Reexamining Organizational Configurations: An Update, Validation, and Expansion of the Taxonomy of Health Networks and Systems

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Objectives. To (a) assess how the original cluster categories of hospital-led health networks and systems have changed over time; (b) identify any new patterns of cluster configurations; and (c) demonstrate how additional data can be used to refine and enhance the taxonomy measures.

Data Sources. 1994 and 1998 American Hospital Association (AHA) Annual Survey of Hospitals.

Study Design. As in the original taxonomy, separate cluster solutions are identified for health networks and health systems by applying three strategic/structural dimensions (differentiation, integration, and centralization) to three components of the health service/product continuum (hospital services, physician arrangements, and provider-based insurance activities).

Data Extraction Methods. Factor, cluster, and discriminant analyses are used to analyze the 1998 data. Descriptive and comparative methods are used to analyze the updated 1998 taxonomy relative to the original 1994 version.

Principal Findings. The 1998 cluster categories are similar to the original taxonomy, however, they reveal some new organizational configurations. For the health networks, centralization of product/service lines is occurring more selectively than in the past. For the health systems, participation has grown in and dispersed across a more diverse set of decentralized organizational forms. For both networks and systems, the definition of centralization has changed over time.

Conclusions. In its updated form, the taxonomy continues to provide policymakers and practitioners with a descriptive and contextual framework against which to assess organizational programs and policies. There is a need to continue to revisit the taxonomy from time to time because of the persistent evolution of the U.S. health care industry and the consequent shifting of organizational configurations in this arena. There is also value in continuing to move the taxonomy in the direction of refinement/expansion as new opportunities become available.

Key Words. Health networks, health systems, hospitals, taxonomy

A number of years ago a taxonomy of health networks and systems was created, using data from the mid-1990s, for the purpose of defining the structures and strategies of newly emerging health care organizations and identifying classes of health care organizations that share common features (Bazzoli et al. 1999). Since that time, the taxonomy has become a valuable tool not only for policymakers and practitioners, but also for health services researchers who have used it to address the performance of groups of health organizations that share similar characteristics (Bazzoli et al. 2000; Bazzoli et al. 2001; Carey 2003; Dubbs 2003; Lee, Alexander, and Bazzoli 2003; Rosko and Proenca 2003; Shortell, Bazzoli et al. 2000).

The health care world, however, has changed a great deal since the mid-1990s and in order for a taxonomy of health networks and systems to continue to be useful, it must be periodically updated to assure it appropriately depicts the spectrum of current organizational configurations. When the initial taxonomy of health networks and systems was created, it reflected organizations' anticipation of continued strong momentum toward service and financial integration created by the prospects for national health care reform in 1994. By 1998, however, this momentum had slowed substantially. In addition, by the late 1990s, capitation trends had failed to unfold as anticipated, consumer backlash against managed care had intensified, merger activity had decreased, and vertical disintegration had begun to occur (Bazzoli et al. 2001; Lesser and Ginsburg 2000; Shortell, Gillies et al. 2000b). As organizational configurations shifted and members of health networks/systems realigned, the major categories of organizations identified in the taxonomy may have changed. As a first step toward understanding these changes, a longitudinal study of organizational trends from 1994 to 1998 was conducted using the original taxonomy categorization scheme (Bazzoli et al. 2001). In this work, significant shifts were found in the numbers of

Funding from the Robert Wood Johnson Foundation's Investigator Awards in Health Policy Research program supported Dr. Bazzoli's involvement in this study (grant number 043527). This research was presented by Dr. Dubbs at the 2001 Academy for Health Services Research and Health Policy annual meeting and at the 2002 Academy of Management annual meeting.

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observations appearing in each organizational category, as well as a general shift whereby observations tended to go from the centralized categories to the more moderately centralized categories. Now, as a next step, the work described in this paper explores the possibility that, over time, there could be additional changes in organizational structure whereby 1998 networks/systems actually cluster into entirely new categories than they did five years ago.

