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More Than Just Hospitals: An Examination of Cluster Components and Configurations

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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ACO	Accountable Care Organization
AHA	American Hospital Association
AMI	American Medical International
ANOVA	Analysis of Variance
ARF	Area Resource File
ARI_{HA}	Hubert-Arabie Adjusted Rand Index
CAH	Critical Access Hospital
CBSA	Core-Based Statistical Area
CHA	Catholic Health Association
CHS	Community Health Systems
CON	Certificate of Need
DEA	Data Envelopment Analysis
DRG	Diagnosis Related Group
ETMC	East Texas Medical Center
EPV	Events Per Variable
HCA	Hospital Corporation of America
HHI	Herfindahl-Hirschman Index
HMA	Health Management Associates

HMO	Health Maintenance Organization
HSD	Honestly Significant Difference
IO	Industrial Organization
MANOVA	Multivariate Analysis of Variance
METSA	Metropolitan Statistical Area
MICSA	Micropolitan Statistical Area
MSA	Measure of Sampling Adequacy
OMB	Office of Management and Budget
PACE	Program of All-inclusive Care for the Elderly
PCMH	Patient-Centered Medical Home
PMC	Pairwise Multiple Comparisons
PPS	Prospective Payment System
RDT	Resource Dependence Theory
RI	Rand Index
SARFIT	Structural Adaptation to Regain Fit
SCP	Structure-Conduct-Performance
SHA	Strategic Hospital Alliance
SOP	Scope of Practice
TCE	Transaction Cost Economics
TQM	Total Quality Management
UHS	Universal Health Services
UPMC	University of Pittsburgh Medical Center

USCB	United States Census Bureau
VIF	Variance Inflation Factor

Abstract

MORE THAN JUST HOSPITALS: AN EXAMINATION OF CLUSTER COMPONENTS AND CONFIGURATIONS

By Patrick Davis Shay, Ph.D., MS

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Over the past 25 years, health care organization scholars have observed the dramatic emergence of hospital-based clusters in local markets throughout the U.S. These important organizational forms require same-system ownership of multiple general, acute care hospitals operating within a single local market, and as such they include multi-hospital systems that are entirely contained in a single urban market as well as clustered extensions or subsystems of larger regional and national systems. However, despite their noted growth as powerful forces in local markets, relatively few studies have examined these clusters, and as a result there remains a significant gap in our knowledge regarding their continued growth or the diverse components and configurations they may exhibit.

This study endeavors to both describe and explain the diversity observed across hospital-based clusters. To fulfill this objective, a national inventory of clusters is updated to reflect cluster membership as of 2012, and a catalog of cluster components – including their hospital-

based and non-hospital-based sites – is created, acknowledging that clusters today consist of more than just general, acute care hospitals. Cluster analysis methods are then employed to develop a taxonomy of cluster forms, using a sample of 114 clusters from local markets in Florida, Maryland, Nevada, Texas, Virginia, and Washington. Applying a conceptual framework informed by concepts from contingency theory and strategic management theory, cluster analysis methods yield a five-group solution, which is then externally validated using a multi-theoretical perspective synthesizing arguments from population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory. Results from descriptive and multinomial logistic regression analyses identify organizational and environmental factors that are significantly associated with various cluster forms.

The study's results suggest that today's hospital-based clusters continue to grow and vary according to the dimensions of differentiation-configuration and integration-coordination. These findings provide a foundation for future examinations of hospital-based clusters, including their provision of services within and outside of hospital walls. These results also accentuate the importance of accounting for geographic considerations when examining health care organization forms, and they display the utility and value of employing a multi-theoretical perspective to examine and explain such complex forms.

Chapter 1: Introduction

With little effort, one may readily identify numerous urban and regional hospital-based health care systems operating in local markets across the United States. Indeed, the presence of these local multi-hospital systems may even seem ubiquitous, as their existence blankets the country and includes some of the health care industry's most widely recognized organizations such as Intermountain Healthcare in Salt Lake City, Utah or Cleveland Clinic in Cleveland, Ohio. Over the past several decades, these urban and regional health care delivery systems have emerged as the predominant organizational form among health care providers at the local market level. This development stems from widespread hospital consolidation observed across the U.S. health care industry at the end of the 20th century (Bazzoli, Shortell, Dubbs, Chan, & Kralovec, 1999; Cuellar & Gertler, 2005; Dranove & Shanley, 1995; Luke, Ozcan, & Olden, 1995). This study defines *urban* hospital-based systems as organizations operating two or more member hospitals within a given urban market. Similarly, *regional* hospital-based systems are defined as organizations operating two or more member hospitals within a given region, expanding beyond the geographic boundaries of a specific urban market to include proximate nonurban areas. These urban and regional forms of the local multi-hospital system grouping have come to be referred to as hospital-based "clusters," which represent "a major new and powerful organizational form" with the potential to dramatically affect the structure and organization of health services (Luke, Luke, & Muller, 2011, p. 1749; Luke, 2010; Luke, Walston, & Plummer, 2004).

As hospitals within local markets partnered with one another to form clusters at the turn of the century, two trends accompanied the emergence of clusters as a dominant organizational form. First, hospitals often paired consolidation with the expansion of services beyond traditional inpatient acute care to include pre-acute and post-acute services on both an inpatient and an outpatient basis (Burns & Pauly, 2002; Coddington, Palmquist, & Trollinger, 1985; Conrad & Dowling, 1990; Luke & Begun, 2001). Second, alternative service delivery sites emerged to compete with individual hospitals across numerous service lines (Al-Amin & Housman, 2012; Burns, David, & Helmchen, 2011; Courtemanche & Plotzke, 2010; Fennell & Alexander, 1993; Ruef, 2000), challenging hospital-based clusters to compete for patients beyond the hospital walls (Giardina, Fottler, Shewchuk, & Hill, 1990; Luke et al., 2011). Examples of such alternative service delivery sites include ambulatory surgery centers, diagnostic imaging centers, freestanding emergency departments, outpatient care clinics, retail clinics, and single-specialty hospitals (acute as well as post-acute), among other health care delivery sites (Al-Amin & Housman, 2012; Burns et al., 2011; Fennell & Alexander, 1993; Longest, 1992; Luke et al., 2011; Luke & Ozcan, 2012). As clusters have varied in their response to these two trends, the diversity of arrangements, service provision, and location among organizational members has yielded a spectrum of cluster forms across markets.

However, despite their emergence and dominance of local markets, clusters remain a remarkably understudied organizational form in health services research (Shay, Luke, & Mick, in press; Sikka, Luke, & Ozcan, 2009). Little is known regarding the diversity of clusters' organizational forms, service configurations, physical arrangements, behavioral patterns, or performance. Previous studies evaluating multi-hospital systems have often failed to differentiate urban and regional hospital-based systems (i.e., clusters) versus larger, national hospital-based systems, and even among studies that have focused on clusters, consideration of their varied provision of services and service locations – particularly in regard to alternative service delivery sites – has been wanting. As a result, we currently lack an adequate inventory of clusters, including their operation of hospital-based and non-hospital-based sites. Furthermore, it remains to be seen whether distinctive model types may be identified across the diverse forms clusters have assumed. In light of this gap in the extant literature, the purpose of this study is to describe and explain the diversity among clusters' provision of health care services across hospital-based and non-hospital based sites.

Specific Aims

This study's purpose will be met by accomplishing four specific aims, three of which focus on describing the diversity observed across hospital-based clusters as an emergent organizational form, with a fourth specific aim focused on explaining such diversity.

Specific aim one. Scholars have repeatedly observed that health care is locally produced and consumed (e.g., Friedman & Goes, 2001; Linenkugel, 2001; Wholey, Christianson, Draper, Lesser, & Burns, 2004). Geography plays an important role in travel distance when seeking and receiving care (Thomas, Griffith, & Durance, 1981; Wholey et al., 2004). In addition, competition among health care organizations is also locally defined, as "competitors interact with rival firms located in the same geographic environments" (Luke, 1991, p. 209). The wave of consolidation among U.S. hospitals, particularly from 1990s to the present, serves as an example of local competition, as such activity has taken place primarily on a local level (Wholey et al., 2004). In the wake of considerable consolidation activity, hospital systems increasingly recognized the value of an approach to health care delivery that focused on local markets (Shortell, Gillies, Anderson, Erickson, & Mitchell, 2000).

The development of multi-hospital systems following a trend of consolidation during the late 20th century has been well documented. These multi-hospital systems have been frequently defined as "two or more physically separate hospitals sharing common ownership" (Dranove & Shanley, 1995, p. 58). However, Luke (1991) argued that such a general definition failed to recognize that consolidation trends occurred "more through the creation of small, local firms and clustered extensions of larger firms" than expansions of national hospital systems (p. 209). In other words, widespread consolidation of hospitals within the U.S. health care industry led to the formation of clusters, either operating as subunits of national multi-hospital systems or comprising an entire multi-hospital system operating within or around a single market.

Recent studies confirm the formation of clusters in local geographic areas and their importance as a revolutionary trend that shaped the current landscape of health care organizations (e.g., Cuellar & Gertler, 2003, 2005; Sikka et al., 2009). Today, clusters are found in markets across the country and are often competitively dominant, representing the majority of acute care general hospitals in urban markets (Cuellar & Gertler, 2005; Luke et al., 2011; Luke et al., 2004; Shay et al., in press). However, few studies of multi-hospital systems have distinguished between national hospital systems and the locally configured clusters that may be considered as "sub-systems" of these national organizations, and few studies have explicitly studied clusters as an organizational form in health services research (for some exceptions, see Cuellar & Gertler, 2003, 2005; Luke, 1991; Luke et al., 2011; Sikka et al., 2009). Furthermore, several major health services databases – including the American Hospital Association (AHA) Annual Survey of Hospitals – account for system membership among hospital members, yet they fail to account for participation within clusters, as system membership is determined regardless of local geographic considerations. Given their importance and powerful role in the U.S. health care industry, and in light of the lack of understanding and inventory of clusters in health services research, the first specific aim of this study is to complete a national inventory of urban and regional hospital-based clusters as of 2012.

Specific aim two. As previously noted, this study's focus is upon clusters' provision of a diverse range of services across the continuum of care at both hospital-based and non-hospital-based locations within local markets. Although past studies have individually acknowledged either the formation of clusters, the varied service offerings of hospital-based systems throughout the continuum of care, or the provision of non-hospital-based services within local markets, no study has examined the collective manifestation of these three trends.

Scholars have previously considered the variety of services provided by hospital-based systems and networks in the wake of consolidation trends (e.g., Bazzoli et al., 1999; Dubbs, Bazzoli, Shortell, & Kralovec, 2004), noting that service differentiation occurred as networks and systems sought to offer "a broad continuum of primary, preventive, acute, and chronic health services" (Bazzoli et al., 1999, p. 189). Such literature has predominantly focused on hospitals, rightfully acknowledging the central role acute care hospitals play as the heart of health care systems in promoting their core business and integrating health care services (Al-Amin & Housman, 2012; Courtemanche & Plotzke, 2010; Luke & Begun, 2001). However, these studies have not distinguished hospital-based from non-hospital-based services, and they may have failed to capture the variety of services offered by clusters throughout the continuum of care, particularly those provided outside of the hospitals' walls. Even among the few studies that have alluded to the behavior of hospital-based clusters to incorporate diverse provider organizations and business units outside of hospitals (e.g., Luke et al., 2011; Luke & Ozcan, 2012), such behavior has not been empirically examined among clusters.

Shortell (1999) questions such a strict focus on hospitals within health services research, asking why "we continue to give so much attention to hospital behavior" when newer organizational forms expanding beyond the hospitals' walls demand our attention as well (pp. 3-4). Extant literature of multi-hospital systems – and, more specifically, of clusters – exhibits a lack of understanding regarding clusters' diverse provision of services throughout the continuum of care at hospital-based and non-hospital-based locations within local markets.

In order to examine the organization of clusters across individual local markets, including their provision of diverse service offerings throughout the continuum of care at hospital-based and non-hospital-based sites, a catalog of clusters' components and configurations will need to be obtained. To the best of this author's knowledge, no current database exists in which hospital-based clusters and their non-hospital-based service locations are cataloged, so in order to obtain such information, this inventory will need to be created. Therefore, the second specific aim of this study is to complete a catalog of clusters' components and configurations.

Specific aim three. Having developed a catalog of clusters and their components across different markets, it is important to carefully analyze this unique set of data and determine whether subgroups of clusters sharing common characteristics may be identified. A taxonomic analysis allows for such classification, indicating whether groupings reflect "a small core of strategies and structures that underlie" diverse cluster arrangements (Alexander et al., 1996, p. 72). Taxonomies are useful for their ability to "reduce a complex set of data to a more comprehensible, parsimonious form" (Lewis & Alexander, 1986, p. 30). In this sense, the third aim of this study is consistent with previous taxonomies of health care delivery systems that have recognized the value of categorization and classification within emerging organizational forms (e.g., Alexander et al., 1996; Bazzoli et al., 1999; Dubbs et al., 2004; Lewis & Alexander, 1986), which in turn helps guard against inappropriate generalizations that occur when organizations are viewed as a collective homogeneous group.

In their explanation and demonstration of cluster analysis, Aldenderfer and Blashfield (1984) stress the importance of applying explicitly stated theory to support the classification of subgroups within taxonomic analysis. This sentiment is shared by numerous scholars (e.g., Ketchen & Shook, 1996; Lewis & Alexander, 1986; Lorr, 1983; McKelvey, 1982), promoting the use of a theoretical framework to explain why any observed subgroups of observations might truly exist. In the study of both clusters and multi-hospital systems, two perspectives have been repeatedly employed to identify key characteristics that distinguish various health care organizational forms: contingency theory and strategic management theory. In particular, the influential works of Lawrence and Lorsch (1967a, 1967b) and Porter (1986) have proven valuable in recognizing key strategic and structural characteristics among health care organizations (e.g., Alexander et al., 1996; Bazzoli et al., 1999; Dubbs et al., 2004; Luke & Ozcan, 2012; Shay et al., in press).

Lawrence and Lorsch (1967a, 1967b) cite differentiation and integration as the key constructs organizations must consider in response to the contingencies of their external environment. Similarly, Porter (1986) argues that organizations build competitive advantage by responding to external pressures and internal competencies through varying degrees of configuration and coordination. Luke and Ozcan (2012) highlight the similarity between these two sets of constructs, suggesting that differentiation is equivalent to configuration while integration is equivalent to coordination. Basic definitions of differentiation and integration provided by Lawrence and Lorsch (1967a) observe differentiation as "the state of segmentation of the organizational system into subsystems," while integration is regarded as "the process of achieving unity of effort among the various subsystems in the accomplishment of the organization's task" (pp. 3-4). In effect, Porter (1986) conceptualizes differentiation as "configuration," representing the number and diversity of components combined within clusters as well as a firm's geographic distribution of value chain activities. In addition, Porter's (1986) view of "coordination" refers to the linking or integration of similar value chain activities to support a firm's competitive positioning.

Though these two pairs of constructs may appear strikingly similar, a primary difference between differentiation and integration as presented by Lawrence and Lorsch (1967b) and the configuration and coordination terms presented by Porter (1986) is the lack of consideration for local geography in Lawrence and Lorsch's work (Luke & Ozcan, 2012; Porter, 1986). However, subsequent examinations of differentiation following Lawrence and Lorsch (1967b) have identified various forms of differentiation, including consideration of hierarchical order (i.e., vertical differentiation), activity division (i.e., horizontal differentiation), and geographic space (i.e., spatial differentiation) (e.g., Blau, 1970; Goldman, 1973; Mileti, Gillespie, & Haas, 1977). Luke (1991) argues that spatial considerations are critical when evaluating health care organizations in local markets, and his primary criticism of Bazzoli and colleagues' (1999) taxonomy of multi-hospital systems and networks stems from its lack of such spatial consideration (Luke, 2006b; Luke & Wholey, 1999). This is apparent in the taxonomy's application of a limited definition of differentiation – adhering to the definition offered by Lawrence and Lorsch (1967b) – that does not account for spatial differentiation. In contrast, Porter's (1986) work incorporates spatial differentiation within the construct of configuration.

As noted earlier, previous taxonomies of health care delivery systems have neglected to adopt a local market focus in their analysis of health care organizations, particularly in regard to the geographic distribution of system members, and therefore have not distinguished local hospital-based clusters in individual markets that operate as part of larger, national hospital systems. A taxonomy specifically focusing on hospital-based clusters has not been developed to date, and such specific consideration of cluster forms by definition incorporates a local market focus and concern for geographic distribution in its attempt to identify taxonomic groups of hospital-based clusters with common attributes. Therefore, the third aim of this study is to develop a taxonomy of cluster forms. The data that will be obtained in completing a catalog of clusters' components and configurations will provide the opportunity to examine subgroups of clusters categorized across various characteristics – including geographic distribution. This taxonomic analysis will apply a theoretical framework based upon elements of contingency theory and strategic management theory, incorporating variables pertaining to the constructs of differentiation-configuration and integration-coordination.

Specific aim four. Once taxonomic groups of cluster forms are identified, the question remains: How do we *explain* the variation observed across clusters, as categorized according to the taxonomy? Organization theory provides a lens through which we may evaluate such a question, assisting in the explanation of diversity observed and described among clusters.

As previously discussed, key constructs from contingency theory and strategic management theory will be employed in this study's taxonomic analysis to classify varying forms adopted by hospital-based clusters. However, experts in cluster analysis methods strongly recommend the validation of clustering solutions using theoretically motivated variables external to the cluster analysis in their possible explanation of cluster forms (Aldenderfer & Blashfield, 1984; Ketchen & Shook, 1996). Therefore, as contingency theory and strategic management theory serve as foundational perspectives with which to *describe* various cluster forms, five popular organization theories will serve as additional perspectives – separate from contingency theory and strategic management theory – with which to *explain* the cluster forms identified in this study.

Recognizing that health care is locally produced and consumed, this study affirms the importance of observing health care organizations at the local market level and acknowledges previous observations that local health care markets vary significantly on the basis of geography, history, health services organization, competition, and product differentiation (Fennell, 1980, 1982; Luke, 1991; Wholey & Burns, 2003). As a result, variations across local markets are expected to influence the configuration of clusters and their local services throughout the continuum of care. Different theoretical perspectives bring attention to different factors in local environments that may determine the structure and behavior of clusters. Acknowledging the value of examining complex organizations using a combination of relevant organization theories (e.g., Azevedo, 2002; Baum & Rowley, 2002; Greenwood & Miller, 2010; Hoskisson, Hitt, Wan, & Yiu, 1999; Lewin, Weigelt, & Emery, 2004; Shortell, 1999; Wells & Banaszak-Holl, 2000), a multi-theoretical approach will be adopted in this study, allowing for the identification of variables to test the study's observations in a quantitative fashion. This theoretical framework, composed of multiple perspectives including population ecology, institutional theory, industrial organization (IO) economics, transaction cost economics (TCE), and resource dependence theory (RDT), will direct the study's fourth aim of performing a regression analysis of the environmental and organizational factors associated with cluster forms. More specifically, a multinomial logistic regression model will test the likelihood of clusters' assumptions of various forms as a function of explanatory variables derived from the study's multi-theoretical framework.

Study Approach

A variety of data sources and study methods will be relied upon to address this study's four aims. In order to accomplish its first aim, this study seeks to update an inventory of clusters previously maintained by Dr. Roice D. Luke and employed in various studies (e.g., Luke, 1992; Luke et al., 2011; Shay et al., in press; Sikka et al., 2009; Trinh, Begun, & Luke, 2014). Data for this inventory are built upon a listing of acute care, general, non-federal hospitals made available in the 2006 AHA Annual Survey database. Adhering to methods described by Luke and colleagues (2011), these data will be updated and supplemented to reflect 2012 hospital system memberships, with such updating efforts including review of hospital and system websites and promotional materials. The study population will include all urban and regional hospital-based clusters in the United States as of 2012.

Sikka and colleagues (2009) note the inherent difficulty in identifying clusters that operate outside of urban boundaries. Although the majority of clusters may be easily identified in the instances that they operate within or surrounding urban markets, a small group of clusters operate across multiple small, urban markets in a single region and require judgment in appropriately identifying their members. When assigning hospitals to these clusters, this study will adhere to the process of hospital inclusion modeled by Sikka and colleagues (2009) that determines cluster membership through identification of spatially proximate combinations.

The second aim involves cataloging the numerous hospital and non-hospital service locations maintained by clusters. As previously noted, to the best of this author's knowledge, no database currently exists that provides such information, and therefore primary data collection will be necessary to accomplish this objective. Service locations for sample clusters will be identified by reviewing hospital and system websites for each cluster in the study sample, with follow-up phone calls made to clarify site information if needed. A convenience sample of clusters in six states – Florida, Maryland, Nevada, Texas, Virginia, and Washington – will be used for primary data collection to develop a catalog of cluster components and configurations. The reasoning behind the selection of six states for the study's convenience sample is due to limited access to hospital data made available by Intellimed, which is a data source that will be subsequently employed in the study's cluster and regression analyses.

The third aim requires the development of a taxonomy of cluster forms based upon the catalog of cluster components and configurations. Among studies seeking to identify groups of organizations with similarities or common configurations, cluster analysis is a widely used and ideal methodology, allowing for descriptions of organizational configurations based upon a set of multiple variables (Hair, Black, Babin, Anderson, & Tatham, 2006; Ketchen & Shook, 1996). In order to select variables with which to group study observations, this study will adhere to the "deductive approach" of selecting variables, in which variables are chosen from a theoretical framework (Ketchen & Shook, 1996). As previously mentioned, contingency theory and strategic management theory serve as the taxonomy's theoretical foundation, with variables selected corresponding to the constructs of differentiation-configuration and integration-coordination. In addition, this study will also incorporate discriminant analysis and analysis of variance (ANOVA) methods to evaluate the reliability and validity of cluster analysis results. For both of these tests, the categorical dependent variable will consist of the taxonomic groups identified in the cluster analysis solution. The independent variables for both analyses will consist of organizational and environmental variables derived from this study's multi-theoretical framework.

A multinomial logistic regression analysis will be performed to meet this study's fourth aim, testing the relationship between organizational and environmental characteristics and cluster forms identified through the cluster analysis. As previously noted, the multi-theoretical framework built upon population ecology, institutional theory, IO economics, TCE, and RDT will be used as a source for such organizational and environmental variables associated with cluster configuration. Measurement data for these variables will be obtained from sources that include the AHA Annual Survey database, the Area Resource File (ARF) database, and the Intellimed database. The dependent measure will be clusters' assignments to taxonomic groups as obtained in the cluster analysis. Together, these study methods are employed to identify common forms of hospital-based clusters based upon their various components and configurations as well as to determine organizational and environmental characteristics associated with such forms.

Significance of the Study

By accomplishing its four specific aims, this study intends to make several important and significant contributions in a variety of respects. As health care industry observers and scholars have called for increased examination of hospital-based clusters, particularly in light of their recent emergence and dominance within local markets (Cuellar & Gertler, 2003; Luke, 1992; Luke et al., 2011; Shay et al., in press; Sikka et al., 2009), this study will contribute to our knowledge about clusters and their varied forms, components, and configurations within the U.S. health care system. Establishing a foundational understanding of cluster forms will also allow for future research to assess and empirically analyze differences across cluster forms, including detailed examination of cluster performance, quality, effectiveness, and efficiency.

In addition, this study has implications relating to health policy. Following sweeping health reform in 2010, the recent promotion of accountable care organizations has emphasized efficiency, quality, coordination, and cost control among local health care providers (Fisher et al., 2009). At first glance, hospital-based clusters appear to be well suited to serve and lead as accountable care organizations within their local markets, particularly given their competitive dominance and provision of services at different levels of care. Identification of various cluster forms may assist policymakers in determining which cluster forms are best suited to successfully achieve accountable care organization ideals. In addition to accountable care organizations, recent health reform has also focused on cost containment efforts and innovative reimbursement strategies, including bundled payments and patient-centered medical homes. As policymakers look for ways to contain rising health expenditures, a better understanding of clusters – including their varied components and configurations – may help identify cluster forms that are models of efficiency and coordination of services throughout the continuum of care. On the other hand, identification of clusters that dominate their local markets in both hospital-based services and the provision of care in alternative, nonhospital settings may be of concern for policymakers striving to promote competition and reduce antitrust behaviors. Enhanced knowledge of clusters may serve as a foundation for future studies examining whether their different forms vary in their relations to reduced competition and higher prices. Such knowledge may also help policymakers evaluate whether clusters' varied forms influence citizens' access to needed services in their communities.

A third contribution is this study's application of multiple theoretical perspectives to explain cluster forms. Organization theory scholars have criticized the common testing of a single theory despite recognition that no single theory adequately explains organizations' behaviors (Azevedo, 2002; Greenwood & Miller, 2010; Luke & Walston, 2003; Mick & Shay, in press; Shortell, 1999; Stiles, Mick, & Wise, 2001). This study takes such criticism into account in its adoption of a multi-theoretical framework, and by focusing on the *local* development of hospital-based systems (as embodied in clusters) and the spatial differentiation they exhibit, this study also acknowledges critics' arguments that previous studies of organizational phenomena and applications of organization theory have paid too little attention to the importance of geographical location (Friedland & Palmer, 1984; Kono, Palmer, Friedland, & Zafonte, 1998; Pfeffer, 2003).

Finally, for practitioners in health care management, this study's examination of clusters may help illuminate the range of forms and local strategies adopted by hospital-based systems in an era of consolidation, increased corporatization, and heightened accountability. Understanding the various organizational and environmental factors associated with different cluster forms may assist health care leaders in their development of strategy, including opportunities for growth, competitive and environmental threats, and attractive organizations to partner with or emulate.

Description of Subsequent Chapters

The dissertation's remaining chapters address in greater detail the various elements identified in this introductory chapter. An examination of previous relevant literature to this study is provided in Chapter 2, including information relating to the development of local multi-hospital systems and the emergence of clusters as a dominant organizational form as well as hospital-based systems' expansion of services throughout the continuum of care and development of non-hospital-based sites. Through a discussion of the extant literature, the second chapter also highlights areas in which this study contributes to our understanding of hospital-based clusters. Having previously noted that three of this study's aims pertain to the *description* of hospital-based clusters, Chapter 3 outlines the conceptual framework that guides the taxonomic analysis of hospital-based cluster forms. This framework is developed from key works in the contingency theory and strategic management theory literature, specifically the writings of Lawrence and Lorsch (1967a, 1967b) and Porter (1986), respectively. Research methods employed to complete a catalog of cluster components and configurations and to conduct the taxonomic analysis are described in detail in Chapter 4, with the results of the catalog and taxnomic analysis presented in Chapter 5. The results of the taxonomic analysis will then serve as a dependent variable in the subsequent logistic regression analysis, which is intended to fulfill the study's fourth aim. In the same way that the third, fourth, and fifth chapters address this study's effort to *describe* cluster components and configurations, the sixth chapter relates to the dissertation's intent to *explain* variation observed across cluster forms. Chapter 6 details the conceptual framework of the study's fourth aim, employing a multi-theoretical perspective with elements from population ecology, institutional theory, IO economics, RDT, and TCE. In addition, the chapter describes the research methods involved in the study's multinomial logistic regression analysis and presents results from related descriptive and regression analyses. A discussion of the study's overall findings and results is offered in Chapter 7, including thoughts on the study's implications, limitations, significance, and potential directions for future research.

Chapter 2: Literature Review

We now proceed to examine the literature on hospital-based clusters that relates to this study, including their emergence and development as an organizational form as well as their impact on the U.S. health care system. Before summarizing the extant literature, the chapter begins with a description of cluster forms that are apparent in two major markets as of 2012. This brief comparison of clusters in the San Antonio, Texas and Hampton Roads, Virginia markets illustrates the widely varied forms that clusters adopt both within and across local markets, including their provision of care at hospital-based and non-hospital-based sites. Beginning with an illustration of clusters' varied forms is important for the literature review because it provides a concrete example of the activities and strategies among clusters and hospital-based systems that are subsequently discussed, and we may use the illustration as a reference point from which to consider how past trends and phenomena have contributed to the development of the varied cluster forms we see today.

The chapter then proceeds to provide a historical perspective of the development of today's hospital-based clusters during the latter half of the 20th century, including the consolidation of hospitals and formation of local multi-hospital systems as well as hospital-based systems' diversification of services throughout the continuum of care and their geographic expansion through non-hospital-based sites. By considering the extant literature, the second chapter closes by highlighting areas in which this study contributes to our understanding of hospital-based clusters.

A Tale of Two Markets: Illustrating Diverse Cluster Forms

As of 2012, the San Antonio metropolitan statistical area, located in south central Texas, and the Virginia Beach-Norfolk-Newport News metropolitan statistical area (often referred to as Hampton Roads), located in southeastern Virginia, are two seemingly similar markets. Both markets are comparable in size, with San Antonio boasting a total population of approximately 2.2 million people and Hampton Roads maintaining a population of roughly 1.7 million residents. Both markets possess deep historical roots, as far back as the 17th century, and a large military presence. And, each market is served by three large hospital-based clusters that are the predominant health care providers in their area. In San Antonio, those clusters include: Christus Santa Rosa Health System, a not-for-profit Catholic-owned cluster with three acute care hospitals; Baptist Health System, a for-profit system owned by Vanguard Health Systems with five acute care hospitals (later acquired by Tenet Healthcare in 2013); and, Methodist Health System, operating five acute care hospitals through a 50-50 co-ownership agreement between the for-profit HCA Corporation and the not-for-profit Methodist Healthcare Ministries. In Hampton Roads, the three clusters are: Bon Secours Hampton Roads Health System, a not-for-profit Catholic-owned cluster with three acute care hospitals; Riverside Health System, a not-for-profit system with four acute care hospitals in the regional area; and, Sentara Healthcare Hampton Roads, a not-for-profit system operating seven acute care hospitals in the local market.

These six clusters provide a variety of acute and non-acute services at both hospital-based and non-hospital-based locations throughout their respective markets. For example, in addition to its acute care hospitals, the Christus Santa Rosa Health System maintains two freestanding specialty hospitals, two freestanding emergency departments, three freestanding ambulatory surgery centers, two outpatient rehabilitation clinics, and two primary care clinics. Similarly, the Baptist Health System and Methodist Health System operate a range of facilities separate from their acute care hospitals, including freestanding emergency departments, women's clinics, and multi-service outpatient care centers. In comparison, the clusters in the Hampton Roads market also operate comparable non-hospital-based sites, including multi-service outpatient care centers and outpatient rehabilitation clinics. However, these three clusters also tend to operate numerous post-acute and even residential care facilities outside of hospital campuses. For example, the Riverside Health System's non-hospital-based sites include four freestanding skilled nursing facilities, a freestanding inpatient rehabilitation facility and long-term acute care hospital, and three continuing care retirement communities that include independent living, assisted living, and skilled nursing services. Bon Secours Hampton Roads Health System and Sentara Healthcare Hampton Roads also offer services at freestanding assisted living and skilled nursing facilities, providing post-acute care options beyond hospital walls.

One may quickly observe that the clusters in the Hampton Roads market tend to provide a range of post-acute care services at non-hospital-based sites in addition to an array of pre-acute service locations, whereas the clusters in the San Antonio market seem to focus their non-hospital-based sites more upon services closely related to primary or acute care, with their post-acute service offerings primarily consisting of outpatient rehabilitation clinics. But, is this comparison between clusters in two markets representative of variation that exists in other U.S. markets? Are there apparent patterns to the variety in non-hospital-based services offered among clusters, or are the aforementioned differences in the cluster examples simply anecdotal and not indicative of a pattern or trend in health services organization? And, if a pattern or trend indeed exists, what reasons lie behind the differences observed among clusters in different markets? For example, why would the clusters in Hampton Roads provide an expanded service offering with a range of post-acute and senior care services, whereas the clusters in San Antonio focus more heavily on primary and acute care services at non-hospital-based locations? This study intends to address these numerous questions by fulfilling its previously presented purpose.

First, it is helpful to address the more basic question of, how did we get here? How has the U.S. health care system developed to the point where hospitals have formed powerful systems that provide a range of services at hospital-based and non-hospital-based sites? And, how has this development been examined in the extant health services literature? We begin by reviewing the literature on the development of multi-hospital systems, including the manifestation of hospital-based clusters in local markets.

From Cottages to Clusters: The Development of Local Multi-Hospital Systems

Before 1970, community hospitals in the U.S. generally operated as freestanding, autonomous facilities that resembled a "cottage industry." The first example of what may be considered a multi-hospital system has been cited as the Youngstown Hospital Association in Ohio, which consisted of two physically separate acute, general hospital facilities upon the opening of its Northside Unit in 1929 (Brown & Lewis, 1976). Thirteen years later, Detroit Grace Hospital established a Northwest Unit, marking the second instance of a hospital expanding to offer general hospital services at two separate locations (Brown & Lewis, 1976). However, these "multiple unit systems" were the exception rather than the rule, and it was not until the late 1960s and early 1970s that the health care field expressed "growing interest in the development of new, purposely-structured combinations of health service organizations" (Starkweather, 1971, p. 468). Since then, a dramatic sequence of organizational trends and turbulent changes – from consolidation and diversification to integration and disintegration – have led to the emergence of today's locally dominant hospital-based clusters.

Consolidation: The growth of multi-hospital systems. The history of clusters' emergence in the U.S. health care system is tied to the growth of multi-hospital systems, which have frequently been defined as "two or more physically separate hospitals sharing common ownership" (Dranove & Shanley, 1995, p. 58; Carey, 2003). Citing data collected from the American Hospital Association across numerous years, scholars regularly tracked the changes in multi-hospital system membership during the latter half of the 20th century (e.g., Alexander & Amburgey, 1987; Ermann & Gabel, 1984; Zuckerman, 1983). In 1945, roughly 5 percent of all nonfederal general and specialty hospitals were members of multi-hospital systems, and this figure remained fairly constant through 1965, at which point system membership began to increase so that approximately 10 percent of such hospitals were system members in 1970 (Alexander & Amburgey, 1987; Zuckerman, 1983). Through the 1970s, multi-hospital systems enjoyed steady growth in facility membership, as the number of hospitals belonging to multi-hospital systems on average grew by over 4 percent each year (Ermann & Gabel, 1984). By the mid-1980s, multi-hospital systems had replaced freestanding, independent hospitals as "the most visible components" of the American hospital industry (Alexander & Fennell, 1986, p. 14), comprising roughly a third of all U.S. community hospitals (Dor & Friedman, 1994; Ermann & Gabel, 1984; Sloan, Morrisey, & Valvona, 1987). What spurred such change across U.S. hospitals? The dramatic movement towards system membership stemmed from a number of converging factors.

Through the first six decades of the 20th century, the predominant concerns regarding regulation of the U.S. health care delivery system pertained to improving the accessibility and quality of medical care, as evidenced in such historical policy initiatives as the Hill-Burton Act in 1946, which sought to modernize and increase the number of hospitals throughout the country, and the introduction of Medicare and Medicaid in 1965, which sought to ensure medical coverage for the elderly, the poor, and the disabled (Shortell, 1988; Zuckerman, 1983). However, hospitals, having traditionally been funded largely through philanthropy, found desirable payment mechanisms in Medicare, Medicaid, and private health insurance (which had become widely adopted), resulting in a hospital field that had become more financially self-sufficient and driven to pursue third-party payments (Neumann, Harms, & Bloomfield, 1978; Provan, 1984; Reynolds & Stunden, 1978; Shortell, 1988). During this time, the environment in which hospitals operated has been characterized as "seemingly unlimited" in its financial support (Zuckerman, 1983, p. 217). As a result, proprietary corporations took interest in entering the hospital industry, stimulating hospitals' competitive pursuit of growth and economic advantage while diminishing their previous focus on philanthropy (Reynolds & Stunden, 1978; Shortell, 1988). With the rapid growth of proprietary hospitals in the late 1960s and early 1970s – and, more specifically, proprietary hospital systems such as the Hospital Corporation of America (HCA) or American Medical International (AMI) – other independent, voluntary hospitals found themselves looking to emulate the success of for-profit chains by forming their own multi-hospital systems, believing system membership would bolster their competitive standing and yield a range of desirable benefits (Dranove & Shanley, 1995; Provan, 1984; Reynolds & Stunden, 1978).

