
Rural Hospital Networks: Implications for Rural Health Reform

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This article summarizes the perspectives gained in the course of evaluating a 4-year demonstration program that supported rural hospital networks as mechanisms for improving rural health care delivery. Findings include: (1) joining a network is a popular, low-cost strategic response for rural hospitals in an uncertain environment; (2) rural hospital network survival is enhanced by the mutual resource dependence of members and the presence of a formalized management structure; (3) rural hospitals join networks primarily to improve cost efficiency but, on average, hospitals do not appear to realize short-term economic benefit from network membership; and (4) some of the benefits of these networks may be realized outside of the communities in which rural hospitals are located.

INTRODUCTION

The recent health care reform debate has once again focused attention on the special issues surrounding the delivery of health services in rural areas. The ability of competitive models to address health care needs in much of rural America is a matter of debate (Fuchs, 1994). Even the strongest advocates of the marketplace suggest that "managed cooperation" among rural providers may be more appropriate in many instances (Buck, 1993). Reflecting this view, some proposals for health care

reform have included financial assistance for the development of rural provider networks and also recommended the relaxation of antitrust laws to encourage collaborative, "joint-venture" arrangements among providers in rural areas (Fuchs, 1994).

The idea that increased collaboration among rural providers could benefit both the collaborating organizations and the communities they serve is not new. In the past, collaboration among rural hospitals has been advocated as a "strategic response" to the challenges these facilities face (Boeder, 1989). However, with respect to participation in multihospital systems (where two or more hospitals are owned, leased, sponsored, or managed by a single entity), the published literature offers little evidence that such arrangements yield significant benefits for rural hospitals (Mick and Morlock, 1990).

Much less is known about rural hospital collaboration in less formal arrangements, variously referred to as cooperatives, alliances, coalitions, consortia, or networks (Size, 1993). These voluntary organizations of rural hospitals are a relatively new phenomenon, and their operations, effectiveness, and impact on participants have not been systematically studied. In the course of evaluating the RWJF Hospital-Based Rural Health Care Program (1988-91), we collected extensive information on the development, operation, and impact of rural hospital networks. This article summarizes the findings of that evaluation and discusses their implications for future rural health reform.¹

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¹ A more detailed presentation of the results of the evaluation can be found in Moscovice, et al. (1995).

RURAL HOSPITAL NETWORKS

Rural hospitals comprise one-half of all community hospitals and one-fourth of all community hospital beds in the United States (American Hospital Association, 1990). Hospitals that operate in rural areas (i.e., counties not included in a metropolitan statistical area) exhibit considerable diversity. Some, especially those located in communities near urban areas, have technologically sophisticated acute-care facilities and serve relatively dense populations. Many other rural hospitals, particularly those in more sparsely populated areas, function under considerably less favorable circumstances.

The strategies pursued by rural hospitals to respond to their changing environments have also been diverse, depending in part on hospital-specific characteristics, regional circumstances, and the hospitals' capacities to change. Strategies have included diversification of services, conversion to other uses such as long-term care or mental health facilities, and, in particular, ownership, lease, or management contracts with multihospital systems (Mick et al., 1993).

The potential benefits of multihospital system affiliations include cost savings due to economies of size, improved ability to recruit staff, and easier access to capital (Moscovice et al., 1991). Empirical evidence has failed to document achievement of those potential benefits from this earlier generation of multihospital linkages (Shortell, 1988; Moscovice, 1989). However, initial results from a recent study of 11 integrated delivery systems that have added physician and insurance components to hospital systems indicate that systems that were more integrated had better financial performance as measured by inpatient productivity, total operating margin, and total net revenue (Shortell, Gillies, and Anderson, 1994).

The rate at which rural hospitals have been linked to large multihospital systems has slowed, possibly because of financial losses incurred by these systems and/or because of concerns by rural hospitals that system affiliation entails a loss of sensitivity to local needs and hospital autonomy (U.S. Senate, 1988). Instead, many rural hospitals have sought to establish less structured, more informal, collaborative arrangements through participation in voluntary hospital networks.

Networks of organizations have been defined at a general level as "... organizational arrangements that use resources and/or governance structures from more than one existing organization" (Borys and Jemison 1989). In essence, the parties to a network voluntarily agree to pursue collective action in some areas, while maintaining organizational autonomy in others. In applying this general concept to hospitals, the American Hospital Association (AHA) defines a hospital network as a formally organized group of hospitals or hospital systems that has come together for specific purposes and has specific membership criteria (American Hospital Association, 1987). With respect to rural hospital networks, a 1986 survey found 9 such networks ranging in size from 4 to 25 hospitals (American Hospital Association, 1988). Two years later, a 1988 staff report to the Senate's Special Committee on Aging estimated that as many as one-fourth of rural hospitals (approximately 650) participated in a hospital network (U.S. Senate, 1988). A national survey conducted in 1989 as part of the evaluation of the Hospital-Based Rural Health Care Program (referred to throughout this article as the Rural Hospital Network Program (RHNP)) yielded 127 rural hospital networks (Moscovice et al., 1991).

