHA Annual Hospital Survey, updated to the year 1992 using information obtained from multiple sources (telephone contacts of systems, systems lists of hospitals, published changes in ownership, etc.). Other measures were obtained from a variety of sources, principally the 1989 Area Resources File.
Study Design. The study presents cross-sectional analyses of rival threats and other factors bearing on LHS formation. Three characteristics of LHS formation are examined: LHS penetration of urban areas, LHS size, and number of LHS members located just outside the urban boundaries. LHS penetration is analyzed across urban markets, and LHS size and rural partners are examined across the LHSs.
Principal Findings. Major hypothesized findings are: (1) with the exception of the number of rural partners, all dependent variables are positively associated with the number of hospitals in the markets; the rural partner measure is negatively associated with the number of hospitals; (2) the number of doctors per capita is positively associated with all but the rural penetration measure; and (3) the percentage of the population in HMOs is positively associated with local cluster penetration and negatively associated with rural system partners. Other findings: (1) average income in the markets is negatively associated with all but the rural penetration measure; (2) LHS size and rural partners are both positively associated with nonprofit system ownership; and (3) they are also both negatively associated with the degree to which their multihospital systems are geographically concentrated in a single state.
Conclusions. The findings generally support the argument that LHS formation is the product of hospital providers attempting to improve positions of power in their local markets.

Key Words. Local hospital systems (LHSs), local markets, market consolidation, health care reform

Until recently, the hospital industry had been undergoing a gradual transformation, evolving from essentially fragmented to increasingly consolidated market structures, especially in urban areas. In the early 1990s, however, the pace of local system formation quickened as many hospitals and other providers entered into or explored consolidations and other interorganizational relationships as strategies for improving competitive positions in an era of reform and rising managed competition. Even the American Hospital Association adopted a major change in policy, recommending that so-called community care networks (CCNs) or locally integrated health care systems be the centerpiece of health care reform (AHA 1992).

Clearly, the hospital industry has moved into a vastly different economic climate than was present through the beginning of the current decade. Thus, if we are to understand the consolidation patterns of the recent past and of the present, it is essential that analyses take full consideration of the discontinuities that occurred in the early years of the 1990s. In order to provide a baseline against which subsequent consolidation patterns might be assessed, this study examines local hospital systems (LHSs) that were in place as of 1992 (an LHS is defined to exist if two or more hospitals in the same system are located in the same urban area or within 60 miles of the largest urban member). It does so by assessing cross-sectionally within 1992 the determinants of LHS formation, with emphasis on the following attributes of local systems: (1) LHS penetration of urban areas; (2) LHS size (number of hospitals per system); and (3) the numbers of LHS members located just outside the urban boundaries, in nearby rural areas.

It is recognized that much local system formation has occurred over an extended period of time (Luke, Ozcan, and Begun 1990). Indeed, some local clusters, especially some that are church affiliated, trace their roots to the early quarter of the century. On the other hand, considerable system growth took place within the past two decades, driven by market, payment, and other forces. For example, the percentage of urban acute care general hospitals that were members of urban clusters (i.e., multihospital system hospitals having one or more system partners in the same metropolitan area) grew from 19

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to 28 percent from 1982 to 1989 (Olden 1994). And many hospitals became members of local clusters throughout the 1970s, along with the growth in multihospital systems. Thus, while not all of the variation in local system formation may be attributable to factors that vary cross-sectionally within a contemporary time frame, a substantial proportion of system growth has occurred in recent periods and can be subjected to cross-sectional analysis.

FRAMEWORK

While the literature on multihospital systems is extensive (e.g., see Shortell 1988; Gray 1986), little scholarly attention has been devoted to the local combinations themselves (for some exceptions, see Luft, Robinson, Garnick, et. al 1986; Luke 1991; Luke 1992; Luke and Begun 1988; Luke, Ozcan, and Begun 1990; Shortell, Gillies, Anderson, et al. 1993; Starkweather 1981; Starkweather and Carmen 1988). This is significant, given the contributions such study could make to the field of practice, policy development, and expanding theory.

The consolidation of hospitals into local systems is especially noteworthy considering the traditional expectations for personal and organizational autonomy that exist among health care providers. There are a number of reasons why hospitals might be willing to compromise autonomies and form into local systems (e.g., see Luke 1991; Shortell 1988; Starkweather 1981; Starkweather and Carmen 1988), although most reduce to the following: to improve efficiencies or to increase market power (Ulrich and Barney 1984), or both. With regard to achieving efficiencies, two explanatory frameworks appear most applicable to local systems. The first is that hospitals combine to capture economies attributable to scale or, more accurately, the operation of multiple facilities. Scherer and Ross (1990) note that the advantages of "multiplant operation" are found in production, distribution, shared management structures, risk spreading/financing, and other areas (pp. 120–125). Not all such advantages, however, are of equal importance for geographically concentrated as opposed to more general multihospital arrangements. For example, economies in sharing management support systems are achievable regardless of whether or not the combinations are geographically concentrated. On the other hand, local systems offer significant opportunities for improving the efficiencies of production; for example, the clustering of hospitals makes it possible to achieve efficiencies by converting individual facilities from general to specialized care or merely by eliminating excess

capacities. Indeed, these advantages are effectively not available to the more geographically dispersed organizational forms.