Following the passage of Medicare and Medicaid, hospitals realized little incentive to limit spending, as facilities could expect to be fully reimbursed for reasonable expenses under a cost-based reimbursement system (Zuckerman, 1983). Significant advances in medicine and technology during the early 20th century also added to both the cost and complexity of health care provision (Provan, 1984). By the early 1970s, the rising costs of hospital care began to gain significant attention, and regulatory efforts shifted towards limiting the growth of medical spending (Zuckerman, 1983). As calls for cost containment heightened and the government subjected health care providers to additional regulation, hospitals grew "increasingly aware of the need to cooperate with one another so that services [could] be purchased and provided more economically than if done alone" (Provan, 1984, pp. 495-496). The growing interest in multi-hospital systems was reinforced by the calls of scholars for increased coordination and consolidation of health care services as well as the endorsement of multi-hospital arrangements through legislation such as the National Health Planning and Resources Development Act of 1974 and initiatives such as the American Hospital Association's Center for Multihospital Systems (Mason, 1979; Neumann et al., 1978; Provan, 1984; Studnicki, 1979).

With regulation that encouraged consolidation, as well as heightened competition that intensified pressures to secure necessary resources, hospitals increasingly saw multi-hospital system membership as a means to grow and effectively compete by capturing economies of scale, minimizing expenses, gaining local and regional influence, and "generating new bases of capital and revenues" (Alexander & Amburgey, 1987, p. 301; Shortell, 1988; Starkweather, 1981; Starr, 1982). And, as technological advancements continued to reshape the health care industry, hospitals turned to consolidation so that, as a larger organization, they may have the means to afford new technology as well as generate a sufficient volume of referrals to support their technological investments (Starkweather, 1981).

In short, a number of converging factors, including economic forces, technological change, demographic shifts, and regulatory pressures, contributed to the development of multi-hospital systems in the 1970s and early 1980s (Alexander, Anderson, & Lewis, 1985a; Provan, 1984; Shortell, 1988; Starkweather, 1981). Observing the evolution in the U.S. hospital field from a collection of autonomous facilities to the emergence of multi-hospital systems during this time, scholars began to critically evaluate and compare the touted benefits of system membership versus the actual outcomes of system membership made apparent through empirical research.

Systems' anticipated benefits and realized outcomes. The initial trend of individual, freestanding hospitals consolidating to form multi-hospital systems in the 1970s and early 1980s represented a strategy of horizontal integration, which numerous industry observers believed would yield an array of advantages over continued autonomy. Proponents of multi-hospital arrangements regularly cited benefits such as economies of scale, enhanced quality, improved access to care, and greater market power (Brown & Lewis, 1976; Neumann et al., 1978). Among such endorsements, the "promises" of multi-hospital systems were typically grouped into four categories: economic benefits, manpower benefits, organizational benefits, and community benefits (Ermann & Gabel, 1984; Morrisey & Alexander, 1987; Zuckerman, 1979).

Economic benefits of system membership include economies of scale made possible by increased coordination, specialization, productivity, and efficiency, as well as improved access to capital and utilization of resources (Ermann & Gabel, 1984; Zuckerman, 1979). Manpower benefits refer to an enhanced ability to recruit and retain key clinical and managerial personnel as well as greater management capabilities and depth, whereas organizational benefits include growth (e.g., expanded service and operation areas), enhanced power with external stakeholders, and, in some cases, survival (Zuckerman, 1979). Dowling (2002) focused on organizational benefits when boiling down two contrasting motives for system membership: for freestanding facilities, consolidation was a means to ensure survival, and for multi-hospital systems, adding new members was an opportunity for growth. And, community benefits refer to lowered costs as well as improvements in the access, quality, and regional planning of care (Morrisey & Alexander, 1987). To this list of desirable benefits, Longest (1980) also defended the pursuit of system membership as part of a stabilization strategy, arguing that multi-hospital arrangements provided needed stability that was otherwise not available for independent hospitals in the midst of an increasingly complex and competitive environment.

However, upon evaluating the actual impact of multi-hospital systems following their emergence in the 1970s and early 1980s, studies at the time yielded mixed findings. Coyne (1982) found system hospitals to generally be more efficient and more effective in their management of resources than independent facilities. On the other hand, studies by Becker and Sloan (1985) and Renn and colleagues (1985) observed no significant effects on hospital efficiency for system members. Coyne (1982) also found that system hospitals generally maintained higher costs and failed to realize improvements in productivity compared to freestanding facilities. Similarly, Ermann and Gabel (1984) reviewed studies evaluating the impact of multi-hospital systems, noting that analyses at the time generally indicated systems were associated with higher costs. However, they also argued that there were important limitations in the extant literature that called such results into question. In addition, their review found a lack of support for systems' impact on access, availability, and quality (Ermann & Gabel, 1984). Levitz and Brooke (1985) identified associations between system membership and both higher prices and access to capital. Using the three categories of multi-hospital system benefits previously described (i.e., economic, manpower, and organizational benefits), Zuckerman (1983) found mixed results after evaluating the evidence from previous studies of the effects of system membership, with the primary clear benefits including access to capital, personnel recruitment, and organizational growth. And, in his critical evaluation of the widely advertised promises of system membership, Shortell (1988) found "little support for any of the alleged advantages of system hospitals relative to their nonsystem counterparts," attributing system members' lack of realized benefit to their failure to behave as a system (p. 183). In sum, early empirical examinations found little convincing evidence that multi-hospital systems realized economies of scale, enjoyed greater efficiency, obtained better clinical outcomes, or provided more services or charity care to their communities than non-system hospitals (Carey, 2003; Shortell, 1988). Shortell (1988) argued that, rather than chase after economic advantages, most facilities pursued system relationships as a defensive tactic to gain protection from a turbulent and increasingly competitive environment, echoing a position earlier outlined by Longest (1980).

Thus, as the number of multi-hospital systems grew throughout the 1970s and early 1980s – first primarily through for-profit hospital chains followed by increased consolidation among not-for-profit providers – scholars and industry observers noted this remarkable development with expectations as to what benefits system membership would yield for hospital members and what changes could be expected for the U.S. health care delivery system as a whole. However, many were surprised and disappointed to find that the empirical evidence of the outcomes of system membership did not match the promises of horizontal integration that had been earlier touted. In some ways, this was perhaps due to the assumptions that system membership had similar effects for each hospital, that factors driving horizontal integration decisions were shared among hospitals across different markets throughout the country, that the anticipated benefits of consolidation would directly relate to each hospital's conditions and their considerations of participating as system members, and that hospitals forming multi-hospital systems would truly function as members of a system rather than continue practices and patterns associated with their previous independent status (Morrisey & Alexander, 1987).

As consolidation trends would revisit the hospital industry with force before the close of the century, scholars would later realize and note that not all systems are the same, and therefore the motives, benefits, and consequences of system membership may vary across different types of hospitals and multi-hospital systems. Importantly, later studies would also begin to distinguish and examine horizontal integration among geographically proximate hospitals, finding key benefits of cost efficiencies and enhanced market power for local hospital system members (Sinay & Campbell, 2002). But, before horizontal consolidation swept through the U.S. health care sector again, another period of change marked by diversification and vertical integration dramatically affected hospital providers and captured the attention of health services researchers.

New directions: From horizontal to vertical growth. As horizontal integration activity led to the formation of multi-hospital systems in the 1970s and early 1980s, a shift in business strategies marked the 1980s and early 1990s, when hospitals increasingly added service lines and sought greater control and coordination in meeting patients' needs throughout the continuum of care (Conrad & Dowling, 1990; Conrad & Shortell, 1996; Longest, 1992; Robinson, 1994; Shortell, Morrison, Hughes, Friedman, & Vitek, 1987). These strategies were often interchangeably described as diversification, vertical integration, or both (Clement, 1988), and there were a number of factors leading to their adoption.

In 1983, Medicare implemented the prospective payment system (PPS) for acute care hospitals, constituting a dramatic change for providers. With reimbursement transitioning from a retrospective (i.e., charge-based) to prospective (i.e., diagnosis-based with fixed rates) basis, hospitals experienced considerably greater difficulty in generating increased revenues and offsetting patient expenses (Manheim, Shortell, & McFall, 1989), while also finding a financial incentive to better manage patient care by integrating throughout the patient care continuum (Conrad, 1993). Under the PPS, acute care hospitals were observed to discharge patients "quicker and sicker" as they gained the motivation, previously not felt under cost-based reimbursement, to reduce patients' length-of-stay, and this development led to an increased need for post-acute and long-term care (Giardina et al., 1990; Robinson, 1996a). Around the same time, hospitals also experienced declines in occupancy rates while simultaneously feeling increased pressure from the rise of non-hospital competitors such as ambulatory surgery centers, urgent care clinics, and outpatient diagnostic centers (Coddington et al., 1985; Shortell, Morrison, & Hughes, 1989). Such competitors were fueled by the growth of outpatient care, which flourished as a result of consumers' and payers' preferences for outpatient procedures as well as technological developments that enabled cost-effective, high-quality care outside of hospital walls (Shortell, 1988; Shortell, Gillies, & Devers, 1995). During this period, hospitals' average net operating margins began to decrease, and hospital-based providers struggled under declining profits (Fox, 1989). An aging population also influenced hospital system strategies, with increased demand for coordinated services catering to chronic care, long-term care, and post-acute care needs (Conrad & Dowling, 1990). In the midst of such challenges, these providers began adopting vertical strategies, including diversification and vertical integration, to expand their service lines and offer health-related services other than inpatient acute care (Coddington et al., 1985; Clement, 1988; Ermann & Gabel, 1985; Fox, 1989; Robinson, 1996a; Shortell et al., 1987).

Vertical integration and diversification defined. The distinction between horizontal and vertical strategies is important, as is the distinction between various vertical activities. Whereas horizontal activity refers to the combination of homogeneous or substitutable outputs (e.g., the joining of two general, acute care hospitals), vertical activity refers to the joining of heterogeneous outputs at various stages (e.g., the joining of an acute care hospital and primary care clinic) (Starkweather, 1971). Depending upon the relatedness and degree of coordination exhibited between the joined outputs, vertical activity has been described using a number of terms, including vertical integration and diversification. Yet, scholars have continuously disagreed regarding the appropriate terms to label such activity. As we consider the strategic trends observed in the U.S. health care delivery system towards the end of the 20th century, it is helpful to briefly distinguish vertical integration and diversification, which were two of the most widely discussed and commonly applied terms within the health services literature for vertical strategies in the 1980s and 1990s. The following discussion includes an initial consideration of vertical activities, as both horizontal and vertical strategies will be discussed in greater detail in the following chapter.

Vertical integration. Vertical integration is often reduced to the incorporation and coordination of multiple production processes – which on their own serve as successive inputs or outputs to the other processes in the development of a product or service – in a single firm (Conrad & Dowling, 1990; Conrad & Shortell, 1996; Gillies, Shortell, Anderson, Mitchell, & Morgan, 1993; Mick, 1990; Shortell, 1988; Snail & Robinson, 1998; Starkweather, 1971). Within this definition, vertical integration scholars particularly note the importance of an organization's *coordination* across services as a distinguishing feature of vertical integration activity. For example, Conrad and Dowling (1990) referred to vertical integration in health care organizations as the provision of a range of services "operated in a functionally unified manner," with examples including services across the entire continuum of care (p. 9). Conrad (1993) later emphasized this point again, describing the coordination of a patient's care over time as "the sine qua non of vertical integration" (p. 492). The term, "vertical integration," also suggests that the functionally unified provision of services occurs in successive stages, such that the different services received by a patient during an episode of care are provided internally and transitioned seamlessly by the same provider (Conrad, Mick, Watts-Madden, & Hoare, 1988). However, as will be noted later in Chapter 3, identifying and distinguishing vertically integrated activity within health care organizations has been described as a problematic endeavor for numerous reasons, including the difficulty of measuring coordination and of specifying a successive service chain in health care (Goes & Friedman, 2001; Luke & Ozcan, 2012; Mick & Conrad, 1988; Shay et al., in press; Singer et al., 2011).

Diversification. In contrast to vertical integration, diversification refers to an increase in output heterogeneity either through the production of new services and products that are non-substitutable with the organization's existing output or through the entrance of new markets with the organization's existing services and products (Dranove & Shanley, 1995; Shortell, 1988; Snail & Robinson, 1998). Furthermore, health care organization scholars distinguish between related and unrelated diversification, suggesting that a hospital system's form of diversification depends upon the degree to which new services relate to its core business and markets (Alexander, 1990; Clement, 1987; Snail & Robinson, 1998). In related diversification – also referred to as concentric diversification – an organization offers new products or services that both complement and share resources with the offerings that had formed the core business or distinct competencies of the organization (Clement, 1987; Longest, 1992).

Within the health care industry, related diversification has been the form of diversification observed most often (Longest, 1992), and diversification efforts for hospital-based systems have typically involved the provision of services other than inpatient acute care (Alexander, 1990; Shortell, 1988). However, confusion exists as to whether specific services should be considered examples of related or unrelated diversification. Snail and Robinson (1998), in their review of empirical evidence regarding hospital integration and diversification, noted that scholars apply inconsistent operational definitions to these strategies, such that vertical activities deemed related in some instances may be considered unrelated in others. Some have proposed a third category of diversification – "partially related diversification" (Shortell, 1988; Shortell et al., 1989), which has added to confusion as to the appropriate classification of diversified services.

Integration or diversification: An ongoing debate. Despite the definitional boundaries that seemingly divide vertical integration and diversification as separate strategies, experts have debated and disagreed regarding the appropriate terms to apply to multi-hospital systems' vertical activities. Some have distinguished vertical integration from diversification by suggesting that a vertical integration strategy, unlike diversification, focuses on supporting the hospital system's core business (i.e., inpatient acute care) and overall firm value (Conrad & Dowling, 1990; Conrad et al., 1988; Fox, 1989). Others contend that a diversification strategy, and in particular *related* diversification, indeed does support the hospital system's core business and enhance its value when implemented successfully (Eastaugh, 2008; Giardina et al., 1990; Wheeler, Burkhardt, Alexander, & Magnus, 1999; Zinn, Mor, Feng, & Intrator, 2009). Similarly, Conrad (1993) suggested that managers and analysts frequently confuse vertical integration with both related and unrelated diversification due to their "failure to realize the central importance of patient care coordination" in the provision of integrated care (p. 492). At times, the terms vertical integration and related diversification have been used interchangeably by health care organization scholars to refer to a range of services offered by hospitals and multi-hospital systems (e.g., Lewis & Alexander, 1986; Robinson, 1994). And, many of the same services frequently used as examples of hospitals' diversification efforts have been employed as examples of vertical integration activity.

Experts have admitted the challenge that exists in determining whether an organizational arrangement is an example of vertical integration or diversification strategies, and some suggest that the two strategies are not mutually exclusive (Longest, 1980; Snail & Robinson, 1998), but that diversification may serve as a form of vertical integration (Giardina et al., 1990; Lewis & Alexander, 1986), or vice versa (Harrigan, 1983, 1984). Mick and colleagues (1993a) addressed this controversy and pursued what may be seen as a "middle ground" in their observation of strategic activity across rural hospitals, amending previously applied terminology to collectively identify "vertical integration-diversification strategies" that may be closely related, partially related, or unrelated. In Chapter 3, we explore in greater detail the different opinions and arguments among scholars as to the appropriate terms relating to clusters' provision and integration of services throughout the continuum of care.

***Growth in vertical activity*.** As hospitals faced an environment in the early 1980s characterized by heightened competition, increased uncertainty, and decreased munificence (Alexander, 1992), vertical activity such as integration and diversification seemed to be a credible and valid response with perceived benefits that were extremely promising to health care managers. Although these strategies gained widespread attention and popularity during the latter decades of the 20th century, such thinking was not new; hospitals' and hospital systems' consideration of vertical growth had already been a topic of discussion for many years.

Vertical integration had been a promoted strategy within health care for much of the 20th century (Brown & McCool, 1986), and during debates of alternative models of health services organization in the early 1970s, Ellwood (1972) reported a "virtual consensus…that the components of health delivery should be vertically integrated by encouraging the formation of larger health care organizations" (p. 99). Thus, after horizontal consolidation dominated the 1970s and led to the development of larger multi-hospital systems, many saw the next logical step in organizational growth as hospital-based systems' vertical expansion and coordination of services throughout the continuum of care. As rapid changes were observed across the U.S. health care delivery system in the 1980s and early 1990s, scholars noted that vertical integration was finally "an idea whose time [had] come" (Walston, Kimberly, & Burns, 1996, p. 83).

Similarly, discussions of diversification as a strategic opportunity for hospitals gained momentum in the 1970s, prior to the initial diversification activity observed in the late 1970s and early 1980s or the prevalent adoption of such efforts following the introduction of PPS (Clement, 1987). At the start of the 1980s, diversification was promoted as a crucial strategy for hospitals' survival and growth (Clement, 1987; Eastaugh, 1984; Goldsmith, 1980), and ten years later, Alexander (1990) suggested diversification had emerged as "the dominant organizational strategy" of the decade (p. 84). By the 1990s, diversification had become "a basic component of the strategic behavior of hospitals in the United States" (Longest, 1992, p. 15; Shortell, Morrison, & Friedman, 1990), which some believed was "the single most important form of organizational expansion in health care" (Robinson, 1996c, p. 158).

Vertical growth patterns. As consolidation trends led to the initial emergence of multi-hospital systems in the 1970s and early 1980s, scholars observed a rising trend in vertical growth patterns that followed horizontal activity, such that multi-hospital systems began to expand beyond inpatient hospital care and offer services throughout the care continuum (Alexander, Lewis, & Morrisey, 1985b; Clement, 1987; Ermann & Gabel, 1984; Zuckerman, 1983). By 1982, "over half of the nation's systems operated health promotion programs, ambulatory care facilities, or nursing homes," with systems on average operating roughly four non-hospital, freestanding health care sites (Ermann & Gabel, 1984, p. 54).

Over time, industry observers noted trends in the types of services and settings targeted in hospitals' and hospital systems' vertical strategies. For example, Eastaugh (1984), in work that built upon a previous study by Berry (1973), observed "diversification patterns" in which initial diversification efforts included services closely related to the acute care hospital core (e.g., operating, delivery, and emergency rooms), with successive diversification stages involving services that were more complex, more unrelated, or both. In the 1980s, hospitals' vertical growth into behavioral health (e.g., psychiatric hospitals) and post-acute care (e.g., home health, skilled nursing services) grew considerably, and hospitals' operation of outpatient facilities roughly doubled (Ermann & Gabel, 1984; Robinson, 1996b). Vertical growth patterns continued into the early 1990s, including tertiary care hospitals' mergers with physician practice groups and non-tertiary facilities (Nakamura, 2010). As trends emerged and changed, scholars observed that the patterns of development and divesture across varied service lines were dictated in part by hospitals' and hospital systems' experiences with what strategies worked, what strategies were being pursued by competitors, the financial requirements of different strategies, and the level of promise exhibited by different strategies for future success (Eastaugh, 2008).

The promises and performance of vertical strategies. The strategies of diversification and vertical integration were both widely touted throughout the 1980s and early 1990s, and they also shared similar presumed benefits. In general, proponents of vertical integration in health care suggested that the benefits of integrating vertically included more effective and continuous patient care, increased power and environmental acceptance, and improved efficiency, productivity, profitability, and cost-effectiveness (Conrad, 1992; Miller, 1996; Walston et al., 1996). Thus, as a flourish of integrative activity was observed in the 1980s and 1990s, organizations adopting a vertically integrated structure anticipated "improved control of patient flow, entry into fast-growing markets, and financial returns" (Clement, 1992, p. 104). Similarly, administrators who embraced diversification strategies hoped that such efforts would provide their organizations with sources of additional revenue, ensure competitive positioning, balance risk and return, allow for entry into developing markets, and serve to establish both additional referral sources as well as early discharge destinations for their patients (Giardina et al., 1990; Lee & Alexander, 1999; Longest, 1992; Shortell et al., 1989; Snail & Robinson, 1998). In addition, expected benefits of diversification included an enhanced brand image and public reputation (Eastaugh, 2008). And, Longest (1980) asserted that, much like the motives for hospitals to integrate horizontally and form multi-hospital systems, diversification into additional service lines served as a stabilization strategy for hospitals in the midst of considerable environmental uncertainty. Given such lofty expectations for these vertical strategies, subsequent analyses of vertical integration and diversification in hospitals and hospital systems evaluated whether their performance lived up to their promise.

Outcomes of vertical integration. Studies have shown that hospitals and hospital systems generally aimed to maintain a competitive posture by pursuing vertical integration activity in the 1980s and early 1990s, but the integration of services across the continuum of care did not necessarily yield the anticipated benefits of improved financial standing, enhanced efficiency, or coordination of patient flow in each integrative endeavor (Cody, 1996; Walston et al., 1996). In many instances, evaluations of the outcomes of vertical integration yielded mixed findings. For example, in California, hospitals were able to increase revenues through pre-acute ambulatory care but had difficulty finding financial success by integrating post-acute care services (Cody, 1996). Wang and colleagues (2001) obtained similar results, observing hospitals' integration with pre-acute services (e.g., physician clinics, ambulatory surgery centers) as a great benefit financially, whereas integration with post-acute services (e.g., skilled nursing, home health, rehabilitation) was found to benefit productivity but fail in enhancing organizational profitability. Other studies' results indicated that integration "into nonacute hospital services" generally failed to positively contribute to organizational success (Thaldorf & Liberman, 2007, p. 126).

Numerous reasons exist why hospital systems pursuing vertical integration strategies may have failed to realize better financial returns, including: disruption of the organization's client base; a lack of fit between new integrated services and the organization's mission and goals; an organization's entry into markets that were either slow-growing, unsustainable, imperfect, or well-established; considerable difficulty on the part of organizations to realize economies in costs and adequately anticipate initial production costs required to integrate vertically; and, a lack of understanding on the part of patients to "understand the relevance of particular vertical arrangements" (Clement, 1992, p. 105). In light of these reasons, it becomes apparent that the pursuit of vertical integration is a complex endeavor that is not simply applied in a uniform fashion, nor does it yield uniform results. Contingency thinking, as described in Chapter 3, may apply here: certain organizations may have been better suited for certain vertical integration strategies, whereas various factors relating to other organizations may have limited their ability to realize success through vertical integration.

On this point, despite industry observers' general disappointment toward the end of the 1990s that vertical integration had failed to live up to its bold promises, some studies found evidence that hospitals and hospital systems did enjoy a degree of success by integrating vertically. For instance, multi-hospital systems that engaged in a diverse range of integrated service offerings to grow both horizontally and vertically increased their market power (Walston et al., 1996). A literature review by Thaldorf and Liberman (2007) reached similar conclusions, finding examples of vertical integration success primarily among large health care organizations that dominated their local markets. Shortell, Gillies, and Anderson (1994) observed that multi-hospital systems exhibiting greater degrees of integration performed better financially in comparison to competitors. And, in situations involving hospitals' integration with hospital-based skilled nursing facilities, hospitals managed to reduce transaction costs while putting their excess hospital capacity to productive use (Lehrman & Shore, 1998).

Outcomes of diversification. Similar to vertical integration, diversification was a widely promoted strategy in the 1980s and early 1990s with mixed findings regarding its actual benefits (Lee & Alexander, 1999). Multi-hospital systems' diversification into non-acute and even non-hospital-based offerings was expected to yield economic benefits including increased profitability, improved means to fund capital acquisitions, greater financial stability, and future growth (Ermann & Gabel, 1984, p. 57). Early observations indicated that hospitals pursuing a diversified portfolio of services enjoyed competitive advantages and increased market power (Eastaugh, 1984; Goldsmith, 1980). However, later research shed doubt on the prudence of such expectations. Industry observers noted that, for many hospital systems, diversification efforts failed to meet expectations or substantially contribute to the overall success and profitability of the organization (Fox, 1989; Shortell et al., 1989; Snail & Robinson, 1998). Clement's (1987) findings that diversification did not increase hospital profitability or reduce risk led to the conclusion that "diversification may have been oversold to hospital managers" (p. 999).

At the same time, such disappointing results may have stemmed from hospital systems' adoption of services that were only partially related to their inpatient acute care business while insisting upon managing such services in the same way that they had always managed inpatient acute care (Shortell et al., 1989). Health care organizations adopting diversification strategies may also have underestimated the transaction costs, risks, and development time that came with diversification (Alexander, 1992; Coddington et al., 1985). On this note, Clement (1987) conceded that the impact of diversification strategies on financial performance may take an extended period of time to observe. Indeed, a later study by Clement and colleagues (1993) identified hospitals' diversification efforts that were related to inpatient acute care and had existed for a longer period of time as being more profitable.

Works by additional scholars also suggested that the profitability or success of certain diversification efforts may depend upon local market factors and may vary across types of services (Longest, 1992; Shortell, 1988; Succi, Lee, & Alexander, 1997). Some studies found profitable diversification efforts to include hospitals' expansion into complex, high-tech ventures such as outpatient respiratory therapy, outpatient diagnostic centers, and ambulatory surgery centers, whereas additions of public health or nursing services such as wellness programs or hospice care were identified as generally unprofitable (Longest, 1992; Snail & Robinson, 1998). In addition, successful diversification ventures typically involved "a greater degree of physician involvement" as well as "services related to existing acute care clinical and managerial competencies," and services that were deemed "partially related diversification ventures" were more likely to succeed if their organizations allowed for "different governance structures and greater autonomy in management" (Snail & Robinson, 1998, p. 444). Furthermore, Clement and colleagues (1993) noted that, in some instances, hospitals' and hospital systems' diversification strategies may in turn contribute to the improved performance of their core hospital business through increased patient flows (p. 759). Finally, Alexander (1990) specifically addressed diversification as a strategy of multi-hospital systems during the early to mid-1980s and found that such activity occurred at a more modest rate than industry observers expected. Many systems had concurrently added new services while divesting other specific businesses, leading to the conclusion that, as a process, diversification requires a combination of business adoption and divestment "in an attempt to achieve a balance between profitability, risk, and stability" (Alexander, 1990, p. 99).

In general, vertical growth strategies of integration and diversification grew in popularity throughout the 1980s and early 1990s, capturing the attention of industry leaders, observers, and analysts. Even if their actual effects on hospitals and hospital systems failed to achieve all of their lofty, presumed benefits, and despite mixed findings, there can be no doubt that the increased diversification and vertical integration observed during this time period had a significant impact on the U.S. health care delivery system and hospital-based organizations. By the start of the Clinton administration, many multi-hospital systems were no longer simply comprised of hospitals; as a result of vertical growth patterns, these organizations often consisted of various non-hospital-based sites such as outpatient diagnostic centers, ambulatory surgery centers, or long-term care facilities. However, dramatic changes would once again disrupt the health care industry, and health care organizations would once again respond with changes in their strategic directions and organizational forms.

Turbulent times: Twin strategies of horizontal and vertical growth. As much interest in the health services literature during the 1980s and early 1990s focused on the diversification and vertical integration strategies pursued by hospitals and hospital systems, a dramatic wave of mergers and acquisitions swept the U.S. health care industry in the 1990s (Abraham, Gaynor, & Vogt, 2007; Bazzoli, LoSasso, Arnould, & Shalowitz, 2002; Coddington, Moore, & Fischer, 1996; Cuellar & Gertler, 2003; Luke, 2006b; Young, Desai, & Hellinger, 2000), and industry observers' attention turned once again to the consolidation and growth of multi-hospital systems. Over the course of the two decades spanning the turn of a new millennium, "many new systems emerged and survived," and system membership continued to expand to the point that multi-hospital systems, particularly in urban areas, dominated local health care markets (Olden, Roggenkamp, & Luke, 2002, p. 33; Bazzoli, 2008; Berenson, Ginsburg, Christianson, & Yee, 2012; Cuellar & Gertler, 2003; Rosko, Proenca, Zinn, & Bazzoli, 2007).

At the same time, the continued growth of managed care and aging of the American population during the 1990s applied pressure on hospital systems to maintain vertical growth efforts such as diversification and vertical integration with outpatient, subacute, and post-acute services, thereby allowing systems to attract patients with a wide range of services throughout the continuum of care and, in turn, offering opportunities for increased revenues, competitive positioning in emerging markets, and diffused financial risk (Coddington et al., 1996; Robinson & Casalino, 1996; Wang et al., 2001; Wheeler et al., 1999). Some described the organizational changes and dynamic environment of the 1990s as the "second wave" of hospital diversification and integration, alluding to the pursuit of horizontal and vertical growth strategies made previously popular during the 1970s and 1980s, respectively (Gruca, Kaltenbach, & Nath, 1993).

Thus, much of hospital systems' strategies and competitive activity in the 1990s was characterized by the twin strategies of horizontal and vertical growth, which many expected would yield a health care landscape dominated by what some called organized or integrated delivery systems (Burns & Pauly, 2002; Charns, 1997; Conrad & Shortell, 1996; Shortell et al., 1994; Zuckerman, 1998). Instead, a period marked by turbulence and uncertainty in the U.S. health care industry saw a failed attempt at ambitious health care reform, a strong backlash against managed care, the seeming demise of clinically integrated health care, and the emergence of hospital-based clusters.

Integrated delivery systems: A passing fad or long-term goal? In the mid-1980s, a common vision of multi-hospital systems was to become more than just a collection of inpatient acute care facilities, but to eventually achieve integration both horizontally and vertically, serving as a provider of services throughout "a continuum of ambulatory-primary care, acute inpatient care, and post-discharge recuperative or chronic care" (Alexander et al., 1985b, p. 53). Combined with the horizontal consolidation of hospitals and formation of multi-hospital systems that had dominated the 1970s and early 1980s, the vertical growth gradually exhibited across the health care industry in the 1980s and 1990s was expected to create what some experts termed "integrated delivery systems," which were also often referred to by a number of different labels such as "organized delivery systems," "integrated health systems," "integrated delivery networks," and "integrated health networks" (Charns, 1997; Conrad & Dowling, 1990; Conrad & Shortell, 1996; Devers et al., 1994; Friedman & Goes, 2001; Gillies et al., 1993; Shortell et al., 1994; Young & McCarthy, 1999). Devers and colleagues (1994) offered a helpful and succinct definition of such integrated models, which consist of "a network of organizations (e.g., ambulatory care clinics, physician groups, diagnostic centers, hospitals, nursing homes, home health care agencies) usually under common ownership which provides, or arranges to provide, a coordinated continuum of services to a defined population and is willing to be held clinically and fiscally responsible for the health status of that population" (p. 8). For the sake of simplicity and clarity, we employ the term "integrated delivery systems" to collectively refer to these idealized organizational forms.

The call for integrated care developed over the course of the 20th century, stemming from the promotion of the regionalization of health services. The Report of the Consultative Council on Medical and Allied Services (i.e., the Dawson Report), presented to the British Parliament and published in 1920, served as a landmark vision of regionalized care which proposed the development of a network of tiered medical care centers. Such centers were expected to be well coordinated, with a "major emphasis…placed on integrating preventive and curative medicine," and the Dawson Report's significant contributions "helped give rise to the now widely accepted format of regional medical care," which today includes integrated delivery systems that are observed in many countries around the world (Pearson, 1975, p. 6; Lega, 2007).

Through the next several decades, subsequent efforts in the United States that continued to promote coordinated health services across the continuum of care in a defined regional area included the final report of the Committee on the Costs of Medical Care in 1932, Thomas Parran's "coordinated hospital service plan" (i.e., "integrated hospital system") in 1944, Joseph Mountin and colleagues' report with the U.S. Public Health Service in 1945, the Hospital Survey and Construction Act (i.e., Hill-Burton Act) and the Commission on Hospital Care's report in 1946, the Ewing Report in 1948, the report by the Magnuson Commission in 1951, and the report of the Commission on Financing Hospital Care in 1954 (Pearson, 1975). During the latter half of the 20th century, the concept of coordinated care in proximate areas was advanced by the

Regional Medical Programs and the Comprehensive Health Planning Act in the mid-1960s (Brown & Lewis, 1976; Brown & McCool, 1986), the "AmeriPlan" concept proposed in 1970 by the American Hospital Association (Brown & McCool, 1986; Conrad, 1993), the Health Maintenance Organization Act of 1973 (Luke, 2010), the National Health Planning and Resources Development Act of 1974 (Brown & Lewis, 1976), the regionalization and subsequent reengineering of the veterans health care system (Kizer & Dudley, 2009; Williams, 1981), and influential works by Donabedian (1972), Ellwood (1972), and Ginzburg (1977).

Within these reports, policies, and models of regionalized care, "one of the more frequently mentioned concepts is that of integrated patient care services" across various medical care facilities (Pearson, 1975, p. 42). Furthermore, those who promoted regionalization often acknowledged the importance of "ordering services spatially" to create "a vertically organized hierarchy" in which medical services and resources in a given area would be rationalized and organized to most effectively meet population needs (Cutchin, 2002, p. 23; Lewis, 1977). The vision to become an integrated delivery system, however, was also acknowledged to take considerable time to achieve, and few systems could boast of having realized such a goal by the 1980s (Alexander et al., 1985b). However, as a period of intense turbulence developed in the early 1990s, health care providers' motivation to integrate horizontally and vertically increased.

The rise of integrated delivery systems. The health care industry in the early 1990s has been characterized as chaotic, unstable, and continuously changing (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Begun & Luke, 2001; Gaynor & Haas-Wilson, 1999). Under the shadow of significant factors affecting the U.S. health care delivery system, including hospital providers' continued adjustment to prospective payments, the continued growth of managed care, rising costs, increased demands for quality, continuing technological advances, and an aging population, health care reform efforts were introduced and developed during the inaugural year of the Clinton administration, with the 1993 Health Security Act serving as a significant and potentially revolutionary health care reform proposal (Burns, Wholey, McCullough, Kralovec, & Muller, 2012; Shortell et al., 1995).

The Health Security Act as well as accompanying state-level health reform efforts during the early 1990s aimed in part to manage rising health care expenditures by promoting competition (i.e., "managed competition"), which in turn helped steer hospital-based systems toward vertical integration so that they could offer "one-stop shopping" and be viewed as attractive and favored providers of care by both patients and payers (Budetti et al., 2002). Importantly, hospitals and hospital systems also saw the formation of integrated delivery systems as a credible response to the threat of increasingly powerful managed care organizations, particularly in light of proposed health care reform, allowing them to not only compete for desirable managed care contracts but also to countervail the considerable influence of managed care, physician groups, and competing hospital-based providers (Luke & Begun, 2001). In particular, the movement to form integrated delivery systems motivated hospital-based systems to align vertically with physicians – "who either referred patients to the hospital or who would serve as primary parties managing care under capitated contracting arrangements" – as well as with health care financing entities "through the development of provider-based insurance arrangements" (Bazzoli, 2008, p. 50; Budetti et al., 2002; Devers et al., 1994; Zelman, 1996). At the same time, a shift to a "systems-oriented approach" focusing on quality gained momentum, further encouraging integrative behavior (Budetti et al., 2002), and industry representative groups such as the American Hospital Association (AHA) and Catholic Health Association (CHA) promoted vertically integrated hospital systems as a means to better coordinate provider services throughout the care continuum while enabling hospitals to become more efficient, thereby addressing persistent concerns related to the costs and quality of care (Luke & Begun, 2001).