Hospital networks can provide a framework for developing a wide range of joint programs among member institutions.

Some network-sponsored programs—such as shared educational programs, marketing surveys, or physician and staff recruitment—are relatively straightforward and low in cost. Others require more cooperation and/or resources (e.g., shared staffing, joint purchase of equipment, or joint development of primary or specialty clinics). Still other network activities necessitate extensive cooperation and a high level of trust among participating hospitals and may involve a loss or change in the identity and mission of an institution (e.g., acute-care bed conversions and joint quality-assurance or credentialing programs).

While the combination of affiliation and autonomy has made network participation a potentially attractive strategy for many rural hospitals, some skeptics have pointed out that networks can be complex, difficult to manage, and inherently fluid and fragile. They have also questioned the ability of networks to respond well to rapidly changing economic conditions (Johnson, 1987).

In part because data on the operation of rural hospital networks have been largely unavailable, no systematic attempts have been made to determine the impacts of rural hospital networks on participating hospitals or rural communities. To the extent that policymakers view voluntary networks as mechanisms for facilitating collaboration among rural providers and meeting health care needs in rural areas, more evaluative information relating to these issues clearly would be helpful. The evaluation of the RHNP, which collected and analyzed data on all operational rural hospital networks in the United States and conducted indepth studies of the 13 rural hospital networks that received grant funds, is a step toward addressing this need.

DESCRIPTION OF THE RHNP

The RHNP, as initially conceived, provided 4-year grants of up to \$600,000 to partic-

ipating networks of rural hospitals or networks containing both rural hospitals and other providers. These grants could be used to support personnel, consultants, travel, supplies, and equipment, as well as startup and marketing expenses associated with new services. Grant recipients were also eligible to apply for up to \$500,000 in low-interest loans. RWJF arranged for faculty from the Graduate School of Public Administration of New York University to provide technical assistance to RHNP grantees.

In order to receive this funding, existing or prospective networks were required to submit proposals to RWJF in which they described how they would implement one or more of the following strategies:

- Enhancement of revenues through diversification of services (e.g., long-term care, preventive care) or through improved management practices with the institution.
- Reduction of costs through increased efficiency, consolidation and merger, or shared service arrangements (e.g., laboratory, X-ray, purchasing, and data management) with other institutions.
- Implementation of quality-assurance mechanisms and recruitment and retention of additional personnel.

The RHNP was not designed to demonstrate any one strategy for improving rural health care, but rather to support the development of a range of strategies to improve the delivery of health care in RHNP communities. RWJF hoped that these strategies, if successful, would be replicated in other rural communities.

The response of rural hospitals to the announcement of this program in 1987 was overwhelming. RWJF received 180 applications, representing approximately 1,700 rural hospitals in 45 States, or approximately two-thirds of all of the rural hospi-

tals in the United States. The applications were reviewed in a multistage selection process that included a critique by a national advisory committee, program office reviews, and site visits to finalists. Fourteen networks were selected as a result of this process; 13 ultimately received funding and participated in the program. Five of the grant recipients completed formal applications and received loan funds from the RWJF. In three cases, networks designed various types of revolving loan pools through which member hospitals would have access to capital for expenditures and loan guarantees. In one network, the loan was used as a source of funds to help reconfigure a local hospital into a primary-care facility. In another network, the loan was used to establish a subsidiary corporation that would recruit and employ physicians and ensure their payment of salary and benefits.

EVALUATION OF THE RHNP

The RHNP provided unique opportunities to examine the development and operational experience of rural hospital networks, to determine the effect of network participation on rural hospitals and rural communities, and to assess the implications of voluntary, collaborative rural hospital networks for rural health policy. However, for valid programmatic reasons, the design and implementation of the RHNP made its evaluation complex: The "intervention" (i.e., the rural hospital network) differed across sites and changed over time; networks were selected for program participation through a purposeful (rather than random) process; existing as well as newly formed networks received funding; financial assistance was provided through both grant and loan funds; and anticipated impacts were multidimensional and often not easily quantifiable. For these reasons, a multifaceted approach

to the evaluation was adopted in which, for various components of the research, the unit of analysis was the network, the rural hospital, and the rural resident. Since the evaluation raised process- and outcome-oriented research questions, both qualitative and quantitative research methodologies were employed.