A second argument on the efficiency side stems from the transaction cost perspective, generally credited to Williamson (1979) and Ouchi (1980). Applying this perspective to the formation of local systems, hospitals would create formal multiorganizational structures in order to make more efficient diverse exchange relationships complicated by increasingly turbulent external environments. Actually, this perspective might better explain vertical relationships (e.g., between hospitals and insurance companies) than horizontal combinations (hospital to hospital) per se. It is along the vertical chain that hospitals engage in the greatest volume of interorganizational exchange, at least in terms of clinical interdependencies.

The second general reason why hospitals might form into local systems is to improve positions of market and organizational power relative to rivals. That increased scale could offset the power of rivals and other economic actors within markets has long been recognized by economists and organization theorists alike (for an application to health care, see Starkweather and Carmen 1988). Several decades ago, Galbraith suggested that markets could be made more efficient if firms built positions of "countervailing power" to offset high levels of either or both buyer and seller market power (1952). Importantly, the pursuit and exercise of market power by rivals is characteristic of an oligopolistic market structure. Oligopoly markets are characterized by a high degree of recognized interdependence among competitors (Bain 1956), that often leads rivals to pursue strategies of power building to overcome the threats of competitors. (A market is said to be oligopolistic if " . . . the sellers are sufficiently few in number to have each believe (a) that its economic fortunes are perceptibly influenced by the market actions of other individual firms, and (b) that those firms are in turn affected significantly by its own actions . . . ." [Scherer and Ross 1990, p. 17].)

The assumption of an oligopolistic structure in urban hospital markets is supported by direct and indirect evidence. For example, the limited number of hospitals found in most small to medium-sized urban markets (which constitute the vast majority of metropolitan areas) suggests that they are oligopolistic. Over 85 percent of MSAs in the United States fall in the less-than-1,000,000 population range, and the average number of hospitals in those MSAs is 5.3. Note that even in the upper spectrum of that range, say, in cities with populations ranging from 500,000 to less than 1,000,000, the average number of hospitals per market is only 10.7. Further, factoring in local hospital consolidations and network formations, the number of competitors becomes fewer still.

Within the organization sciences, the role of power in motivating interorganizational combinations is perhaps best developed in the resource dependency perspective (Pfeffer and Salancik 1978). Its basic premise is that organizations will attempt to restructure their positions of power (vis a vis other organizations on which they are dependent) by expanding vertically, horizontally, and/or through diversification. Vertical integrations, for instance, might be used to control "symbiotic" interdependencies that are prevalent in buyer-seller relationships; horizontal combinations, to reduce "competitive" interdependencies or threats among rivals; and diversifications, to reduce the relative magnitude of dependencies.

In view of the intensification of market and payment threats in the decades prior to the 1990s, we suggest that hospitals tended to join local systems primarily to improve positions of power (market and interorganizational) relative to rivals. Certainly, many would have taken into consideration the need to improve efficiencies when exploring strategic responses to market forces. And even if efficiencies ranked high as a rationale for consolidation, as discussed earlier, they would not necessarily have led hospitals to adopt the local system form. Many other options were available for achieving improved efficiencies (e.g., joining a large and geographically dispersed multihospital system, implementing enhanced utilization controls, supporting management innovations such as continuous quality improvement, and investing in improved information systems), most of which may have been considerably less disruptive to management and medical staffs, or less threatening to individual and organizational autonomies. On the other hand, the local system option represented a direct and effective approach to building positions of power relative to local rivals.

It is argued, therefore, that hospitals engaged in local system formation primarily to enhance positions of power relative to competitors. Building on this, a general hypothesis is offered: that LHS formation will be found to be greater in markets where the threat from rival organizations (the power argument) is greater. This is tested using indicators of rival threat that stem from both vertical (physicians and HMOs) and horizontal (hospitals) sources. Also, selected control variables are included to capture other influences that might affect LHS formation in local markets.

VARIABLE SELECTION AND HYPOTHESES

As explained earlier, local market restructuring is represented by three dependent variables: (1) LHS penetration of urban areas, (2) LHS size, and (3) the

numbers of LHS members that are located just outside the urban boundaries, in nearby rural areas. LHS penetration is measured in two ways: as the percentage of urban hospitals that are in LHSs and, using a somewhat more conservative measure, as the percentage that are in local clusters (LCs). Recall that the LHS measure counts urban hospitals as being hospitals within systems even when there may be only one urban member, if that member has at least one nonurban partner within a 60-mile radius. The LC alternative defines a local system to exist only where two or more hospitals in the same system are located in the same MSA. The dependent variables and their measurements are listed in Table 1.