Even as national health care reform efforts would fail during President Clinton's first term, expectations continued through the mid-1990s that managed care organizations would continue to grow in power, such that "HMOs, selective contracting, and full-risk payment arrangements would become predominant" (Devers, Brewster, & Casalino, 2003, p. 455; Zelman, 1996). As a result, hospitals continued to pursue integrated delivery system arrangements to position themselves as "must-have" providers, and adoption of integrated forms became increasingly apparent across major markets (Devers et al., 2003; Friedman & Goes, 2001; Shortell et al., 2000; Zelman, 1996). Furthermore, Coddington and colleagues (1996) noted that "once a specific local market [began] to experience consolidation and integration, it frequently [became] impossible for physicians and hospitals to stay on the sidelines," with providers wanting to move quickly to form integrated delivery systems rather than risk being left out or overshadowed by competitors (p. 7). Thus, a frenzy of merger and acquisition activity developed throughout the 1990s, with "waves of collaboration, integration, and outright merger" occurring across different providers (Gaynor & Haas-Wilson, 1999, p. 142; Bazzoli et al., 2000; Begun & Luke, 2001). In light of the unprecedented level of consolidation and continued calls for vertical integration, industry experts increasingly anticipated a future in which health care would be provided in a coordinated and continuous fashion by integrated health care organizations (Burns et al., 2012; Shortell et al., 1995). Others, however, warned that achieving the level of coordination required of integrated delivery systems would be a considerably difficult task, casting doubt as to whether such organizational forms would truly come to fruition

(Friedman & Goes, 2001; Goldsmith, 1994; Luke & Begun, 1996; Slomski, 1995). Indeed, at the end of the decade, the "juggernaut" concept of integrated delivery systems began "to run out of steam" (Friedman & Goes, 2001, p. 4).

The seeming demise of integrated delivery systems. Despite their promises, integrated delivery systems were largely seen as a failure by the turn of the century (Burns & Pauly, 2002). At the time, of the small number of empirical studies that had systematically evaluated the performance of integrated delivery systems, findings were mixed and suggested that the ability of such systems to meet performance expectations depended on individual organizational competencies (Shortell et al., 2000, p. 28; Snail & Robinson, 1998). Friedman and Goes (2001) noted that the difficulties experienced by such systems in achieving their performance goals and realizing the presumed benefits of integration, made evident in both anecdotal stories and empirical studies, led many to question whether the pursuit of integration at the cost of substantial resources was truly a wise or feasible endeavor.

In hindsight, organizations that failed to achieve their goal of becoming integrated delivery systems faced numerous barriers and a myriad of likely problems. These included: system members' resistance to surrender their coveted autonomy; a lack of advanced technology (i.e., well-developed health information systems) with which to effectively coordinate activities and decisions throughout the system; an unyielding focus on financial performance outcomes, even at the expense of adhering to integration plans; difficulty defining or measuring system progress or outcomes; poor vision and leadership; a failure to effectively align or execute strategies throughout the organization; the resistance of the organization's culture to change or expand its focus outside of inpatient acute care hospitals; system members' uncertainty regarding their roles and responsibilities; a lack of patience or steadfastness to realize long-term results;

and, ineffective communication that failed to attend to the concerns or gain the trust of stakeholders or employees (Bazzoli, 2008; Conrad & Shortell, 1996; Friedman & Goes, 2001; Shortell et al., 1994; Young & McCarthy, 1999). Some system leaders pursued the integrated delivery system model as a strategic response to mimic the activities of their competitors, disregarding the potential costs, pertinent market conditions, or fundamental reasons behind the decision to integrate (Luke & Begun, 2001). Others failed to consider issues that mattered most to physicians during the integration process, and as a result were not able to successfully align with physicians or gain their buy-in (Bazzoli, 2008; Budetti et al., 2002). Yet another barrier to integrated delivery systems was the public's general wariness of "monopoly power, bureaucratic inertia, and the depersonalization of relations between physicians and patients" that they sensed would develop in a future where health care services were dominated by "horizontally and vertically integrated corporations" (Robinson, 1996c, p. 156).

Fearing a lack of individual freedom, and unwilling to grant corporate direction in their personal medical decisions, the American public pushed back against managed care (Blendon et al., 1998). The resulting "managed care backlash" at the turn of the century led to the weakening of managed care organizations. In the midst of such changes, many hospital-based systems that had pursued the integrated delivery system form acknowledged their failure to achieve the desired performance outcomes promised by vertical integration, and, in an effort to "dis-integrate," they shed the physician organizations and insurance products that had been incorporated in their attempts to become integrated delivery systems (Bazzoli, 2008; Bazzoli, Shortell, Ciliberto, Kralovec, & Dubbs, 2001; Lesser & Ginsburg, 2000). To some, these actions appeared as evidence that the industry had given up on integrated delivery systems as a failed concept, surrendering hope that clinically integrated care could ever become a reality.

Yet even in the "aftermath" of the integrated delivery system movement, a number of scholars criticized those who suggested such organizational forms were a failure. Noting the reported demise of integrated delivery systems, which they referred to as "integrated health networks," Friedman and Goes (2001) encouraged industry leaders to one day return to the promising vision of local integrated delivery systems, which they described as "one of the best mechanisms available to delivery high-quality, cost-effective care to local communities" (p. 24). And, despite evidence of numerous failed attempts to develop integrated delivery systems, some scholars pointed to contrasting examples of well-known systems that successfully engaged in integrative activity – such as Sentara Healthcare in eastern Virginia, Advocate Health Care in greater Chicago, Henry Ford Health System in Detroit, Allina Health in Minneapolis, and Memorial Hermann Health System in Houston – to suggest that the goal of integrated delivery system development was indeed possible (Coddington et al., 1996; Linenkugel, 2001; Luke & Begun, 2001; Shortell et al., 2000; Young & McCarthy, 1999).

Furthermore, to say that the difficulties and challenges felt in the U.S. health care industry during the integrated delivery system movement were in vain would be misguided. Even as some hospital-based systems moved away from integration with physicians or insurance products, horizontal activity continued, coupled with "the desire to maintain a full spectrum of services across a broad geographic area" (Lesser & Ginsburg, 2000, p. 214). Although the resulting changes may not have strictly followed predictions or expectations, significant transformation did occur, as "many new, large, and dominating players…emerged at the local level," offering a variety of coordinated services throughout the continuum of care (Luke & Begun, 2001, p. 50; Zelman, 1996). In other words, rather than yield a field of integrated delivery systems, increases in both horizontal and vertical relationships during the 1990s ultimately gave rise to the development and growth of local hospital systems – also referred to as clusters – providing a range of services across various locations in their respective markets.

The emergence of hospital-based clusters. While much attention paid towards health care organization strategy during the 1980s focused on hospitals' efforts to integrate and diversify, a small number of reports began to emerge in the mid-1980s describing a change in multi-hospital systems' acquisition and divestiture activities that would later become widespread in the coming decades. These trade articles described the "clustering" of hospitals operating within the same market to create *local* multi-hospital systems (Gentile & Kanter, 1986; Shahoda, 1986b, 1986e). That is, systems' evaluations of whether to add or subtract facilities was increasingly based upon those facilities' abilities to fit in with "corporate clustering" activity in local markets, with primary consideration given to market share and geographic location, particularly if a facility was located in an expanding community within the cluster's market (Alexander et al., 1985b; Gentile & Kanter, 1986; Shahoda, 1986c, 1986e).

These clustered systems were not just recognized for their horizontal activity, however. Although they maintained acute care hospitals as their core component, clusters were also observed to offer services throughout the continuum of care at both hospital-based and non-hospital-based facilities in their spatially-defined markets, including outpatient clinics, diagnostic testing facilities, behavioral health centers, and skilled nursing facilities, to name a few (Gruca et al., 1993; Shahoda, 1986b). In sum, the emerging clusters identified as early as the mid-1980s were distinguished in that they exhibited both horizontal and vertical strategies, were hospital-based with supporting non-hospital-based service locations, and were strategically designed according to spatial considerations, focusing on individual local markets.

Luke (1991, 1992) was one of the first to formally identify and empirically examine this emerging and relatively unheralded trend, initially identifying these organizations as both "local hospital systems" and "clusters." In this work, local hospital systems (i.e., clusters) have been commonly defined as combinations of multiple hospitals with common ownership located in or around the same geographic market (e.g., Cuellar & Gertler, 2003; Dranove & Shanley, 1995; Luke, 1992; Luke et al., 1995; Sikka et al., 2009). Nearly thirty years ago, a small number of scholars anticipated the widespread development of local hospital-based clusters (e.g., Luft et al., 1986; Luke & Begun, 1988), and as time has progressed, it has become more and more apparent to researchers that hospital system formation and growth has focused on the development and operation of multiple facilities within local markets, including subsystems of larger, nationally and regionally distributed systems (e.g., Bazzoli, 2008; Trinh et al., 2014).

Although some hospital systems began clustering at the local level prior to the wave of consolidation in the 1990s, the member hospitals of these local systems often competed with one another rather than operate in a coordinated fashion (Clement et al., 1997). Generally speaking, it was not until the turbulent environment of the early 1990s that existing local multi-hospital systems truly began to function in a unified manner to achieve "either strategic or operational objectives on behalf of their members," even as other clusters began to emerge and large, national hospital systems continued development of clusters in individual markets (Clement et al., 1997, p. 201). Hence, the tumultuous conditions observed in the health care industry towards the close of the 20th century motivated local hospital systems to make gains in coordination and unification. Furthermore, these existing clusters at the beginning of the 1990s decade found themselves in an ideal position to serve as leaders of the integrated delivery systems movement, having gained considerable power in their local markets and possessing the resources and size essential to attempt successful integration (Luke & Begun, 2001, pp. 45-46).

Looking back upon health care in the 1990s and the consolidation efforts and integrated delivery system development that characterized the decade, scholars and industry observers noted the remarkable local patterns that had emerged, with intense activity focused on the formation of multi-hospital systems at the local level (Bazzoli et al., 2002; Cuellar & Gertler, 2003; Dranove & Lindrooth, 2003; Zelman, 1996). During this period, many hospitals viewed consolidation as an opportunity to improve their financial standing, gain operating efficiencies, expand market share, and improve their accessibility or visibility in the local market (Bazzoli et al., 2002). On the other hand, Luke and colleagues (1995) stressed that cluster formation – encompassing both horizontal and vertical growth – occurred as a strategic response to market forces, primarily intending to increase power and competitive advantage relative to local rivals.

Indeed, although hospitals' efforts to consolidate during the 1990s may not have consistently achieved the efficiencies or economies of scale previously anticipated, such activity certainly led to increased market power by hospital systems, and the opportunity for hospitals to increase their market share continued to attract and drive consolidation behavior (Zelman, 1996, p. 99). For example, in contrast to previous periods of consolidation and system formation, the increased merger and acquisition activity at the end of the 20th century commonly involved systems' pursuit of "larger market players" that were desirable for their size, high-tech services, and high occupancy, illustrating the pursuit of power and competitive advantage within local markets (Bazzoli, Manheim, & Waters, 2003, p. 19; Bazzoli, Dynan, Burns, & Yap, 2004). National and regional hospital systems such as HCA increasingly developed subsystems in specific local markets at the time (Bazzoli et al., 2001), and the threat of national hospital corporations rumored to enter a hospital's local market, in addition to the coexisting threats of powerful insurers and large purchasers, contributed to freestanding facilities' decision to consolidate and form local multi-hospital systems (Duke, 1996). In turn, considerable growth in system membership during this period of increased consolidation involved not-for-profit hospitals and systems, which looked to increase their market power and strengthen their competitive posture by acquiring or partnering with competing hospitals operating within their local markets (Luke, 2010; Luke & Ozcan, 2012).

By the end of the decade, the majority of U.S. hospitals belonged to multi-hospital systems (Carey, 2003), and over 40 percent of all private hospitals were members of *local* hospital systems, or clusters (Cuellar & Gertler, 2003). Thus, following a period of dramatic change – including the defeat of national health care reform, the backlash against managed care, and numerous barriers encountered against attempts at integration – the integrated delivery systems that were expected to develop and flourish by the start of the 21st century were never fully realized as many scholars and industry observers had anticipated. Instead, what had undeniably emerged at the dawn of the new millennium were clusters: locally focused multi-hospital systems (including facilities belonging to national and regional hospital companies grouped together within individual markets) that displayed both horizontal and vertical configurations. These emergent organizational forms were well-suited to thrive amidst the coming rush to expand services and geographical presence, and during the next decade, clusters grew to become the dominant health care providers we observe today in local health care markets across the U.S.

Off to the races: Retail strategies and geographic expansion. We next consider that, following periods of increased diversification and integration occurring primarily within hospital walls, more recent activity among hospital-based providers has included a focus on geographic expansion. Industry observers have labeled this trend a “geographic expansion race,” in which clusters have complemented service development strategies with geographic expansion strategies in order to attract well-insured patients from outlying high-growth or prosperous areas in their local markets and expand their referral bases, thereby increasing admissions at their flagship facilities (Carrier, Dowling, & Berenson, 2012; Felland, Grossman, & Tu, 2011).

As their interest in the development of integrated delivery systems waned, hospital systems reallocated “significant financial and nonfinancial resources” previously committed to the development of vertically integrated forms and instead applied them towards the addition and expansion of services and service locations “in order to retain market share and revenues” (Devers et al., 2003, p. 463; Bazzoli, 2004; Lesser & Ginsburg, 2000). Such focus upon service expansion, combined with the weakened influence of managed care, led scholars to proclaim the arrival of a renewed “medical arms race,” marked by systems engaging in “one-upmanship” and mimicking one another in their development of services and facilities (Devers et al., 2003; Ginsburg, 2008; Lesser, Ginsburg, & Devers, 2003; Trinh, Begun, & Luke, 2008). But, unlike the medical arms race of the 1970s and 1980s (Ermann & Gabel, 1985; Robinson & Luft, 1987), the renewed medical arms race of the 21st century has involved more than just the expansion of services across hospital systems; this movement has also incorporated a strong sense of location and geography in the strategies clusters have adopted to compete with other local providers. In other words, the renewed medical arms race has paired hospitals’ pursuit and expansion of high-quality services with geographic expansion of service locations, recognizing that both quality and distance are important determinants of patients’ choice of care providers (Tay, 2003).

Clusters' geographic expansion has involved both the addition of freestanding non-hospital-based sites (e.g., multi-service outpatient centers, physician clinics, freestanding emergency departments) as well as the development of new hospital facilities (Carrier et al., 2012; Ginsburg, 2008; Kutscher, 2012; Zuckerman, 1998). Furthermore, the addition of such sites has primarily occurred in strategic locations, particularly in fast-growing suburban areas and locations just outside of systems' traditional service areas (Carrier et al., 2012, p. 827; Ginsburg, 2008; Kutscher, 2012). This form of geographic expansion conveys clusters' adoption of a "population approach" towards system development, targeting organizational growth in the key areas experiencing population growth in a local market rather than continuing to simply build new facilities adjacent to or in close proximity to existing facilities (Fellows, 2013). The addition and geographic expansion of new service sites allows clusters to, in a sense, build "outposts" within their local markets, and these sites serve as "access points" that make patients' use of system services more convenient while aiding the capture of additional referrals for inpatient hospital care (Devers et al., 2003; Felland et al., 2011).

Such expansion has been motivated in part by the growing threat of freestanding alternative service delivery sites such as ambulatory surgery centers, diagnostic facilities, outpatient specialty centers, and urgent care clinics that have begun to compete directly with hospitals and hospital systems for patients across various service lines (Al-Amin & Housman, 2012; Burns et al., 2011; Courtemanche & Plotzke, 2010; Ruef, 2000). Other sources of motivation have been clusters' desire to be seen by commercial health plans as "must-have" providers and attract well-insured patients, to defend market share, to increase inpatient admissions at clusters' flagship facilities, and to prevent having to refer patients to competitors for specific services (Carrier et al., 2012; Devers et al., 2003; Felland et al., 2011). However, this recent trend has also led to increased competition, as clusters' extended presence through new service sites allows them to "penetrate traditional market boundaries of other hospital systems" (Devers et al., 2003, p. 459).

Numerous factors have influenced clusters' combined expansion of outpatient services and locations, including patient preferences, payer preferences, technological advancements, financial incentives, health care policy, competitive trends, an aging patient population, and a growing emphasis on health and wellness (Fellows, 2013; Kutscher, 2012; Tocknell, 2013). These factors also promise to play a significant role in clusters' future strategies and success, and given recent health care reform efforts, clusters appear to be well-suited to succeed in a U.S. health care industry undergoing considerable change and facing an uncertain future.

Clusters' future and accountable care. Today, hospital-based clusters dominate their local markets and show no signs of slowing. As of 2009, cluster members comprised nearly three-fourths of all urban acute care hospitals and displayed dramatic growth in both size and market shares (Shay et al., in press; Trinh et al., 2014). And, clusters continue to exhibit both horizontal and vertical traits in their organizational forms and strategies, making them central figures in the provision of health care services at the local level and giving them a key role in the U.S. health care delivery system's future.

Although the managed care backlash at the turn of the century diminished providers' interest in vertical integration (Lesser et al., 2003), recent health care reform, including the promotion of accountable care organizations (ACOs) and bundled payments, has led to a renewed interest in integration strategies. As hospital-based clusters enter the era of accountable care, they are increasingly looking to manage costs and quality while obtaining "greater control over the entire spectrum of care, from promoting wellness and prevention to offering post-acute care" (Kutscher, 2012, p. 26; Mansfield, 2012). A recent survey of health system leaders suggests that continued expansion and coordination efforts, particularly with outpatient services, will be the dominant strategy of clusters in the wake of health care reform (Fellows, 2013; Tocknell, 2013).

Interestingly, many of the central elements of the ACO model echo the defining aspects of integrated delivery systems. For example, Gillies and colleagues (1993) defined integrated delivery systems as "a network of organizations that provides or arranges to provide a coordinated continuum of services to a defined population and is willing to be held clinically and fiscally accountable for the outcomes and health status of the population served" (p. 468). The emphasis in their definition on both coordination throughout the continuum of care and the accountability for population health mirrors the primary aims of ACOs today, even as integrated delivery systems – like health maintenance organizations (HMOs) before them – served as an updated version of the concept of regionalized health care that has been promoted since the early 20th century. In the same way that integrated delivery systems offered to accomplish "the unfulfilled promise of HMOs" by ensuring "the health and well-being of defined populations" (Luke & Begun, 1996, p. 46), ACOs serve as the latest organizational model to promote the coordinated care and wellness of local populations – in a sense, offering to accomplish the unfulfilled promise of integrated delivery systems. And, the same types of organizations previously identified as having the greatest potential to develop into integrated delivery systems – prominent clusters dominating their local markets with geographically dispersed service sites throughout the continuum of care (Luke & Begun, 2001; McManis, 1990; Zelman, 1996) – also serve as ideal candidates for the ACO model (Burns et al., 2012).

Summary: How did we get here? To summarize, the evolution of hospital-based clusters as we see them today – dominant providers of health care services in local markets throughout the U.S. – is the result of various events and trends spanning several decades. With roots extending to the promotion of regionalized care during the early 20th century, clusters are the evolved descendants of multi-hospital systems, which began to grow in prominence during the late 1960s and 1970s as independent, freestanding hospitals entered a period of consolidation and horizontal integration. Vertical growth characterized the 1980s, as multi-hospital systems pursued diversification and vertical integration strategies to expand their service offerings and locations throughout the care continuum. In the 1990s, both vertical and horizontal strategies were observed among hospitals and hospital systems. This period was defined by considerable turbulence, as providers remained uncertain whether health care reform efforts would succeed, managed care continued its strong growth, and hospitals systems sought to build market power and gain competitive advantage to ensure survival.

Toward the end of the 20th century, many anticipated the successful formation of integrated delivery systems throughout the country, but instead, consolidation trends occurred at the local market level, and hospitals pursued clustering strategies to form local hospital systems. Rather than begin the next century with a strong population of integrated delivery systems, the nation saw the formation and rapid emergence of hospital-based clusters: horizontally integrated systems of locally grouped hospitals with vertically arranged services and service sites. Following a failed national health care reform attempt and a backlash against managed care in the late 1990s, a renewed medical arms race and, most recently, a geographic expansion race have marked the U.S. health care delivery system in the early 21st century. During this period, clusters have sought to increase their service offerings and geographic reach in local markets, with components consisting of more than just acute care hospitals, further establishing their dominance as the leading providers of health services throughout the continuum of care.

Throughout each of these periods, a vision was continually expressed and promoted that, one day, a spectrum of health care services would be coordinated and provided by multi-institutional health care organizations responsible for the health and well-being of a local population. And, with each period of change, this vision was brought seemingly closer to reality given the formation and growth of local hospital-based clusters. A myriad of factors contributed to changes in hospitals' organizational forms in each of these periods, including an aging population, rising health care costs, increased demands for quality, growing pressures from managed care, changing reimbursement systems, ongoing technological advancements, and intensified competition, particularly at local market levels. As the U.S. health care delivery system enters an era of accountable care following the passage of health care reform in 2010, clusters have established themselves as the entities best positioned to lead the local delivery of care in the future.

What We Know: Extant Literature on Hospital-Based Clusters

Having examined the development of hospital-based clusters in the U.S. health care delivery system, we now turn to address the question, what do we currently know about these prevalent organizational forms? The following section provides a review of the extant literature that has specifically focused on clusters, including observational reports, descriptive works, and empirical studies.

Hospital-based clusters: Early observations. The earliest identification of hospital-based clusters as an emerging form includes trade literature reports written in the mid-1980s. As previously described, these works involved the observations of hospital industry reporters that consolidation of hospitals was taking place at the local level, forming what would later be commonly referred to as clusters. Stories of multi-hospital systems' various business developments as well as the personal accounts of system executives regarding their organizations' strategies painted the picture of a quickly changing landscape in which the pursuit of local market power was taking precedence over other business considerations. Although these accounts initially appeared in trade literature, they soon captured the attention of health care organization scholars such as Roice Luke, who would later develop a line of research examining the emergence and dominance of clusters.

Shahoda (1986b) was one of the first to describe the "clustering" of multi-hospital system facilities within individual, local markets rather than across multiple markets, adhering to specific geographic boundaries. Such activity was apparent among well-established not-for-profit systems as well as large for-profit hospital companies, including HCA, which was noted to have developed separate clusters in major markets such as Miami, Nashville, Tampa, and Dallas-Fort Worth (McWhorter, 1985; Shahoda, 1986b). Throughout 1986, Shahoda (1986c, 1986d, 1986e) would continue to report on clustering strategies adopted by multi-hospital systems, observing that such organizational forms not only displayed horizontal growth but also increasingly pursued vertical expansion throughout the care continuum, offering a wide range of services on the campuses of cluster hospitals as well as at physically separate, freestanding, non-hospital-based facilities maintained within their local markets. The development of a range of services and service locations – spanning preventive to tertiary to long-term care – was also depicted as a long-term endeavor, as cluster leaders acknowledged such growth would take considerable time and resources (Shahoda, 1986b).

During this same period, Gentile and Kanter (1986) detailed the results of a survey administered to leaders of multi-hospital systems regarding their acquisition and divestiture strategies. The results depicted systems' clustering strategy as a primary factor in their decision to add or subtract targeted facilities, placing a priority on the geographic location and market share of specific sites rather than their financial standing or cost (Gentile & Kanter, 1986). As multi-hospital systems looked toward a future of intense competition, declining utilization, and tightened reimbursement, many were observed to consider disinvestment of unprofitable services and facilities, including hospitals themselves, particularly if those facilities were not members of a local cluster (Gentile & Kanter, 1986; McWhorter, 1985; Shahoda, 1986c, 1986e). In addition, hospitals and local hospital systems increasingly approached mergers in local markets as a means to expand their geographic coverage and enhance their positioning with payers, thereby forming "small regional systems providing coverage throughout an entire metropolitan area" (Higgins, 1986, p. 64).

Within a few years, some industry observers predicted that clustering strategies would take off, and that large, hospital-based clusters would become the dominant health care providers across major metropolitan markets, competing "to deliver a full range of services efficiently" and expanding their outreach to include surrounding rural areas and facilities (McManis, 1990, p. 57). This prediction echoed that previously found in an important work by Luft and colleagues (1986), who in their examination of hospital behaviors in local markets observed a growing trend of neighboring hospitals merging together to consolidate services. They anticipated an increase in hospital consolidation, making "local hospital markets even more monopolistic or oligopolistic" and shifting "power from medical staffs to hospital administrators" (Luft et al., 1986, p. 244). Examples of major health care systems engaging in clustering strategies towards the late 1980s led to such a vision, although the barriers, sacrifices, and difficulties they experienced in the process also illustrated how the development of clusters could be a challenging and time-intensive endeavor (McManis, 1990).

Early examples of clusters. Lutheran Health Systems, which would later merge with Samaritan Health System in 1999 to form Banner Health, was recognized in the mid-1980s as an example of a multi-hospital system pursuing a clustering strategy, organizing its 75 hospitals and nursing homes into clusters based upon geographic location (Barkholz, 1985; Gerew, 1986; Mistarz, 1985). Such activity saw Lutheran's acute and non-acute facilities linked to its dominant tertiary care centers in various regions, forming clusters in which members would share certain services and both refer to and admit from one another (Barkholz, 1985; Gerew, 1986). In a feature article in *Modern Healthcare* in 1985, Lutheran Health Systems specifically identified clustering as a strategy with which to provide local communities with a full range of services throughout the continuum of care, including increased emphasis on ambulatory and long-term care, thereby bolstering the system's core business of acute care hospitals (Barkholz, 1985). By forming clusters within predetermined geographic areas, individual facilities were expected to benefit through enhanced relationships with fellow cluster members, and pressure for individual facilities to perform in isolation – particularly felt by Lutheran's many hospitals located in small, rural areas – eased as evaluation shifted from the individual facility level to the cluster and its facility members as a whole (Gerew, 1986). At the same time, the adoption of the clustering strategy by Lutheran Health Systems was not without difficulty, as facilities that did not fit within the clustering strategy based upon their location were put up for sale (Barkholz, 1985). Gerew (1986) observed one of the principle barriers towards clustering as working past individual facilities' reluctance in relinquishing their autonomy to join a cluster and adopt the perspective of their local system.

Beyond Lutheran Health Systems, numerous other multi-hospital systems were observed to pursue a clustering strategy during the mid-1980s. HCA served as an example of a large, national multi-hospital system that developed clusters in specific geographic markets, and its clusters were observed to not only include acute care hospitals but also ambulatory care facilities, physician clinics, and home health services, among other services and service sites throughout the continuum of care (McWhorter, 1985; Shahoda, 1986a). The company's president and chief operating officer at the time, R. Clayton McWhorter (1985), described HCA's clustering strategy as an approach to gain efficiencies, develop revenue, enhance marketing, and strengthen provider relationships in the key markets where HCA had established multiple facilities. The formation of clusters allowed HCA to market individual facilities in a local area for their unique services, while also marketing the cluster as a whole and its provision of a continuum of services throughout the area to generate brand awareness and enhance brand value (Shahoda, 1986a). Furthermore, hospitals functioning as the sole HCA facility in their market were carefully evaluated as candidates for divestiture due to a lack of strategic fit (McWhorter, 1985).

Other systems, including Summit Health, National Medical Enterprises, and HealthWest, were also reported to follow the cluster approach, strategically grouping geographically proximate facilities as well as non-hospital-based services and sites (e.g., nursing facilities) to offer an entire continuum of care within individual markets (Mistarz, 1985). Catholic multi-hospital systems such as Wheaton Franciscan Services and Sisters of St. Joseph of Peace Health and Hospital Services (later renamed PeaceHealth), were also observed to adopt cluster models in their various local markets, combining and expanding services throughout the continuum of care in targeted locations in which they had previously established multiple facilities (Shahoda, 1986d). Such strategic activity represented a change in direction for these organizations, as Catholic multi-hospital systems had "traditionally developed on an ad hoc regional basis to reflect their teaching and religious missions," but "were not *planned* from a regional standpoint" (Shahoda, 1986d, p. 42).

Luke and Begun (1988) noted these trends in their development of a typology of small multi-hospital systems' strategic behaviors, observing "evidence that local system development [was] emerging as a major strategy…even for the large, investment-oriented" systems with facilities in multiple markets (p. 616). That same year, Starkweather and Carman (1988) published findings from an analysis of hospitals' competitive behaviors in a large, California community referred to as "Growthville," in which they observed a three-step progression in competitive activities from 1979 through 1986: first, the diversification of services across 14 independent hospitals; second, the consolidation of these 14 facilities to form four local hospital systems; and, third, the vertical integration and geographic expansion of these local systems to provide a continuum of services and products throughout the market, including ambulatory medical practices and health insurance. Two years after this article was published, Luke, Ozcan, and Begun (1990) commented again on the clustering pattern, describing how hospitals, including members of larger, more geographically dispersed systems, were "adopting, within their broader horizontal expansion strategies, a strategy for expanding local market shares and creating hospital interdependencies at local market levels" by initiating or participating in local clusters (p. 322). These articles, though not specifically examining hospital-based clusters, provided insight into the development patterns already at work among hospital systems to form clusters in local markets. The authors' focus on small multi-hospital systems (defined as systems with less than eight hospitals) recognized that such systems were "generally more geographically concentrated" and "likely to be uniquely affected by changing local market forces" (Luke & Begun, 1988, p. 600), both traits that could be attributed to clusters as well. Furthermore, by consolidating horizontally to form local hospital systems, providers attempted to restrict local competition and increase their market power, setting the stage for future vertical growth and continued horizontal expansion (Starkweather & Carman, 1988). Given the varying horizontal and vertical strategies exhibited by small multi-hospital systems and their widespread presence in markets throughout the country, these authors astutely anticipated that the development patterns of such systems would offer a glimpse into the U.S. health care industry's future (Luke & Begun, 1988; Luke et al., 1990; Starkweather & Carman, 1988).

Clusters and the market model. In the process of differentiating the strategic orientations of small multi-hospital systems, Luke and Begun (1988) presented three categories of growth strategies: the historical model (with growth guided by normative objectives), the investment model (with growth guided by financial objectives), and the market model (with growth guided by local market objectives). These categories were observed to relate to specific ownership forms, with the historical model exhibited most often by Catholic systems, the investment model commonly exhibited by large, for-profit systems, and the market model typically exhibited by small, not-for-profit systems. Luke and colleagues (1990) followed that study by examining how the growth models of "parent" hospitals initiated the ensuing growth of their systems, finding that local acquisition patterns were adopted by market model systems, with such patterns not consistently observed for systems exhibiting historical or investment models.

One cannot help but notice the direct connection between the market model of system growth observed in these studies and the formation of clusters. Whereas the historical model saw the development of systems through the acquisition of spatially distant facilities, and the investment model saw a general disregard for geographic location when acquiring facilities, the market model emphasized the growing dominance of the parent hospital by increasing its market share and expanding the organization to include geographically proximate facilities that would support the parent and enhance its control of the local market (Luke et al., 1990). Noting the different organizational patterns displayed by the three strategic growth models, the authors predicted that systems previously defined by the historical and investment models would increasingly adopt the strategies pursued by market model systems, seeking to gain market share in specific locations and emerging as locally focused entities in order to, ultimately, survive (Luke & Begun, 1988; Luke et al., 1990). Indeed, this prediction was consistent with industry observers' previous reports on the clustering strategies adopted by systems such as Wheaton Franciscan Services and HCA, shifting away from their historical and investment models of growth, respectively. With the U.S. health care industry's focus increasingly turned towards the provision and financing of care in local markets, Luke and colleagues (1990) also anticipated that hospitals would seek "to build strong positions in local areas," forming local multi-hospital systems in order "to compete effectively for inclusion within health insurance packages as well as to countervail the often greater economic strength of insurance companies (p. 310).

Thus, through 1990, much of the discussion regarding the formation of local multi-hospital systems through clustering strategies took place within industry reports in trade magazines. At that time, the few instances in which scholars recognized and distinguished clustered hospitals (e.g., Luke & Begun, 1988; Luke et al., 1990; Starkweather & Carman, 1988) occurred as part of more broad examinations of small multi-hospital systems and local market activities. A clear definition of these emerging organizational forms was lacking, as was any attempt to explain their formation or empirically assess their growth and activity.

Hospital-based clusters: Definitions and numbers. In the early 1990s, Luke (1991, 1992) published two seminal articles that collectively established a foundation for the future study of hospital-based clusters. These works brought attention to the unique spatial considerations directing hospital consolidation trends and offered the first formal definitions and detailed, empirical examinations of clusters.

Examining local consolidation trends. First, in an effort to explain patterns behind the consolidation of hospitals in local markets, Luke (1991) argued that spatial factors must be taken into consideration, as health care is a local good and hospitals generally compete and cooperate locally. He applied resource dependence theory to depict hospitals' management of interdependencies with local competitors, suggesting that such interdependencies could be characterized according to their competitiveness, symbiosis, or symmetry. These three characteristics of interdependencies, as well as a fourth factor – goal congruency – shaped how hospitals structured their cooperative relationships with other providers in their markets. Hospitals with highly competitive interdependencies could be expected to differentiate their services as well as partner with local rivals, with partnership least likely to occur with extremely close or distant competitors (p. 230). Like local hospitals in competitive relationships, hospitals with symbiotic interdependencies were also expected to partner with fellow hospitals at an intermediate distance range, and facilities with asymmetric relationships (i.e., size or power inequality) were suggested to be more likely to cooperate (p. 231). For each of these categories of interdependencies, the goal congruency between providers was suggested to moderate their decisions to cooperate, as facilities with incompatible goals would be less likely to pursue partnership (p. 227).

Given these four factors shaping hospital combinations, Luke (1991) proposed three types of local market models that characterized the formation of local hospital systems: regional systems, horizontal systems, and horizontal clusters. Regional systems, which were also introduced as the “local market model” in Luke and Begun’s (1988) previous work, display both asymmetric and symbiotic relationships among their facilities, with a large, central parent facility in an urban market supported by smaller secondary and primary care facilities extending into nearby suburban and rural locations (p. 228). In contrast, horizontal systems are characterized by symbiotic relationships between symmetric facilities, and horizontal clusters – not to be confused with the more general term, hospital-based clusters, currently applied to local multi-hospital systems – include symmetric facilities that generally lack symbiotic exchanges and are typically combined through an external corporation’s horizontal expansion efforts (p. 229). Each of these three models depicted the formation of what would later be termed hospital-based clusters, with their differences pertaining to the degree of symmetry and symbiosis apparent among local system members. Luke (1991) expected regional systems to “dominate local-hospital markets” in the future, and he also noted that facilities displaying any of these models could transition to another form in time, such as a horizontal system evolving into a regional system (pp. 228-229). From this work, Luke (1991) set forth numerous questions and considerations for future research, presenting a compelling argument for the examination of hospital combinations in local markets.

Characteristics of local hospital systems. The following year, Luke (1992) offered the “first detailed examination” of what would later be referred to as clusters, defining local hospital systems as "combinations of two or more hospitals that are in the same company and located in or around the same metropolitan [area]" (p. 3). In this work, he explained the emergence of spatial clustering as a strategy adopted by multi-hospital arrangements to form locally integrated health care delivery systems, suggesting that one of the main benefits of the formation of such systems was the potential to develop regionalized models of care that, as had been anticipated throughout the 20th century, could rationalize health care at the local level. After introducing key concepts related to regionalization, Luke (1992) presented features and characteristics of local hospital systems in the U.S. as of 1989. Explaining that spatial interdependencies and parent centeredness "underpin the formulation of the local hospital system concept," he assessed local hospital systems based upon their hierarchical ordering and geographic spread while controlling for differences in system ownership (p. 16).

Luke (1992) observed just over 400 local hospital systems based in urban areas, representing nearly half of all multi-hospital system members and 20 percent of all general hospitals in the U.S. at the time. He found not-for-profit multi-hospital systems to have the highest percentage of clustered systems (85 percent), and in particular, *small*, not-for-profit multi-hospital systems engaged in clustering within their local markets to a significantly greater degree in comparison to small Catholic or for-profit systems. At the same time, *large*, not-for-profit multi-hospital systems (defined as including 11 or more facilities) exhibited lower percentages of clustering activity than large for-profit or Catholic systems, and both for-profit and Catholic systems displayed higher percentages of cluster formation for their large systems versus small systems.