The objectives of this paper are to revisit the taxonomy of health networks and systems in order to: (a) assess how the original cluster categories of hospital-led health networks and systems have changed over time; (b) identify any new patterns of cluster configurations; and (c) demonstrate how additional data can be used to refine and enhance the taxonomy measures.

STUDY DESIGN AND SAMPLE

The study is designed to replicate the original taxonomy development.¹ As before, separate cluster solutions for health networks and health systems are identified. The analysis involves applying three strategic/structural dimensions (differentiation, integration, and centralization) to three components of the health service/product continuum (hospital services, physician arrangements, and provider-based insurance activities). Data are taken from the 1998 American Hospital Association (AHA) Annual Survey of Hospitals and aggregated from the individual hospital level to yield a sample of 216 health networks and 342 health systems.

ANALYTICAL APPROACH

To meet our goal of reassessing the original taxonomy, we faithfully followed the procedures that had been used with the 1994 data. To begin, we conducted principal components factor analysis with Varimax and Oblimin rotations to create scales for differentiation, integration, and centralization variables. By and large, the 1998 factor analysis results replicated 1994 patterns.² Scales for differentiation and integration mirrored their original strength and variable groupings. However, the hospital service centralization measures were condensed into one factor in 1998 rather than the two that were present with the 1994 data. This compression is not surprising because there has been a documented shift among health networks and systems to less

centralized forms (Bazzoli et al. 2001). As in the prior work, once factors were created, they were standardized into z-scores for the cluster analysis. Next Mahalanobis distance measures were compiled to identify and remove outlier networks and systems. Six networks and four systems were eliminated, which was consistent with the number of deletions in 1994.

We then conducted hierarchical cluster analysis using the stepwise Ward method with squared euclidean distance specifications. We clustered on randomized split halves of the network and system samples to assess the reliability of emergent cluster solutions and conducted visual inspection of dendograms to determine suitable and parsimonious numbers of cluster solutions. Duncan multiple range testing was used to assess key similarities and differences across cluster categories. Similar to the 1994 taxonomy, a four-cluster solution for networks and a five-cluster solution for systems were identified. Subsequently, we ran discriminant analyses to internally validate the cluster solutions, which yielded comparable rates of correct classification (95.1 percent for networks and 88.1 percent for systems) relative to the 1994 analysis. Such comparability suggested that a four-cluster network solution and a five-cluster system solution were internally valid and robust over the two study periods. Lastly, we ran another round of Duncan multiple range tests using the post discriminant analysis cluster groupings to arrive at cluster labels and descriptions for the final 1998 solutions.

1998 CLUSTER SOLUTIONS

As in 1994, centralization and differentiation once again appear to be more prominent parameters in distinguishing 1998 organizational categories than integration. This results because networks and systems seem to be engaging in both ownership and contractual based integration rather than using just one of these strategies. As a consequence, the 1998 clusters are defined primarily on the dimensions of differentiation and centralization in their distinguishing features.

For networks, we identified four clusters.

Network Cluster 1: Independent Hospital Networks (n = 131)

These networks are characterized by a lack of vertical relationships. They have only a few physician arrangements and little insurance product development at either the hospital or the network level. They have very little centralization of hospital services. They have a relatively narrow differentiation of hospital

services, physician arrangements, and insurance product development. They tend to be comprised of hospitals with small bed size that are located in close proximity to one another. There tends to be only a few hospitals in each network.

Network Cluster 2: Decentralized Networks (n = 38)

These networks are typified by decentralized hospital, physician, and insurance activity. They have little network-level centralized activity, yet extensive hospital services, physician arrangements, and significant insurance product development at the hospital level. They have a higher differentiation of hospital services, physician arrangements, and insurance products than other network cluster categories. These networks tend to be comprised of hospitals with relatively large bed size, have many participating hospitals, and be dispersed across many geographic areas.

Network Cluster 3: Centralized Hospital Services Networks (n = 22)

The key distinguishing feature of these networks is that, relative to other clusters, they have highly centralized hospital services, but little centralized physician and insurance activities. They have narrow differentiation in hospital services, physician arrangements, and insurance product activity. These networks tend to have small numbers of affiliated hospitals and are comprised of hospitals with small bed size located in close proximity.