Also, Table 1 summarizes the independent variables included in the analyses. As can be seen, two types are used: (1) rival threat and (2) control variables–regulation, demography, and system characteristics. The hypothesized relationships between the indicators of rival threat and the dependent variables are presented in Table 2; their rationale is now discussed.

Rival Threat. Of the five variables representing rival threat, the number of local competitors should be especially important, for several reasons. First, the level of rivalry has increased in recent decades. Second, the number of competitors is a direct indicator of rivalry. In bounded, urban markets, rivalry becomes a zero-sum game: gains by one competitor become losses to another. It is expected that competitor threat rises with the numbers of competitors and, therefore, that hospitals facing greater numbers of competitors will tend to seek improved market positions through LHS formation. LHS formation, for example, can provide considerable market gains over what might be possible for freestanding hospitals. Many of the LHSs, especially those in which three or more hospitals are combined, are able to increase considerably their collective market shares over what the largest hospital in the cluster might enjoy were it to stand alone.

Third, participation in LHSs should be easier when compatible partners, that is, hospitals that share similar value, religious, or service orientations, are numerous (Luke 1991). Obviously, the more hospitals in an area, the greater the chances of finding compatible partners–put simply, hospitals located in the larger urban areas have available to them more degrees of freedom in choosing partners. This argument reinforces the expectation of a positive relationship between the number of competitors and hospital participation in LHSs. Note that the degrees of freedom argument accounts for the only reversal in hypothesized sign across the dependent variables, as indicated in Table 2: the number of rural partners is expected to be inversely rather than positively related to the number of competitors in a market. It

Table 1: Measurement of Variables, Means, and Standard Deviations

Variables	*Measures*	*Mean*	*s.d.*
Dependent			
LHS penetration	Percent of urban hospitals that are in LHSs	0.25	0.27
LC penetration	Percent of urban hospitals that are in LCs	0.20	0.26
LHS size	Log number of hospitals in LHS	2.75	1.23
Rural LHS hospitals	Number of rural hospitals in the LHS	0.52	0.88
Independent			
Rival Threat			
Number of competitors	Log number of hospitals	1.66	0.94
Number of competitors per capita	Log number of hospitals per capita	−4.10	0.41
Percent in HMOs	Percent of population in HMOs	0.12	0.11
Percent teaching	Percent of MSA hospitals that are teaching	0.06	0.12
Doctors per capita	Log number of licensed doctors per capita	0.60	0.42
Regulation (Control)			
CON stringency	Sum of stringency scores	7.68	3.63
Payment stringency	Categorical stringency scores, 1–3	1 = 0.53 2 = 0.32 3 = 0.15	
Demographic (Control)			
Average income/1000	Average income divided by 1000	1.44	0.28
Percent minority	Percent of population that are minority	0.14	0.10
Percent aged	Percent of population that are aged	0.11	0.03
System Characteristics (Control)			
MHS ownership	Categorical: 1 = nonprofit, 2 = investor-owned, 3 = Catholic	1 = 0.44 2 = 0.34 3 = 0.22	
MHS geographic concentration	Largest percent of MHS hospitals in any single state	0.63	0.35
LHS parent size	Number of beds in largest hospital in LHS	376.61	257.19

Note: LHS = local hospital system, LC = local cluster, HMO = health maintenance organization, CON = certificate of need, MHS = multihospital system.

is in the smaller markets–those in which fewer compatible partners are, in general, available–that urban hospitals are most likely to look beyond urban boundaries to find partners.

In addition to the number of hospitals, a measure of the density of hospitals in each market has been added–the number of competitors per capita. (Note that the correlation between the number of competitors and the number per capita is very low, $r = .07$.) Assuming that greater density implies greater competitiveness, both the number of hospitals and the number

Table 2: Hypothesized Relationships by Variable

	Dependent Variables		
Independent Variables	*LHS or LC Penetration*	*LHS Size*	*Rural LHS Hospitals*
Rival Threat			
Number of competitors	+	+	−
Number of competitors per capita	+	+	+
Doctors per capita	−	−	−
Percent in HMOs	+	+	+
Percent teaching	−	−	−

Note: See Table 1 note for identification of abbreviations.

per capita are hypothesized to be positively associated with local system formation.