Luke (1992) employed four measures to identify the presence of structural features in local hospital systems indicative of regional systems: a large "parent" facility (measured as operating 285 or more beds); high vertical differentiation (measured as a ratio below 0.50 of nonparent facility beds to parent facility beds); a substantial number of locally operated hospitals (measured as four or more facilities); and, cluster member presence in proximate nonurban areas (measured as operating within 60 miles of the largest cluster member's location). Evaluating these measures across ownership categories, he observed that "patterns of local hospital system development vary quite substantially by ownership type," with the not-for-profit clusters exhibiting the greatest potential to develop into regional systems (p. 41). The majority of not-for-profit and Catholic clusters included a large parent facility, while less than a quarter of for-profit clusters maintained a facility with 285 or more beds. Similarly, most not-for-profit and Catholic clusters exhibited high degrees of vertical differentiation, but the differences in size between for-profit clusters' parent and nonparent hospitals were generally not substantial. In 1989, the majority of clusters were comprised of two hospital members, with less than 20 percent operating four or more hospitals. Of these, not-for-profit systems averaged the most facilities per cluster, and Catholic systems averaged the fewest. In terms of nonurban market penetration, over one-third of clusters included at least one nonurban member. Nearly half of for-profit clusters expanded into nonurban areas, while just over one quarter of not-for-profit systems exhibited such geographic reach.

Luke (1992) concluded with a call for the increased examination of local hospital systems, including assessments of their effects on local markets, evaluations of their formation across local markets, and analyses of their performance. As subsequent studies responded to this call, it became apparent that scholars held varying definitions of clusters and even applied different terms to refer to same-system partners established in local markets.

Defining clusters. When Luke (1992) provided the first broad assessment of hospital-based clusters, he defined these "local hospital systems" as two or more members of the same multi-hospital system located in the same urban area or within 60 miles of their urban area center (i.e., the location occupied by the cluster's largest facility, or "parent"). This definition would essentially serve as the basis for future cluster examinations, although the terms used to label these organizational forms varied. For example, Cuellar and Gertler (2003) referred to clusters as "hospitals…being in systems locally," which they defined as multiple same-system hospitals, or "local hospital partners," operating in the same metropolitan statistical area, "even if the system they both belong to is a national chain" (pp. 79-80). Young and colleagues (2000) adhered closely to Luke's (1992) definition of clusters, which they also referred to as "local hospital systems," although they extended the boundary for such systems from 60 to 70 miles from the system's parent. Dranove and Shanley (1995) examined clusters as "local multihospital systems," which they defined as "three or more community hospitals in the same geographic market sharing common ownership" (p. 62). Like Cuellar and Gertler (2003, 2005), they regarded geographic markets as metropolitan statistical areas, but Dranove and Shanley's (1995) definition of clusters was unique in that they required no fewer than three same-system hospitals working together locally. This same definition and term for clusters ("local multihospital systems") was also applied in Dranove and colleagues' 1996 study.

In his 1992 article, Luke primarily referred to clusters as local hospital systems, although he did include the "cluster" term periodically in explaining local system relationships, particularly when referring to clustered groups of hospitals owned by multi-hospital systems operating in multiple markets. In 1994 and 1995, subsequent works applied both the "local hospital system" and "cluster" terms. Olden's (1994) study adopted the same definition of local hospital systems as previously established by Luke (1992), but he also distinguished local hospital systems from "local cluster hospital systems." The former incorporated proximate, non-urban facilities as cluster members, and the latter restricted cluster membership to facilities operating within urban boundaries. In this sense, all local cluster hospital systems were also included as local hospital systems. Similarly, Luke and colleagues (1995) distinguished local hospital systems from local clusters, explaining that local clusters required two or more same-system hospitals to operate within an urban market boundary, whereas local hospital systems included multi-hospital systems even if only one member operated within an urban market boundary, provided that a non-urban partner operated within 60 miles of the local system's largest urban member. Later, the "local cluster" and "local hospital system" terms employed in the mid-1990s (Luke et al., 1995; Luke & Olden, 1995; Olden, 1994) would be substituted by the labels "urban clusters" and "regional clusters," respectively (e.g., Shay et al., in press). By the late 2000s and early 2010s, the term "cluster" was regularly applied to refer to multi-hospital system members grouped in geographically proximate areas that collectively served a local market (e.g., Luke, 2010; Luke et al., 2011; Sikka et al., 2009; Trinh et al., 2010).

An issue of boundaries. In general, these varied definitions required clusters to maintain single ownership and operate multiple hospitals in the same local market. Other studies, however, would directly address the definition of "local market," questioning whether clusters' markets extended past urban boundaries into proximate suburban and rural areas. Although his study incorporated cluster facilities reaching out as far as 60 miles from the parent hospital, Luke's (1992) examination of local hospital systems excluded clusters if their parent facilities were established in non-urban areas. His measurement of local hospital systems also excluded facilities operating in a separate but nearby – and, in some instances, contiguous – metropolitan area from the cluster's parent facility (e.g., San Francisco and Oakland), as such facilities would be designated as operating in two distinct markets. Luke and colleagues (1995) also used a 60-mile radius from the urban parent facility to establish the market reach of local hospital systems (i.e., regional clusters). And, as previously noted, Young and colleagues (2000) applied the same boundaries as Luke (1992) but extended the local market limits to 70 miles from the urban parent hospital.

In contrast to these conceptualizations of market boundaries, other analyses defined local markets as adhering to the boundaries of metropolitan statistical areas (e.g., Cuellar & Gertler, 2003, 2005; Dranove & Shanley, 1995; Dranove et al., 1996; Luke et al., 2011). Similarly, Trinh and colleagues (2010, 2014) identified clusters as same-system partners located in the same metropolitan statistical area or adjacent county. By adopting such boundaries, these studies focused strictly upon urban clusters, excluding any potential, proximate cluster members that may have existed just beyond the metropolitan statistical area. However, Shay and colleagues (in press) argued that the application of urban boundaries restricts researchers from obtaining an accurate view of clusters. In their chapter, the authors presented the differences between urban clusters and regional clusters, illustrating that non-urban facilities represent a significant component of the cluster population, particularly for urban clusters located in smaller markets that combine with facilities in nearby rural areas. By applying the expanded regional boundaries, one may avoid the underrepresentation of cluster formation that occurs as a result of an urban cluster definition, particularly for clusters in smaller markets (Shay et al., in press).

Although Luke (1992) had previously measured the regional cluster boundary as a 60-mile radius from the largest urban partner, his updated work with Shay and colleagues (in press) extended this radius to 150 miles, noting that it captured the outer limits of cluster configurations, even as the strong majority of cluster members (82 percent) operate within 50 miles of their parent facility. The authors' comparison of urban and regional clusters as of 2009 found that, by adopting a regional cluster definition, a substantial number of rural and suburban facilities are properly identified as cluster members that would have been excluded in the urban cluster definition. Under the regional cluster definition, nearly 30 percent of all multi-hospital system facilities participating in clusters consisted of rural hospitals. In addition, application of regional cluster boundaries increases the share of *urban* multi-hospital system facilities participating in local clusters by 15 percent, bringing the total to 94 percent of hospitals, an overwhelming majority. In small markets with total population equal to or less than 250,000 residents, a regional cluster definition yields a dramatic 177 percent increase in the number of facilities participating in clusters. Large markets with populations greater than 1 million, as well as medium markets with populations between 250,000 and 1 million residents, also observe increased cluster participation using a regional boundary definition, with gains of 20 and 59 percent for such markets, respectively. Furthermore, for these small, medium, and large markets, regional cluster boundaries increase the respective number of clusters by 58, 15, and 6 percent.

The chapter by Shay and colleagues (in press) also offers anecdotal evidence as to why regional cluster boundaries more accurately reflect cluster membership, relating examples of actual clusters to urban and regional cluster definitions. Work by Sikka and colleagues (2009) acknowledged the differences between urban and regional cluster boundaries as well, ultimately favoring the regional view of clusters. In this dissertation, the local market boundary definition associated with regional clusters is preferred and, as will be noted later, applied for analysis of clusters' components and configurations.

Cluster confusion. It is important to recognize that past studies have used the "cluster" term to refer to different concepts within the health services organization literature. One well-known application of the term, supported and popularized primarily by Porter (1998a), regards clusters as "geographic concentrations of interconnected companies and institutions in a particular field" that "encompass an array of linked industries and other entities important to competition" (p. 78). This interpretation does not require geographically concentrated firms to share the same ownership, and it has been adapted, specifically through limited focus on the hospital industry, and applied in key studies by Thomas, Griffith, and Durance (1981) as well as Fennell (1980, 1982). Thomas and colleagues (1981) referred to clusters as a group of hospitals that together serve a local, identifiable community within an urban region (e.g., neighborhoods, small suburbs, etc.) and "account for most or all of the hospital care provided to the residents" (p. 46). Likewise, Fennell (1980, 1982) examined clusters as all hospitals operating within the same metropolitan statistical area and serving the same population, regardless of differences in ownership or system membership.

Similar examples of this application of the term "cluster," extend into the 1990s and 2000s. For example, Gruca and colleagues (1993) characterized "healthcare clusters" as hospital-driven integrated delivery systems that provide "a care continuum which meets the needs of a given geographic population," but their definition of clusters did not require common ownership across cluster members, instead allowing for network relationships with non-hospital-based providers (p. 62). And, more recently, Cohen and Morrison Paul (2008) examined the agglomeration economies of "hospital clustering" among Washington State hospitals, requiring only geographic proximity for cluster membership. In contrast, the meaning of the term “cluster” adopted for this study and in previously cited works requires same-system membership among two or more hospitals in the same local market.

Hospital-based clusters are also not to be confused with cluster solutions obtained using cluster analysis methods. Important taxonomies within health services research, including the influential taxonomy of hospital systems and networks created by Bazzoli and colleagues (1999), have utilized cluster analysis methods to identify groups of health care organizations sharing common structural characteristics and strategies. These groups derived from cluster analyses are frequently referred to as clusters or cluster solutions. Even as this study employs cluster analysis methods in the development of a taxonomy of hospital-based clusters’ components and configurations, the cluster solutions obtained through cluster analysis methods do not refer to the hospital-based clusters that serve as this study’s subject.

Expanding the definition. As common definitions of clusters have emerged over the past several decades, it has become apparent that these organizations are developed around general, acute care hospitals. As such, most studies of clusters have focused strictly upon their collection of hospitals and disregarded their inclusion of non-hospital-based sites. But by limiting the composition of hospital-based clusters, important components of these emergent organizational forms have been ignored, leaving a gap in our understanding of how clusters vary in their components and configurations. That is not to say, however, that previous works failed to acknowledge clusters’ non-hospital-based members. In the reports of hospitals forming clusters in local markets during the mid-1980s, industry observers frequently defined the strategy of “clustering” as hospitals “concentrating their resources into vertically integrated health care services clustered in predetermined geographic areas,” including the acquisition or development of integrated non-hospital-based service sites throughout the continuum of care (Shahoda, 1986b,

p. 56; Gentile & Kanter, 1986; Gerew, 1986; McWhorter, 1985; Mistarz, 1985). Several years later, as Luke (1992) provided a detailed examination of local hospital systems, he noted that his study's focus on general acute care hospitals did not include clusters' non-acute care components, and he explained that inclusion of these additional health care entities would be needed in future research (p. 15). Yet, even through the consolidation wave of the 1990s and, more recently, the renewed medical arms race and geographic expansion race, examinations of hospital-based clusters have continued to focus solely on clusters' hospital components. As previously noted, this study seeks to contribute to the extant literature in its acknowledgement and evaluation of clusters' components in addition to their general, acute care hospitals.

Although different terms have been applied to hospital-based clusters, and although scholars and industry observers have varied in their definitions and measurement of clusters, an evaluation of past examinations of clusters reveals their remarkable development and heightened role in the U.S. health care delivery system. Having considered previous efforts to define and measure clusters, we proceed to consider how clusters' growth has been studied over the past thirty years.

Tracking the growth of clusters. Following the foundational articles by Luke (1991, 1992), future efforts addressing the growth and activity of clusters in the U.S. periodically emerged, though such efforts seemed to be continually overshadowed by integrated delivery systems and the significant amount of attention they received. The first studies that tracked the growth of clusters observed changes in cluster membership during the 1980s. Olden (1994), analyzing a data set created and maintained by Roice Luke, observed roughly 45 percent of hospitals as members of multi-hospital systems in 1982, and less than one-fifth of general, acute care hospitals were members of urban clusters. By 1989, system membership had risen slightly to just below 48 percent of acute care hospitals, but clusters saw more marked growth, with approximately 28 percent of hospitals participating in urban clusters and nearly one-third operating as members of regional clusters (Olden, 1994). In large markets with populations greater than or equal to 450,000 residents, the number of hospitals participating as urban cluster members grew from one-quarter of facilities in 1982 to roughly one-third in 1989 (Luke & Olden, 1995). Furthermore, roughly 58 percent of all multi-hospital system members belonged to urban clusters, and nearly two-thirds of system members participated in regional clusters (Olden, 1994).

Formation of hospital-based clusters increased dramatically throughout the 1990s. In 1995, the percentage of urban hospitals participating in clusters had grown to 42 percent, and approximately half of all general, acute care hospitals in markets with 450,000 or more residents belonged to urban clusters (Luke & Olden, 1995). By the start of the 21st century, Luke (2001) identified 465 urban clusters across the U.S., representing 59 percent of urban hospital beds, and the majority of these organizations (52 percent) consisted of just two hospitals. Such growth was also apparent in cluster facilities' share of local market admissions, increasing from 34 percent in 1995 to 48 percent in 2000 (Cuellar & Gertler, 2003). Active cluster formation was not only observed in urban areas but also in rural markets, where cluster membership increased from 32 percent of hospitals in 1995 to 40 percent in 2000 (Cuellar & Gertler, 2003). And, Madison (2004) reported that cluster growth occurred throughout the 1990s decade for both large and small facilities in urban and rural areas. Among hospitals with 250 or more beds, cluster participation during the decade doubled from 32 percent to 64 percent (Madison, 2004). Due to the significant restructuring and consolidation of hospitals to form clusters, the concentration of hospital-based providers observed in local markets increased significantly, particularly in urban markets with populations less than 1 million individuals, where the collective market shares for the top four firms averaged above 90 percent (Luke, 2001). By 2000, roughly 75 percent of all system hospitals participated as members of local clusters (Cuellar & Gertler, 2003). Building upon this growth, the next decade would witness the continued expansion of hospital-based clusters throughout the country.

As of 2009, Luke and Ozcan (2012) identified 505 urban clusters and 638 regional clusters, representing 59 percent and 91 percent of multi-hospital system hospitals in the U.S., respectively. Almost thirty years since hospitals' adoption of clustering strategies was reported in trade literature, convincing evidence exists of clusters' current dominance in urban areas. In large metropolitan markets with populations exceeding 1 million individuals, urban clusters' aggregate market shares grew from 38 percent in 1989 to 71 percent in 2009 (Shay et al., in press). And, among urban hospitals participating in multi-hospital systems, nearly 80 percent served as urban cluster members in 2009, a considerable increase from 56 percent in 1989 (Luke et al., 2011). By expanding the cluster definition to include proximate, non-urban members, the evidence of clusters' dominance commands even greater attention. As of 2009, approximately 94 percent of urban system hospitals cooperated with local cluster partners (including urban and non-urban cluster members), and three-fourths of rural system facilities operated as members of clusters (Shay et al., in press).

Thus, numerous studies over the past couple decades – many involving the efforts of Roice Luke who has continually tracked and analyzed cluster membership – have followed the growth of hospital-based clusters. As the industry saw the emergence of clusters in local markets throughout the country, scholars and industry observers also commented on the varied motivations for hospitals to pursue cluster membership as well as the activities observed among clustered hospitals and the impact of cluster formation on hospitals, markets, and the U.S. health care delivery system.

Clusters' presumed benefits, realized outcomes, and observed activities. Having considered the rapid rise and dominance of clusters in local health care markets, what factors motivated hospitals to form or join local clusters? Consistent with presumed benefits long touted for multi-hospital system membership in general, the presumed benefits of cluster membership listed by various sources are many: economies of scale, increased scope of services, enhanced market control, purchasing economies, strengthened competitive positioning, cost sharing, reduced service redundancy, improved convenience for patients, administrative efficiencies, decreased capital requirements, capture of future referrals and patient business, enhanced marketing effectiveness, and local support, among others (e.g., Gruca et al., 1993; Shahoda, 1986b; Trinh et al., 2010). To this list, experts also note the unique advantages offered to cluster members through spatial proximity, including heightened defense against local market threats, increased innovation opportunities, reduced communication barriers, and an enhanced ability to achieve both horizontal and vertical integration (Luke, 1992; Luke & Ozcan, 2012). However, although such potential advantages were acknowledged as factors considered by health care organizations pursuing a clustering strategy, a number of scholars identified the pursuit of market power and competitive advantage as the primary reason for clusters' development.

Higgins (1986), in both a reflection of past developments and a prediction of changes to come in the hospital field during the 1980s, commented on the consolidation of hospitals within local markets that had begun to gain attention among industry observers. He suggested such activity was motivated by hospitals' "desire to eliminate a nearby competitor, improve community healthcare, or create a larger local entity to enhance credit and competitive position"

(Higgins, 1986, p. 63). The following year, Johnson (1987) predicted that local, vertically integrated health care organizations comprised of multiple acute care hospitals, post-acute care facilities, primary care centers, and other non-hospital-based services sites (i.e., cluster forms that we observe today) would dominate their local markets in the future, and he saw the opportunity to effectively compete with other local providers and HMOs as a primary reason for hospitals to integrate both horizontally and vertically within their local markets (p. 21).

Seeking to explain factors driving cluster membership in the following decade, Olden (1994) concluded that participation in local hospital systems offered "reduced market uncertainty" as well as "increased power to manage…local markets," particularly in markets with fewer available resources or uncertain market structures (p. xi). Yang (2000) found support for this claim, observing cluster formation to be more prevalent in local markets with fewer health care resources. Though not specifically examining clusters, Bogue and colleagues (1995) evaluated the general strategies influencing merger activity between hospitals in local markets, and they suggested the two possible strategic reasons for such mergers were to either limit competition and integrate complementary services, or to pursue horizontal growth and expand the organization's geographic reach. Furthermore, Luke and colleagues (1995) assessed the factors motivating consolidation of hospitals in metropolitan areas to form local hospital systems, and they also observed competition as a significant factor in clusters' development, leading to the conclusion that "local system formation is the product of hospitals attempting to improve positions of market and interorganizational power locally" (p. 571).

Pursuit of power through clustering strategies was also seen as a means to countervail the growing influence of managed care. Numerous scholars suggested that the dramatic consolidation trends observed during the 1990s, including the formation of clusters, stemmed in part from the rise of managed care (e.g., Bazzoli, 2008; Cuellar & Gertler, 2003, 2005; Dranove & Lindrooth, 2003; Dranove, Simon, & White, 2002; Lesser & Ginsburg, 2000; Luke & Begun, 2001), although such sentiments were not unanimous (Town, Wholey, Feldman, & Burns, 2007). In sum, the drive to gain market power, improve competitive positioning, and secure resources through cluster participation suggests that hospitals viewed clustering mainly as a survival strategy in an increasingly competitive health care environment (Gruca et al., 1993).

Benefits versus outcomes. However, as scholars attempted to understand the various rationales behind the formation of local hospital-based clusters, some found that, when it came to the benefits of cluster membership, expectations did not always match reality. Studying local multi-hospital systems in California in 1988, Dranove and Shanley (1995) found these clusters did not yield anticipated benefits of reduced production costs. On the other hand, evidence of marketing benefits were apparent, leading the authors to conclude that the benefits of cluster membership existed more in retailing opportunities and marketing efficiencies than production efficiencies (Dranove & Shanley, 1995, p. 72). In a complementary study the following year, Dranove and colleagues (1996) obtained similar results. They found that local multi-hospital systems failed to "achieve superior production efficiency" through reduced costs, but they "achieved substantial marketing efficiencies instead," including through the development of brand identities and the ability to offer "one-stop shopping" to patients and payers in a local market (Dranove et al., 1996, pp. 102-103). Cuellar and Gertler's (2005) evaluation of local hospital systems from 1995 to 2000 found that hospitals that consolidated into local hospital systems enjoyed increased market power rather than more efficient or higher quality care. Luke and Ozcan (2012) suggest that the limited benefits of cluster membership observed to date within the extant literature may be attributed to individual members' resistance to yield autonomy, hindering clusters' abilities to identify and achieve ideal configuration and coordination among facilities.

Local hospital mergers and strategic hospital alliances. Related studies of local hospital mergers and strategic hospital alliances also shed light on the impact of consolidation on local markets. Though they did not specifically examine the outcomes associated with cluster formation, these studies assessed the effects of organizational consolidation through alliances or mergers between hospitals in local markets. Several studies found merging health care organizations in competitive markets to maintain lower costs and prices than non-merging facilities, whereas local hospital mergers yielded increased prices and minimized cost savings in more concentrated and less competitive markets (Connor, Feldman, Dowd, & Radcliff, 1997; Connor, Feldman, & Dowd, 1998; Spang, Bazzoli, & Arnould, 2001). In contrast, Krishnan and Krishnan (2003) examined the effects of hospital mergers in local Californian markets and observed increased revenues and operating margins for merging facilities rather than lowered operating costs, leading them to dismiss the notion that mergers offered production efficiencies for participating firms.

At the turn of the century, several studies examined strategic hospital alliances (SHAs), which also served as a concept that grouped together hospitals in local environments (Clement et al., 1997; McCue, Clement, & Luke, 1999; Olden et al., 2002). SHAs consisted of two or more hospitals that joined with other hospitals and health care providers in a local market for strategic reasons. Like clusters, SHAs included providers joined together under common ownership (referred to as "tightly coupled" SHAs), but unlike clusters, SHAs also could include alliance members with different ownership groups (referred to as "loosely coupled" SHAs). Thus, hospital-based clusters qualified as tightly coupled forms of SHAs, while health networks

(Bazzoli et al., 1999) served as loosely coupled SHAs. In their examination of SHA members' financial performance, Clement and colleagues (1997) concluded that alliance hospitals enjoyed increased market power, but, at the same time, had not taken advantage of significant economies (p. 193). This finding mirrored similar studies previously described of the effects of cluster membership on organizational efficiency and market power. In related work, McCue and colleagues (1999) examined and compared financial performance measures across different SHA forms, including single ownership SHAs (i.e., clusters). They observed that, compared to other SHA forms, clusters were "no more effective at enhancing revenues or reducing costs," and they failed to obtain evidence that centralization among alliance members added financial value or improved financial performance (McCue et al., 1999, p. 1020).

Studies of multi-hospital system membership. As previously described, following the first wave of multi-hospital system formation in the 1970s and early 1980s, scholars had evaluated the impact of system membership on individual hospitals and, at the time, generally suggested that system hospitals enjoyed no significant advantages in efficiencies or costs compared to freestanding facilities. Scholars continued to introduce studies assessing the impact of system membership throughout the remainder of the 20th century and into the 21st century, often with mixed findings. And, although these studies examined multi-hospital system membership in general, as opposed to membership in local clusters, their results mirror some of the same findings obtained in analyses of clusters.

For example, Bazzoli (2008) noted that the empirical literature has largely failed to observe cost savings or efficiencies for hospitals joining multi-hospital systems, and even among studies that find efficiency improvements or cost savings among merged facilities, those benefits tend to be relatively small or short-lived. Improvements in quality of care as a result of hospital consolidation have also been difficult to find within the empirical literature (Burns et al., 2012). Snail and Robinson (1998) spoke of "great variation in observed operational changes and effects on costs and financial performance" in their review of studies examining horizontal integration (p. 440), and Lee and Alexander (1999) reached similar conclusions regarding the effects of multi-hospital system membership, asserting that the "evidence has been decidedly mixed" (p. 232). At the same time, system participation has been repeatedly associated with increases in prices, revenues, and profitability among system members, suggesting that consolidation and concentration into systems generates enhanced market power for member hospitals (Bazzoli, 2008; Burns et al., 2012; Connor et al., 1998; Gaynor & Haas-Wilson, 1999).

Reasons offered as to why the effects of system membership have been inconsistent in the empirical literature are numerous. Some of the most sensible explanations include a "failure to consider organizational, economic, and environmental contingencies," a misguided assumption that the effects of system membership are universal for each circumstance and time period, and a general disregard for long-term outcomes (Lee & Alexander, 1999, p. 242; Bazzoli et al., 1999; Menke, 1997; Smith & Piland, 1990). Burns and Pauly (2002) offered the instructive reminder that not all systems or system members could expect to experience the same benefits or outcomes of system membership. They highlighted Sutter Health and the University of Pittsburgh Medical Center (UPMC) as examples of hospital-based systems successfully adopting horizontal integration strategies in their local markets, but they also acknowledged examples of horizontal failures. Explaining such different outcomes, the authors noted that each system's experiences may be unique given market and organizational factors, which has since been supported in subsequent studies. For example, Rosko and colleagues (2007) found evidence that the benefits of system membership are dictated by system characteristics.

Similarly, Spang and colleagues (2009) observed the impact of hospital consolidation on efficiencies, costs, and prices to be sensitive to ownership forms. Rosko and Proenca (2005) also suggested that, in order to realize system benefits such as improved efficiency and performance, hospitals must take advantage of the provision of services at the system level and collaborate with other system facilities, not just nominally identify with a system in order to gain legitimacy.

In other words, simply because a facility joins as a member of a multi-hospital system does not mean that every system member can expect identical benefits and outcomes resulting from consolidation. And, simply because a health care organization has formed a hospital-based cluster does not mean that each cluster shares the same traits or circumstances.

Clusters and regionalized care. As several studies assessed the possible effects of cluster membership in the 1990s and 2000s, particularly on efficiencies and market power, a few scholars also sought to explain the activities of clusters in their provision of coordinated care, questioning whether clusters exhibited the structural traits and service arrangements necessary to achieve regionalized care.

The history of efforts to promote regionalized care and its relation to hospital-based clusters has been thoroughly addressed in previous works by Luke (1992, 2010), who convincingly argued that clusters display the potential to form regional systems as endorsed throughout much of the 20th century, particularly given their operation of geographically proximate facilities and incorporation of both horizontal and vertical strategies that could allow for local coordination throughout the continuum of care. Regionalization is defined as “an approach in which disparate components of health care delivery are integrated into a unified whole for the purpose of providing, in a rational manner, a broad spectrum of health care to all members of a defined, usually local population” (Luke, 1992, p. 6). Based upon this definition, it is not difficult to see the similarities between regional systems and the hospital-based clusters that recently emerged as dominant health care providers throughout the care continuum in local markets throughout the U.S.

In the earliest attempt to connect hospital-based clusters to regionalized care delivery systems, Luke (1992) presented and evaluated structural criteria for regionalization, concluding that the vast majority of local hospital systems at the time failed to display essential characteristics that would qualify them as potential regional systems (i.e., hierarchical order and geographic spread). However, he also offered examples of several local hospital systems that *did* exhibit the potential to be qualified as regional systems, such as Intermountain Health Care in Salt Lake City and Carilion Health System in Roanoke, Virginia, noting that such systems dominated their local markets and, on average, operated nearly half of the acute care beds in their respective areas in 1990 (p. 43). As the consolidation wave swept through the health care industry during the 1990s, many more clusters would form, and additional clusters would adopt structural characteristics and configurations necessary to establish regionalized care (Luke, 2010; Sikka et al., 2009). Luke (2010) reported that a significant proportion of cluster formation and growth during this time occurred as larger, dominant hospitals consolidated with smaller hospitals throughout their local communities, thereby establishing hierarchical order while increasing geographic spread. Empirical examinations of clusters during the 2000s and early 2010s assessed the degree to which clusters exhibited traits and achieved outcomes associated with regional systems of care, with findings largely supporting clusters as potential vehicles for regionalization.

One important presumed benefit of regionalized care is enhanced organizational performance, including improved efficiency, quality, and financial performance, through rationalization of services and capabilities throughout the system (Luke & Ozcan, 2012). Sikka and colleagues (2009) examined the configurational efficiencies of clusters using data envelopment analysis (DEA) methods, observing that factors significantly associated with cluster efficiency included the size of the cluster's primary hospital (i.e., parent facility) and the proportion of urban members in a cluster. This finding led the authors to conclude that clusters, particularly those exhibiting strong operational performance, display service configurations that resemble regionalized forms of care. Similarly, Swofford (2011), in his dissertation examining the fit between rural hospitals' system participation and performance, observed that rural hospitals belonging as members of local clusters enjoyed both better financial performance and improved productive efficiency in comparison to rural hospitals lacking cluster partners. Furthermore, rural hospitals in hierarchical cluster relationships were also observed to enjoy significant financial benefits. And, relating to clusters' improved quality of care as regionalized systems, Madison (2004) found substantially lower mortality rates for patients at small rural hospitals (i.e., operating fewer than 250 beds) with large, local parent facilities (i.e., operating 250 or more beds). Such findings suggest that membership in vertically differentiated, hierarchically ordered clusters may yield improvements in the provision of patient care.

Regionalized systems of care are expected to rationalize their resources and functions in order to ensure coordinated and efficient care. Recently, a few studies have assessed the degree to which rationalization, or the lack thereof, is apparent among hospital-based clusters. In their investigation of service patterns and distributions among urban clusters for seven high-risk surgical procedures, Luke and colleagues (2011) found lead cluster facilities (i.e., those with the highest number of high-risk procedures per clinical category) to be larger and increasingly admit greater percentages of clusters' high-risk cases in comparison to their fellow cluster partners.

Given such findings, the authors concluded that clusters “have hospital configurations in place that are capable of concentrating high-risk cases within local markets,” but that more effort would be needed for clusters to realize their potential in effectively coordinating care across local areas (Luke et al., 2011, p. 1748). In a pair of studies investigating the sharing, receiving, and duplication of services among local cluster members, Trinh and colleagues (2010, 2014) identified market and organizational characteristics influencing service rationalization. Factors associated with the exchange of service capabilities among cluster members included managed care market penetration, market population size, hospital market competition, facility size, and facility occupancy rates, and focal hospitals that received services from cluster members enjoyed increased efficiencies and profits (Trinh et al., 2010). In addition, the authors found that the duplication of services among clusters varies by market demand, and that certain clusters “face higher barriers to service rationalization” based upon their organizational characteristics, including those with fewer facilities, closely located hospitals, high case mix indexes, not-for-profit ownership, and high bed size range (Trinh et al., 2014, p. 46). Reflecting upon these findings, the authors note that clusters display the promising potential to organize regionalized models of care delivery, but such an achievement would require considerable efforts as well as a much greater understanding of clusters, their varied forms, and the factors influencing their forms and activities (Luke et al., 2011; Trinh et al., 2010, 2014).

Summary of the extant literature on clusters. To date, there are numerous certainties that can be claimed about hospital-based clusters based upon a review of the extant literature. We know they first gained attention in the mid-1980s as trade reporters observed the adoption of clustering strategies among multi-hospital systems, and we know that such strategies flourished during the 1990s’ wave of consolidation, as multi-hospital system formation and growth primarily occurred within local markets. We also know that clusters adopted both horizontal and vertical strategies in their pursuit of local market power, and their remarkable growth from the 1990s through the early 21st century led to the current state of local markets dominated by local clusters through their operation of hospital-based and non-hospital-based sites offering services throughout the care continuum. The past thirty years have witnessed the expansion of clusters, such that today, they frequently extend their presence past strictly defined urban boundaries and reach into surrounding non-urban areas.

In addition, we know that, despite numerous presumed benefits of cluster membership, the primary advantage of local cluster participation that has been observed across empirical studies is the increased market power for these emergent organizational forms, as opposed to anticipated operating efficiencies or improved quality of care. At the same time, recent studies indicate that clusters indeed exhibit the potential to develop into regionalized care delivery systems that have been consistently discussed and promoted in the U.S. for nearly 100 years.

However, despite these numerous certainties, there also exists considerable uncertainty regarding clusters. In particular, we do not yet know what common organizational configurations have been adopted by clusters, nor do we know what common components have been adopted by clusters in their pursuit of horizontal and vertical growth. In other words, we require a better understanding of hospital-based clusters in order to both describe their common forms and explain the diversity observed across clusters.

What Yet Needs Known: Current Gaps in the Literature on Hospital-Based Clusters

As previously noted, although hospital consolidation in the late 1980s and 1990s was observed to occur "less through national expansions and more through the creation of small, local firms and clustered extensions of larger firms" (Luke, 1991, p. 209), relatively little empirical attention was initially devoted to the formation of clusters in local markets, with much discussion at the time instead directed towards the anticipated development of integrated delivery systems. Thus, as hospital-based clusters became dominant health care providers in local markets throughout the country by the turn of the century, there existed a paucity of research examining these important organizational forms. To date, efforts to fill the gap of knowledge regarding clusters have increased, yet at the same time, there still remains much that is not understood regarding clusters, including their varied components and configurations. Specifically, little is known about the diversity apparent among clusters, and without identification of different forms adopted by these providers, their empirical examination is limited to the homogeneous categorization of clusters (Luke & Ozcan, 2012).

In continued contributions to our knowledge of clusters over the past 25 years, Roice Luke and his colleagues have repeatedly described clusters as understudied and overlooked, and they have called for increased research of clusters and their varied forms, particularly in light of their growing local power, expanding size, and complex structures (e.g., Luke, 2001; Luke & Ozcan, 2012; Shay et al., in press; Sikka et al., 2009). Proponents of the study of clusters have criticized existing data and analyses that have traditionally either focused on individual hospitals or failed to distinguish clusters from their larger multi-market parent systems, including examples such as Banner Healthcare, HCA, Sutter Health, and Trinity Health, to name a few (Cuellar & Gertler, 2003; Luke, 2001, 2010).

In addition, scholars who have focused on clusters have decried a lack of analysis to identify categories of cluster forms. For example, in the late 1980s, Luke and Begun (1988) observed that local hospital systems did not “simply represent homogeneous groups” but instead exhibited considerable differences “on a wide variety of characteristics” including both organizational and market factors (p. 598). During the next decade, Luke and colleagues called for the increased exploration of clusters, including the patterns and determinants of their development as well as the creation of a taxonomy strictly classifying local hospital clusters (Luke et al., 1995; Luke & Wholey, 1999). This call went unanswered through the 2000s, as Sikka and colleagues (2009) suggested that a key to needed research on clusters remained "the development and testing of organizational taxonomies" among cluster forms, noting that clusters' performance and behaviors "is very likely to differ by distinctive cluster characteristics" (p. 259). Luke and Ozcan (2012) recently echoed this observation, suggesting that, although "there is no single template for how the clusters are configured or what particular services and business units they offer," general patterns exist among clusters and their "distinctive combinations of facilities and businesses" (p. 13).

Thus, one evident gap in the literature on hospital-based clusters is the lack of a taxonomic effort to categorize clusters' forms in a descriptive manner based upon their components and configurations. The purpose of this study aims to address this gap, and in so doing, its purpose is similar in ways to previous studies that have sought to examine and categorize emergent organizational forms based on their differences and common patterns. We now consider prior efforts to describe and categorize common groupings of health care organizations through the development of taxonomies.

Describing health care organization forms: Previous taxonomic efforts. Efforts to categorize health care organization forms according to common characteristics stem from the analysis of multi-hospital systems during their rise to power in the latter half of the 20th century. Even as multi-hospital systems had emerged as dominant providers following their growth in the 1970s and early 1980s, some argued that scientific evaluation and understanding of multi-hospital systems was sorely lacking, with studies largely resting upon the presumed benefits of system membership as opposed to actual consequences (e.g., Alexander & Fennell, 1986; Fottler, Schermerhorn, Wang, & Money, 1982; Luke, 1992). As scholars began to focus their attention on the empirical assessment of multi-hospital systems, calls also increased for the identification of multi-hospital system categories based upon shared characteristics, a demand stemming from the criticism that multi-hospital systems had been regarded as homogeneous forms (Alexander & Fennell, 1986; Morrisey & Alexander, 1987).