Network Cluster 4: Centralized Physician/Insurance Networks (n = 25)

In contrast to network cluster 3, these networks are defined by extensive network-level activity in the physician and insurance domains, but largely decentralized hospital services. Hospital services and insurance products are moderately differentiated but physician arrangements are less so. These networks tend to be comprised of small numbers of medium bed size, geographically close hospitals.

For systems, we identified five clusters.

System Cluster 1: Independent Hospital Systems (n = 56)

These systems are characterized by a lack of vertical relationships in terms of physician arrangements and insurance product development among system components at any level. They demonstrate almost no centralization of hospital services. They have narrowly differentiated hospital services,

physician arrangements, and insurance activity. These systems tend to have hospitals with proportionately smaller bed size and investor-based ownership than hospitals for other types of systems.

System Cluster 2: Decentralized Systems (n = 141)

These systems exhibit relatively low system-level centralized activity across all product/service dimensions. Hospital services, physician arrangements, and insurance products all demonstrate relatively moderate degrees of differentiation. These systems tend to be comprised of a relatively small number of hospitals with small bed size that are located in close proximity to one another.

System Cluster 3: Decentralized Physician/Insurance Systems (n = 34)

Although systems in this category demonstrate moderate system-level activity on each of the three service/product dimensions, this feature is combined with largely decentralized, hospital-level-based physician and insurance arrangements. These systems have a higher differentiation of hospital services, physician arrangements, and insurance products than other system cluster categories. These systems consist of proportionately larger, more urban, more geographically dispersed, and more church-owned hospitals relative to the other cluster categories. They also tend to have larger numbers of affiliated hospitals.

System Cluster 4: Moderately Centralized Systems (n = 11)

These systems exhibit moderate degrees of centralization across all product/service dimensions. They have medium levels of differentiation in hospital services, physician arrangements, and insurance activities. Hospitals in these systems tend to be medium sized in terms of the number of beds and are often not-for-profit facilities. Systems in this category tend to have a medium number of hospital affiliates as compared to other system types.

System Cluster 5: Centralized Systems (n = 100)

These systems display consistently high degrees of centralization across all product/service dimensions. They tend to have moderate levels of differentiation in physician arrangements and a relatively broad array of insurance activities and hospital services. They tend to have a relatively small number of affiliated hospitals and these hospitals tend to be medium sized in terms of numbers of beds. Hospitals in these systems are largely not-for-profit and often in close proximity to one another.

1998 VERSUS 1994 CLUSTER SOLUTION COMPARISON

Although we observe some realignment of categories along certain structural/strategic dimensions, by and large, the taxonomy parameters appear robust over time. That is to say, differentiation, integration, and centralization of hospital service-mix, physician arrangements, and insurance product development remain useful dimensions by which to classify the activities of health networks and systems. Some of these dimensions continue to carry more weight than others (i.e., centralization versus integration), but key variables remain significantly valuable in distinguishing patterns of variation across network/system clusters.

Cluster descriptions, while reminiscent of the original taxonomy, have discernible distinctions. In Table 1 and the discussion below, we compare the original taxonomy clusters to those in the updated version with an eye toward offering insights into how hospital-led organizations have reacted to the industry turbulence of recent years.

For the health networks, the results suggest that independent hospital and decentralized forms persist, but that centralization of product/service lines is occurring more selectively than in the past. The original 1994 analysis placed the majority of health networks into a moderately centralized category. In contrast, in the 1998 revised taxonomy, this moderate cluster disappears entirely while the dominant clusters in 1998 become those in the independent hospital and decentralized categories. This shift may signal evidence of a retrenchment away

Table 1: Comparison of 1994 versus 1998 Cluster Categories for Networks and Systems