An alternative to using either the number of competitors or the number per capita as indicators of competitiveness would be to use measures of market concentration, for example, the Herfindahl index, which is defined as the sum of squared market shares across all firms in a market (Scherer and Ross 1990, p. 72). By summing the squared shares, the Herfindahl captures not only the variance in the number of firms, but their share distributions (higher variances in size produce larger index scores). This and other similar indexes, however, are particularly problematic when applied to local markets. Since urban areas vary dramatically by the overall number of hospitals, and since much of this variance is driven by population statistics, the concentration indexes tend to reflect market size more than firm concentration within the market. Indeed, the correlation between the Herfindahl itself and the log-adjusted MSA population is −.71, indicating that as MSAs get larger the Herfindahl declines, regardless of the level of consolidation that may have taken place. Additionally, since the penetration measures, percent LHS and percent LC, are themselves indicators of consolidation, a tautology would be created were concentration measures used on both sides of the equation. For these reasons, it was decided to use the count of hospitals (more specifically, the log values of the count, correcting for skewed distributions in this variable) rather than the Herfindahl. Also, the measure for number of hospitals is not tautologically related to the penetration measures.

Two variables capture possible threats along the vertical chain: the number of doctors per capita and the percentage of the population enrolled in HMOs. There are several reasons why differences across markets in levels of physician capacity might be related to patterns of local system formation. If

physicians were assumed to be agents for generating hospital demand, relative surfeits of physicians would enable hospitals to be somewhat less focused on the control of physician flows, referrals, and the like, and therefore less in need of strengthened interorganizational structures to help assure patient demand. On the other hand, were they seen as substitutes for hospital care, greater numbers of physicians could have the reverse effect. More physicians would mean greater uncertainty and threat and thus a greater need for local system building. It is argued that the former explanation is the more probable. Over the years, hospitals have invested considerable effort in maintaining loyal medical staffs, an effort that has continued, possibly with even greater intensity as a response to the rising environmental turbulence of recent decades. It is therefore hypothesized that the relationship between number of physicians per capita and system formation will be negative.

With increases in the power of managed care systems (Interstudy 1994), hospitals can be expected to turn to local systems as vehicles for restructuring relative power positions. HMOs threaten reductions in overall hospital use and are likely to engage in selective contracting. It is hypothesized, therefore, that local system formation will be positively related to the percentage of the population enrolled in HMOs.

Finally, the percentage of teaching hospitals in urban areas is expected to affect local system formation. The presence of a major teaching institution could play an important role in either driving or inhibiting system formation. Evidence suggests that many local systems are initiated by large community hospitals as they integrate with smaller, feeder hospitals and other health care organizations for the purpose of building regional systems (e.g., see Luke and Begun 1988; Luke, Ozcan, and Begun 1990). The presence of major teaching hospitals could induce large community hospitals to engage in consolidation activities in order to draw away the flow of referrals that might otherwise go to the often less strategically oriented teaching hospitals. Alternatively, the presence of teaching centers and their high dependence on established referral relationships could inhibit smaller, perhaps less powerful hospitals from aggressively building market shares through acquisitions and other forms of local hospital consolidation. While it is unclear whether teaching facilities will have a positive or negative effect, given the relatively strong market positions many of them have in their particular markets, it is hypothesized that the relationship will be negative.

Control Variables. Three types of control variables are included in the analyses in order to adjust for the influence of other factors on LHS formation:

regulation, demography, and system characteristics. Possible effects these might have on LHS formation are explored briefly.

Markets located in states where regulatory controls (e.g., certificate of need and rate review) are aggressively applied can be expected to experience lower levels of LHS formation, given the dampening effect that regulation may have on competition. Alternatively, to the degree that regulation heightens uncertainties in local markets, it can be positively related to LHS formation. Certificate-of-need regulation, by constraining bed expansions, could stimulate hospitals to pursue share increases by other means, including participation in LHSs. Demographic factors (e.g., income, population age, presence of minority populations, etc.) could also affect patterns of LHS formation, especially to the degree that they represent variances in resource availability in the markets. For example, greater proportions of older people in local populations could represent lesser levels of reimbursements due to well-known Medicare underpayments (Altman 1993).

The penetration measures, as they represent differences in the degree to which multihospital (MHS) versus nonsystem hospitals are located in given markets, could be tautologically related to any system characteristics that might be used as control variables. Thus, system characteristic measures are not included in the analyses of LHS penetration itself, but are used to analyze the other two dependent variables–size of LHS and number of rural LHS hospitals–which assess differences across systems rather than between system and nonsystem hospitals. In their study of small MHSs, Luke and Begun observed that nonprofit systems were significantly more likely to have pursued geographically concentrated system-building strategies (1988) than were Catholic or investor-owned systems. Regardless of ownership type, it is expected that MHSs concentrated within single states may, because of their relatively greater geographic focus, tend both to be larger and to have more partners in the nearby rural areas. Thus, an indicator of overall system concentration of facilities within a single state is included as a control variable. Finally, the role of large hospitals in the evolution of LHSs is examined. It has been suggested that larger system hospitals, especially those that range above the 300-bed mark, may play important roles in initiating additional system development (Luke 1992). Larger hospitals, because of their tertiary functions and relatively high interdependencies with other hospitals in their areas as well as their relative size in the local markets, often have the capacity to structure vertical relationships and thereby to take advantage of possible symbiotic interdependencies with other, smaller hospitals in both their urban and nearby rural environments.