In one of the earliest categorization attempts of multi-hospital systems, Alexander and colleagues (1985a) employed cluster analysis methods to a sample of not-for-profit, multi-hospital system member facilities. They identified "distinct groupings of hospitals, based largely on size and affiliation status," that displayed variation in their performance characteristics (p. 913). The following year, Lewis and Alexander (1986) developed a taxonomy of multi-hospital systems using a variety of concepts, including governance structure, authority relations, medical staff relations, system heterogeneity, scale of operations, geographic dispersion, vertical integration, system control, and system age. Their 15-cluster solution served as evidence of the considerable differentiation observed across multi-hospital system forms at the time. However, both the taxonomies by Alexander and colleagues (1985a) and Lewis and Alexander (1986) failed to gain widespread acceptance by health services researchers (Swofford, 2011), as Alexander and colleagues' (1985a) taxonomy lacked a convincing conceptualization of hospital systems' behavioral and relational attributes (Shortell, 1988), while Lewis and Alexander's taxonomy involved an unwieldy number of system categories (Swofford, 2011). Other examples of health care organization taxonomies include Weiner and Alexander's (1993) taxonomy of not-for-profit hospital governance forms, in which "board forms varied systematically by specific organizational and environmental conditions" (p. 325), and Alexander and colleagues' (1996) taxonomy of physician-organization arrangements, which similarly found that "most delivery organizations employ multifaceted rather than single approaches to physician integration," with such approaches "endemic to particular environmental and organizations conditions" (p. 71).

Perhaps the most widely recognized and oft-cited taxonomy within health care organization studies is Bazzoli and colleagues' (1999) taxonomy of health systems and networks, which was later updated by Dubbs and colleagues (2004). Their taxonomy has since become a popular and valued tool, adopted by policymakers, practitioners, and health services researchers, even earning inclusion in the American Hospital Association's Annual Survey data files (Dubbs et al., 2004; Luke, 2006b). Bazzoli and colleagues (1999) empirically developed their taxonomy by categorizing health systems' and health networks' hospital services, physician arrangements, and provider-based insurance activities based upon three dimensions: differentiation, integration, and centralization. The results of their cluster analyses led to four categories of hospital-led health networks (centralized health networks, decentralized health networks, moderately centralized health networks, and independent hospital networks) and five categories of hospital-led health systems (centralized health systems, centralized physician/insurance health systems, decentralized health systems, moderately centralized health systems, and independent hospital systems), with roughly 70 and 90 percent of health networks and health systems classified within these cluster solutions, respectively.

Bazzoli and colleagues' taxonomy: Contributions and criticisms. The taxonomy originally developed by Bazzoli and colleagues (1999) served as a foundation for numerous important studies in the 21st century (Burns et al., 2012), including assessments of organizations' strategic changes over time (e.g., Bazzoli et al., 2001; Dubbs et al., 2004), the financial performance exhibited by common system forms (e.g., Bazzoli et al., 2000; Burns, Gimm, & Nicholson, 2005), the relation of various system forms to their hospitals' community responsiveness (Lee, Alexander, & Bazzoli, 2003), and the effects of system membership on operational performance (e.g., Carey, 2003; Rosko et al., 2007) and quality (Chukmaitov et al., 2009). However, some may argue that the taxonomy's primary contribution was its identification of common health system and health network forms, allowing health services researchers to no longer resort to studying the implications of system membership with the false assumption that all systems adopt homogeneous forms and manage identical organizational and environmental factors.

Despite the widespread acclaim Bazzoli and colleagues have deservedly gained for their taxonomy, which has made a significant contribution within health services research, there have been a few criticisms leveled against it. In particular, Luke and Wholey (1999) noted the taxonomy's definition of health systems solely required unified ownership but failed to limit the geographic scope of system membership (i.e., local, regional, or national hospital systems). This criticism, which was later reemphasized by Luke (2006b), suggested that the taxonomy examined and classified the practices of some multi-market hospital systems despite using data that was designed to "examine local service configurations among clustered system hospitals" (Luke, 2006b, p. 620). Studies that have examined health care organizations at the system level without recognizing local clusters among system members fail to account for the interdependence and shared power that is fostered among same-system hospitals in a local market. On the other hand, examination of multi-hospital systems at the cluster level takes into consideration local service configurations, and proponents of the cluster view of multi-hospital systems suggest it is the appropriate approach in studying health care systems given the importance and influence of local markets (Luke, 2006b; Luke & Wholey, 1999). Given this criticism, Luke and colleagues have called for a separate taxonomy of hospital-based clusters (e.g., Luke, 2006b; Luke & Ozcan, 2012; Luke & Wholey, 1999; Sikka et al., 2009), even as they acknowledge the importance of Bazzoli and colleagues' taxonomy and incorporate its valuable findings into their own research (e.g., Shay et al., in press).

Proposal for a new taxonomy. At first glance, this study's expressed attempt to identify groups of common cluster forms may appear to be very similar to Bazzoli and colleagues' (1999) seminal taxonomy of health systems and networks. However, we clarify that this study does not intend to critique past taxonomies of health care organizations, nor does it seek to replace important taxonomy efforts of the past. Instead, this study intends to contribute to the extant literature and build upon prior taxonomic applications by developing a new taxonomy strictly focused upon hospital-based clusters and their varied components and configurations.

Acknowledging the important and heralded work of Bazzoli and colleagues (1999), it is helpful to clarify ways in which this study departs from their work to avoid confusion between these two taxonomic efforts. First, the unit of analysis between the two studies is different. Bazzoli and colleagues (1999) examined hospital-led networks and systems, whereas this study focuses upon hospital-based clusters and their non-hospital service locations. By focusing upon hospital-based clusters, this study incorporates geographical considerations for defining hospital systems, whereas many previous studies of hospital systems failed to examine or account for the regional or local "sub-systems" that comprise larger, national hospital systems (e.g., HCA), and instead examined such organizations as a single system. A focus on identifying taxonomic groups of *clusters* has not been attempted to date, despite repeated calls for such efforts.

In addition, the taxonomy by Bazzoli and colleagues (1999) categorizes hospital systems and networks according to the differentiation, integration, and centralization displayed among hospital services, physician arrangements, and insurance products. In contrast, this study categorizes clusters according to the differentiation, integration, configuration, and coordination displayed among their hospitals and non-hospital service sites, as is discussed in the following chapter. The acknowledgement and inclusion of clusters' non-hospital-based service sites is an important distinction of this study, particularly in light of the renewed medical arms race and geographic expansion race that have been observed recently across local markets in the U.S. Previous studies have not specifically regarded both systems' hospital-based *and* non-hospital-based service sites, nor have they considered the impact of these diverse service sites on systems' spatial differentiation and geographic reach.

Finally, the intent of this study's taxonomy is to describe the varied forms exhibited by clusters and to explain these varied forms given the numerous market and organizational factors affecting individual clusters. In this second task, a multi-theoretical perspective will be developed to empirically examine the determinants of cluster forms. Few documented efforts exist that have sought to explain the formation of clusters and the varied strategies they have adopted in local markets. In particular, efforts employing perspectives from organization theory to address cluster activities have been limited and have often lacked empirical testing. Luke's (1991) influential examination of local hospital competition and cooperation applied resource dependence theory to explain the different types of interdependent relationships observed among early cluster forms. Over ten years later, Luke and Walston (2003) applied a multi-theoretical perspective to explain the varied strategies pursued by health care organizations during the turbulent 1990s decade, including the formation and growth of clusters. The authors explained that health care organizations' attempts to pursue rational strategies in response to environmental forces – as predicted by resource dependence theory, transaction cost economics, and industrial organization economics – was limited by the institutional barriers they faced in their local markets and among their respective stakeholders, as suggested by institutional theory. And, most recently, Shay and colleagues (in press) have called for the development of a conceptual framework drawing from multiple organization theories to explain how clusters' microenvironments and organizational characteristics shape their strategic responses to numerous contingencies and generate the diversity observed today among local clusters. However, though their arguments are convincing, each of the three works just described lack empirical testing of their theoretical applications.

A Summary of the Literature Review

Over the past fifty years, the story of hospitals and their organizational forms has been marked by a series of industry changes and strategic trends. What was once a cottage industry of independent, freestanding acute care hospitals evolved to a collection of locally dominant and highly differentiated clusters, with such local multi-hospital systems comprised of hospital-based and non-hospital-based service sites dispersed in a defined geographic market. This transformation was not immediate, but gradually developed through extended periods in which hospitals pursued popular strategies of horizontal consolidation, vertical growth and diversification, horizontal and vertical integration, dis-integration, and renewed consolidation and geographic expansion.

As scholars and industry observers noted these changing trends over time and the emergence of clusters, a growing number of attempts to understand clusters were published, with common themes including cluster members' pursuit of increased market power and the potential for local clusters to develop into regionalized care systems. However, even as clusters continue to form, grow, and expand their service offerings and geographical presence in local markets, we lack the ability to distinguish common groups of cluster forms from one another and are instead resigned to empirically examine clusters as homogeneous organizational forms. Thus, a taxonomy of cluster forms that identifies groups of clusters sharing common characteristics and strategic postures is required to fill this significant gap. This study's effort to describe or categorize clusters' components and configurations is similar to previous taxonomic efforts in health services research but, at the same time, offers new contributions in its strict focus on clusters and its evaluation of both hospital-based and non-hospital-based service sites. Furthermore, a taxonomy of cluster forms will serve as a foundation for future studies of hospital-based clusters, and it will serve as the base from which we can attempt to explain common cluster forms using a multi-theoretical perspective. In the following chapter, we begin the process of categorizing common cluster forms by applying concepts from organization theory to characterize clusters' varied structures and strategies.

Chapter 3: Theoretical Framework – Taxonomic Analysis

This chapter provides a theoretical framework from which to categorize varied cluster forms. When classifying subgroups of populations, such as in the development of a taxonomy using cluster analysis methods, it is critical to apply a theoretical framework that allows for characteristics across subgroups to be distinguished and identified (Aldenderfer & Blashfield, 1984; Ketchen & Shook, 1996; Lewis & Alexander, 1986; Lorr, 1983; McKelvey, 1982). Past well-regarded taxonomic efforts in health services literature that have attempted to identify key structural and strategic characteristics observed among health care organizations have found value in applying concepts from contingency theory (e.g., Alexander et al., 1996; Bazzoli et al., 1999; Dubbs et al., 2004), in particular incorporating concepts of differentiation and integration featured in the seminal works of Lawrence and Lorsch (1967a, 1967b). In addition, recent works examining hospital-based clusters have also applied concepts of differentiation and integration (Shay et al., in press) as well as elements of strategic management theory (Luke & Ozcan, 2012), specifically focusing upon notions of configuration and coordination as promoted by Porter (1986).

Collectively, this body of literature points to the relevance and value of both contingency theory and strategic management theory in understanding varied organizational forms and arrangements. In this chapter, we seek to present a theoretical framework to classify cluster forms, building upon influential works from contingency theory and strategic management theory. We begin with a general overview of each of these theoretical perspectives, followed by a discussion and synthesis of key theoretical concepts: differentiation, configuration, integration, and coordination. This theoretical framework is then applied to our subject, hospital-based clusters, in order to identify common cluster forms in this study's taxonomic analysis.

Contingency Theory

Contingency theory, also referred to as structural contingency theory, stands as an essential theoretical perspective within organization studies, originating primarily from a collection of influential works during the mid-20th century (e.g., Burns & Stalker, 1961; Lawrence & Lorsch, 1967a, 1967b; Perrow, 1967; Thompson, 1967; Woodward, 1958, 1965). Emerging as one of the first contributions to the open system perspective (Carr, 1968; Mick & Shay, in press; Scott, 2004), contingency theory primarily argues that the designs adopted by organizations are dependent, or *contingent*, upon environmental factors and tasks, and the degree to which organizational designs or structures "fit" environmental demands and tasks in effect determines organizational performance (Scott & Davis, 2007, p. 103).

Early works that shaped the contingency theory perspective suggested that the effectiveness of organizational forms may be depicted as a continuum, such that as environments and tasks progress from more simple and stable (consistent with the rational system perspective) to more complex and dynamic (consistent with the natural system perspective), corresponding organization structures prove more effective as they progress from being more bureaucratic and "mechanistic" to less formal and more "organic" (Aiken & Hage, 1968, 1971; Burns & Stalker, 1961; Hage & Aiken, 1969; Lawrence & Lorsch, 1967b; Pennings, 1987). Such thinking recognizes that organizations face varied environments and situations, and for each environment or situation, certain organizational structures are better suited to thrive. In this sense, contingency theory has been viewed as a model that aligns and reconciles the rational system, natural system, and open system perspectives in organization studies, acknowledging the diverse and conflicting demands environments place upon organizations, even across varying levels within organizations (Baum & Rowley, 2002; Gresov, 1989; Scott & Davis, 2007).

Organization scholars have often identified three essential tenets of contingency theory. These include: 1) no single "best" way to organize exists; 2) for any given situation, not all ways of organizing are equally effective; and, 3) the most suitable or preferred way to organize in a given situation depends upon an organization's task and environmental conditions, or "contingencies" (Galbraith, 1973; Mick & Shay, in press; Scott & Davis, 2007; Starkweather & Cook, 1983). Initially, the contingencies examined in organizational analyses primarily included technology (Child, 1975; Khandwalla, 1974; Perrow, 1967; Thompson, 1967; Woodward, 1958, 1965), environmental uncertainty or complexity (Burns & Stalker, 1961; Child, 1975; Galbraith, 1973; Lawrence & Lorsch, 1967b), and firm size (Blau & Schoenherr, 1971; Child, 1975; Hickson, Pugh, & Pheysey, 1969). However, later studies recognized contingencies as "any variable that moderates the effect of an organizational characteristic on organizational performance" (Donaldson, 2001, p. 7), and as contingency theory has developed since its introduction in the 1960s, scholars have examined a growing list of contingencies influencing organizational design and performance. These have come to include leader personalities (Miller & Droge, 1986), knowledge (Birkinshaw, Nobel, & Ridderstrale, 2002), and other factors such as participant predispositions, cultural differences, scope, and life cycle of the organization (Scott & Davis, 2007).

Lex Donaldson, one of the chief proponents and experts of contingency theory, has promoted contingency arguments and reviewed the development and application of the contingency perspective in numerous works. In particular, Donaldson (1995, 2001) has emphasized the importance of the concepts of fit and performance within contingency thinking, developing the structural-adaptation-to-regain-fit (i.e., "SARFIT") model. According to this model, contingencies and structural characteristics are related, such that they either exhibit "fit" or "misfit"; changes to contingencies cause misfit, thereby yielding changes in organizational structures; and, by changing their structures, organizations may regain fit and restore desired levels of performance (Donaldson, 1995, 2001; Scott & Davis, 2007). When considered in light of the dynamic nature of contingencies, the SARFIT model suggests that organizations operate in a state of continual pursuit towards fit, as even those organizations that achieve fit can expect to encounter future environmental changes that in turn will disrupt their "fitness" and require structural adaptation to regain fit. In this sense, contingency theory explains why we observe continual change across both contingencies and organizational structures (Donaldson, 2001).

One cannot deny the impact of the contributions of early contingency theorists such as Lawrence and Lorsch: their work has inspired scholars and managers alike "to abandon the 'one best way' approach to management and organizational theory and to replace it with the contingency approach" (Bluedorn, 1991, p. 495). Yet, in some respects, the considerable attention initially paid towards contingency theory began to wane by the 1980s and 1990s, as other popular organization theories had emerged and drew organizational scholars' focus away from questions of organizational structure and performance, including resource dependence theory, neo-institutional theory, population ecology, and transaction cost economics (Lawrence & Lorsch, 1991, p. 491). In addition to the rise and application of competing theoretical perspectives, another certain cause for the shift in scholars' attention away from contingency thinking was the influence of critics' examinations of contingency theory's weaknesses.

Numerous scholars challenged contingency theory through a variety of criticisms, including a lack of conceptual clarity, consistency, or specificity as well as, in several instances, weak empirical support (e.g., Comstock & Scott, 1977; Drazin & Van de Ven 1985; Duncan, 1972; Fry & Smith, 1987; Mohr, 1971; Pennings, 1975; Schoonhoven, 1981; Tosi & Slocum, 1984; Van de Ven & Drazin, 1985). In health services literature, the reduced application of contingency theory became apparent by the end of the 20th century as studies of organizational change largely overlooked the variety of contingencies facing health care organizations and their varied impact on organizational change (Lee & Alexander, 1999, p. 264).

This is not to say, however, that contingency thinking is no longer applied within health care organization studies, or that scholars or managers have dismissed the notion that many ideal organizational forms exist for different task and environment contingencies. On the contrary, despite its detractions, contingency theory has repeatedly been recognized as one of the most influential perspectives in organization studies (e.g., Donaldson, 2001; Scott & Davis, 2007; Tosi & Slocum, 1984; Van de Ven & Drazin, 1985), in part due to its widespread appeal and useful implications for practitioners and managers (Bluedorn, 1991; Scott, 2004; Shortell & Kaluzny, 1983). In today's "accountable" health care environment with its heightened interest in performance and its promotion of emerging organizational forms, contingency theory remains particularly relevant given its focus on issues of structure, fit, and performance. Furthermore, Boyd and colleagues (2012) suggest that contingency theory has enjoyed a "resurgence" among today's organization scholars (p. 280), and recent works in health services literature continue to support the tenets of contingency theory. For example, Clark (2012), in his evaluation of health care organization design and efficiency, echoed traditional contingency theory arguments in concluding that "there may not be a single 'best practice' with respect to organizational configurations in health care" (p. 98). Other previous examples of studies that have applied contingency theory in the health care organization literature include Baldwin's (1972) study of the effects of integration and differentiation on hospital performance, Veney and Khan's (1973) examination of hospital services, Comstock and Scott's (1977) evaluation of subunit structures in hospital patient care wards, Schoonhoven's (1981) analysis of the surgical transformation process in acute care hospitals, Argote's (1982) study of coordination problems in hospital emergency units, Leatt and Schneck's (1981, 1982a, 1982b, 1984) works analyzing hospitals' grouping of activities into nursing subunits, Alexander and Randolph's (1985) examination of nursing subunit quality of care, Zinn and colleagues' (1998, 2003, 2007b) studies of structural factors affecting the provision of care to elderly patients, Swofford's (2011) evaluation of rural hospitals and system membership, Fareed and colleagues' (2012) examination of hospitals' electronic medical record enterprise application strategies, an analysis by Van de Ven and colleagues (2012) of community clinic performance, Shay and Ozcan's (2013) assessment of inpatient rehabilitation facilities' structures and performance in uncertain environments, and Fennell and colleagues' (in press) synthesis of contingency theory and institutional theory perspectives to evaluate advances in genomic medicine.

In sum, contingency theory serves as a well-established and important perspective within the macro-organization theory canon. Importantly, although scholars widely recognize contingency theory's ability to address questions of organizational performance, contingency theory also accounts for variation in organization structures, recognizing that the contingent environments and tasks that demand "fit" and influence performance also vary and conflict (Scott, 2004). In light of this, a contingency theory perspective merits application in studies seeking to examine and explain varied organizational structures, such as this study's consideration of the varied components and configurations of hospital-based clusters. Perhaps the single work most closely associated with contingency theory is Lawrence and Lorsch's (1967b) seminal text examining organizations' pursuit of differentiated and integrated structures, which, as previously noted, has also been repeatedly applied to examine variation in health care organization structures. We now more closely examine this important work and the key concepts of differentiation and integration.

Differentiation and integration: Lawrence and Lorsch's basic elements. In their foundational work, *Organization and Environment: Managing Differentiation and Integration*, scholars Lawrence and Lorsch (1967b) described and conceptually connected a collection of organizational studies from the mid-20th century to build a theoretical model they initially termed, "contingency organization theory," which would later be referred to simply as "contingency theory." Their model suggests that various task and environmental "conditions of concern" create unique "constraints and opportunities" for organizations that ultimately determine their forms, leading to the conclusion that "there can be no one best way of organizing a business" (Lawrence & Lorsch, 1967b, p. 191). Lawrence and Lorsch's (1967b) text focuses upon organizations' pursuit of *differentiation* in reaction to diverse and uncertain environments and task requirements, with such differentiation subsequently requiring *integration* in order to resolve the internal organizational conflict it produces. This dual consideration of differentiation and integration recognizes that different structures are required for different environments and tasks, which is a central tenet of contingency theory.

Lawrence and Lorsch's study (1967b) generated empirical evidence to challenge the previously dominant closed system model, calling for organizations to "learn a lot more about the environment" and use such knowledge to develop differentiated and integrated forms that meet environmental demands (Carr, 1968, p. 276). The acclaimed scholars focus on the concepts of differentiation and integration as "the two basic elements of the organization's design," suggesting that through these two concepts, an organization and its sub-systems may "mesh with its related environmental sector" (Lawrence & Lorsch, 1991, p. 492). In other words, differentiation and integration are "environmentally required states" confronting each organization and influencing each organization's effectiveness (Lawrence & Lorsch, 1967b, p. 132). Thus, we see that, within Lawrence and Lorsch's contingency model, organizational forms are described according to their levels of differentiation and integration as they seek to adopt structures that best fit the demands of their varied tasks and environments.

Lawrence and Lorsch (1967a) define differentiation as "the state of segmentation of the organizational system into subsystems, each of which tends to develop particular attributes in relation to the requirements posed by its relevant external environment" (pp. 3-4). The authors proceed to define integration as "the process of achieving unity of effort among the various subsystems in the accomplishment of the organization's task," with the term *task* meaning "a complete input-transformation-output cycle involving at least the design, production, and distribution of some goods or services" (Lawrence & Lorsch, 1967a, p. 4). Such concepts translate to health care organizations with relative ease. Health care organization scholars have defined differentiation as the varied number, type, and distribution of health care services and programs across the continuum of care, and integration pertains to organizational activities and structures that unify and maximize the value of differentiated services and programs throughout the continuum of care (Bazzoli et al., 1999, p. 1686; Bazzoli et al., 2000, p. 235; Conrad & Shortell, 1996, p. 25). In this sense, a health care organization's task is to design, produce, and distribute health-related services throughout the continuum of care "for purposes of preventing illness and maintaining, restoring, and enhancing the health of individuals and communities" (Conrad & Shortell, 1996, p. 25).

Limitations of past conceptualizations. However, while supporting the notion of differentiation and integration as central to organizing, later works have also highlighted some limitations of Lawrence and Lorsch's (1967a) approaches to these two key concepts. For example, Dougherty (2001) noted differentiation occurs beyond functional departments, including across different organizational levels, processes, products, and markets, while integration "involves many more complex kinds of unified efforts" than the "mechanisms and liaison roles" initially described by Lawrence and Lorsch (p. 613). Furthermore, she reimagined work as "practice," requiring "active, hands-on, problem-solving" rather than "passive maintenance of the system," and, as such, the concept of differentiation is expanded to include organizational "breaks" based upon groupings such as specialized capabilities, customer channels, and geography (Dougherty, 2001, p. 629). This description of "practice," though applied by Dougherty (2001) to characterize innovative firms, may just as well be describing the "active, hands-on, problem-solving" nature of health care, and the organizational breaks she identifies to define differentiation may also be observed in the varied specialized capabilities, customer channels, and geographical arrangements noted in earlier anecdotal descriptions of clusters' components and configurations.

Gulati and colleagues (2005), in their examination of adaptation in vertical relationships, also called for an expanded conceptualization of integration. Noting that the traditional application of the term "integration," as used by Lawrence and Lorsch, has referred to cooperation or collaboration among firm departments, Gulati and colleagues (2005) suggest that integration also demands *coordination*, which they define as "the alignment of actions" that overcomes “the lack of shared and accurate knowledge about the decision rules that others are likely to use and how one’s own actions are interdependent with those of others” (p. 419). In other words, true integration involves both the alignment of interests and motivations (i.e., *cooperation*) as well as the alignment of actions through knowledge of how others act and behave in interdependent relationships (i.e., *coordination*) (Gulati, Lawrence, & Puranam, 2005).

Furthermore, in their study of the headquarters-subsidiary relations between a large medical group practice and its individual primary care clinics, Van de Ven and colleagues (2012) suggested that Lawrence and Lorsch’s view of differentiation and integration is incomplete as it focuses on a single organizational level and fails to appropriately describe multisite organizations with geographically dispersed units. To address this shortcoming, Van de Ven and colleagues (2012) promote a multilevel view of differentiation and integration, citing work by Donaldson (2001) and Nohria and Ghoshal (1994) that acknowledges differentiation and integration occur at different organizational levels: micro (i.e., subsidiaries) and macro (i.e., headquarters). According to this group of organizational scholars, “differentiation focuses on the subsidiary level,” incorporating differences across subsidiary units as well as their levels of autonomy and interdependence, whereas “integration applies to the corporate level” and serves to standardize and coordinate organizational activities, strategies, and norms (Van de Ven et al., 2012, p. 1058). By definition, hospital-based clusters are multisite organizations with geographically dispersed units, and thus the headquarters-subsidiary relationship is one that accurately describes the relationship of a cluster organization (i.e., headquarters) and its numerous health care facility members (i.e., subsidiaries). A multilevel view of clusters that acknowledges both the “macro” corporate level and the “micro” subsidiary unit level also allows for a proper consideration of the different levels of differentiation and integration. Without such a perspective, activity that appears deintegrative at the individual facility level may fail to be accurately recognized as vertical differentiation or integration at the cluster level. Similarly, the simultaneity of deintegration and integration across these levels and throughout organizations (Mick, 1990) may be only partially considered or overlooked altogether.

Studies examining hospital-based clusters have previously acknowledged the value of broadening traditional conceptualizations of differentiation and integration. Whereas numerous studies in health services literature have defined differentiation as an array of services and programs throughout the continuum of care (e.g., Bazzoli et al., 1999; Conrad & Shortell, 1996), which may be considered *product* or *service* differentiation, Luke (1991) noted that differentiation occurs along many dimensions, including *spatial* differentiation (accounting for varied geographical arrangements), *vertical* differentiation (accounting for varied levels of service), and *horizontal* differentiation (accounting for varied types of service at the same care levels). Over two decades later, Shay and colleagues (in press) again raised the arguments that any consideration of clusters' pursuit of differentiated forms must acknowledge the importance of spatial proximity as well as distinguish between horizontally and vertically differentiated forms. Their work also examined clusters' pursuit of integration following the development of service differentiation across cluster members, noting the importance of coordination – in accord with Gulati and colleagues' (2005) notions of aligned actions, not just aligned interests – during instances of inter-organizational exchange.

Thus, in light of these previous works, the value of an expanded conceptualization of differentiation and integration becomes apparent, including definitions that account for the importance of geography and distinguish vertical and horizontal relationships. In their discussion of strategic issues involved in the formation and operation of clusters, Luke and

Ozcan (2012) address the importance of geographic proximity when examining cluster forms from a strategic management perspective. They promote Porter's (1986) structural dimensions of *configuration* and *coordination* as concepts that correspond respectively to Lawrence and Lorsch's (1967b) definitions of differentiation and integration but also account for spatial relations. In order to broaden this study's conceptualizations of differentiation and integration, we borrow from Luke and Ozcan's (2012) arguments by applying a strategic management perspective, specifically incorporating concepts of configuration and coordination originally introduced by Porter (1986). We then synthesize differentiation and integration with configuration and coordination, respectively, to develop a framework with which to categorize clusters' varied forms.

Strategic Management Theory

Strategic management theory is frequently traced to the foundational work by Chandler (1962), which addressed "how strategic change leads to structural change" and portrayed strategic change as a response "to opportunities or needs created by changes in the external environment" (Hoskisson et al., 1999, p. 422). Following this work, scholars increasingly examined the relationship between environmental characteristics and managers' strategic decisions (Boulton, Lindsay, Franklin, & Rue, 1982), with seminal contributions to the development of the strategic management perspective including efforts by Ansoff (1965), Andrews (1971), Child (1972), Hofer (1975), Miles and Snow (1978), Schendel and Hofer (1979), and Porter (1980, 1985). Collectively, these works acknowledged the importance of connections between organizations' external environments and their internal processes. Developed to address the question of why organizations succeed or fail (Boyd et al., 2012, p. 279; Porter, 1991, p. 95), the strategic management perspective asserts that, "through its strategy, an organization selects and interprets its environment, responds to those elements it considers fixed, and attempts to shape the remaining elements to its advantage" (Keats & Hitt, 1988, p. 574).

One of strategic management theory's underlying assumptions is that "environmental changes lead organizations to change their overall strategies" (Zajac & Shortell, 1989, p. 413). Thus, strategic management theorists place an emphasis on organizational adaptation and adaptive specialization in the midst of environmental changes (e.g., Chakravarthy, 1982; Ginsberg, 1988; Kimberly & Zajac, 1985). Various models of strategic formulation have been offered within the strategic management perspective over time, portraying strategic adaptation as a continual process. Within this process, organizational leaders anticipate or react to environmental changes by formulating specific strategies, taking into account environmental conditions, organizational variables, and past performance. In turn, such strategic adaptation requires structural adaptation to support organizational strategies, and these strategic and structural changes lead to behavioral changes within the organization that ultimately affect firm performance (Ginsberg, 1988; Ginsberg & Venkatraman, 1985; Hoskisson et al., 1999; Kimberly & Zajac, 1985; Luke et al., 2004; Mick et al., 1993a, 1993b; Miller, 1988; Shortell, Morrison, & Robbins, 1985; Shortell et al., 1990; Zajac & Shortell, 1989).

Another emphasized concept within the strategic management perspective is the importance of organizations' alignment of their internal strengths and weaknesses with environmental opportunities and threats (Hoskisson et al., 1999; Luke et al., 2004; Porter, 1991). These contrasting internal and external sources of competitive advantage are most particularly emphasized in two common views within strategic management: the resource-based view (e.g., Barney, 1991; Wernerfelt, 1984) and the market structure (i.e., industrial organization economics) view (e.g., Porter, 1980, 1985), respectively. Luke and colleagues (2004) synthesized these two dominant views within the strategic management perspective to develop a framework that outlines the process of strategy formulation and identifies sources of sustained competitive advantage. Within this framework, an organization evaluates its external environment through the opportunities and threats presented by the environment, market structure, and conduct of competitors, as detailed in the market structure view. This analysis then informs the organization's evaluation of its internal strengths and weaknesses, including its resources, capabilities, and activities, as described in the resource-based view. With the combined results of an external and internal analysis, organizational leaders proceed to form strategic decisions, commit organizational resources, realize improved organizational performance, and achieve and sustain competitive advantage (Luke et al., 2004, pp. 45-47).

Thus, strategic management theory addresses the role that strategic decision making plays in the alignment between organizations and their environments (Bourgeois, 1980). Contingency-based thinking has guided scholars' approach to this alignment, as the strategic management perspective asserts that no single strategy or set of strategic choices is best for all organizations (Boyd et al., 2012; Ginsberg & Venkatraman, 1985; Hofer, 1975; Murray, 1988). In addition, strategic management theory places emphasis on the importance of fit for organizational performance, suggesting that "the appropriateness of a firm's strategy can be defined in terms of its fit, match, or congruence with the environmental or organizational contingencies facing the firm" (Zajac, Kraatz, & Bresser, 2000, p. 429). Strategy experts have repeatedly linked organizational performance to the fit between an organization's distinctive competencies and conduct (i.e., its strengths and weaknesses) and surrounding environmental trends and industry structures (i.e., environmental opportunities and threats) (e.g., Bourgeois, 1985; Chakravarthy, 1982; Hoskisson et al., 1999; Luke et al., 2004; Porter, 1991; Shortell & Zajac, 1990; Venkatraman, 1989; Venkatraman & Camillus, 1984; Zajac et al., 2000).

These arguments echo some of the central tenets of structural contingency theory, which Bourgeois (1980, 1985) observed displays close connections to the strategic management perspective. Indeed, the two theories emerged at roughly the same time and developed from similar lines of thought, and some organization theorists incorporate the strategic management perspective within contingency theory as a "strategic contingency" framework, viewing an organization's strategy as an additional contingency affecting organizational fit and performance (e.g., Donaldson, 2001). However, whereas contingency theory examines the relationship between an organization's environment and its *structure*, strategic management theory emphasizes the importance of an organization's *strategy* in relation to environmental demands, viewing structure as a means to support strategy or a direct outcome of strategy (Zajac et al., 2000).

Child (1972) offered an important critique of structural contingency theory that both contributed to the development of strategic management theory and distinguished the strategic management perspective from structural contingency arguments. In this work, Child (1972) reviewed environmental uncertainty, technology, and size as previously acknowledged contingencies within the structural contingency framework and called for recognition of the ways in which strategic choices affect organization-environment and organization-performance relationships. Citing the influence of Chandler's (1962) work, which emphasized the influence of organizational strategy in the changes firms make in their size, technology, and location, Child (1972) concluded that "strategic choice is the critical variable in a theory of organizations" (p. 15). He further argued that structural contingency theorists' focus on the fit between environment and structure was too limiting, urging scholars to consider the ability and agency of organizational leaders to exercise "strategic choice" and make strategic decisions that would affect organizational design, manipulate environmental features, and alter their organization's fit with its environmental demands (Child, 1972).

Subsequent studies have echoed this point, assuming organizational leaders play an active role in the management and strategic direction of their organizations, with the ability to respond to environmental conditions and demands as well as influence their environments (e.g., Hoskisson et al., 1999; Miller, 1988; Zinn, Mor, Feng, & Intrator, 2007a). Krein (1999) noted the presence of agency considerations within the strategic management perspective, specifying how internal environment and culture influence an organization's strategy in addition to its external environments such that strategies are not simply the decision of what an organization *should* do but also what it *can* and *wants* to do (p. 36). Similarly, Bourgeois (1985) described the considerable agency allowed within strategic management thinking, suggesting that executives' perceptions and decisions to act upon environmental demands "plays a large role in corporate conduct and performance" (p. 548). Thus, strategic management theory portrays organizational leaders as selecting their organizations' strategies and competitive positions, even affecting their environments through such strategies, unlike other deterministic perspectives that suggest organizational changes are strictly determined by environmental conditions or inertial theories that suggest "organizational size and structure, initially determined by environment, constrain future changes" (Keats & Hitt, 1988, pp. 571-572; Miller, 1988).

However, simply because strategic management theorists are critical of structural contingency theory's focus on structure does not mean that the strategic management perspective places a reduced value on the impact of structure to organizational performance. On the contrary, an organization's structure serves as "a strategic resource that contributes to the achievement of competitive advantage" (Pertusa-Ortega, Molina-Azorin, & Claver-Cortes, 2010, p. 1296). Porter (1991) suggests a firm's ability to attain competitive advantage is the result of "drivers," which he defines as "structural determinants of differences among competitors in the cost or buyer of activities or groups of activities" (p. 104).

Yet, even as the strategic management perspective developed as an alternative to other established theories that critics suggested limited consideration of managers' agency or organizations' adaptive abilities, strategic management theory is not without its shortcomings. One of the primary criticisms leveled against strategic management theory is its lack of clear theoretical formulations and coherent arguments as opposed to other, more well-known perspectives within the organization theory canon (Bourgeois, 1985; Ginsberg & Venkatraman, 1985; Keats & Hitt, 1988; Venkatraman & Camillus, 1984). Hofer (1975) suggested that a reason for the lack of development of a parsimonious strategic management theory is that scholars have assumed strategies are primarily situational and depend on a considerable array of factors unique for each individual organization and situation, making the development of general strategic management propositions a fraught exercise (p. 785).