<i>NETWORKS</i> 1994	<i>NETWORKS</i> 1998
Independent Hospital (<i>n</i> = 55)	Independent Hospital (<i>n</i> = 131)
Decentralized (<i>n</i> = 4)	Decentralized (<i>n</i> = 38)
Moderately Centralized (<i>n</i> = 105)	
	Centralized Hospital Services (<i>n</i> = 22)
	Centralized Physician/Insurance (<i>n</i> = 25)
Centralized (<i>n</i> = 29)	
<i>SYSTEMS</i> 1994	<i>SYSTEMS</i> 1998
Independent Hospital (<i>n</i> = 61)	Independent Hospital (<i>n</i> = 56)
Decentralized (<i>n</i> = 30)	Decentralized (<i>n</i> = 141)
	Decentralized Physician/Insurance (<i>n</i> = 34)
Moderately Centralized (<i>n</i> = 64)	Moderately Centralized (<i>n</i> = 11)
Centralized Physician/Insurance (<i>n</i> = 60)	
Centralized (<i>n</i> = 47)	Centralized (<i>n</i> = 100)

from more integrated vertical systems of health delivery to allow greater independence and autonomy for organizations to respond quickly to local market changes. Also in 1998, the centralized health network category from 1994 vanishes and, in its place, two distinct groupings emerge, a centralized hospital services cluster and a centralized physician/insurance cluster. The centralized categories present in the 1998 version are more limited in scope than before, focusing on only one or two of the product/service dimensions, rather than all three. This may signal a trend toward selective, rather than complete centralization, perhaps driven more toward establishing contracting leverage.

Health systems present some similarities and some differences to health networks. Like the networks, health systems demonstrate substantially fewer observations in the moderately centralized cluster category now than in the original taxonomy. Also like the networks, the decentralized category had grown considerably in 1998, as compared to the original taxonomy. It appears that systems are no longer flocking to a middle ground, hedging their bets between greater or lesser centralization. Instead they appear to be either continuing down a path toward truly integrated delivery or reversing direction and mainly decentralizing activity. Growth of the decentralized cluster category might be a reflection of the diseconomies that can come from overcentralization, as noted in research by Bazzoli et al. (2000) who found diminishing financial returns to centralization for system-affiliated hospitals. Finally, similar to the networks, independent hospital and centralized forms for health systems also persist but, here, participation has grown in and dispersed across a more diverse set of decentralized organizational forms. In contrast to the networks, we find that the centralized category for systems in the 1998 taxonomy consolidates two of the original 1994 clusters (i.e., centralized systems and centralized physician/insurance systems) while the opposite occurs for decentralized forms (i.e., the decentralized cluster of 1994 had been divided into a decentralized system cluster and a decentralized physician/insurance system cluster in 1998). This consolidation/expansion in categories suggests that innovation in system design has shifted to focus on more loosely configured, rather than tightly configured, structures. In essence, we see played out in a large scale many of the same trends depicted by Shortell, Gillies, and coauthors (2000) who, in their recent book, describe how systems have "modified their approach to integrated health care delivery over the past four years. Among the most prevalent developments have been: a growing recognition that health care delivery value is created locally...a resulting movement toward greater decentralization and sharing of functional support services with local regions and within local regions with local delivery

units... [and] the growth of blended models of centralization and decentralization" (pp. 249–50).

Given the continuing importance of centralization to the taxonomy, we explore how the definition of centralization has changed over the five years since the original taxonomy. Are the 1998 centralized networks/systems fundamentally different from those in the 1994 centralized categories? Table 2 shows a comparison of centralization in 1994 versus 1998.

For networks, both of the 1998 centralized categories (centralized hospital services cluster and centralized physician/insurance cluster) depict organizational configurations containing fewer numbers of network-level insurance products, fewer numbers of network-level physician arrangements, and a less-centralized service mix than existed in the 1994 centralized cluster category. In other words, on all three product/service dimensions of health networks, the benchmark for what constitutes "high centralization" has declined consistently over time.