Some caution needs to be taken in interpreting the results for the system characteristics variables. As is the case with many such factors, these are often highly correlated with ownership itself. The association between ownership and geographic concentration is $r = .51$ and between ownership and parent bed, $r = .44$. Nonprofit MHSs in general are more concentrated and have larger hospitals than is the case for the other MHS types.

METHODS

Data. The study data were drawn from two main sources: the 1991 American Hospital Association annual survey and the 1989 version of the Area Resources File. Effectively, when the modifications discussed further on are considered, the LHS and LC populations represent the year 1992. All federal, all non-acute care, and all non-general hospitals were eliminated from the data, producing a total of 5,374 hospitals within which the LHSs and LCs were identified.

To enhance the accuracy of hospital assignments to systems, hospital memberships were obtained directly from many MHS companies to correct possible errors and changes in the data. Further, many corrections and changes in ownership have been added over the past two years based on information from a variety of published materials, phone calls, and other sources. In addition, the data were supplemented by including as systems other hospital combinations not officially listed as such in the AHA data. These were uncovered by searching the *AHA Guide* for listings that combined two or more hospitals as if they were one. These hospitals were contacted by phone to clarify types and locations of combined hospitals. Some were not considered as multiples if their hospitals were located on the same campus or were physically connected by walkways or in other ways.

The AHA multihospital data include contract management firms as well as managed hospitals. It could reasonably be argued that contract management firms are not per se multihospital systems or that hospitals managed under contract are not members of the systems managing them. On the other hand, many contract managing firms fit their managed hospitals into their strategic plans, almost as if they were owned. This is especially true of the systems that combine owned and contract-managed hospitals in the same local markets. Also, many contract management relationships do, over time, evolve into owned or at least more formal arrangements. For these reasons it was decided to retain contract management firms and managed hospitals in the database.

Nonurban LHS hospitals were identified by scanning in a 60-mile radius around the largest urban system member. Straight-line distances between hospitals were computed using as each hospital's location the latitude and longitude for the center point of its zip code. (For an elaboration of the methods for geographic search, see Luke 1992.)

Two units of analysis are used in this study: the 321 MSAs located in the 50 states for the penetration analyses and the 421 LHSs for the analyses of LHS size and rural penetration. In the analysis of LCs, MSAs with only one hospital were dropped–urban clustering is not possible in markets that have but one hospital–thus eliminating 19 MSAs, bringing to 302 the number of MSAs in the LC analysis. Note that an LHS could form in one-hospital markets if the one hospital were to link up with a nearby rural partner. Thus, all MSAs were included in the analysis of LHSs.

The focus on urban areas reflects an assumption that the boundaries of hospital markets correspond primarily to those of the metropolitan areas. The limitations of this assumption are recognized (Morrisey, Sloan, and Valvona 1989). Clearly, for some hospitals market boundaries extend well beyond urban borders. Also, urban markets do vary in their proximities one to another and thus in the degree of inter-MSA competition. Many natural and manmade boundaries also divide given urban markets into often distinctive segments. The market boundaries of individual hospitals also vary greatly depending on the characteristics of the markets, hospitals, and services offered. Nevertheless, we argue that the vast majority of major rivals with which most urban hospitals compete are located within the boundaries of their own urban areas, which supports the use of the MSA to define local markets.

Measures: Dependent Variables. As summarized in Table 1, LHS penetration is measured as the percentage of local hospitals that are members of local systems. LC penetration is measured similarly, except that an LC exists only where at least two urban members of the same MHS are in an MSA. The size of the LHSs is measured by the log number of hospitals in the LHSs, including both rural and urban members. Thus, an LHS that has one urban and five rural members would have a size of six. The number of rural hospitals per LHS is measured by a simple count of rural partners.