In addition, the seemingly fragmented and loosely defined nature of strategic management theory may also be attributed to its incorporation of elements and arguments from numerous schools of thought and theoretical perspectives (Bourgeois, 1980; Hambrick, 1981; Hoskisson et al., 1999; Luke & Walston, 2003; Mick et al., 1994; Topping & Hernandez, 1991; Venkatraman & Camillus, 1984). In a sense, however, the inclusion of concepts across multiple perspectives is fitting for a theory that acknowledges strategy as "a function of the interaction among environments, organizations, managers, markets, and performance" (Shortell & Zajac, 1990, p. 154). As various theoretical approaches address these "building blocks" of strategic formulation and adaptation to varying degrees, strategic management theorists have incorporated key concepts from a variety of perspectives. For example, Child (1972) included elements of structural contingency theory in his influential work on strategic management, and Porter (1980, 1991) famously introduced principles from industrial organization economics into the strategic management literature. Likewise, Ginsberg (1988) and Chakravarthy (1982) included sociological considerations from institutional theory and population ecology, respectively, in their work evaluating strategic adaptation and change. Others integrated multiple perspectives in their considerations of strategic management. For example, Venkatraman and Camillus (1984) evaluated "fit" in strategic management by including arguments from resource dependence and population ecology perspectives. Similarly, Hoskisson and colleagues (1999) incorporated concepts from structural contingency theory, industrial organization economics, and transaction cost economics in their work, and Bluedorn and colleagues (1994) included considerations from institutional theory, resource dependence theory, and transaction cost economics. In examinations of health care organizations' strategies, Mick (1990) synthesized transaction cost economics and strategic management theory in his assessment of vertical integration decisions, and Shortell and colleagues (1985) applied contingency thinking and elements of population ecology in their examination of health care organizations' strategy formulation. Additionally, Luke and Walston (2003) considered how industrial organization economics, institutional theory, resource dependence theory, and transaction cost economics informed local hospital systems' strategic decisions in the 1990s.

Despite its limitations, strategic management theory is an important and valued perspective that has provided a thoughtful approach to recognizing the role of managers to direct their organizations within changing and complex environments so that they may realize sustained competitive advantage. For much of the 20th century, strategy received little attention in the health care organization literature until dramatic environmental changes marked the health care industry in the 1970s and 1980s, causing managers and scholars alike to seek a better understanding of health care organizations' strategic management (Kimberly & Zajac, 1985; Luke et al., 2004; Shortell et al., 1985; Topping & Hernandez, 1991). As industry changes continued through the 1980s and 1990s, prompting increased diversification and integration activity among hospitals and health systems, the strategic management perspective continued to gain popularity among health services researchers (Fennell & Alexander, 1993; Luke & Begun, 1988). Examples of health care organization studies that have employed strategic management theory are myriad. In the 1980s, these included Longest's (1980) exploration of multi-hospital arrangements, Coddington and colleagues' (1985) assessment of survival strategies in a changing hospital industry, Kimberly and Zajac's (1985) review of strategic adaptation in health care organizations, Luke and Begun's (1988) application of strategy typologies to small multi-hospital systems, and Zajac and Shortell's (1989) examination of changing strategies among hospitals. In the following decade, strategic management theory was applied in Ginn's (1990) evaluation of strategic change in acute care hospitals, in Shortell and colleagues' (1990) study of strategic adaptation among hospitals, in Mick and colleagues' (1993a, 1993b, 1994) studies of strategic management activities at rural hospitals, and in Succi and colleagues' (1997) evaluation of rural hospital closures. More recently, health care organization scholars have continued to find value in applying a strategic management perspective in their studies of health care organization activities and phenomena. Examples include Trinh and O'Connor's (2002) study of strategic change and urban hospital performance, Jiang and colleagues' (2006) examination of factors contributing to hospital performance improvement, Payne and colleagues' (2007) test of strategic fit and firm performance among medical groups, and Zinn and colleagues' (2007a, 2008) assessments of strategic adaptation and performance in nursing homes.

In sum, strategic management theory provides a unique framework that incorporates elements of other economic and organization theories while emphasizing organizational leaders' discretion to choose strategies in light of external circumstances and internal conditions. In particular, the strategic management perspective complements contingency theory as it recognizes that leaders, anticipating or responding to environmental changes, formulate and pursue strategies that alter organizational structures, thereby influencing an organization's fit with environmental demands and, as a result, impacting its overall performance. As this study applies key concepts from the structural contingency perspective to categorize clusters' varied components and arrangements, specifically Lawrence and Lorsch's influential concepts of differentiation and integration, we find value in concurrently employing related and complementary concepts from the strategic management perspective, specifically the concepts of configuration and coordination as promoted by Porter (1986).

Configuration and coordination: Porter's concepts. In 1986, Porter examined competitive strategy specifically from the perspective of international firms, and he introduced two important concepts – configuration and coordination – as the key dimensions that characterize international firms' strategic activities. Porter's configuration-coordination framework adheres to the strategic management perspective, suggesting that organizations achieve competitive advantage and improved performance by identifying the appropriate combination of configuration and coordination that fits their environmental demands, varied industry pressures, and internal competencies (Holtbrugge, 2005; Morrison & Roth, 1993;

Porter, 1986; Roth, 1992). A concept central to the configuration-coordination framework is the "value chain," which offers a disaggregated view of organizations and recognizes them as collections of various and discrete activities (Porter, 1986, p. 19). Porter (1986) suggests that an organization's value chain is characterized by its "competitive scope," which is defined as "the breadth of activities the firm performs in competing in an industry" that "is vital to competitive advantage because it shapes the configuration of the value chain, how activities are performed, and whether activities are shared among units" (p. 22).

In the configuration-coordination framework, configuration refers to where and in how many sites an organization's value chain activities are physically located (Morrison & Roth, 1993; Porter, 1998b; Roth, 1992; Taggart, 1998). Configuration arrangements adopted by firms range from *concentrated*, in which activities are performed at a single location, to *dispersed*, in which activities are performed across multiple locations (Porter, 1986; Roth, 1992). Craig and Douglas (2000) pointed to an organization's spatial configuration as "a key element of its competitive strategy," using the term "configural advantage" to refer to the spatial deployment and effective use and management of an organization's resources and capabilities that allows it to establish its market position (p. 8).

In contrast to configuration, coordination refers to the integration of value activities, schedules, technical components, and processes across firm locations, with the intent to maximize the organization's overall competitive position (Morrison & Roth, 1993; Porter, 1986; Taggart, 1998). Coordination efforts range from low or none, in which firm activities are performed independently without regard to other activities or firm locations, to high, in which value chain activities across sites are closely linked or integrated through controls, information systems, technology, and management systems (Roth, 1992, p. 534; Taggart, 1998, p. 328).

Scholars note that firms find it extremely difficult to successfully coordinate across geographically dispersed sites due to substantial investments required in time, training, and resources as well as differences in physical distance, culture, managerial incentives, and norms across locations (Porter, 1986; Taggart, 1998). Thus, of the two concepts in the configuration-coordination framework, configuration is suggested to be the easier strategic issue for firms to address (Porter, 1986, 1998b). However, the competitive advantages realized by firms exhibiting effective coordination can be substantial and enduring, leading to enhanced organizational competitiveness and flexibility (Porter, 1986, 1998b; Taggart, 1998).

By evaluating organizations' strategic activities and arrangements using the two dimensions of configuration and coordination, scholars have identified four common strategies pursued by international firms (Morrison & Roth, 1993; Porter, 1986; Taggart, 1998). Firms with value chain activities that are widely dispersed and highly coordinated across locations display a "high foreign investment" strategy. Organizations with activities that are widely dispersed but lack coordination exhibit a "country-centered strategy," with sites behaving and operating without regard to fellow subsidiaries outside of their geographic area. An "export-based strategy" refers to firms that concentrate their activities but fail to exhibit coordination. And, the operation of geographically concentrated and highly coordinated activities is labeled a "purest" or "archetypal" global strategy, exhibited by organizations conducting most or all of their global activities from a home base.

Scholars point to numerous advantages of each of the configuration-coordination options that face organizations. For firms that adopt concentrated configurations, potential advantages include economies of scale, a proprietary learning curve and accumulation of expertise or specialized knowledge, eased opportunities to achieve coordination, and comparative advantage if the location offers the most cost-effective array of resources (Craig & Douglas, 2000; Porter, 1986, 1998b). Firms pursuing dispersed configurations enjoy advantages such as reinforced brand reputation and enhanced brand awareness opportunities, minimized production costs relating to transportation or storage, reduced risk that comes with operating in a single location, and an enhanced ability to learn about and respond to local market conditions and preferences (Craig & Douglas, 2000; Porter, 1986, 1998b). Meanwhile, advantages possible through coordination of dispersed activities include the ability to "respond to shifting comparative advantages," to "reinforce the corporate brand reputation" among buyers engaging the organization at different locations, and "to respond more cost effectively to competitive threats by choosing the location at which to do battle" (Porter, 1998b, p. 318). On the other hand, in conditions where "local needs and conditions vary, all customers are local, or few economies of scale are present," firms may find that coordination of dispersed activities is not ideal, instead preferring to allow dispersed locations to function independently without coordinating their activities beyond their local environment (Porter, 1998b, p. 318).

Applying the configuration-coordination framework to clusters. Porter's (1986) conceptualizations of configuration and coordination were initially developed and subsequently applied to the headquarter-subsidiary relationships and global strategies of multi-national firms with value chain components located across separate countries (e.g., Craig & Douglas, 2000; Holtbrugge, 2005; Roth, 1992; Taggart, 1998). As a result, few studies have explicitly applied the configuration-coordination framework outside of the global strategy literature. However, the headquarter-subsidiary relationships and their varied configuration and coordination strategies observed across international organizations in many ways mirror the patterns previously described in Chapter 2 about hospital-based clusters and their locally proximate components

(Trinh et al., 2014). Luke and Ozcan (2012) noted that, as clusters emerged and became dominant providers within local markets during the 1990s and 2000s, their "need for multi-unit coordination and rationalization" across clusters' sites and components quickly became apparent as shared ownership and spatial proximity "introduced very important inter-organizational interdependencies" (p. 2). In other words, configuration and coordination are key strategic considerations for hospital-based clusters, just as they are for international firms and their headquarter-subsidiary relationships.

In addition, just as the value chain is a central concept within the configuration-coordination framework, identifying the discrete value activities that collectively define an organization (Porter, 1986), health care organization scholars have repeatedly offered and promoted disaggregated views of hospital-based health systems within the literature on health services integration (e.g., Clement, 1988; Conrad, 1993; Conrad & Dowling, 1990; Conrad et al., 1988; Conrad & Shortell, 1996; Robinson, 1994; Shortell, 1988). In these efforts, health systems have been portrayed as offering services across a chain of productive stages, often labeled as the "continuum of care." For example, Conrad and colleagues (1988) developed a "health services value chain," which they adapted from Porter's value chain concept, depicting "vertical structures" in health care organizations with stages such as service outputs (e.g., ancillary services or preventive programs), episodic patient care services (e.g., hospital acute inpatient or outpatient services, physician services for acute episodes, and non-physician provider services for acute episodes), and chronic patient care services (e.g., nursing home services, rehabilitative services, home health care services, or extended care and living services) (p. 54). In the same way that global firms with multiple units must determine how they will configure and coordinate their various value chain activities (Porter, 1986, 1998b), health care organizations with multiple proximate service locations – such as clusters – must determine how they will configure and coordinate services throughout the continuum of care.

As previously noted, Luke and Ozcan (2012) applied the configuration-coordination framework to hospital-based clusters, arguing that cluster performance is affected by the structural dimensions of configuration and coordination. Furthermore, they suggested that the two dimensions are essentially equivalent, respectively, to the concepts of differentiation and integration described by Lawrence and Lorsch (1967a, 1967b), with the exception that Porter's configuration-coordination framework accounts for geographic proximity whereas Lawrence and Lorsch (1967a, 1967b) did not address spatial considerations. Similarly, Shay and colleagues (in press) acknowledged the relative paucity of geographic considerations in organization theory's conceptualizations of organizational forms, including in conceptualizations of differentiation and integration by Lawrence and Lorsch (1967a, 1967b). This criticism is particularly important within health services literature, in which research has frequently illustrated that geography and spatial proximity indeed matter in the organization and provision of health care (e.g., Abraham et al., 2007; Alexander & Fennell, 1986; Donabedian, 1972; Finlayson, Birkmeyer, Tosteson, & Nease, 1999; Lewis & Alexander, 1986; Lindrooth, 2008; Luke, 1991, 1992; Shay et al., in press; Shortell, 1988; Shortell et al., 1994; Thaldorf & Liberman, 2007; Wholey et al., 2004; Zwanziger, Melnick, & Eyre, 1994). Morrison and Roth (1993) also suggest that the concept of coordination acknowledges spatial relationships and expands upon previous conceptualizations of integration by providing "details of *where* activities are geographically located and *how* these activities are integrated" (p. 799).

In light of these arguments, this study suggests that the configuration-coordination framework is appropriate to describe cluster strategies, and further, that the configuration-coordination framework complements and enhances the conceptual application of differentiation and integration to hospital systems. Thus, we proceed to explore the synthesis of these frameworks through application of combined concepts: differentiation-configuration and integration-coordination.

Differentiation-Configuration in Clusters

As previously described, Lawrence and Lorsch's (1967a, 1967b) description of differentiation involves the division of the organization into subsystems or subunits based upon specific tasks and responsibilities that, collectively, comprise the organization as a whole system. Blau (1970) offered a similar definition, using the term *structural* differentiation to refer to "the number of structural components that are formally distinguished in terms of any *one* criterion" such as labor positions or managerial levels or organizational subunits (p. 204). However, within this concept of structural differentiation, numerous forms of differentiation have been distinguished by organizational scholars, including horizontal differentiation, vertical differentiation, and spatial differentiation (e.g., Blau, 1970; Goldman, 1973; Mileti et al., 1977; Nelson & Quick, 2008). In applying the differentiation-configuration concept to hospital-based clusters, we examine these three distinct differentiation forms, incorporating the concept of configuration as an equivalent strategy to spatial differentiation.

Horizontal differentiation. Mileti and colleagues (1977) succinctly defined horizontal differentiation as "the number of services or jobs performed" by an organization (p. 210). For health care organizations, horizontal differentiation is "a major strategic decision" that refers to "the type and scope of services to offer" to patients and their communities (Bazzoli et al., 1999, p. 1686). In an examination of horizontal differentiation in hospital-based clusters, this concept translates to the number of services offered collectively across cluster member hospitals as well as the number of services offered by the hospital-based cluster at non-hospital-based sites. However, the health services organization literature has predominantly focused on individual hospitals to date, despite calls for scholars to recognize that many of today's hospitals function as parts of larger health care systems with services and programs offered beyond hospital walls (e.g., Conrad & Shortell, 1996; Dranove & Shanley, 1995; Shortell, 1999).

Why is this so? Devers and colleagues (1994) remarked that integrated delivery systems faced the challenge of shifting away from a focus on individual, freestanding hospitals to instead adopt "systems thinking," and they noted numerous barriers to overcome in making such a shift, including "overemphasis on acute care, the entrepreneurial interests of successful hospitals, and the lack of incentives for achieving systemwide objectives" (p. 9). In the same way, health care organization scholars have faced barriers in making the shift from individual hospital analysis to assessments of multi-hospital systems and their non-hospital-based components. Perhaps the greatest obstacle has been a lack of readily available data. Numerous studies (e.g., Bazzoli, 2004; Bazzoli et al., 1999; Luke, 1992; Luke & Ozcan, 2012) have communicated the importance of understanding and assessing the components of hospital systems beyond their acute care hospital members, but they acknowledge that access to information providing detailed accounts of systems' hospital-based and non-hospital-based members has been limited.

Yet, a brief look at the growth of multi-hospital systems – including clusters – and their varied components supports the notion previously expressed that "hospitals represent only one element of the large, diverse health [systems]" in which they participate (Bazzoli et al., 1999, p. 1689). Hospital systems' expanded offering of services beyond acute inpatient care has been well-documented over the past several decades. For example, consider the growth and promotion of ambulatory care beginning in the latter half of the 20th century (Davis & Russell, 1972). Involvement by hospital-based systems in outpatient care grew dramatically during the 1970s and 1980s (Gold, 1984). By 1997, ambulatory care accounted for roughly a third of hospital systems' total net patient revenue, with increased pressure placed on providers to develop high-quality, cost-effective ambulatory care in a range of diverse outpatient settings (Zuckerman, 1998, p. 1). Growth in ambulatory services and sites has continued into the 21st century, with industry observers recently noting that hospital-based systems have increasingly shifted significant attention and resources towards outpatient care (Fellows, 2013; Kutscher, 2012). Examples of outpatient care settings include ambulatory surgery centers, diagnostic imaging centers, urgent care clinics, freestanding emergency departments, outpatient rehabilitation clinics, and multi-service outpatient centers, to name a few.

Numerous studies have offered evidence of the increased operation of these settings by hospital-based systems, particularly freestanding emergency departments (e.g., Carrier et al., 2012), urgent care clinics (e.g., Berry & Mirabito, 2010; Longest, 1992), ambulatory surgery centers (e.g., Al-Amin & Housman, 2012), and retail clinics (e.g., Berry & Mirabito, 2010; Kaissi, 2010; Kaissi & Charland, 2013). Multi-service outpatient centers, also referred to as "multipurpose ambulatory care centers" or "health parks," are also an increasingly popular form of non-hospital-based care provided by local hospital systems, with facilities offering a range of ambulatory services (e.g., urgent care, ambulatory surgery, outpatient rehabilitation, diagnostic imaging, physician services, fitness programs) at a single location (Fellows, 2013; Kutscher, 2012; Zuckerman, 1998). And, in addition to ambulatory care, other offerings throughout the care continuum have grown as part of hospital systems over the past thirty years, including long-term care, post-acute care, specialty services, and preventive care. For example, acute care hospitals encountered increased pressures and incentives toward the end of the 20th century to expand into long-term care services such as nursing homes and home health (Shah, Fennell, & Mor, 2001). On the opposite end of the care continuum, hospital systems' expansion into preventive care and wellness services has recently surged, with clusters increasingly operating health promotion sites such as medical fitness centers or wellness clinics in their local markets (O'Donnell & Bensky, 2011).

Thus, the extant literature suggests that hospital-based clusters may offer a range of services across their hospital-based as well as non-hospital-based sites. In this study's effort to identify common cluster forms, we anticipate that the horizontal differentiation exhibited by clusters across their hospital-based and non-hospital-based locations will vary, serving as a distinguishing characteristic across cluster groups.

Vertical differentiation. Whereas horizontal differentiation refers to the number of services performed by an organization, *vertical* differentiation accounts for the hierarchical ranking of organizational services or functions (Blau, 1970; Goldman, 1973; Mileti et al., 1977; O'Reilly & Roberts, 1977). Scholars have often used the term vertical differentiation to distinguish the levels of quality observed across organizational services or products (e.g., Banciu, Gal-Or, & Mirchandani, 2010; Boccard & Wauthy, 2010; Brecard, 2010; Gabszewicz & Wauthy, 2012). In health care, quality also translates to the complexity or level of care (e.g., primary, secondary, or tertiary services) offered by health care providers, and thus vertical differentiation has been recently conceptualized as qualitative variation in the complexity or level of care provided by hospitals and other health care organizations (e.g., Bardey, Canta, & Lozachmeur, 2012; Brekke, Nuscheler, & Straume, 2007; Gravelle & Sivey, 2010; Shay et al., in press; Tay, 2003).

In 1992, Luke acknowledged the importance of vertical differentiation for local hospital systems (i.e., clusters), particularly with regard to their development into regionalized models of care (p. 21). Over twenty years later, his work with Shay and Mick pointed to evidence of vertical differentiation within clusters (Shay et al., in press), building off of two previous studies to highlight examples of vertical differentiation by services and cases. First, matching categories of organizational centralization from Bazzoli and colleagues' (1999) taxonomic study to updated cluster data indicating the size of lead and non-lead facilities, the authors identified service concentration patterns, distinguished by levels of complexity, across clusters. Second, expanding upon a study by Luke and colleagues (2011) regarding the distribution of high complexity cases within clusters, in which "lead" facilities increasingly handled high-risk procedures throughout the cluster, Shay and colleagues (in press) examined indicators of vertical case differentiation by comparing case mixes, referral admission percentages, emergency admission percentages, and inter-hospital transfers between lead and non-lead cluster hospitals. Their results led to the conclusion that cluster members, particularly those belonging to clusters with a dominant "lead" facility, indeed display vertical differentiation by indicators of both service and case complexity levels (Shay et al., in press). Thus, given prior indications of vertical differentiation activity across clusters, this study anticipates that levels of vertical differentiation will also serve as a distinguishing characteristic across cluster groups.

Spatial differentiation and configuration. Considered together, the two concepts of horizontal and vertical differentiation have also been referred to as *service* or *product differentiation*. Strategy experts assert that, as product differentiation is one way in which organizations can display their distinctiveness from competitors, another important source of distinctiveness is *spatial* differentiation (Luke, 1991). Spatial differentiation, also referred to as geographic differentiation or spatial dispersion, has been commonly defined as the number of physical locations where organizations conduct their work or provide their services and the geographic dispersion of these locations (Goldman, 1973; Mileti et al., 1977; Nelson & Quick, 2008). Such a definition directly relates to Porter's concept of configuration, defined earlier as where and in how many sites an organization's value chain activities are located. Therefore, this study regards spatial differentiation and configuration as equivalent concepts, applying them to the number and geographic dispersion of clusters' facilities in their respective local markets.

Geographic configuration is a key strategic dimension for hospital-based clusters and health care organizations in general (Luke et al., 2004; Luke & Ozcan, 2012), as has been made evident in recent studies and industry reports. Hospital-based systems have increasingly come to the realization that, to effectively compete, they need to offer care at locations that are easily accessible and convenient (Fellows, 2013; Kutscher, 2012). Such care locations include additional hospital facilities as well as non-hospital-based sites, enabling systems to expand their geographic coverage within local markets and offer increased access to a range of services at diverse locations. For example, Andrews and Evans (2008) observed increasing patterns of spatial differentiation among health care organizations within local communities, including "growth in the range of settings" as well as growth in hospitals' provision of services to "reach far beyond their walls into local communities" (p. 766).

Over the past two decades, local hospital systems have aggressively pursued spatial differentiation strategies through non-hospital-based sites such as retail clinics, urgent care centers, freestanding emergency departments, and primary care clinics. These ventures have allowed systems to establish a physical, "satellite" presence in locations experiencing significant growth, lacking nearby hospital services, or lacking a significant system presence, without requiring the intense level of resources associated with the development of a new hospital facility (Kaissi, 2010; Longest, 1992). Anecdotal evidence of clusters' pursuit of spatial differentiation includes a recent focus by powerful systems such as Memorial Hermann, Texas Health Resources, and WellStar Health System to expand throughout their local markets through outpatient services at satellite locations, bringing the convenience of ambulatory care close to patients in the suburban and outlying rural areas of their local markets (Fellows, 2013; Kutscher, 2012). Similarly, freestanding emergency departments have become "a particularly attractive geographic expansion strategy" for local hospital systems in recent years, and such facilities have been developed by clusters to establish competitive positions in growing and outlying communities, to encroach on competitors' traditional territories, and to feed their system hospitals with transfers involving patients that may have not previously had reason to access their system services (Carrier et al., 2012, p. 830).

Eyles (1990) provided a convincing appeal for the examination of spatial configurations of health care systems, noting that spatial patterns help shape system differentiation. Also referring to spatial differentiation as "structuring," he argued that system forms should be classified in part by their geographic configurations, recognizing spatial form as a significant and defining trait of health care systems. As a classificatory principle, geography "locates the structure of provision and shapes the nature of availability and accessibility" to health care services, and it also reflects both "the role of the level of urbanization in the shaping of health care systems" and "the past operation and impact of economic development, political structure and ideology, and allocational mechanisms" (Eyles, 1990, pp. 162-163). In other words, a health care system's spatial form provides a glimpse of its overall configuration and degree of differentiation, and Eyles connected spatial differentiation to other differentiation patterns by acknowledging that "locational possibilities for service delivery" are limited by "similar spatial solutions and patterning, which is in part a result also of the hierarchical ordering of different types of formal care" (p. 163). Although his paper specifically addressed the spatial configuration of health care delivery systems throughout the world, Eyles' arguments easily apply to health care organizations at the local market level. Through this work, he pointed to the importance of spatial consideration in the comparison and classification of health care organizations.

The importance of spatial considerations. Geographic location is central to the concepts of configuration and spatial differentiation, yet many past efforts to define and examine organizational differentiation strategies disregard spatial considerations, solely focusing on "the array of products and services" offered by firms that distinguish them from competitors and provide competitive advantage (Shortell & Kaluzny, 2000, p. 14). Even within strategic thinking in general, Porter (2000) lamented that "the role of location is all but absent," with attention directed primarily on "what goes on inside companies" while location is viewed as losing its influence in an age that is increasingly "global" (p. 253). Such a shortcoming is particularly glaring given the considerable evidence available in the health services literature that hospital competition is characterized not only by hospitals' product differentiation, but also by their significant geographic differentiation (Town & Vistnes, 2001, p. 752; Succi et al., 1997). However, Porter's studies (e.g., 1998a, 1998b, 2000) of geographically concentrated and interconnected companies have led him to conclude that "much of competitive advantage lies outside a given company…residing instead in the locations of its business units" (2000, p. 254).

Proximity plays a large role in providing competitive advantage and enhancing performance among cluster members, allowing for the development of benefits such as specialized knowledge, enhanced productivity, trust, increased market power, innovation, enhanced reputation, and efficiency (Luke et al., 2004; Porter, 2000). In other words, due to their geographic positioning near fellow cluster units, cluster members may more readily develop complementarities and pursue benefits that, without proximate partners, would not be available. For example, spatial proximity in local markets allows hospital-based clusters to pursue a "hub-spoke model" structure, in which members can engage in vertical differentiation by adopting hierarchical roles, or a "flat model" configuration, in which members engage in horizontal differentiation by assuming distinct clinical functions (Luke et al., 2004). Such configurations are possible because cluster members, operating within the same local market, can function cooperatively and develop interdependent relationships in which they share – rather than duplicate – selected health care services or programs (Luke, 1991, 1992; Luke et al., 2004, 2011). These configurations also illustrate how spatial differentiation complements both horizontal and vertical arrangements, as "activities can be dispersed geographically according to either vertical or horizontal functions" (Banner & Gagne, 1995, p. 137; Luke et al., 2004).

Thus, given the importance of spatial arrangements to clusters, this study emphasizes the value of evaluating cluster forms based upon their physical configurations, anticipating that levels of spatial differentiation will play a role in distinguishing cluster groups. Furthermore, the expansion of services and locations by clusters, as previously described, points to the development of powerful local health care providers that exhibit differentiation and configuration strategies. Indeed, previous studies have observed interdependence between organizations' product differentiation and spatial differentiation (i.e., configuration) strategies (Luke, 1991; Mileti et al., 1977; Olden et al., 2002). As clusters vary in their adoption of such strategies, we expect to see common groups of cluster types based upon dimensions of differentiation and configuration. Scholars suggest that, as organizations engage in increasing levels of horizontal, vertical, and spatial differentiation, they grow in their complexity, and in turn, the opportunity and value of enhanced coordination and integration increases (Aquinas, 2008; Banner & Gagne, 1995). We now explore these additional concepts – integration and coordination – that may also distinguish variations in cluster forms.

Integration-Coordination in Clusters

Whereas *differentiation* in health care organizations refers to the varied structure, number, type, and distribution of health care services and programs across the continuum of care, *integration* pertains to organizational activities and structures that unify, coordinate, and maximize the value of differentiated services and programs throughout the care continuum in local markets (Conrad & Shortell, 1996; Shortell et al., 1994). For these organizations, integrative activities and structures are a means to realize and accomplish their ultimate task, which is to design, produce, and distribute health-related services throughout the continuum of care "for purposes of preventing illness and maintaining, restoring, and enhancing the health of individuals and communities" (Conrad & Shortell, 1996, p. 25).

Within health services research, the term integration has been both widely used and widely interpreted. At a foundational level, integrative activities are typically distinguished as either horizontal or vertical. Horizontal integration refers to the combination of organizations with substitutable outputs, and, in health care, many studies focus on horizontal integration as the joining of two or more hospitals under common ownership, thereby creating a multi-hospital system (e.g., Conrad et al., 1988; Fottler, Savage, & Blair, 2000; Mick et al., 1993a; Snail & Robinson, 1998). In contrast, vertical integration describes connections of non-substitutable components within complex systems, referring to the "linking together [of] successive stages in the production of a product" (Snail & Robinson, 1998, p. 419; Brown & McCool, 1986; Clement, 1988; Conrad et al., 1988; Mick, 1990). In health care, this "product" is the provision of health care services to patients (Conrad et al., 1988; Gillies et al., 1993), and thus vertical integration describes a health care system's provision of "a range of patient care and support services operated in a functionally unified manner" (Ginter, Swayne, & Duncan, 2002, p. 223).

In addition to horizontal and vertical integration, this study examines coordination as a strategy distinguishing cluster forms. Within the health services literature, coordination has also been described as "clinical integration," which represents "the extent to which patient care services are coordinated across the various functions, activities, and operating units of a system" (Gillies et al., 1993, p. 468; Conrad & Shortell, 1996). Coordination, as described by Porter (1986), is a complementary concept very closely related to integration (Luke & Ozcan, 2012; Taggart, 1998). In fact, given the concepts' parallel qualities, Gillies and colleagues (1993) suggested that coordination "subsumes both horizontal and vertical integration" (p. 468), while other health care organization scholars have described integration and coordination as synonymous (e.g., Clark, 2012; Singer et al., 2011). Scholars recognize that, just as integration is described as a critical strategy following the increased complexity that results from differentiation, configuration precedes coordination as a strategy, with coordination providing unity and structured arrangement to an organization's interdependent tasks spread across proximate organizational units (Luke & Ozcan, 2012). However, as previously noted, the concept of coordination pays particular attention to spatial considerations, examining how and where an organization's activities are coordinated across multiple locations (Morrison & Roth, 1993).

Having generally defined these three related concepts, we now consider in greater detail the application of horizontal integration, vertical integration, and coordination to clusters. We also explore the importance of both spatial considerations and the "value chain" to these concepts, and we distinguish *vertical integration* from two terms with which it has been previously confused: *virtual integration* and *diversification*.

Horizontal integration. Much has been written regarding horizontal integration strategies within health care organization literature, particularly during the wave of consolidation and system formation that took place during the latter part of the 20th century. As described in the previous chapter, hospitals pursued horizontal integration at a significant level during the 1970s and 1980s as they sought to gain competitive advantage during a period of tumultuous change. Some of the benefits anticipated through horizontal integration included improved efficiencies and economies of scale, increased access to resources and capital markets, and enhanced power (Conrad & Shortell, 1996; Fottler et al., 2000; Thaldorf & Liberman, 2007). Although many of these promising advantages never came to fruition, the consolidation activity that took place in pursuit of perceived benefits led to growth in the number of horizontally integrated forms in health care markets throughout the country. Luke (1991) observed that these patterns of horizontal integration observed in hospital consolidation trends during the late 20th century occurred particularly in *local* markets, leading to the formation of today's hospital-based clusters.

The predominant focus on measuring horizontal integration activity in the health care sector has been the joining of acute care hospitals. However, Gillies and colleagues (1993) aptly noted that horizontal integration can take place at other settings in the health care sector as well, referring to "the coordination of functions, activities, or operating units that are at the *same stage* in the process of delivering services" (p. 468). Thus, it is important to consider that horizontal integration activity does not just pertain to hospitals, but for clusters, it also includes stages and activities throughout the continuum of care. This perspective on horizontal integration also recognizes the provision of health care services as a process taking place over the course of different stages, referencing the concept of the value chain which we will later revisit. As clusters vary in the number of acute care hospitals as well as the number of other care delivery sites and services in specific stages of the continuum of care, we expect that varied horizontally integrated forms will play a role in distinguishing common cluster types.

Vertical integration. Just as scholars provided extensive examinations of horizontal integration strategies during periods of heightened hospital consolidation activity in the late 20th century, the concept of vertical integration has been studied and discussed at length within the health care organization literature, particularly during the late 1980s and throughout the 1990s as the integrated delivery system concept was heavily promoted (e.g., Arndt & Bigelow, 1992; Brown & McCool, 1986; Charns, 1997; Cody, 1996; Conrad & Dowling, 1990; Conrad et al., 1988; Fox, 1989; Gillies et al., 1993; Mick & Conrad, 1988; Mick et al., 1993a; Miller, 1996; Robinson & Casalino, 1996; Walston, Kimberly, & Burns, 1996). Within these works, the concept of vertical integration has been broken down into numerous dimensions and directions.

Conrad and Dowling (1990) characterized vertical integration as the "linkage of businesses (service lines) that are at different stages in the production process of health care," with the ultimate objective to promote, enhance, and control the processes surrounding the organization's core operations, which for hospital-based clusters is acute inpatient care (p. 10). Clusters pursuing a strategy of vertical integration face "a decision to grow along the channel of distribution of the core operations," and this growth can occur in two possible directions:

forward or backward (Ginter et al., 2002, p. 223). Forward – or "downstream" – vertical integration seeks to link activities and services flowing from the core operations towards the final output, and backward – or "upstream" – vertical integration maintains a flow in the opposite direction, towards the inputs and suppliers of the production process (Clement, 1988; Conrad et al., 1988; Fottler et al., 2000; Ginter et al., 2002; Mick & Conrad, 1988).

As an example of backward vertical integration, hospitals that seek to own and operate physician practices for the purpose of gaining access to potential acute care admissions pursue what Gamm and colleagues (1996) term an "admissions-focused strategy" (p. 240). This strategy aims to reduce transaction costs associated with identifying and securing production inputs, in this case, patients (Snail & Robinson, 1998, p. 421). In contrast, an example of forward vertical integration is hospitals' adoption of an "outplacement strategy" in which they own and operate nursing homes or home health services "to reduce discharge delay-induced inpatient costs, capture additional revenues from the patient at the conclusion of the acute care episode, contribute to continuity of care, and attract subsequent admissions that are lost if the patient is transferred to a distant nursing home" (Gamm et al., 1996, p. 240). David and colleagues (2013) recently found evidence that an outplacement strategy in which acute care hospitals integrated with skilled nursing facilities and home health care allowed for the improved allocation of care setting resources and tasks and resulted in improved efficiency, coordination, and patient outcomes. Together, the two directions of vertical integration activity span clusters' efforts and services throughout the continuum of care – from pre-acute to acute to post-acute care services – with the acute care hospitals serving as the clusters' core operations.

In addition to the directions of vertical integration activities, Harrigan (1984, 1985) proposed numerous "dimensions" of vertical integration which may also be helpful in classifying cluster forms. These dimensions include vertical integration breadth (i.e., number of upstream or downstream tasks), stages (i.e., number of steps within the production process), degree (i.e., proportion of production requirements fulfilled internally), and form (i.e., ownership arrangement), and they have been applied specifically to the health care sector in several well-regarded studies. For example, Clement (1988) includes ancillary, outpatient, nursing home, and secondary inpatient care services, among others, as examples of vertical integration "stages," and she cites "the number of secondary inpatient care services" as an illustration of vertical integration breadth (p. 104). Similarly, Conrad and Dowling (1990) offer "the range of diagnosis related groups (DRGs) cared for by the vertically integrated system" as an example of integration breadth, and Mick and Conrad (1988) offer the example of a hospital with multiple units (e.g., primary care centers) at different stages of the continuum of care (e.g., primary care) as an example of a broadly integrated system. Conrad (1993) builds upon the illustration of vertical integration stages, viewing clinically and vertically integrated health care systems as offering coordinated services throughout the continuum of care (e.g., primary care, specialty care, long-term care, rehabilitative care, preventive care, etc.). In this respect, a hospital belonging to a vertically integrated health care system would be integrated with patient referral sources (e.g., physician practices and outpatient clinics) as well as patient placement channels (e.g., nursing homes, inpatient rehabilitation facilities) (Charns, 1997).

Given the range of concepts associated with vertical integration, we anticipate that clusters will vary in their direction and dimensions of vertical integration activities, and various vertical integration strategies will serve to discriminate between general cluster forms.