The different units of analysis and research methodologies required that data collection occur at several levels. For some aspects of the research, secondary data sources, including Medicare Cost Reports, the Area Resource File of the U.S. Department of Health and Human Services (DHHS), AHA Guidebook data, and Robert Wood Johnson Quarterly Management Reports, proved sufficient. For other elements of the research, we collected data through in-person site-visit interviews, telephone surveys, and mail surveys.

The major components of the evaluation included:

- A descriptive qualitative analysis of network development and operational experience.
- Intensive case studies of selected programs implemented by networks.
- A quantitative analysis of the impact of network participation on rural hospital financial indicators.
- A quantitative analysis of the impact on rural residents of network participation by local hospitals.

RURAL HOSPITAL NETWORKS

Creation of a National Data Base

As part of the comprehensive evaluation of the RHNP, we created an information base on all rural hospital networks in the United States. The 180 applicants to the RWJF provided a partial list of potential networks. Telephone contacts with hospi-

tal association staff in each of the 50 States suggested possible additional networks. These lists and contacts yielded a total of 269 potential rural hospital networks in the United States, the universe for the first survey of U.S. rural hospital networks.

Our working definition of a rural hospital network eliminated several types of hospital groups, including individual rural hospitals working only with other non-hospital institutions or groups (e.g., nursing homes, State agencies), and groups of rural hospitals that met for discussion purposes only. Similarly, groups of rural hospitals that were primarily working together due to multihospital system ownership or contract management arrangements were eliminated, as were groups of rural hospitals that pursued a single planning and/or legislative liaison activity.

The initial survey consisted of structured telephone interviews conducted with network coordinators during December 1988 and January 1989. Interviewers collected baseline information on network characteristics in several categories: the age of each network; the reasons it was formed; the frequency of meetings; the number of hospital and non-hospital members; network staff, budget, and governance structure; and the types of activities pursued by the network. Interviews were completed with 266 potential network contacts, a response rate of 99 percent. That baseline survey identified 127 groups of rural hospitals (including the 13 RHNP networks) that could be considered networks, using our definition of a hospital network; that is, a formally organized group of hospitals that voluntarily came together for specific purposes and had specific membership criteria.

We repeated our survey in April and May of 1991, beginning with the 127 organizations identified as rural hospital networks in our baseline survey. In the process of con-

ducting the 1991 followup survey, we realized that 13 of the organizations designated as rural hospital networks in 1989 had in fact been planned networks that never materialized. Thus, we adjusted the baseline data to reflect only the 114 networks that had actually been operating in 1989. In addition to those 114 networks, 46 new organizations were identified as possible networks through a repeat telephone survey of State hospital associations. The followup survey attempted to contact representatives from each of those organizations.

We were able to contact individuals associated with all but 4 of the 114 active networks identified at baseline. The telephone interviews revealed that 74 of those networks were still operating as rural hospital networks. Eleven of the 46 new organizations identified by State hospital association staff fit our criteria for a rural hospital network and were thus added to the list of operating networks in 1991, for a total of 85 active networks.

In addition to the network data set previously described, we also assembled a data set for all rural hospitals in the United States over the 6-year inclusive period 1985-90. This timeframe enabled us to examine data from 3 years prior to the initiation of the RHNP through 3 years post-initiation. Only short-term, general, non-Federal hospitals located in non-metropolitan areas were included. The data set contained data from the following sources: the AHA Annual Survey; the Prospective Payment System Minimum Data Set (PPSII-VII); our two network surveys; the HCFA Provider Specific Files; and the Medicare Case Mix Index Files. Individual hospitals were identified as RHNP or non-RHNP network or non-network participants through our network surveys. The resultant hospital data file was then merged with a set of county-specific socioeconomic and demographic measures

taken from the Area Resource File. Thus each hospital was assigned the set of selected measures for its county.

We also collected information on the nature and extent of the relationships between rural hospitals and the networks in which they participate, from the perspective of rural hospitals in networks. Telephone interviews were completed during February 1992 with the administrators of 401 rural hospitals identified as members of the 85 active networks in 1991. The sampling frame was designed to adequately represent the different sizes of networks as well as the total population of hospital network members. Respondents provided information on the benefits hospitals hoped to achieve when they joined a network, the extent of hospital participation in networks, and the perceived benefits hospitals realized from network membership.