Measures: Independent Variables. Table 1 also summarizes ways in which the independent variables are measured. Beginning with the rival threat variables, the number of competitors is measured using the log of the number of hospitals in each MSA. The number of hospitals per capita is measured by the log of the number of hospitals divided by the MSA population ($\times$ 1,000). The logs adjust for skewed distributions on these measures. The percentage of

patients in HMOs is calculated using 1989 HMO enrollments obtained from the University of Minnesota (see Christianson et al. 1991). They provided percentages for just over two-thirds of the 321 MSAs. For the remainder (which included mostly smaller MSAs), 1989 state averages were used, the data for which were obtained from the Group Health Association of America. (To test for the possibility that the state averages might understate urban penetration and thus bias the results, all of the regressions were rerun excluding those MSAs for which the estimates were used. This produced only very slight changes in the estimated coefficients for the HMO variable, as would occur merely for having reduced the number of observations in the regressions.) Percent teaching is measured as the percentage of MSA hospitals that are affiliated with the Council of Teaching Hospitals (COTH); and doctors per capita is measured by the log of the number of doctors divided by the MSA population. The teaching hospital measure was obtained from the AHA data, and the doctors per capita measure was from the Area Resources File.

Two regulation measures are used in the analyses, both of which were obtained from the Center for Health Services and Policy Research at Northwestern University. The certificate-of-need indicator is a summary based on degrees of stringency, using the following indicators: 1986 CON review threshold levels for capital expenditures, major medical equipment and new institutional services that are regulated, 1984 data on state planning agency budgets per nonfederal hospital, and the percentage of hospital application approvals in 1984. States that had no CON program received values of zero. Total stringency scores ranged from 0 to 15 (the average across the 50 states was 8.1). The second indicator, payment stringency, is based on the status of hospital reimbursement legislation in effect in each state by the end of 1985. States that had Medicare PPS waivers or mandatory, all-payer prospective rate setting determined by a state agency were given scores of two ($n = 7$); those that had any state-legislated rate of increase controls, mandatory budget reviews, or negotiated ceilings encompassing Blue Cross, self-pay, and commercial payers in place by the end of 1985 received scores of one ($n = 10$); and those that had no legislated state hospital rate regulation for payers other than Medicaid received a score of zero ($n = 34$). The stringency of regulation enters as a categorical variable, with the highest score of the three serving as the reference group in the analyses.

Three demographic variables are used, each calculated as a percentage of total MSA population. The numerators included, respectively, total income, number of minorities, and number of persons over age 65. Data for these were obtained from the Area Resources File.

Three system characteristic variables are included in the analyses. For the first, system ownership, nominal scores are given for three types–nonprofit, investor-owned, and Catholic–as indicated in the AHA data for the MHSs themselves. Catholic serves as the reference group in the analyses. MHS geographic concentration is measured using the maximum single-state percentage across all states in which an MHS has hospitals. Parent size is measured by the number of licensed beds in the largest urban hospital that is a member of an LHS.

It should be noted that per capita adjustments carry the assumption that measures of MSA populations capture relative levels of demand. Of course, many markets serve populations that live outside the MSA boundaries (especially those that are teaching hospitals) or, alternatively, lose demand to other population centers. Adjustments using MSA populations should be seen as a limited method for capturing relative levels of patient demand.

RESULTS

Ordinary least squares is used to examine the relationships among variables. Before conducting the full analyses, the possibility that some of the independent variables might not be linearly related to the indicators of local system formation was examined. This was a concern especially for the penetration analyses, given the possibility that rival threat might rise at a diminishing rate with increases in the number of competitors, doctors, and so forth. This was thus examined by regressing the dependent variables individually on each indicator of rival threat, where each was expressed alternatively in linear and polynomial forms. Only for one of the independent variables–the number of competitors per capita–were the coefficients using the polynomial form found to be highly significant (at the $p < .001$ level) and not significant using the linear form. This was true only in the analyses of the penetration measures. The linear forms fit better in all of the other partial analyses. Thus, the number of competitors per capita is expressed as a polynomial (i.e., using both the absolute and the squared values) in the regressions involving the penetration measures.

Table 3 reports the full regression results. With regard to the penetration regressions, the relationships with the log number of hospitals are positive, very significant ($p < .001$ level) and in the direction hypothesized. The coefficients for the log number of hospitals per capita (expressed as polynomials) are negative and significant ($p < .01$ level), but the reverse of what was expected.

The log number of doctors per capita is positive and significant in the LHS penetration analysis and the percent HMO is positive and significant in the LC analysis. The positive sign on the doctors coefficient is the reverse of what had been hypothesized, while the positive sign for percent HMO is as hypothesized. The only other significant finding is for average income, the signs for which are negative. Notably, the other two demographic variables, percent minority or percent aged, were not significant in either analysis nor were the regulation variables. In general, it appears, as expected, that rival threat is a strong contributor to variations in local system penetration, although several of the significant signs were opposite of those hypothesized.

Table 3 also provides the results for the analyses of the LHSs themselves. As can be seen, four of the five rival threat variables appear related to the size of LHSs, percent in HMOs being the only one not significant. The significant positive sign for the log doctors per capita, while the reverse of what was hypothesized, is nevertheless consistent with the finding of a positive association in the LHS penetration analysis. The significant negative sign found for the percent teaching hospitals measure is in the direction hypothesized.