Table 2: Comparison of 1994 versus 1998 Centralized Categories for Networks and Systems—Cluster Means on Aggregated Centralization Measures

	1994 Centralized Networks (n = 29)	1998 Centralized Hospital Services Networks (n = 22) ^a	1998 Centralized Physician/Insurance Services Networks (n = 25) ^b
<i>NETWORKS</i>			
Network level insurance products	.4618	.0796***	.2340***
Network level physician arrangements	.7609	.0585***	.3575***
Centralized hospital services	.1657	.0557***	.0171***
			1998 Centralized Systems (n = 100)
<i>SYSTEMS</i>	1994 Centralized Systems (n = 47) ^c		
System level insurance products	.3475*		.4823
System level physician arrangements	.9471*		.7198
Centralized hospital services	.2506***		.1358

* $p < .05$,

** $p < .01$,

*** $p < .001$.

^aAsterisks indicate comparison between 1994 Centralized Networks and 1998 Centralized Hospital Services Networks.

^bAsterisks indicate comparison between 1994 Centralized Networks and 1998 Centralized Physician/Insurance Networks.

^cAsterisks indicate comparison between 1994 Centralized Systems and 1998 Centralized Systems.

Sources: American Hospital Association (1994, 1998).

Health systems, however, show a slightly different pattern. In 1998, the centralized system category includes fewer numbers of system-level physician arrangements and a less-centralized service mix than was evident in the 1994 centralized cluster category. Yet higher numbers of system-level insurance products are evident in 1998. This may indicate that systems are still focused on a defensive strategy to help hospitals navigate survival in a managed care world. That is to say, centralized insurance product development may enable access to valuable resources (e.g., information system capabilities, clinical protocol development capacities, and contract negotiation leverage) crucial for operating in today's medical environment (Alexander et al. 2001; Dubbs 2003). Alternatively, this finding might simply be a manifestation of inertia. For instance, systems may have difficulties finding buyers for their insurance components in a market with low margins. Or perhaps in the face of environmental turbulence, system executives were simply reluctant to change their strategies. Finally, the fact that the insurance components of systems remain centralized while the other dimensions do not may be an artifact of the particular snapshot in time we are looking at with the 1998 data. According to Lesser and Ginsburg (2000), the movement of providers to divest of health plans lagged behind other decentralization trends and did not really accelerate until around 1999.

Tables 1 and 2 demonstrate that even though some organizations remain relatively more centralized than others, in general, both networks and systems are becoming more decentralized over time. While networks and systems appear to be moving in similar directions, they are moving at different paces. In 1994, the percentages of networks and systems in decentralized or independent cluster categories were roughly comparable (31 percent for networks and 35 percent for systems). In 1998, however, 10 percent more networks than systems fall into these categories. Networks, therefore, appear to have decentralized more quickly than systems. Furthermore, while networks and systems both appear to be on a track toward looser configurations, they may not be following identical paths. The manner by which networks and systems decouple centralized products and services appears to involve differences in strategic focus and concentration.

CONSTRUCTING NEW MEASURES TO ENHANCE THE TAXONOMY

In addition to updating the original taxonomy's empirical framework, we also recognize the need to search for ways to expand it by constructing additional

measures of physician, hospital, and insurance arrangements. The 1998 data afford us an opportunity to explore one such expansion as a result of new questions that were added to the 1998 AHA Annual Survey specifically with regard to physician–hospital relationships.

When the taxonomy was developed initially, data on the number of physicians participating in specific arrangements were unavailable. Physician–hospital integration was measured by proxy based on the existence of multiple models of physician–hospital arrangements and gauged via dichotomous variables reflecting the presence/absence of these arrangements. The intensity with which individual physicians were participating in these arrangements could not be measured, however. New questions in the 1998 survey provide more fine-grained data that allow real values and continuous measures to be calculated for the number of physicians that are actually affiliated with each of the different models of physician–hospital arrangements. The improvement is only partial, however, because the new data reflect these intensities only at the hospital but not at the network/system level.