Finally, to estimate the impact of rural hospitals' participation in networks on rural residents, we conducted telephone surveys in early 1989 and in early 1992 to collect information on community residents' use of their local hospital and their opinions about specific aspects of the local hospital. For comparison purposes, we selected a random sample of households in the market areas of rural hospitals in RHNP networks ($n=810$), in other (non-RHNP) networks ($n=600$), and not participating in networks ($n=600$). Survey response rates were 93 percent in 1989 and 90 percent in 1992.

Characteristics

Table 1 provides a comparative overview of national rural hospital network characteristics in 1989 and 1991. Formal cooperative action among rural hospitals is relatively new. These rural hospital networks had been operating for an average of 5.8 years in 1989 and 6.8 years in 1991. We found sub-

stantial variation in the size and composition of these networks. They ranged from networks containing 2 small rural hospitals to networks with more than 50 members, including larger rural hospitals, urban hospitals, and/or non-hospital members as well as the rural hospitals themselves. Many of the larger networks were offshoots of State hospital associations. On average there were 15 members per network (including non-hospital organizations) in 1989; the average network membership increased only slightly in 1991.

Rural hospital networks were located in 43 States, with the heaviest concentration in the North Central, Great Lakes, and Western regions of the country. New England and the Mid-Atlantic States had the lowest concentration of rural networks.

When asked about the reasons their networks had formed, network directors gave a variety of responses. The most frequently cited reason (28 percent) was the desire of rural hospital members to help improve their financial status and stability. Another 12 percent of directors indicated that the availability of grant funding had served as a catalyst for the formation of their networks.

Data on organizational structure indicate that the structures of networks were more formalized in 1991 than in 1989. The percentage of rural hospital networks having a board of directors increased from 61 percent in 1989 to 75 percent in 1991. Similarly, the percentage of networks with a paid director increased from slightly less than one-half (45 percent) in 1989 to 75 percent in 1991. Sixty-five percent of networks in 1989 reported having an annual budget; by 1991, that figure had increased to 95 percent. Sources of funding varied considerably among the rural hospital networks. In 1989, about one-third of the networks generated operating revenues through member dues, with somewhat smaller percentages receiving funding from grants,

Table 1**Comparison of Rural Hospital Networks in the United States: Calendar Years 1989 and 1991**

Characteristic	1989 (n=114)		1991 (n=85)	
	Mean	Standard Deviation	Mean	Standard Deviation
Average Age of Network (Years)	5.8	7.4	6.8	5.6
Average Number of Members (Total)	15.1	17.2	15.7	17.5
Organizational Structure (Percent of Networks)				
Board of Directors	61	—	75	—
Paid Director	45	—	60	—
Budget	65	—	95	—
Sources of Funding (Percent of Networks)				
Member Dues	35	—	42	—
Grant Funding	26	—	46	—
Revenues From Activities	26	—	48	—
Other Revenue Sources	25	—	29	—
Average Number of Activities	5.9	2.5	4.6	2.5
Type of Activities (Percent of Networks)				
Physician or Staff Education	80	—	66	—
Shared Services	81	—	56	—
Legislative or Regulatory Issues	66	—	46	—
Recruitment of Medical or Professional Staff	52	—	54	—
Management or Financial Services	46	—	39	—
Shared Staff	47	—	33	—
Marketing, Community Relations	61	—	38	—
Quality Assurance, Credentialing	39	—	44	—
Acute-Care Bed Conversions	18	—	15	—
Specialty Clinics	44	—	34	—
Regional or Strategic Planning	55	—	38	—

NOTE: Four networks in the 1989 survey could not be contacted in the 1991 survey.

SOURCE: Moscovice, I., University of Minnesota, 1995.

activities, and other sources. Networks surveyed in 1991 were more likely to cite activity-related revenues and grant funds as revenue sources.

Rural hospital networks engaged in 11 general categories of joint activities, ranging from education to shared staff to the development of joint specialty clinics (Table 1). Networks reported an average of 5.8 activities in 1989. For the networks reporting in 1991, the average number of activities had declined to 4.6. The two most frequent activities in both 1989 and 1991 were physician or staff education and shared services. Two-thirds of the networks took part in legislative or regulatory issues in 1989, while slightly less than one-half of the networks did so in 1991; in both years, approximately one-half of the networks pursued initiatives on shared recruitment of medical or professional staff. Acute-care bed conversions

were the least frequent network activity (18 percent of networks in 1989 and 15 percent in 1991).