With regard to the control variables, system characteristics are among the most important. Of these, the size of the parent or largest hospital in the LHS has the most significant coefficient. The positive sign suggests that larger hospitals may play critical roles in stimulating growth in local systems. And it is also compatible with the significant positive sign found for nonprofit multihospital systems, since nonprofit MHSs tend to have larger urban hospitals overall. While significant only at the $p < .10$ level, the negative sign for the MHS geographic concentration measure is not consistent with these findings. The negative sign suggests that MHSs that are more geographically concentrated at the state level may tend to be less expansive at the local market level. As was the case in the penetration analyses, the sign for average income is significant and negative.

Both system and rival threat factors also appear to be the most important in explaining the penetration of urban-centered systems into nearby rural areas. Again, the log number of competitors is very significant, though negative as hypothesized. Also, as observed in the other analyses, the log number of doctors per capita is positively related to the number of rural partners in LHSs. Contrary to what was found in the LC penetration analysis, the percent in HMOs variable is negatively associated with the number of rural hospitals in LHSs. Interestingly, the number of rural partners is also negatively related to MHS geographic concentration. This can be attributed less to local strategic considerations than to a tendency on the part of the more expansive MHSs

Table 3: LHS and LC Penetration, LHS Size and Rural Outreach Regressed on Independent Variables

Variable Name	*LHS Penetration*†	*LC Penetration*†	*LHS Size Rural*†	*LHS Hospitals*†
	(Unit of analysis: MSAs; N = 321 for LHS and 302 for LC)		*(Unit of analysis: LHSs; N = 421)*	
Rival Threat				
Log number of competitors	0.0717****	0.0888****	0.1597**	−0.2540****
	(.0193)	(.0196)	(.0740)	(.0490)
Log number of competitors per capita	−1.3863***	−1.3928***	−0.4232*	0.0119
	(.4985)	(.5108)	(.2472)	(.1637)
Log number of competitors per capita squared	−0.1652***	−0.1607***	–	–
	(.0601)	(.0623)		
Log doctors per capita	0.1055**	0.0447	0.4221**	0.3627**
	(.0489)	(.0470)	(.2431)	(.1610)
Percent in HMOs	0.0021	0.0035**	0.0124	−0.0101**
	(.0015)	(.0016)	(.0078)	(.0052)
Percent teaching	−0.2005	−0.0353	−1.6132**	0.0506
	(.1700)	(.1624)	(.7689)	(.5092)
Regulation				
Certificate-of-need stringency	−0.0041	−0.0022	0.0136	0.0216*
	(.0045)	(.0044)	(.0189)	(.0125)
Payment stringency 1. low	0.0196	0.0542	−0.1518	−0.1579*
	(.0366)	(.0351)	(.1428)	(.0945)
2. medium	−0.0187	−0.0119	−0.1546	−0.2066
	(.0516)	(.0503)	(.2196)	(.1447)
Demographic				
Average income/1000	−0.0182***	−0.0178***	−0.0735**	−0.0325
	(.0070)	(.0069)	(.0306)	(.0203)
Percent minority	−0.0782	−0.0364	−0.1185	−0.2284
	(.1635)	(.1617)	(.7587)	(.5024)
Percent aged	0.4601	0.0016	−0.7825	−1.6339
	(.5427)	(.5323)	(2.279)	(1.509)
System Characteristics				
MHS ownership 1. nonprofit	–	–	0.2852**	0.1760**
			(.1202)	(.0796)
2. investor-owned	–	–	0.0511	−0.0266
			(.1295)	(.0858)
MHS geographic concentration	–	–	−0.4653*	−0.5187***
			(.2682)	(.1776)
LHS parent size	–	–	0.0012****	−0.0002
			(.0003)	(.0002)
Adjusted R^2:	0.1445	0.1815	0.1447	0.2587

Note: See Table 1 note for identification of abbreviations.

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

†Values in parentheses are standard errors of the estimates.

(i.e., those with less single state concentration) to acquire hospitals in rural markets, thereby creating, strictly by default, greater opportunities for rural hospitals to be paired up with adjacent urban counterparts. The finding of a significant positive sign for the nonprofit MHSs is consistent with what might be expected: more nonprofit prospects for partnering both within and outside urban areas. Finally, the findings hint at a regulatory effect, although the signs for both CON and payment stringency are significant at only the $p < .10$ level.

DISCUSSION

Perhaps the most important finding in this study is the effect that rival threat might have on the formation of local hospital systems. These results generally support the argument offered earlier that local system formation is the product of hospitals attempting to improve positions of market and interorganizational power locally. Among the market variables examined, the number of competitors was especially important. It was strongly and positively related, as hypothesized, to the two-system penetration measures and LHS size, and negatively related to LHS rural penetration. These findings should not be surprising given the significant differences that exist in the overall sizes of local markets, which differences are themselves related to a number of population-related factors that also vary across markets. The findings thus point out the need for market size, whether measured in terms of population or numbers of competitors, to be fully considered in research conducted at the local market level.