The value chain. The portrayal of integrated activities flowing upstream or downstream across stages in the continuum of care is consistent with the previously described concept of the "value chain." Earlier we observed the importance of the value chain to the configuration-coordination framework, acknowledging its disaggregated view of hospital-based health systems and its recognition of groupings of discrete activities, and the value chain also assists in defining and identifying horizontal and vertical integration arrangements.

In his seminal text, Thompson (1967) defined vertical integration as "the combination in one organization of successive stages of production," in which "each stage of production uses as its inputs the product of the preceding stage and produces inputs for the following stage" (p. 40). Similarly, Harrigan (1983, 1984) incorporated the concept of a sequence of processes in her depiction of the "vertical chain," and she maintained a strict definition of vertical integration as linking production processes that are adjacent in their sequence. These important works both adopted a perspective which viewed organizations according to their varied activities and production stages, and Porter (1985), in his promotion of the value chain concept, argued that such a view is essential to identifying sources of competitive advantage. Health care organization scholars who have evaluated concepts of differentiation and integration have often incorporated the continuum of care – the "value chain" of the health care industry – into their definitions, depictions, descriptions, and assessments of differentiation and integration strategies (e.g., Clement, 1988; Conrad, 1993; Conrad & Dowling, 1990; Conrad et al., 1988; Mick & Conrad, 1988).

As this study applies a theoretical framework using the synthesized concepts of differentiation-configuration and integration-coordination to categorize common cluster forms, we also adopt a disaggregated view of clusters, acknowledging their varied provision of services and programs throughout the continuum of care. Furthermore, we borrow from previous models and depictions of the continuum of care in the health care organization literature in generating

Figure 1. This figure illustrates the varied services (i.e., differentiation-configuration) and stages (i.e., integration-coordination) that clusters may include through their components and structures, and it is adapted from works by Clement (1988), Conrad and colleagues (1988), Mick and Conrad (1988), and Conrad (1993). We also assume Clement's (1988) view of vertical integration stages in the continuum of care as accounting for patients' consumption of services during an episode of care rather than a lifetime, and Figure 1 allows for patients to return to previous stages during an episode of care rather than adhere to a specific sequential (and unrealistic) order.

In addition, Figure 1 allows for the recognition that, within health care systems, differentiation-configuration and integration-coordination strategies do not simply pertain to the provision of services or programs *within* a hospital's walls, even if they extend through the continuum of care. Starkweather (1972) called attention to consideration of health services *beyond* those found in a hospital that would be vertically aggregated and integrated within multi-hospital systems, which would "seek to extend health care in new ways to new population groups" (p. 60). At the same time, this study's consideration of hospital-based and non-hospital-based sites does not preclude consideration of inpatient and outpatient services. As the U.S. health care industry shifts towards outpatient care, the importance of outpatient services for hospital-based clusters is difficult to overstate. Recognizing this, the study accounts for clusters' delivery of both inpatient and outpatient services at cluster sites, including hospital locations as well as non-hospital facilities that have so frequently been disregarded in previous studies. In other words, this study acknowledges that inpatient care takes place both at general, acute care hospitals as well as less common sites such as inpatient rehabilitation facilities and behavioral health hospitals, and by the same token, outpatient care takes place both at non-hospital-based

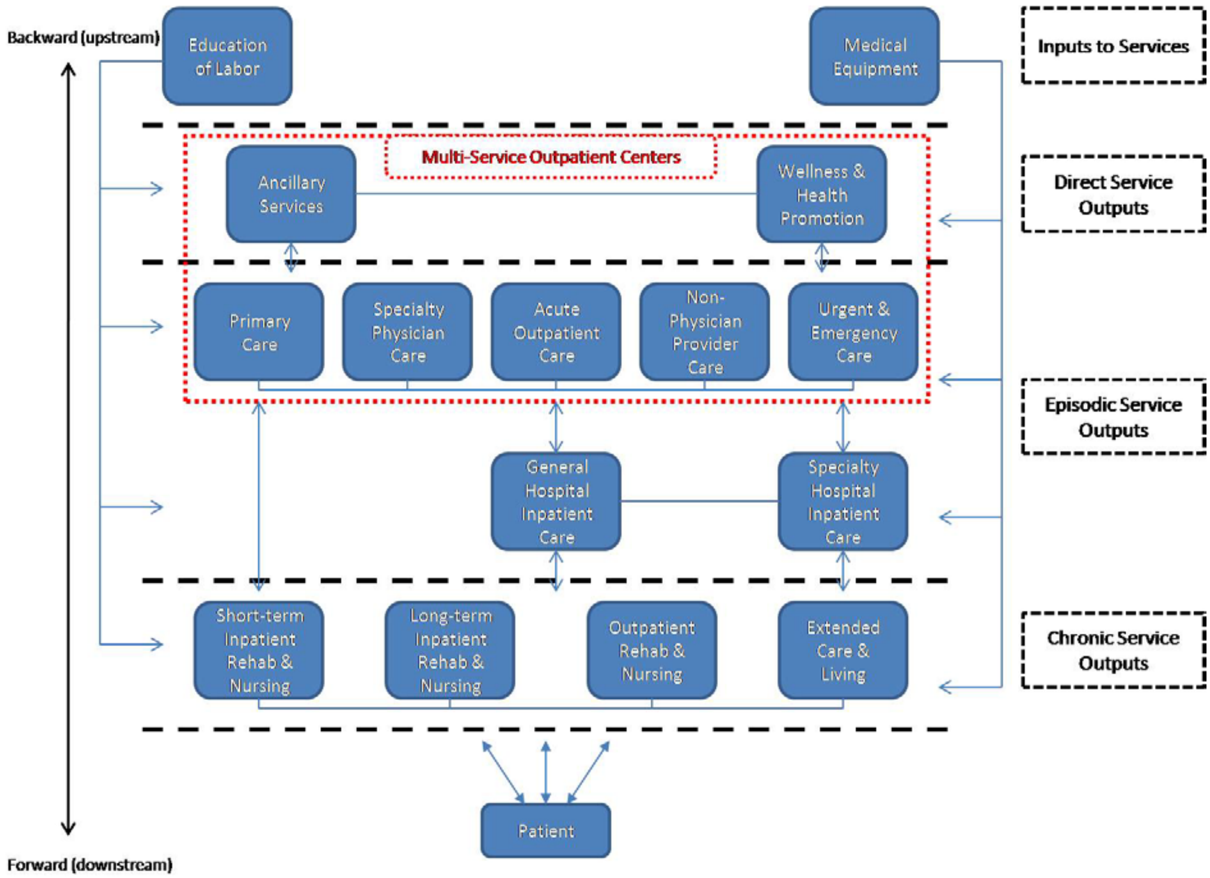


Figure 1. The Continuum of Care[1,2,3]

[1] Adapted from similar depictions by Clement (1988, p. 103), Conrad et al. (1988, p. 54), Mick & Conrad (1988, p. 351), and Conrad (1993, p. 493).
[2] Examples of service settings at each of the vertical integration stages shown in Figure 1 include, among others:
Education of Labor: nursing schools, therapy schools, management schools;
Medical Equipment: durable medical equipment vendor locations;
Ancillary Services: laboratories, diagnostic imaging centers, pharmacies;
Wellness & Health Promotion: fitness centers, diabetes clinics, pregnancy testing & education sites;
Primary Care: primary care physician practices & clinics;
Specialty Physician Care: specialty physician practices & clinics;
Acute Outpatient Care: ambulatory surgery centers, sleep clinics, wound care clinics;
Non-Physician Provider Care: retail clinics, physical rehabilitation clinics, behavioral health clinics, occupational health clinics;
Urgent & Emergency Care: freestanding emergency centers, urgent care clinics;
General Hospital Inpatient Care: general, acute care hospitals;
Specialty Hospital Inpatient Care: heart hospitals, surgical hospitals;
Short-term Inpatient Rehab & Nursing: inpatient rehabilitation facilities, behavioral health hospitals;
Long-term Inpatient Rehab & Nursing: long-term acute care hospitals, skilled nursing facilities;
Outpatient Rehab & Nursing: home health, comprehensive outpatient rehabilitation facilities;
Extended Care & Living: long-term care facilities, assisted living facilities, continuing care retirement communities, adult day care centers, hospice homes.
[3] Multi-Service Outpatient Centers may include varied combinations of ancillary, wellness & health promotion, primary care, acute & specialty outpatient care, non-physician provider care, or urgent and emergency care services.

settings such as retail clinics and ambulatory surgery centers as well as within hospital facilities.

Vertical versus virtual integration. In Harrigan's (1984, 1985) descriptions of the dimensions of vertical strategy, she noted that the form of integrated ownership may vary, such that an organization may fully own, partially own, or be contractually engaged with vertically integrated ventures. Similarly, works in the health care organization literature examining integration strategies acknowledge that integration may occur between entities with shared ownership as well as through contractual arrangements between organizations with varied ownership, which is often referred to as "virtual integration" (Clement, 1988; Fottler et al., 1982; Mick, 1990; Mick & Conrad, 1988).

For many organizations, virtual integration serves as an attractive alternative to full integration arrangements. Virtually integrated systems establish cooperative and collaborative relationships without requiring common ownership, thereby preserving member autonomy (Conrad & Shortell, 1996; Fottler, Savage, & Blair, 2000; Robinson & Casalino, 1996). In addition to contractual arrangements, Harrigan (1983) also identified *taper integration* and *quasi-integration* as alternatives to full integration, with both strategies allowing for organizations to own a portion of their value chain while also acquiring certain processes or stages externally. Fottler and colleagues (2000) described combinations of owned and contractually-based components within an organization as a "merged form," arguing that such an arrangement displays promise for "future survival and high performance" (p. 26).

However, support for virtual integration arrangements is not unanimous. For example, Snail and Robinson (1998) suggested that virtual arrangements, or networks, offer "weaker governance structures" that struggle to achieve efficiency levels comparable to full integration arrangements, and they also appear "more likely to unravel" in comparison to fully integrated forms "since they create relatively weak interorganizational linkages" (p. 440). Contractual-based integration also requires higher transaction costs (Bazzoli et al., 1999), and Luke (2006a) argued that networks offer "inadequate legal, administrative, and structural arrangements for strategic objectives to be accomplished" (p. 641). Most recently, Dahlen (2010), an executive of the Banner Health cluster in Phoenix, suggested that emerging accountable care organizations would best navigate regulatory limitations and "collaborate to reduce duplication and treat problems at the earliest opportunity" through ownership-based integration (p. 2).

Given this study's focus on hospital-based clusters, which by definition require same-system ownership, our approach to and measurement of integration strictly regards integrative activities between cluster members with common ownership. We also acknowledge that clusters within this study may include components that are fully owned by the parent organization while also engaging in virtually integrated, contractually-based activities with external groups. However, this study limits its focus to cluster components that are owned by the organization, excluding consideration of virtually integrated activities.

Diversification: A debate of definitions. Upon review of the extant literature on vertical integration, one may note the disagreement that has persisted regarding the appropriate definitions and use of vertical integration and a second concept: diversification. Indeed, scholars have readily acknowledged the confusion and, to some, seeming overlap between the two terms (Mick et al., 1993a; Snail & Robinson, 1998). Mick and colleagues (1993a), having reviewed diversification and vertical integration concepts in health services literature, observed "no crisp empirical distinction between the two phenomena" (p. 101). In order to avoid confusion, we briefly discuss scholars' different views of vertical integration and diversification by defining diversification and noting how it has been compared to vertical integration as well as some other strategic concepts.

In an influential article comparing vertical integration to diversification, Clement (1988) defined diversification as "the relationship among two or more final consumable outputs…that cannot be substituted for each other at any stage of production" (p. 106). Related works examining diversification have applied similar definitions (e.g., Alexander, 1990; Clement, 1987; Clement et al., 1993; Conrad et al., 1988; Mick et al., 1993a; Shortell, 1988; Shortell et al., 1989) and have distinguished diversification as either related or unrelated. Related, or "concentric," diversification occurs when corporate diversification efforts use production technologies, serve consumer groups, or require consumer functions that are similar to the organization's core business, where as corporate diversification efforts that entail entering new markets or employing production technologies dissimilar to those of the core business may be considered unrelated, or "conglomerate," diversification (Clement, 1988, p. 107; Ginter et al., 2002; Shortell, 1988). To these categories of diversification, Longest (1992) also added product/service diversification and market diversification. Product/service diversification is a strategy to add new products or services to an organization's existing offerings, whereas market diversification is a strategy to bring either new or existing products or services to new markets. According to Longest (1992), product/service differentiation represents the most common form of diversification for hospitals, and most examples of product/service diversification also qualify as examples of related or concentric diversification.

Clement (1987, 1988) differentiated between diversification and vertical integration, describing vertical integration's focus as "on relationships among components of the production process" for a given hospital output, whereas "diversification refers to the relationship among two or more final consumable outputs" (p. 106). On the other hand, Conrad and Dowling (1990) as well as Fox (1989) distinguished vertical integration and diversification in terms of how the firm's services contribute to its core business. According to this line of thought, vertical integration strategies adopted by hospitals and multi-hospital systems aimed to support the organization's core business of acute inpatient care through a range of health-related businesses and enhance the overall value of the firm rather than ensure the value and profitability of individual service lines (Conrad & Dowling, 1990; Fox, 1989). In contrast, a diversification strategy would seek to move a multi-hospital system's focus away from its core business of acute inpatient care and towards "new ventures [that] can be managed profitably on a stand-alone basis" (Fox, 1989, p. 51).

Others, however, would directly disagree with such a distinction between vertical integration and diversification, particularly those that regard related diversification as a strategy that seeks to introduce new products or services that complement the core business, as previously described. Studies of acute care hospitals' diversification efforts into service lines such as long-term care, rehabilitation, and skilled nursing have described diversification as a valuable strategy that, when successful, supports the core business of the acute care hospital by facilitating discharge for patients requiring post-acute care and enhancing the hospital's ability to reach a growing market, even when the individual new service lines fail to realize profit (Eastaugh, 2008; Giardina et al., 1990; Wheeler et al., 1999; Zinn et al., 2009). Furthermore, Eastaugh (2008) contended that health care organizations are unlikely to express interest in diversification towards unrelated business lines that fail to support their core business; instead, these firms are assumed to adopt related diversification strategies given their maintained interest in patient care and community health.

Although diversification and vertical integration are generally thought of as separate strategies, the debate within strategy and economic literatures regarding whether they are truly distinct constructs is unsettled (Eastaugh & Clement, 1988). Disagreement persists within the health services research community regarding the correct use of related diversification or vertical integration as terms to describe a hospital system's provision of a range of services across the care continuum (Giardina et al., 1990). For example, in their debate regarding the success of diversification efforts, Eastaugh and Clement (1988) disagreed as to whether hospitals' provisions of nursing home services are appropriately labeled as a form of diversification or vertical integration. Zinn and colleagues (2009) later supported Eastaugh's position, describing long-term care services (i.e., nursing homes) as a related diversification strategy for hospital-based organizations. The issue of whether a hospital's provision of post-acute care services is diversification or vertical integration also exemplifies this debate. When Harrigan's (1983, 1984) strict definition of vertical integration is applied, requiring the provision of adjacent services along the vertical chain, post-acute care may be regarded as a vertically integrated service if there is a direct connection between patients being discharged from acute care settings to system-owned post-acute care sites. However, such a definition may deem post-acute care services as an example of related diversification if such sites are simply a means to expand into new markets or capture potential referral sources. Acknowledging diversification as the production of new services and products that are non-substitutable with the organization's existing output (Snail & Robinson, 1998), one may find difficulty identifying diversification examples when many services in today's health care industry are described as being substitutable (e.g., post-acute care) (Shay & Mick, 2013).

In addition to vertical integration, the concepts of horizontal integration and differentiation have also been confused for diversification. For example, Snail and Robinson (1998) suggested that neither vertical integration nor horizontal integration were mutually exclusive with diversification (p. 422), and Lawrence and Lorsch (1967b) equated horizontal integration with diversification, describing it as the development of new product lines to form a conglomerate (p. 240). Bazzoli and colleagues (2000) observed that differentiation (specifically, *product* differentiation) has been referred to as diversification in past studies. Indeed, past definitions of product or service *differentiation* are very similar to the definition of product/service *diversification* provided by Longest (1992). Within the health services literature, differentiation commonly refers to organizations' strategies regarding the "type and scope of services to offer" across the care continuum (Bazzoli et al., 1999, p. 1686). To the extent that these services are new, are not substitutable or complementary, and relate to the markets and functions associated with the organization's core business, the differentiated activity may also serve as an example of related diversification. Likewise, to the extent that differentiated services are new, not substitutable or complementary, and dissimilar to existing markets or production technologies, they may be considered an example of unrelated diversification. Thus, differentiation may capture both related diversification and unrelated diversification efforts.

In summary, considerable confusion and debate has marked the definition of diversification and the distinction between diversification and other concepts such as vertical integration, horizontal integration, and differentiation. And, upon examination of the different forms of diversification, it is clear that overlap exists among diversification and these other various terms. However, this study views the differentiation-configuration and integration-coordination concepts as more relevant than the concept of diversification to describe the strategies adopted by clusters in their pursuit of varied formations and components.

Coordination. In the same way that Lawrence and Lorsch (1967a, 1967b) and subsequent studies have paired the concepts of differentiation and integration, Porter (1986) paired the concept of configuration with coordination, as previously noted. As health care organization scholars and strategists have approached the concept of coordination, it has been described as "one of the most important functions of management," viewed by some as essential for the effective provision of health care services (Longest & Young, 2000, p. 213; Longest, 1981). For example, Donabedian (1972) argued that, in order to achieve the objective of providing for individuals' diverse health needs throughout their lifetime, health care organizations must exhibit coordination and continuity across their varied elements as well as accept accountability for the health of the populations they serve. Two decades later, descriptions of the integrated delivery system concept promoted organizations that could "effectively coordinate services to patients across the range of care required to maintain, restore, or enhance the patient's health status," with integrated services spanning the entire health care continuum (Gillies et al., 1993, p. 470). Such thinking, essentially calling for clinical coordination across the care continuum, has been revived once again with the promotion of accountable care organizations. Furthermore, experts suggest that coordination affects health care organization performance, requiring the effective management of interdependencies and activities within an organization in an effort to guide and facilitate the attainment of shared objectives (Longest & Young, 2000; Longest, 1981).

Scholars' examination of coordination strategies has been previously applied to headquarter-subsidiary relationships, as previously described, and such relationships mirror clusters' arrangements of parent hospitals and additional member service sites. Porter (1986) portrayed coordination as a range of options for a given activity across a firm's multiple sites. Similarly, Longest (1981), citing previous work by Georgopoulos (1972), defined organizational coordination as "the ability to articulate, interrelate, and regulate – to constantly coordinate, in time and space – the many diverse but related roles and interdependent activities" within an organization, pursuing "the attainment of organizational objectives" (p. 102). Organizations displaying high levels of coordination link activities and exhibit consistencies across firm locations, reducing redundant or duplicate operations, whereas organizations with low or no coordination operate sites that work independently and appear very different from one another (Morrison & Roth, 1993).

As horizontal and vertical growth has shaped health care organizations over the course of the past several decades, today's hospital-based clusters – emergent organizational forms that are complex and defined in part by common ownership among spatially proximate service locations – exhibit considerable need and opportunity for coordination (Luke & Ozcan, 2012). Health care industry leaders are well aware of this need and opportunity for coordinated care, recently identifying coordination throughout the care continuum as one of the most significant challenges they face towards achieving clinical quality improvement (Tocknell, 2013). Considering this, we expect that measures of clusters' coordination efforts will vary and help to distinguish common cluster forms.

Spatial considerations in integration-coordination. Although the consideration of geographic factors is more explicit in the concept of coordination as promoted by Porter (1986), the value of spatial arrangements for integrated relationships has been recognized by scholars assessing various forms of integration-coordination in health care organizations. Conrad and

Dowling (1990) suggested that the integration of health care services "implies geographic proximity" and establishes spatial boundaries at the local market level in conformity with individual patients' service areas (p. 10). Scholars who examined the horizontal integration strategies of hospitals that consolidated in local markets – that is, formed clusters – during the 1980s noted that the ability of those organizations to realize *geographic* competitive advantage in their markets was enhanced when paired with a vertical integration strategy of providing a wide range of health care services (Conrad & Dowling, 1990; Fox, 1989). Furthermore, local hospital-based clusters were at the forefront of integrating health care services across the continuum of care during the wave of consolidation in the late 20th century (Luke & Begun, 2001).

As previously explained, proximity among local system members is a key factor for the adoption of organizational structures and competitive strategies among clusters. This includes integrated structures and strategies, as the spatial proximity of cluster hospitals offers the potential to "seek economies from market coordination" and achieve both horizontal and vertical integration (Snail & Robinson, 1998, p. 422; Luke, 1992, p. 16; Brown & McCool, 1986; Shay et al., in press). Thaldorf and Liberman (2007) noted that the benefits of horizontal integration depend upon the degree to which organizational components are spatially located: horizontally integrated entities dispersed within a local market may enjoy "market dominance, reduce redundancy by sharing services, share technological systems and resources, and pursue specialization within a local market," while horizontally integrated organizations that fail to situate their members within a geographically contiguous area but scatter facilities across different markets find such advantages difficult to achieve (p. 118). In addition, clusters' configurations as spatially proximate, horizontally integrated forms allows for the development of coordinated and vertically integrated structures within local markets (Shortell, 1988). As clusters further pursue such strategies of integration and coordination, they progress towards the realization of becoming regionalized systems of care, a vision nearly a century in the making (Fottler et al., 2000; Luke, 1992, 2010; Shay et al., in press).

Summary of Theoretical Framework

As renowned voices during the development of the contingency theory perspective, Lawrence and Lorsch (1967a, 1967b) convincingly argued that no single "best way" to organize exists, but that organizations must pursue structures that fit varied contingencies in order to realize improved performance and ensure survival. They revealed that organizations simultaneously pursue differentiation and integration in an effort to respond to environmental demands and uncertainties while resolving internal conflicts. Since the publication of their foundational work, differentiation and integration have become particularly relevant concepts to health care organizations as hospitals and health care systems have witnessed successive decades defined by dramatic change, including the rise of multi-hospital systems, the diversification of health care organizations, the rise and fall of integrated delivery systems, the emergence of clusters, and, looking ahead, the uncertain future of accountable care organizations. Today, the concepts of differentiation and integration are recognized as significant strategic challenges, distinguishing organizational features, and key theoretical constructs that serve as an important dimension "characterizing multiorganizational entities" in health care (Bazzoli et al., 1999, p. 1686).

Roughly twenty years following Lawrence and Lorsch's work (1967b), Porter (1986), a distinguished strategic management scholar, offered a similar and complementary framework to characterize the structures and strategies adopted by multiorganizational, multi-national firms.

Promoting the concepts of configuration and coordination, Porter's framework is also relevant for clusters – multi-unit health care organizations operating in local markets. Importantly, the configuration-coordination framework acknowledges the role that geography plays in an organization's structure and ability to formulate and successfully execute its strategies.

By synthesizing the differentiation-integration and configuration-coordination frameworks, this chapter has identified key constructs to apply in the taxonomic analysis of common cluster forms. We anticipate that clusters' components and configurations will vary according to the levels of horizontal differentiation, vertical differentiation, spatial differentiation, horizontal integration, vertical integration, and coordination they exhibit across their cluster members. Figure 2 depicts the conceptual model from which a taxonomy of cluster forms will be developed. In the next chapter, we develop measures and variables from the constructs shown in the conceptual model, and we discuss the analytic methods to conduct a taxonomic analysis of cluster forms based upon these key characteristics.

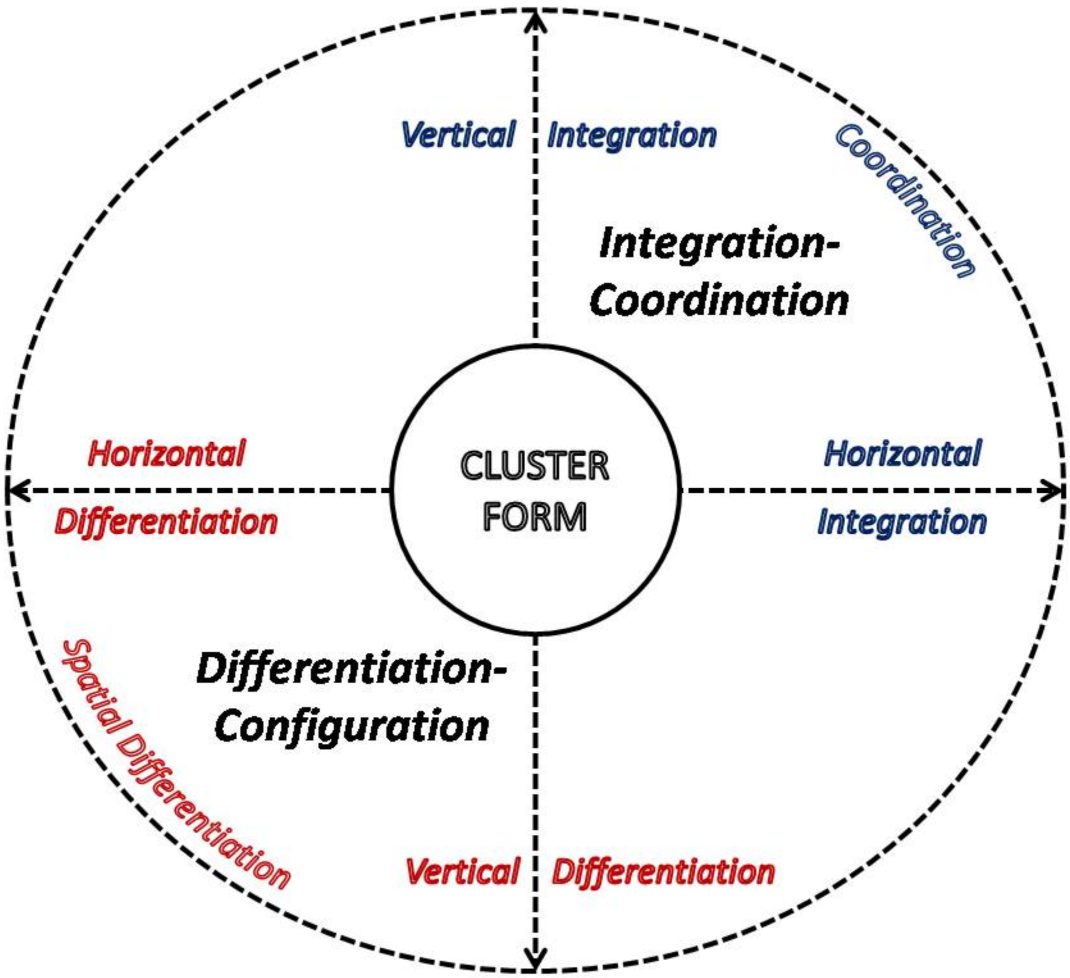


Figure 2. The Conceptual Model

Chapter 4: Methodology

This chapter presents the methods used to describe the varied components and configurations of hospital-based clusters. Included in the following discussion is a description of the study's research design, data sources, variable measurements, and analytic methods that apply to the study's first, second, and third specific aims.

Study Design

As previously described, the study's first three aims include: (1) completing an inventory of local hospital-based clusters as of 2012; (2) completing a catalog of local clusters' hospital-based and non-hospital-based service locations; and, (3) developing a taxonomy of cluster forms. Collectively, fulfillment of these aims allows for the identification of common forms assumed by clusters, described according to their diverse components and configurations. Thus, the research conducted to fulfill the first, second, and third study aims are descriptive and non-experimental in design. The adoption of a descriptive design provides an important and appropriate foundation for the research of hospital-based clusters, as descriptive studies "observe, describe, and document aspects of a situation as it naturally occurs" while also providing a basis for future hypothesis generation (Polit & Beck, 2008, p. 274), as will subsequently be done corresponding to the study's fourth aim.

The study's unit of analysis is the hospital-based cluster. Past studies have commonly defined a *cluster* as "two or more same-system hospitals located in the same local market or region" (Sikka et al., 2009, p. 253; Luke et al., 2011; Trinh et al., 2014). However, recent work by Shay, Luke, and Mick (2011, in press) has highlighted the importance of specifying the boundaries of local markets when defining clusters. That is, clusters may be defined according to *urban* boundaries, in which same-system members must operate within the same urban market (defined as core based statistical areas, which include metropolitan and micropolitan statistical areas), or they may be defined more broadly according to *regional* boundaries, with same-system members required to operate within a 150-mile radius of the local system's largest, or "lead," hospital. For the purposes of this study, efforts to update the inventory of hospital-based clusters in the U.S. account for *urban* clusters as well as *regional* clusters. But, as described in Chapter 2, empirical evidence convincingly suggests that *regional* cluster boundaries more accurately reflect hospitals' cluster membership given the bias of urban boundary definitions against clusters operating in smaller markets. In comparison to applications of regional cluster boundary definitions, studies evaluating clusters strictly using urban boundaries also underreport both the number and the size of hospital-based clusters across the U.S., including urban clusters that expand their reach into nearby rural areas (Shay et al., 2011, in press). Therefore, the *regional* cluster boundary definition is applied to the cataloging of local cluster components and configurations as well as the taxonomic analysis of local cluster forms.

Data Sources

Fulfillment of the study's first three aims relies upon data from varying sources. First, an updated inventory of local hospital-based clusters in the U.S. as of 2012 requires utilization of data from the AHA Annual Survey database and an inventory of clusters collected and maintained by Dr. Roice Luke. Second, a catalog of clusters' hospital-based and non-hospital-based sites as of 2012 requires the development of a new dataset using primary data collection methods. And, third, the development of a taxonomy of clusters using cluster analysis methods requires data from the updated cluster inventory, the catalog of cluster components, the AHA Annual Survey database, and data on hospital admissions from Intellimed.

Data sources for aim one. For more than twenty years, Luke has tracked general, acute care hospitals' membership in local hospital systems, or clusters. As detailed in several studies relying upon this unique dataset (e.g., Luke, 1992; Luke et al., 1995, 2011; Sikka et al., 2009), Luke's inventory of hospital-based clusters in the U.S. has required periodically updating the AHA Annual Survey data to reflect cluster membership by reviewing hospital system websites, merger and acquisition announcements, and hospital communications. Most recently, an inventory of hospital-based clusters reflecting membership as of 2009 (based upon AHA's 2006 Annual Survey data) has been used in studies by Luke and colleagues (2011) and Shay and colleagues (2011, in press). In fulfillment of the first aim, this study updates the inventory of hospital-based clusters in the U.S. to reflect hospitals' membership as of 2012. In order to update this dataset, methods consistent with those described in previous studies of clusters (Luke et al., 2011; Sikka et al., 2009) are employed, including reference to Luke's 2009 cluster dataset, the AHA's 2011 Annual Survey data, and hospital system websites and promotional materials.

As previously noted, this study documents hospitals' participation in clusters using both *urban* and *regional* cluster boundary definitions. Urban cluster membership is determined as multiple same-system hospitals operating within a single core-based statistical area (CBSA), as defined by the United States Census Bureau [USCB] and Office of Management and Budget [OMB]. According to the U.S. Census Bureau (2013), CBSAs include metropolitan and micropolitan statistical areas (METSAs and MICSAs, respectively), with a METSA maintaining a population greater than or equal to 50,000 residents in its core urban area and a MICSA maintaining a population between 10,000 and 50,000 residents. CBSAs are delineated on the basis of county composition, with each METSA or MICSA consisting of "one or more counties," including "the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core" (USCB, 2013). The most recent CBSA delineations were released by the USCB in February 2013, based upon 2010 U.S. Census data and the OMB's adoption of 2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas (USCB, 2013).

In contrast to urban cluster boundaries, cluster membership utilizing the regional cluster boundary definition includes same-system hospitals operating within the same urban area as well as same-system hospitals operating in non-urban areas that are located within 150 miles of the largest local system member (as measured by bed size), also referred to as the "lead" facility (Luke, 1992; Shay et al., in press). This study measures distance between cluster members using drive distance measurements, defined as "the shortest path distance traveled over a road network" (Jones, Ashby, Momin, & Naidoo, 2010, p. 319) and calculated by the Google Maps web mapping service application. By using drive distance measurements, as opposed to Euclidean or "straight-line" distance measurements, this study accounts for the influence of topological structures and road networks that may create barriers affecting geographical access, thereby providing more precise measurement of cluster members' spatial relations (Jones et al., 2010).

Thus, this study measures cluster membership using both urban and regional boundary definitions. It is important to note that, when defining cluster membership, some clusters consist of entire multi-hospital systems operating within a single local area, whereas other clusters serve as “sub-systems” of larger multi-hospital systems that operate hospitals across multiple local markets.

Data sources for aim two. In fulfillment of its second aim, this study develops a catalog of cluster components – including hospital-based sites and non-hospital-based sites – that serves as a unique dataset of local hospital systems’ varied service locations. Identifying service locations requires primary data collection methods, similar to the methods employed to identify cluster membership, in which hospital system and cluster facility websites and communications are thoroughly examined to determine the number, physical address, and type of service locations operated by each cluster. Efforts to develop a cluster component catalog using primary data collection methods also capture the number of beds operated by each general, acute care hospital within clusters.

Identification of clusters’ varied numbers and types of service locations, including non-hospital-based sites, is a critical aspect of this study. As previously described in Chapter 3 and depicted in Figure 1, the continuum of care – health care’s “value chain” – includes multiple stages of care, from wellness and health promotion to extended care and living, among others. During the primary data collection process, each care delivery site type is identified, with sites then categorized according to one of the fifteen stages within the continuum of care depicted in Figure 1. In addition, many clusters operate multi-service outpatient centers, in which a range of ambulatory services across multiple stages (e.g., diagnostic imaging, fitness and wellness, primary care, ambulatory surgery, outpatient rehabilitation, etc.) are provided at a single location. Rather than categorize multi-service outpatient centers according to a single service, they are identified as a distinctive service location type and stage in the continuum of care.

This study's taxonomic analysis, in fulfillment of the third aim as previously noted, requires in part facility discharge data from the Intellimed dataset. However, access to Intellimed data is limited in this study to clusters operating in six states: Florida, Maryland, Nevada, Texas, Virginia, and Washington. In light of the limited availability of Intellimed data, and given the challenge and considerable effort required to collect data for each service location within an individual cluster, a convenience sample of clusters in the six Intellimed states is used to create a catalog of cluster components. Clusters included within the catalog consist of those identified in the updated 2012 cluster inventory operating within Florida, Maryland, Nevada, Texas, Virginia, or Washington, using the regional cluster boundary definition.

Data sources for aim three. The study's third aim relates to a taxonomic analysis of cluster forms, which requires multiple sources of data. The study sample involved in the taxonomic analysis includes local hospital-based clusters (using a regional cluster boundary definition) in Florida, Maryland, Nevada, Texas, Virginia, and Washington as of 2012. These clusters are identified in the updating of the national inventory of clusters, as previously described. In addition, numerous variables used in the taxonomic analysis to distinguish common cluster forms employ measures from varying data sources.

The catalog of cluster components, developed from primary data collection to fulfill the second study aim, provides information on each cluster's number of hospitals, number of beds per hospital, number of service locations, type of service locations, and distances among locations. Hospital-level data from the AHA 2011 Annual Survey are aggregated to the cluster level, providing information on each clusters' hospital-based service offerings. In some instances, 2011 service data are not provided for individual hospital facilities, and for these observations, AHA 2010 Annual Survey data, if available, are substituted to reflect an individual facility's service offerings, which in turn are aggregated to the cluster level. In other instances, the AHA dataset reports service data for multiple system member hospitals in a single observation, as "the AHA Annual Survey gives spatially clustered hospitals the option of reporting two or more local hospitals as if they were one" (Sikka et al., 2009, p. 253). For example, the Baptist Health System in San Antonio, Texas, previously owned and operated by Vanguard Health Systems until their acquisition by Tenet Healthcare Corporation in 2013, reports its hospital service offerings under a single facility in the AHA Annual Survey dataset. That is, although it operates five distinct general, acute care facilities throughout the San Antonio metropolitan area, its reported operations for these five sites are combined as a single observation in the AHA Annual Survey dataset. Finally, the Intellimed dataset provides hospital-level admissions data which are then aggregated to the cluster level. Such data include hospitals' case mix index, number of cases categorized at the highest severity level ("extreme"), and number of cases for various admission sources. For five of the six states included in the study sample, the Intellimed dataset offers such data for the 2012 calendar year. However, for the state of Texas, the Intellimed dataset is limited such that data for Texas facilities represent admissions from July 2011 through June 2012. Data from each of these distinct sources are merged to create a unique dataset, providing detailed information on each cluster in the six-state sample.