LESSONS LEARNED

The evaluation of the RWJF's Hospital-Based Rural Health Care Program examined the development and operational experience of rural hospital networks and assessed the effects of those networks on their members and on the communities they serve. The major findings of the evaluation include:

Joining a network is a popular, low cost strategic response for rural hospitals in an uncertain environment. Almost one-half of all of the rural hospitals in the country participated in a rural hospital network at some point between 1985-90. Voluntary cooperation with other rural hospitals through participation in a rural hospital network was

more common for rural hospitals during this period than affiliation with a multihospital system (via management contracts, lease, or ownership arrangements). Rural hospitals have a strong desire to maintain local autonomy while still acquiring the potential, through participation in a large group, to expand financial, technical, and human resources. However, simply joining or forming a network does not assure that substantive collaboration with other organizations will occur. Our research examined many types of network activities but found only a limited number of examples of networks whose members shared decision-making, contributed significant resources to network support, and sacrificed some measure of their individual autonomy to reach common network goals.

Joining a network can be a low-cost strategy for rural hospitals, both in terms of financial commitment and in terms of the degree of authority relinquished to the group. More than one-half of the rural hospitals in networks did not pay dues to the network. Grants and revenues from network activities accounted for more than 60 percent of the average network budget. Membership dues contributed less than one-fourth of the financial support for rural hospital networks. Some rural hospitals balanced loyalty to a network with loyalty to other dues-collecting organizations, such as the State hospital association. In other cases, networks may not have asked rural hospitals for dues for fear of losing them as members (although only 19 percent of the hospital chief executive officers (CEOs) we surveyed indicated they would not be willing to pay any dues to remain members of their networks).

Three-fourths of the networks were governed by a board of directors that generally had representation from each hospital in the network. Hospital CEOs reported that they provided substantial input to policy

decisions and operations of the network, presumably through governing board actions. Most networks were characterized by hospital CEOs as having an open, participative style and democratic decision-making processes rather than being dominated by a single member. Thus, in addition to maintaining institutional autonomy, hospitals appeared to exercise ongoing influence over network decisions.

Rural hospital network survival is enhanced by the mutual resource dependence of members and the presence of a formalized management structure. The literature suggests that hybrid organizational forms, such as networks, are likely to be less stable than hierarchical organizational structures (Powell, 1990). During a 2½-year period from 1988 to 1991, almost one-third of rural hospital networks in the country ceased operation, and the majority of networks that continued operating added and/or deleted members. Based on the existing literature and the experiences of the 13 RHNP networks, we developed several propositions concerning the factors likely to affect the survival of rural hospital networks. We hypothesized that the probability of network survival would increase with the perceived intensity of environmental threats to participants (except where threats are extreme), the level of resource dependency among participants, lower costs of coordination and participation, greater homogeneity among network participants, and the presence of a formalized management structure; and would decrease for new networks in their initial stage of development.

Logistic regression models were used to estimate the probability that a network would survive over the 1989-91 period (Table 2). The probability of network survival was positively related to two factors: the mutual resource dependence of its members (as measured by participation

Table 2

Logistic Regression Results on Survival of Rural Hospital Networks: Calendar Years 1989-91

Measure	Coefficient	Significance
Perceived Intensity of Environmental Threats		
Percent of Network Hospitals with Negative Operating Margins ¹		
51-74 Percent	-.67	.36
75-93 Percent	-.84	.23
94 Percent or More	-.21	.79
Average Percent of Admissions in Network Hospitals from Medicare/Medicaid ²		
48-52 Percent	-.73	.27
53-59 Percent	-.52	.50
60 Percent or More	-.98	.17
Level of Resource Dependency Among Participants		
Whether Network Has Urban or Large Rural Hospital Member	.92	.18
Whether Network Has Shared Services Activity	1.82	.01
Average Number of Administrative Staff in Network Hospitals	-.29	.11
Percent of Network Hospitals in Another Network or Multihospital System	-.89	.27
Cost of Coordination and Participation		
Number of Hospitals in Network	.04	.18
Whether Grants Funds Are Available	-.48	.51
Homogeneity of Network Hospitals		
Percent of Hospitals That Are City or County	.93	.28
Percent of Hospitals That Are Rural	-.16	.86
Newness of Network		
Years Network Has Been in Existence ³		
3-5 Years	-.62	.34
6 Years or More	-.53	.42
Formalization of Management Structure		
Degree of Formalization	.95	.01
(0 = No Board or Paid Directors; 1 = Board or Paid Director; 2 = Board and Paid Director)		
Model Chi Square	30.93	(.02)

¹ 0-50 percent category is omitted.

² 0-47 percent category is omitted.

³ 0-2 years category is omitted.