Of the remaining rival threat factors, the doctors per capita measure was found to be significant in three of the four analyses and was positive in all. The finding of positive signs, which was not consistent with what had been hypothesized, may suggest that greater numbers of physicians per capita could represent greater instability in physician markets and thus greater potential for physicians to compete directly with hospitals. This could stimulate hospitals, as a competitive response, to engage in local system formation. The important relationship between system formation and physician numbers needs more investigation, especially in view of current efforts to form integrated systems, acquire physician practices, and form physician/hospital organizations. It could be, for example, that the behavioral response comes from the physician, rather than hospital side. Physicians could behave differently depending on the relative numbers of competitors per capita, resulting in differing reactions to efforts on the part of hospitals to form into systems. The relative numbers

of physicians per capita could also be important in determining other dimensions of local system formation, including, in particular, the organizational structures created to sustain ever tightening relationships between hospitals and physicians. The results could, of course, simply be the product of measurement error, given the limitations of adjusting for MSA population.

An interesting pair of relationships was observed for the percent in HMO variable, which was found to be positively related to LC penetration and negatively related to the number of rural partners. This could suggest that the threat of HMOs is a particularly urban phenomenon, leading hospitals to seek power relationships only among urban counterparts and also, perhaps, to avoid rural involvements. The finding also could be related to market size–both HMO and LHS penetration are greater in the larger markets–and compatible with the positive and significant relationships observed between both percent in HMO and log number of urban hospitals, and LC penetration. It is also compatible with the negative and significant relationship observed between the number of rural partners in LHSs and the log number of competitors. In sum, these findings suggest that LHSs located in areas where there are relatively few potential urban partners are more likely to build local systems by joining up with nearby rural hospitals. This variable will certainly become increasingly important as reform and managed care continue to evolve.

A possible impact of teaching hospitals on the formation of local systems is observed in the significant negative relationship found between percent teaching and LHS size. As suggested earlier, teaching hospitals could, in effect, extract from the markets much of the referral flow, thus weakening somewhat the role local systems might play in structuring referral relationships. In a broader sense, this highlights the need to better understand production interdependencies, as well as the restructuring of relative power positions, in the formation of LHSs.

Among the control variables, average income was found to have a significant negative relationship to local system formation in three of the four analyses. This is consistent with a resource dependency explanation of organizational integration. It thereby implies that the more resources are threatened in the environment, as might be the case with further health care reform, the greater the likelihood that organizations dependent on those resources will combine forces both to reduce their dependencies and, generally, to survive.

The system characteristics measures were consistently significant in the analyses of LHS size and rural penetration. Relative to other MHS types, nonprofit MHSs were found both to have larger LHSs and to be more likely

to have linkages with hospitals located in nearby rural areas. As mentioned earlier, the negative signs found in the two analyses for the MHS geographic concentration measure are not consistent with this finding–the more geographically concentrated systems tend to be nonprofit. It is important also to note the relationship found between the size of the largest hospitals in the LHSs and the number of hospitals in the LHSs. The positive association suggests not only that these larger hospitals may play a major role in stimulating system formation and expansion but, by extension, that they also may be better able to evolve into comprehensive or regional, systems (Luke 1992). It is important that the implications local consolidations might have on the formation of such fully developed system forms be explored.

CONCLUSIONS

Clearly, the LHS approach to organizing health care delivery represents a major break with traditional forms of health care organization. This has long been an industry bent on preserving fragmented delivery, leading to the oft-heard characterization of health care as being delivered within a "nonsystem." Much attention has been devoted to the study of multihospital systems over the past decade or two. But while multihospital systems have produced important changes in our industry, the local systems may offer far more potential for restructuring how the various providers (physicians, hospitals, nursing homes, etc.) interact with each other. The physician community, in particular, is having to choose between alignment with or competition against the often highly powerful local hospital systems (often leading to the formation of larger and larger single- and multispecialty group practices). The same is also true for the other players, not the least of which are the insurance carriers, HMOs, and other types of managed care organizations. They will all be weighing how best to compete or work with the local hospital systems, especially those that will have achieved dominating positions in their local markets.

It is thus imperative that the many issues relating to the local hospital systems–ranging from questions on how they affect competition to what organizational forms they assume–be fully and urgently explored. There is a particular need to follow their evolution beyond the baseline years, to observe their patterns of development in the current and changing market environments. In addition, it is essential that researchers take proper care to conceptualize and typologize this new multiorganizational phenomenon, especially if they hope to isolate the underlying determinants of change and logics for interorganizational combination.

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