Despite only partial data, we nevertheless decided to investigate what happens when we replace the original hospital-level measures for the presence/absence of hospital arrangements with new continuous measures of physician involvement. We incorporated these new measures into the taxonomy programs and reran them. We found that some network/system observations shifted across cluster categories due to the refined physician–hospital data but, by and large, the category labels held, which supports the soundness of the 1998 system/network taxonomy. Moreover, we found higher numbers of affiliated physicians in those networks and systems that had insurance products, even though these physicians may be dispersed across network/system affiliated hospitals. This finding provides insights into how a network's or system's physician and insurance capacities interact, suggesting that a large, broad network of physicians may be an essential ingredient for systems and networks to offer an insurance product.

CONCLUSIONS AND IMPLICATIONS

The value of the taxonomy of health networks and systems increases as it is updated and refined. Assessing the changes that occur in the taxonomy clusters over time provides health care leaders, health services researchers,

and policymakers with a means for tracking and keeping pace with national trends in industry and organizational restructuring. For example, we note that certain configurations exist in both the 1994 and 1998 versions of the taxonomy. While continued turbulence in health markets caused many health organizations to rethink prior strategies and reconfigure based on new realities, industry experts and health leaders may well conclude from the new taxonomy that widespread organizational instability was not omnipresent and that some degree of inertia was evident during the late 1990s. Also, in noting the shift toward more decentralization in cluster categories, health care analysts may well speculate that networks and systems in 1998 may be more able to respond to local needs, but less able to act in as unified ways as was expected in 1994.

In addition, in its updated form, the taxonomy continues to provide policymakers and practitioners with a descriptive and contextual framework against which to assess organizational programs and policies. The degree of centralization has implications for capital formation. Given hospitals' increasing need for more capital in order to invest in expensive new medical and information technologies, as well as to replace or upgrade physical plants, it may be that the more centralized networks and systems are better positioned to raise and allocate such capital than those more decentralized. In other words, while there may be operating advantages to more decentralized or moderately centralized entities, there may be greater financial and capital formation advantages to centralization. The relative degree of centralization of networks and systems also raises potential issues of antitrust. Two networks or systems may have identical market share, but the more centralized may be in a better position to exert market power by virtue of its unified market strategies. Antitrust enforcement agencies may be well advised to take into account the organizational form of local health networks and systems in addition to the share of the market they have achieved.

The taxonomy also holds important implications for quality improvement initiatives involving patient safety, error reduction, organizational processes, workflow redesign, and knowledge management inside and across organizations. For example, while centralization creates potential economies for implementing quality improvement initiatives, it may also act as a barrier to responding to local needs and initiatives. Finding the right balance between centralization and decentralization in implementing quality improvement initiatives could be a major challenge. The taxonomy also holds potentially important implications for performance accountability. The federal government is currently in the process of developing a national Quality Report Card

involving a common set of performance metrics for selected conditions, as well as prevention and patient satisfaction measures. Over time, hospitals and other health care entities will have to provide data that can be compiled into the report card. The ability of hospitals to do so may well vary as a function of where they are located within the various clusters of the taxonomy.

The findings presented in this article provide an important base of knowledge on which future study can build. The 1998 cluster solutions can be used to continue to explore important relationships between strategy, structure, and performance in health care organizations. Future research might examine differences in the adoption and diffusion of technology across different types of health networks and systems. Future work could also examine the extent to which telecommunication initiatives play a role in changing the configurations between hospitals, physician groups, and health plans. Finally, the extent to which the taxonomy can shed light on major workforce issues merits attention. For instance, more needs to be known about the ability to recruit, retain, and develop a wide range of health professionals as a function of the relationships among organizational units within networks and systems.

The need to revisit the taxonomy from time to time will continue because of the persistent evolution of the U.S. health care industry and the consequent shifting of organizational configurations. The need to further refine the taxonomy as new measures become available will also remain important. If physicians continue to reject hospital-led organizations in favor of physician-led ones, as has been reported by Lesser and Ginsburg (2000), it will be essential to supplement the now hospital-centric taxonomy with more physician-centric indicators so that future versions of this work can capture these developments.

NOTES

1. Due to space requirements, detailed description is limited here. Full information on the study design, methodology, and theoretical underpinnings of the original taxonomy can be found in Bazzoli et al. 1999.
2. Detailed factor analysis results are available from lead author.

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