SOURCE: Moscovice, I., University of Minnesota, 1995.

in a shared service activity, which resulted in a six-fold increase in the odds of survival); and the presence of a formalized management structure (as measured by the presence of a paid director and a governing board of directors, which resulted in a 260-percent increase in the odds of survival). There was no significant relationship between network survival and the intensity of environmental threats to a network's members. Networks may form primarily as defense mechanisms for rural hospitals to adapt to an uncertain health care environment, but to survive over time those networks must add value to their member institutions.

It is not surprising that rural hospital networks are rapidly evolving organizations,

with substantial numbers of networks dissolving or changing membership each year and new networks forming. They may be relatively easy to disband because of the limited degree of integration of the members in many networks. However, the decrease in the number of networks does not necessarily suggest that rural hospital networks are a dying breed. In fact, new starts also occurred during the study period. One-seventh of the 85 networks operational at the end of that period had not existed in late 1988. It remains to be seen whether the decrease in the number of voluntary networks continues in the 1990s or whether public and private sector health care reform efforts precipitate the development of more and different types of networks.

Table 3
Effect of Network Participation on Rural Hospital Financial Performance, by Network Type:
Calendar Years 1985-90¹

Measures of Performance	Fixed Effects		Random Effects	
	Estimate of Effect of Network Participation	t-Statistic	Estimate of Effect of Network Participation	t-Statistic
Profitability				
Operating Margin				
RHNP	.005	1.524	-.006	-1.196
Non-RHNP	-.001	-.647	.001	.726
Liquidity				
Current Ratio (log)				
RHNP	-.001	-.111	-.27x10 ⁻³	-.014
Non-RHNP	-.012	-1.671	.021	1.877
Capital Structure				
Equity Financing Ratio				
RHNP	.016	.814	NA	NA
Non-RHNP	-.016	-1.191	NA	NA
Long-Term Debt-to-Equity Ratio				
RHNP	-.002	-.227	.001	.079
Non-RHNP	.001	.186	.012	*2.026
Other				
Average Daily Census (log)				
RHNP	.010	1.123	-.006	-.452
Non-RHNP	.012	*2.166	-.46x10 ⁻³	-.066

* Significant at the .05 level.

¹ The independent variables used in the analysis included hospital bed size, bed size squared, Medicare payment status, ownership, and case-mix index, as well as a dummy variable for each year.

NOTES: RHNP is the Rural Hospital Network Program. NA is not available.

SOURCE: Moscovice, I., University of Minnesota, 1995.

Rural hospitals join networks primarily to improve cost efficiency but, on average, hospitals do not appear to realize short-term economic benefit from network membership. The literature suggests that institutions join quasi-organizations such as networks for the purposes of acquiring resources, meeting information needs, and making political gains (Knoke, 1988). Hospital administrators in the study cited promoting cost efficiency as their strongest motivation for joining a network. However, administrators did not rank economic advantage as a major benefit their institutions had received from network membership. Instead, the facilitation of information diffusion (often referred to as peer networking or collegial interaction), which was identified as the second most frequent motivation for joining a network, was cited as the primary benefit received from network membership.

To estimate the effect of network participation on rural hospital financial performance, we used an analytic approach that included a before/after comparison of the financial performance of hospitals participating in RHNP networks with those in two contemporaneous control groups—hospitals in non-RHNP networks and hospitals not participating in any network. Using the 6-year rural hospital data set previously described, we first corrected for heteroscedasticity in the data and then estimated both a fixed-effects and a random-effects model in order to test the sensitivity of the results to model specification (Table 3).

Neither the fixed-effects model nor the random-effects model showed any clear impact of network participation on a range of financial performance indicators for rural hospitals. These indicators included operating margin, current ratio, equity financing ratio, long-term debt-to-equity

ratio, and average daily census. This does not imply that specific hospitals did not benefit financially from network participation or that individual network activities were not effective. It may be that relatively new organizations, such as networks, require longer periods of time before they undertake the kinds of shared programs that can yield direct financial benefits. Programs that focus on improving access or quality of care may yield benefits to rural communities, but those programs do not necessarily provide short-term solutions to the financial problems of individual institutions. Also, rural hospitals typically devote a relatively small portion of their overall resources to network activities. The scale of these activities, relative to overall hospital operations, may not be large enough to have a significant impact on a hospital's bottom line.

Some of the benefits of rural hospital networks may be realized outside of the communities in which rural hospitals are located. Urban hospitals, larger rural hospitals, and State hospital associations have shown substantial interest in rural hospital networks. Most rural hospital networks have an urban and/or larger rural hospital member, and several State hospital associations have responded with technical assistance and other support to help their rural members form networks. These institutions have resources that can benefit networks. In addition, they are able to assume the risks involved in network formation, and are likely to place greater weight on the long-term benefits of networks. The participation of these institutions raises the issue of who benefits from network relationships.

Multivariate analyses of the impact of network participation by local hospitals on the health behavior and beliefs of rural residents found no statistically significant effect at the 5-percent level (Table 4). For these analyses, we used an analytic

approach similar to the one used in the financial performance analyses (i.e., before/after comparison using two control groups). The community survey data previously described allowed us to examine time trends for the period 1989-92 for four measures: (1) willingness to use local providers if help was needed for various specific situations, (2) actual use of the local hospital for hospitalizations during the past year, (3) perception of the local hospital along specific dimensions, and (4) satisfaction with various aspects of the health care received from all sources. For the analysis of consumer satisfaction, perceptions, and willingness-to-use measures, we examined change scores as a function of whether the resident was in a RHNP or non-RHNP hospital market area and a set of individual, household, geographic area, and local hospital characteristics. For the analysis of actual use of local hospitals and of the willingness to use local providers, we also employed weighted least squares methods. In the case of actual use, we used a fixed effects regression model, with the fixed effect being specified as a market-level variable.²

Although not statistically significant, use of the local hospital for hospitalizations during the prior year decreased by 16 percentage points for the residents of non-RHNP network hospital market areas and 7 percentage points for the residents of RHNP hospital market areas relative to the residents of non-network market areas. At the very least, this indicates that participation in networks did not improve

² The use of change scores and of fixed effects models implies that our estimates may be less precise than they could have been if the site effects for individual market characteristics were uncorrelated with being in the RHNP, non-RHNP, or non-network groups. As an alternative, the data set was structured as a panel of two observations per respondent, and we employed weighted least squares estimators, with a correction in the variance covariance matrix for cluster effects. We also substituted logistic regression for the least squares estimator for dichotomous outcomes. The estimates and conclusions from these alternative models do not differ qualitatively from those reported here.

Table 4

Effect of Network Participation on Rural Resident Behavior and Attitudes: Calendar Years 1989-92¹

Measures of Performance	RHNP Versus Non-Network		Non-RHNP Versus Non-Network	
	Effect	t-Statistic	Effect	t-Statistic
Profitability				
Percent Who Would Use Local Facility or Provider for:				
Severe Chest Pain	.020	.530	.015	.331
Major Fracture	.064	1.361	-.023	-.386
Delivery of a Baby	.092	1.532	-.012	-.213
Routine Surgery	.025	.575	-.042	-.882
Very Ill Child	-.051	-.658	-.072	-.682
Kidney Infection	-.088	*-1.941	.006	.113
Cancer Treatment	.027	.557	.093	*1.717
Pneumonia	.038	.952	.013	.296
Mental Health Counseling	.008	.146	-.033	-.536
Percent Who Used Local Hospital for Hospitalization During Past Year	-.072	-.764	-.156	*-1.765
Perception of Local Hospital (9 Item Scale Normalized to 0 to 1 Range With 1 Indicating Highest Perception)	.028	*1.89	.005	.301
Satisfaction With Health Care Received (6 Item Scale Normalized to 0 to 1 Range With 1 Indicating Highest Satisfaction)	-.005	-.358	-.019	-1.018

*p < .10.

¹ The control variables used in the multivariate analysis included individual and household characteristics (age, age-squared, gender, household size, household income, length of time living in area, education level, health insurance coverage, perceived health status, travel time to nearest hospital, travel time to next nearest hospital, usual source of care in local community, shop for essentials such as food in local community), geographic area characteristics (physicians per capita in the county, hospital beds per capita in the county, census region, per capita income in the county, percent population below poverty level in the county), and local hospital characteristics (bed size, bed size squared, control status, Joint Commission on Accreditation of Healthcare Organizations status, number of services provided, number of medical units, regional referral center, sole community hospital). For the actual use run, the control variables also included a variable that indicated whether the hospitalization was for a surgical procedure.

NOTE: RHNP is the Rural Hospital Network Program.

SOURCE: Moscovice, I., University of Minnesota, 1995.

inpatient market share for rural hospitals in the short term. In conjunction with the finding of no clear impact of network participation on the financial performance of rural hospitals, the previous result raises two pertinent issues: Why are patients not using the local hospital more frequently? Which institutions are benefitting from network relationships?

When rural residents who were hospitalized outside their local community were asked why they used a non-local hospital, they cited the availability of specialists and services (36 percent) and referral patterns of local and non-local physicians (25 percent). In contrast, the local hospital's quality of care was mentioned only 7 percent of the time as a factor affecting non-local use. This suggests that network participation is not likely to increase inpatient market

share for local rural hospitals unless it is able to alter the centralization of specialists and technology and the referral patterns of physicians. On the other hand, network participation may be able to help rural hospitals to meet the health needs of their local communities through other means, such as the development of outpatient clinics, shared staffing and services, and quality assurance or credentialing programs.

IMPLICATIONS FOR RURAL HEALTH REFORM

Relatively few examples of rural-based networks that provide a full range of acute inpatient and outpatient services to rural communities currently exist (Christianson and Moscovice, 1993). Existing rural health networks tend to be groups of similar

providers, such as rural hospitals, that form to address common problems or to respond to reimbursement opportunities. The experience of these more limited networks has demonstrated that rural providers can work together cooperatively. However, that same experience provides little evidence regarding the ability of rural networks to effectively assume responsibility for all of the medical care of entire communities, to operate within a constrained budget, to guarantee access to needed services, or, in fact, to generate substantial benefits for their members.

Nonetheless, some recent State-level reform efforts (e.g., Minnesota, Florida, New York, Washington) have adopted rural health network formation as one of their cornerstones. These State programs have created incentives for rural health professionals and institutions to develop networks that can offer a comprehensive range of services. In addition, the Federal Government has been promoting rural network development through programs such as HCFA's Rural Health Network Reform Initiative (Health Care Financing Administration, 1993). These initiatives carry the explicit or implicit expectation that rural health networks in the future will need to provide a broader range of services and have a more diverse membership than the rural hospital networks discussed in this article.

Many of the lessons learned from the RHNP evaluation could arguably apply to integrated rural health networks (IRHNs), the organizations that may provide the full range of health services to rural communities in the future. Based on our observations of rural hospital networks, we expect that:

- Newly formed IRHNs may be relatively unstable, particularly if they involve a diverse set of parties. Asymmetry may exist between the motivations of participants for joining IRHNs and the benefits

that they receive. To reduce this asymmetry, the focus and goals for IRHNs should be clearly articulated by their members.

- All local constituencies may not benefit equally from the development of IRHNs. The distribution of institutional and community benefits resulting from participation in networks should be monitored and used to assess the effect of network participation on the residents and health care organizations in rural communities.
- In many areas, the rural health care infrastructure will need strengthening in order to support the development of IRHNs. State and Federal government can enhance infrastructure development through a variety of mechanisms. Substantial amounts of initial grant support may actually serve as an impediment to the maturation of IRHNs. While grant support makes network startup easier, receiving a grant can postpone the development of member commitment, long-term planning, and the development of funding sources. When the grant period ends, the survival of the network is at substantial risk. Startup grant support may allow network members to avoid facing the difficult tradeoffs between operating joint programs and maintaining total autonomy. The use of low-interest loan funds is an alternative that may stimulate the long-term interest, commitment, and involvement of local residents and health professionals. Loan funds can be used as leverage to obtain other sources of funding, and their acquisition often requires an explicit commitment of network members to a shared and financially linked future.
- Establishing IRHNs with members that assume shared financial risk will be difficult and much more complicated than establishing networks whose members simply participate in collaborative activities with little or no economic consequence. However, IRHNs may not be

effective structures on which to base rural health reform unless their members have a closely integrated financial future.

Interest in the use of health care networking as a fundamental strategy for restructuring rural health care delivery and financing is growing despite the lack of empirical evidence, beyond case studies of selected successful networks, that documents benefits for providers and the public's health. The potential benefits of networks remain: increased retention of health care expenditures in local communities, increased access to specialty services and relevant technologies including information systems, enhanced recruitment and retention of health professionals, and the reduction of unnecessary duplication. However, at this point in time, the development of IRHNs should be viewed more as a social experiment than as a foundation on which to rebuild the health care systems serving rural communities.

Does it make sense for policymakers to support this social experiment? Clearly there are opportunity costs associated with social experimentation. On the other hand, the status quo has limited hope for meeting the future health needs of the residents of many rural communities. Also, the current climate is receptive to rural network formation. However, both policymakers and rural health administrators need to have realistic expectations about the likely scope of influence of IRHNs. If the support of IRHNs is adopted as a strategy for rural health care reform, it should be accompanied by a research agenda that addresses:

- Whether networks improve the health and well-being of rural residents.
- Which groups receive the greatest benefit from network development.
- Which types of networks accomplish benefits for the least expenditure of resources.

- How different environments (i.e., economic, regulatory, geographic) influence network performance.

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