Variable Measurements

Chapter 3 presented the theoretical framework utilized as a basis for a taxonomic analysis of cluster forms. In applying concepts from both structural contingency theory and strategic management theory, this study anticipates that cluster forms will vary based upon the characteristics of differentiation-configuration and integration-coordination. These synthesized concepts can be further broken down into distinct constructs, which in turn may be operationalized into numerous variables that will be employed in the study's cluster analysis.

Differentiation-configuration. There are three constructs stemming from the synthesized concept of differentiation-configuration, as previously described in Chapter 3. These constructs include horizontal differentiation, vertical differentiation, and configuration (also referred to as spatial differentiation). We incorporate multiple measurements for each of these constructs.

Horizontal differentiation. Horizontal differentiation is often defined and measured as the number of services offered by an organization (Mileti et al., 1977), and for health care systems, this typically pertains to the number of services offered across system hospitals (Bazzoli et al., 1999). Thus, the first measure of horizontal differentiation included in this study is clusters' total percentage of services offered among member hospitals, calculated by dividing the collective number of services offered within a cluster (as reported in the AHA Annual Survey dataset) by 151, which is the total possible number of services to report in the 2011 AHA Annual Survey. In addition to general, acute care hospitals, the AHA Annual Survey database also includes service data for specialty hospitals such as behavioral health and psychiatric hospitals, surgical hospitals, inpatient rehabilitation facilities, children's hospitals, and long-term acute care hospitals, among others. For clusters that operate such specialty facilities, any service data reported in the AHA Annual Survey database for cluster-member specialty hospitals are also aggregated to the cluster level in an effort to capture an accurate and complete assessment of clusters' total provision of services.

Furthermore, this study's evaluation of cluster forms recognizes that hospitals only serve as a component – though a significant and substantial component – of local hospital-based systems. Therefore, it is important to consider the provision of services and programs offered *beyond* hospital walls when evaluating a cluster's horizontal differentiation activity. A second measure of horizontal differentiation within this study's taxonomic analysis includes each cluster's number of different service location types. This measure comes from the catalog of cluster components obtained through primary data collection, which provides an inventory of each cluster's different locations and the type of service locations operated by clusters within the study sample. For example, the Bon Secours Hampton Roads Health System, a cluster owned by Bon Secours Health System and operating in the Hampton Roads market in Virginia, operates a total of 6 different types of service locations: acute care hospitals, multi-service outpatient centers, specialty physician clinics, outpatient rehabilitation clinics, an assisted living facility, and a skilled nursing facility. In comparison, the Sentara Hampton Roads cluster operates a total of 14 different types of service locations: acute care hospitals, multi-service outpatient centers, primary care physician clinics, specialty physician clinics, urgent care clinics, fitness and wellness centers, outpatient rehabilitation clinics, continuing care retirement communities, skilled nursing facilities, PACE (Program of All-inclusive Care for the Elderly) centers, health professions schools, a diagnostic center, an occupational health clinic, and a freestanding imaging center. By evaluating each clusters' operation of distinct service location types, this study aims to assess clusters' varied provision of services beyond that which is provided within hospital walls and which may go unreported by individual hospital facilities in the AHA Annual Survey.

Vertical differentiation. As previously discussed, vertical differentiation pertains to the hierarchical ranking of organizational services, and in health care the construct has referred to differences in the quality or complexity of care offered by health care providers (e.g., Bardey et al., 2012; Brekke et al., 2007; Gravelle & Sivey, 2010; Shay et al., in press; Tay, 2003).

Luke (1992) suggested that a "direct way to get at *vertical differentiation*" is to examine differences among cluster members' case mix (p. 21). In his later work with Shay and colleagues (in press), evidence of vertical differentiation was noted by examining differences in the case mix index of a cluster's largest – or "lead" – hospital and the average case mix of remaining cluster members. The authors suggested that a large case mix difference between lead and non-lead cluster members would indicate a hierarchical ordering of care levels across cluster facilities, as lead hospitals in such clusters would provide a higher order of service complexity than fellow cluster members. Likewise, clusters in which lead hospitals exhibit little difference in case mix from non-lead members would exhibit little evidence of differentiation by level of care. Consistent with this argument, this study measures vertical differentiation as the difference in the case mix index of a cluster's lead hospital and the average case mix of its non-lead members.

In addition to facilities' case mix, the Intellimed dataset provides data that categorize the severity of patient cases for each hospital facility into four groups: minor, moderate, major, and extreme. In an effort to further identify clusters that distribute a disproportionate share of complex, high severity cases to lead facilities, this study also measures vertical differentiation as the difference in a lead hospital's percentage of cases categorized as extreme cases (the highest severity) and the average percentage of cases seen by non-lead cluster members that are categorized as extreme. With this measure, a large difference in the distribution of extreme severity cases would indicate that a lead hospital cares for a larger share of its cluster's most complex cases, which in turn would provide evidence of a cluster's differentiation of facilities by service complexity.

Together, these two measures of vertical differentiation gauge a cluster's hierarchical differentiation of hospitals by the level of complexity offered among cluster members. However, in addition to differentiation by level of complexity, clusters may also exhibit vertical differentiation by the *type* of care offered among cluster members. Shay and colleagues (in press) explain this form of vertical differentiation as occurring when clusters "designate individual hospitals to become, in effect, centers of excellence in the treatment of given categories of illness… regardless of acuity or urgency" (p. 190). Examples could include distribution of specific service lines, such as cardiology or oncology services, as well as distribution of specific clinical conditions, such as diabetes or mental illness, to certain hospitals designated as centers of excellence within the cluster (Shay et al., in press). Although a comparison of case distribution among cluster members across an extensive array of service lines would be more exhaustive, the limited availability of data detailing such distribution or identifying inter-organizational transports for such cases, as well as the increased complexity and lack of parsimony that would result, leads this study to focus on a single service line as an indicator of clusters' differentiation by types of cases. Specifically, the Intellimed dataset offers data regarding admissions by birth to individual hospitals, allowing for identification of clusters that designate specific members as specializing in maternity services (i.e., labor and delivery care) according to their distribution of childbirths. Thus, this study measures vertical differentiation – as occurs in differentiation by *types* of cases – as a cluster's standard deviation in the number of childbirths as a percentage of total admissions among cluster members. Clusters with a higher standard deviation in birth admissions reflect a larger discrepancy in the number of childbirth cases across each facility, indicating designation of specific facilities as specializing in maternity services. And, to the degree that a cluster exhibits vertical differentiation in its distribution of childbirth cases to specific facilities, the cluster may also apply vertically differentiated distributions to other service lines and clinical conditions.

Configuration. Turning from consideration of *service* differentiation measures to measures of *spatial* differentiation, this study includes three different measures to capture a cluster's *configuration*. First, previous works have often measured spatial differentiation as an organization's number of physical locations (Goldman, 1973; Luke, 1992; Mileti et al., 1977; Nelson & Quick, 2008). Consistent with such a practice, this study incorporates each cluster's count of unique service locations as a measure of spatial differentiation. Data used to operationalize this measure come from the catalog of cluster components developed through primary data collection, as previously described. By specifying service locations that are *unique*, this study recognizes that many clusters may operate service locations in which multiple service location types exist. For example, as of 2012, East Texas Medical Center (ETMC) in Tyler, Texas operates multiple physician clinics, an inpatient rehabilitation facility, a long-term acute care hospital, an outpatient rehabilitation clinic, a sleep disorders center, and a wound healing center, among other service sites, all on the campus of ETMC-Tyler, a general, acute care hospital and the cluster's flagship facility. Rather than repeatedly count the same location for each of these same-campus sites, this study seeks to develop a precise measure of configuration by recognizing these sites collectively as a single, unique location.

In addition to the *number* of unique locations, this study operationalizes the configuration of clusters by measuring the *distance* between cluster member locations. In their taxonomic analysis of multihospital systems, Lewis and Alexander (1986) recognized the importance of a system's geographic dispersion, which they defined as "the physical distance among hospitals in the system and between hospitals and corporate headquarters" (p. 36). However, their study failed to actually measure the physical distance between system facilities, instead operationalizing geographic dispersion as "the number of different counties in which the system operates hospitals divided by the total number of hospitals in the system," with "high values…indicative of greater geographic dispersion" (Lewis & Alexander, 1986, p. 53). This study intends to include more precise measurements of distance among cluster members when accounting for clusters' configurations. In one distance measure, a cluster's geographic "reach" is calculated as the average distance in miles between a cluster's unique service location sites and its lead hospital. The second distance measure, a cluster's geographic "spread," is calculated as the average distance between a cluster's unique service location sites and their nearest acute care, general hospital member. These distance measures are determined using the addresses obtained for each cluster service site in the catalog of cluster components, with precise driving distances (as opposed to straight-line or Euclidean distance) calculated using the Google Maps web mapping service application.

As depicted in Figure 3, clusters may assume a variety of spatial configurations, ranging from limited reach to extensive reach as well as a concentrated spread to a dispersed spread. By incorporating two distinct distance measures as well as a measure of the number of unique cluster locations, this study intends to more accurately capture variations in clusters' configurations.

Integration-coordination. Similar to three constructs stemming from differentiation-configuration, there are three constructs relating to the synthesized concept of integration-coordination. These include horizontal integration, vertical integration, and coordination.

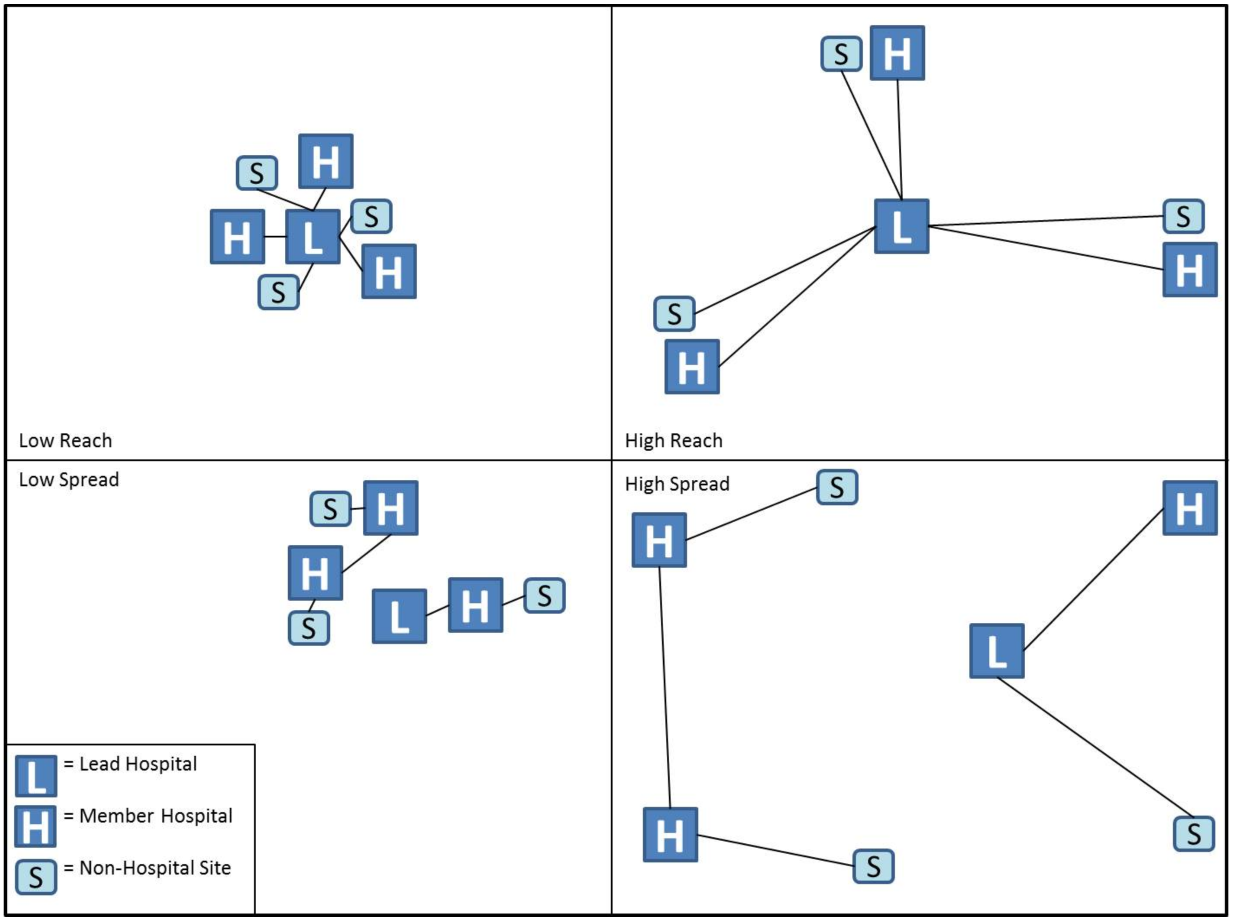


Figure 3. Cluster Reach and Spread

Horizontal integration. Horizontal integration has often been depicted and operationalized as the number of hospitals functioning collectively in a multi-hospital system (e.g., Conrad et al., 1988; Fottler et al., 2000; Snail & Robinson, 1998). Consistent with this common practice, this study measures a cluster's horizontal integration as the number of general, acute care hospitals owned and operated by the organization.

However, beyond acute care hospitals, horizontal integration may also be considered as the integration of multiple same-stage services and service locations at other levels in the continuum of care (Gillies et al., 1993). As previously described, the continuum of care – health care's "value chain" – includes multiple stages of care, from wellness and health promotion to extended care and living, among others, and during the primary data collection process, each care delivery site type is categorized within a stage of the continuum of care. From this list of service location types comes a second measure of horizontal integration, consisting of the number of stages throughout the continuum of care in which a cluster operates *multiple* care delivery sites other than general, acute care hospitals. For example, using the previous illustration of the Bon Secours Hampton Roads Health System and the Sentara Hampton Roads clusters, the Bon Secours Hampton Roads System maintains sites corresponding to three horizontally integrated stages (specialty physician care, non-physician provider care, and multi-service outpatient centers) in addition to its general hospital inpatient care. In comparison, the Sentara Hampton Roads cluster includes sites corresponding to ten horizontally integrated stages (education of labor, ancillary services, wellness and health promotion, primary care, specialty physician care, non-physician provider care, urgent and emergency care, multi-service outpatient centers, long-term inpatient rehabilitation and nursing, and extended care and living) in addition to its general, acute care hospitals. This comparison illustrates the differences in horizontal integration activity between the two competing clusters, with Sentara Hampton Roads exhibiting horizontally integrated activities across a greater span of the continuum of care.

Building from this measure of horizontally integrated stages, a third measure of horizontal integration for this study consists of the average number of freestanding sites among each cluster's horizontally integrated stages, not including the number of general, acute care hospitals that serves as a separate measure of horizontal integration. For example, in addition to its three general, acute care hospitals, the Bon Secours Hampton Roads Health System cluster's horizontally integrated offerings include three specialty physician clinics, twelve outpatient rehabilitation clinics, and three multi-service outpatient centers, for an average of six service locations per horizontally integrated stage. The Sentara Hampton Roads cluster, in addition to its seven general, acute care hospitals, operates two health professions schools, two imaging and diagnostic service centers, two fitness and wellness centers, ten primary care physician clinics, nine specialty physician clinics, eight non-physician provider care sites (seven outpatient rehabilitation clinics and an occupational health clinic), four urgent care clinics, seven multi-service outpatient centers, three skilled nursing facilities, and five extended care and living sites (three continuing care retirement communities and two PACE centers), collectively averaging 5.2 service locations per horizontally integrated stage. As is made evident in this example, these two measures reveal important differences between the two competing clusters' horizontal integration strategies. Although the Sentara Hampton Roads cluster exhibits horizontal integration strategies across a wider range of service location sites, the Bon Secours Hampton Roads Health System cluster maintains a higher average of service locations per horizontally integrated stage, primarily due to their considerable number of outpatient rehabilitation clinics, thereby reflecting a strategy of horizontal integration focused on specific service stages.

Vertical integration. Three measures of vertical integration are incorporated in this study. The first measure pertains to the number of vertically integrated *stages* operated by hospital-based clusters. Harrigan (1984, 1985) identified stages as a key dimension of vertical integration, defined as the number of steps included in a production process. Subsequent studies of vertical integration activity in the health care organization literature (e.g., Clement, 1988; Conrad, 1993; Conrad & Dowling, 1990) applied this dimension of vertical integration to the process of health care provision, with examples of vertical integration stages including ancillary services, primary care, and long-term nursing services, to name a few.

As previously described, Figure 1 adapts several scholars' depictions of the continuum of care (Clement, 1988; Conrad, 1993; Conrad et al., 1988; Mick & Conrad, 1988) and identifies fifteen unique stages that comprise this "vertical chain" in health care. These stages include: the education of labor; medical equipment; ancillary services; wellness and health promotion; primary care; specialty physician care; acute outpatient care; non-physician provider care; urgent and emergency care; general hospital inpatient care; specialty hospital inpatient care; short-term inpatient rehabilitation and nursing; long-term inpatient rehabilitation and nursing; outpatient rehabilitation and nursing; and, extended care and living. Using this depiction of stages throughout the continuum of care, this study's first measure of vertical integration is the number of different stages in which a cluster provides services or maintains a service location. To obtain this measure, data from both the AHA Annual Survey dataset and the catalog of cluster components are assessed collectively. First, clusters' provision of services in any given stage is identified in its operation of a care delivery site categorized within that stage, as obtained through primary data collection. Second, clusters' provision of services in any given stage is also assessed through its reporting across the 2011 AHA Annual Survey dataset's 151 service variables.

In their seminal taxonomy of hospital systems and networks, Bazzoli and colleagues (1999) created differentiation, centralization, and integration measures by consolidating a list of 78 hospital services identified in the 1994 and 1994 AHA Annual Survey datasets into 15 hospital service dimensions such as general acute care services, pediatric services, surgical services, and long-term services, among others. Their study then calculated for each hospital system or network the percentage of services offered among member hospitals within each service dimension, and in aggregating individual service variables into service dimensions, Bazzoli and colleagues (1999) cited their emulation of previous work by Dranove and colleagues (1992), who reduced a list of 171 specialized hospital services from the 1983 California Office of Statewide Health Planning dataset into 11 service groups based upon clinical and technological factors, such as emergency services and cardiology services. Later, Newhouse and colleagues (2003) developed hospital integration and differentiation measures by consolidating 86 service variables from the 1998 AHA Annual Survey into 15 service dimensions, also building from the work by Bazzoli and colleagues (1999) and Dranove and colleagues (1992).

In a similar manner, this study assigns each of the 151 service variables in the 2011 AHA Annual Survey dataset to a specific service stage in the continuum of care (depicted in Figure 1). A detailed listing of each 2011 AHA Annual Survey service variable and its assigned stage in the continuum of care, as well as a listing of corresponding service location types identified in primary data collection, is provided in Appendix 1.

In addition to vertical integration *stages*, a second key dimension identified by Harrigan (1984, 1985) is the *breadth* of vertical integration assumed by an organization, which includes the number of tasks upstream or downstream from the organization's core operations. For health care providers, vertical integration breadth has been measured as the number of services stemming from acute care hospitals' referral sources, also known as pre-acute care, and their placement channels, also referred to as post-acute care (Charns, 1997; Clement, 1988; Mick & Conrad, 1988). One may refer to the pre-acute services pertaining to the portion of the care continuum prior to general, acute care hospital inpatient services as "upstream" (Clement, 1988; Conrad et al., 1988; Fottler et al., 2000; Ginter et al., 2002; Mick & Conrad, 1988), and this study measures clusters' upstream vertical integration breadth as the percentage of "upstream" services provided by cluster members out of the possible 90 service variables in the 2011 AHA

Annual Survey dataset assigned to "upstream" stages. As noted, Appendix 1 provides a detailed listing of each service variable's assignment across care continuum stages, including identification of which stages and services are considered "upstream."

Similarly, the post-acute services pertaining to the portion of the care continuum following general, acute care hospital inpatient services may be referred to as "downstream" (Clement, 1988; Conrad et al., 1988; Fottler et al., 2000; Ginter et al., 2002; Mick & Conrad, 1988). This study measures clusters' *downstream* vertical integration breadth as the percentage of "downstream" services provided by cluster members out of the possible 22 service variables in the 2011 AHA Annual Survey dataset assigned to "downstream" stages. Again, Appendix 1 identifies which specific service variables are classified as "downstream" services.

Coordination. Coordination is the final construct included in this study's taxonomic analysis and is a concept closely related to integration (Gillies et al., 1993; Porter, 1986; Singer et al., 2011; Taggart, 1998). Past work by scholars has frequently portrayed coordination as the ability to effectively manage and link together activities across an organization's multiple sites (e.g., Longest, 1981; Morrison & Roth, 1993; Porter, 1986), underscoring the interdependence that exists across sites for organizations that effectively coordinate diverse activities. For hospital-based clusters, one indicator of such coordination would be the linking of activities across member facilities such that cluster members would work together in caring for patients, and this may be reflected in a cluster's increased referral of cases to its "lead" hospital. In this case, member facilities would work together within the cluster to refer specific cases to its lead or flagship facility, exhibiting a level of interdependence in order to coordinate care for patients requiring specialized resources.

Thus, one measure of coordination included in this study is the difference between a cluster's percentage of referral admissions at its lead hospital and the average percentage of referral admissions among its non-lead hospital members. This measure is calculated using the percentage of admissions for each hospital facility classified as transfers or admissions from other hospitals, as reported in the Intellimed datasets. It is important to consider, as noted in previous work by Shay and colleagues (in press), that such inter-hospital transport data may include transfers and admissions from non-cluster hospitals, but we believe there is value in using this measure as a proxy for intra-cluster transports.

In addition, organizations engaging in high levels of coordination work cooperatively and reduce redundancies across their multiple sites, while organizations lacking in coordinated efforts tend to maintain sites that work independently and duplicate one another's operations (Morrison & Roth, 1993). Thus, a second measure of coordination utilized within this study is a cluster's average service duplication proportion, with each service duplication proportion calculated as the number of cluster hospitals offering an individual service (as indicated across 151 service variables from the AHA Annual Survey dataset) divided by the cluster's total number of hospital members. This measure is similar to one previously applied by Trinh and colleagues (2014) in their examination of urban clusters' configurations and service duplication. A high average proportion of duplicated services across cluster members may reflect lower levels of coordination, as multiple facilities engage in the provision of the same services, whereas a lower percentage of duplicated services may reflect higher levels of coordination, as different cluster members rely on specific facilities within the cluster to perform specific services.

Collectively, this study develops a total of 16 variables to distinguish cluster forms, with 8 variables relating to the constructs of horizontal differentiation, vertical differentiation, and configuration, and another 8 variables relating to the constructs of horizontal integration, vertical integration, and coordination. A listing of each of these variables, their measure descriptions, and their data sources is provided in Table 1.

Analytic Methods

Analytic methods are involved in pursuit of each of the study's first three aims. First, descriptive analysis provides a picture of characteristics of the study population (i.e., hospital-based clusters in the U.S.) as well as characteristics of the study's sample of clusters (i.e., clusters based in Florida, Maryland, Nevada, Texas, Virginia, and Washington). Descriptive statistics are also obtained for measures relating to the study's taxonomic analysis. Second, cluster analysis methods are employed to identify common cluster forms in relation to the study's third aim. Each of these analytic methods is now described in further detail.

Descriptive analysis. For each of the variables included in the study's first three aims, descriptive statistics are calculated. These include statistics describing the number of local hospital-based clusters across the U.S. as of 2012, with comparisons of the numbers of clusters according to urban and regional boundary definitions. In addition, the inventory of hospital-based clusters is analyzed according to cluster size (i.e., the number of hospital members in a cluster), cluster market types (i.e., whether a cluster operates in a single urban area, multiple urban areas, urban and rural areas, or a rural area), and cluster ownership (i.e., government, nonprofit, or for-profit ownership). The population of cluster-member hospitals is also compared to the overall population of general, acute care hospitals in the U.S. as well as the population of U.S. general, acute care hospitals that are members of multi-hospital systems.

Table 1. *Taxonomic analysis classification variables*

Construct	Variable	Measure	Data Source
Horizontal Differentiation	*Hospital Services*	The collective number of a cluster's services offered across member hospitals, as a percentage of 151 surveyed services	AHA Annual Survey
	Service Location Types	The number of different types of service locations operated by a cluster	Primary Data Collection
Vertical Differentiation	*Case Mix Difference*	The difference between a cluster's lead hospital case mix and the average case mix of its non-lead hospitals	Intellimed
	Extreme Case Share	The difference between a cluster's percentage of admissions categorized as "extreme" cases at its lead hospital and the average percentage of admissions categorized as "extreme" at its non-lead hospitals	Intellimed
	Birth Case Distribution	The standard deviation of childbirths as a percentage of total admissions across a cluster's member hospitals	Intellimed
Configuration	*Locations*	The number of unique service locations operated by a cluster	Primary Data Collection
	Geographic Reach	The average distance, in miles, between a cluster's unique service locations and its lead hospital	Primary Data Collection
	Geographic Spread	The average distance, in miles, between a cluster's unique service locations and that location's nearest general, acute care member hospital	Primary Data Collection
Horizontal Integration	*Hospitals*	The number of general, acute care hospitals owned and operated by a cluster	Primary Data Collection
	Horizontally Integrated Stages	The number of stages in the continuum of care in which a cluster operates multiple care delivery sites, excluding general, acute care hospitals	Primary Data Collection
	Locations Per Horizontally Integrated Stage	The average number of unique service locations among a cluster's horizontally integrated stages	Primary Data Collection
Vertical Integration	*Vertically Integrated Stages*	The number of stages in the continuum of care in which a cluster operates a service location or provides a service	AHA Annual Survey / Primary Data Collection
	Upstream Vertical Integration Breadth	The collective number of a cluster's "upstream" services offered across member hospitals, as a percentage of 90 surveyed services categorized as "upstream"	AHA Annual Survey
	Downstream Vertical Integration Breadth	The collective number of a cluster's "downstream" services offered across member hospitals, as a percentage of 22 surveyed services categorized as "downstream"	AHA Annual Survey
Coordination	*Hospital Transfer Difference*	The difference between a cluster's percentage of admissions classified as transfers or admissions from other hospitals at its lead hospital and the average percentage of admissions classified as transfers or admissions from other hospitals among its non-lead hospitals	Intellimed
	Duplication of Services	The average proportion of a cluster's member hospitals providing a given service across all of the cluster's services.	AHA Annual Survey

Because the catalog of cluster components, in relation to the study's second aim, is developed from a sample of clusters in six states, as opposed to the entire population of regional clusters in the U.S., descriptive statistics are calculated comparing clusters in the study sample to the study population. In addition, descriptive statistics regarding the catalog of cluster components are provided, including the number of different types of service locations.

Using primary data collected for the compilation of the cluster catalog as well as data from the Intellimed and AHA Annual Survey datasets, the study's 16 classification variables are constructed, as previously described and depicted in Table 1. Descriptive statistics for each of these variables are calculated, including their means and standard deviations.

Taxonomic analysis. The third aim of this study is to identify and classify common configurations and organizational forms observed among hospital-based clusters. Such attempts at classification call for taxonomic analysis, which Short and colleagues (2008) note involves the application of empirical techniques to conceptually and theoretically grounded schemes (p. 1058). Cluster analysis serves as the most common empirically-based analytic method to determine classification groups (Short et al., 2008), and indeed, some of the more well-known taxonomic analyses in the health services literature derive their grouping results using cluster analysis techniques (e.g., Alexander et al., 1996; Bauer & Ameringer, 2010; Bazzoli et al., 1999; Dubbs et al., 2004; Lewis & Alexander, 1986; Weiner & Alexander, 1993). Although cluster analysis is a widely used and ideal methodology for the identification of common organizational forms, it is not without various criticisms and examples of misuse, and therefore numerous steps in the analytic process are suggested by experts as critical to address when applying cluster analysis methods (Ketchen & Shook, 1996; Hair et al., 2006).

Variable selection. First, when conducting a cluster analysis, the selection of variables with which to distinguish and categorize organizational configurations is "one of the most critical steps in the research process" (Aldenderfer & Blashfield, 1984, p. 19). In particular, the "deductive approach," which utilizes an explicitly stated theoretical framework from which to identify and select classification variables, is strongly recommended by well-regarded scholars of cluster analysis methods (Aldenderfer & Blashfield, 1984; Hair et al., 2006; Ketchen & Shook, 1996). As has been made evident in this chapter and Chapter 3, we closely adhere to this recommendation, applying a theoretical framework that synthesizes contingency theory and strategic management theory.

Identification of outliers. One of the first steps necessary to perform before partitioning observations into common groups is to identify and remove aberrant or non-indicative observations that could distort cluster analysis results (Hair et al., 2006). In order to detect such outlier observations, scholars have promoted use of the Mahalanobis distance measure, a generalized distance procedure that computes distances between individual observations and the sample mean across clustering variables and allows for identification of observations that significantly differ from the remainder of the sample (Hair et al., 2006, p. 575; Bazzoli et al., 1999; Dubbs et al., 2004; Lewis & Alexander, 1986). Adhering to this recommended practice, we evaluate Mahalanobis distance measures across the study sample observations, defining outlier observations as those differing from the study sample at a 0.001 significance level using a Chi-square probability distribution.

The selection of the prespecified significance level is important in screening for aberrant observations. However, one must also take caution that observations deemed as outliers and thereby removed from the cluster analysis are truly aberrant, and not representative observations of a small or underrepresented segment of the population (Hair et al., 2006, p. 572). Therefore, this study applies the 0.001 prespecified significance level as a conservative basis from which to identify outlier observations, which in turn are screened prior to their removal from the cluster analysis.

Appropriateness of classification variables. In the same way that examination of study observations is necessary prior to cluster analysis, a careful evaluation of classification variables is also recommended in order to ensure that inappropriate variables that could affect the partitioning process are not included. One of the most critical issues that must be examined and addressed regarding the appropriateness of classification variables is the presence of substantial multicollinearity among variables, which may lead to the implicit overweighting of underlying constructs (Hair et al., 2006, p. 582; Ketchen & Shook, 1996).

Scholars offer varying approaches to identifying and correcting multicollinearity. One common and straightforward approach towards addressing multicollinear variables is to examine each variable's inflation factor (VIF), with the reduction or removal of variables displaying VIF scores indicative of high degrees of multicollinearity (Hair et al., 2006). A variable's VIF score is the inverse of its tolerance value, which is defined as "the amount of variability of the selected independent variable *not explained by the other independent variables*" (Hair et al., 2006, p. 227). High VIF scores indicate substantial multicollinearity, with values of 10 or more generally viewed as indicative of very high collinearity and commonly used as a cutoff threshold for the removal of collinear variables. However, in studies with smaller sample sizes, Hair and colleagues (2006) suggest that more conservative VIF cutoff scores may be needed in order to ensure underlying constructs are not overweighted (p. 230). In light of this, we examine multicollinearity across the study's classification variables by evaluating their VIF scores and applying the prespecified VIF score of 5.3 as a more conservative threshold from which to identify highly collinear variables. A VIF score of 5.3 indicates the variable has a multiple correlation of 0.90, with all other variables explaining 19 percent of its variability (Hair et al., 2006), and classification variables with VIF scores above this threshold are considered for removal from the cluster analysis.

In addition to the examination of VIF scores, past taxonomies have employed factor analysis to address multicollinearity as well as assess the level of contribution individual variables provide to the total variance of the study data (Aldenderfer & Blashfield, 1984; Lewis & Alexander, 1986; Weiner & Alexander, 1993). In terms of correcting multicollinearity, factor analysis allows researchers to "reduce the dimensionality of the data, thereby creating new, uncorrelated variables that can be used as raw data for the calculation of similarity between cases" (Aldenderfer & Blashfield, 1984, p. 21; Punj & Stewart, 1983). However, this method of addressing multicollinearity has been frequently described as controversial, with scholars warning that the use of factor analysis can lead to the exclusion of valuable information as well as make the separation between certain clusters more difficult to discern, thereby resulting in cluster solutions that are less than optimal (Ketchen & Shook, 1996, p. 444; Aldenderfer & Blashfield, 1984; Dillon, Mulani, & Frederick, 1989; Hair et al., 2006; Lewis & Alexander, 1986). Therefore, it is recommended that multiple cluster analyses be performed, changing the method of addressing multicollinearity in each analysis and then comparing the final results to determine to what degree cluster assignments are affected by the substitution of factor scores for classification measures (Ketchen & Shook, 1996). Given the expressed concerns of numerous scholars regarding the use of factor scores as classification variables in cluster analyses, this study primarily addresses multicollinearity through the examination of VIF scores, using factor scores in comparative cluster analysis to evaluate the reliability of cluster solutions.

However, factor analysis is also used to evaluate whether variables are representative of underlying dimensions or, if they fail to substantially contribute to the variance in factor structures, whether they are inappropriate as classification variables (Hair et al., 2006; Lewis & Alexander, 1986; Weiner & Alexander, 1993). Thus, factor analysis methods are used in this study to identify any classification variables that may fail to adequately represent the conceptual framework previously established, and any such variables that are not representative are considered for removal.

Prior to performing a factor analysis, a Bartlett test of sphericity is applied to test whether significant correlations exist among at least some of the classification variables. Evidence of such intercorrelation, as indicated by a statistically significant Bartlett test of sphericity (with a significance value less than 0.05), would suggest that underlying factors indeed exist within the dataset and that factor analysis methods are appropriate and justified (Hair et al., 2006). In addition, a measure of sampling adequacy (MSA) is calculated, with a value above 0.50 indicating sufficient intercorrelation exists to proceed with a factor analysis (Hair et al., 2006). In the application of factor analysis methods, this study specifically uses principal components analysis, which is a commonly used method of factor analysis that has also been employed in previous taxonomies in the health services literature (e.g., Bauer & Ameringer, 2010; Bazzoli et al., 1999; Dubbs et al., 2004; Lewis & Alexander, 1986; Weiner & Alexander, 1993).

A key consideration when performing principal components analysis is determining the number of factors to retain, and there a number of different criteria scholars may use to make this decision. First, using the latent root criterion, a common cutoff employed in factor analysis is retaining factors with eigenvalues greater than 1.0. However, Hair and colleagues (2006) caution that, in analyses of fewer than 20 variables, this cutoff point tends to produce too few factor extractions. A second common criterion is to retain the number of factors that account for a prespecified cumulative percentage of the variance in the study data (Jolliffe, 2002; Tuffery, 2011), and although "no absolute threshold has been adopted" across different fields of study (Hair et al., 2006, p. 120), such cutoffs generally range between 70 and 90 percent (Jolliffe, 2002). Some recent taxonomic efforts employing factor analysis methods (e.g., Bauer & Ameringer, 2010) have utilized a specified percentage of variance criterion of 80 percent. Finally, a third common example of stopping criteria is to examine the scree test, which identifies "the optimum number of factors that can be extracted before the amount of unique variance begins to dominate the common variance structure" (Hair et al., 2006, p. 120). In evaluating a scree test, the number of factors to extract is suggested by the point at which the eigenvalue plot straightens to become a horizontal line, also referred to as the "inflection point," and this typically allows for the retention of a greater number of factors than the latent root criterion (Hair et al., 2006; Jolliffe, 2002; Tuffery, 2011). Acknowledging these common factor extraction criteria, this study will evaluate several stopping criteria to identify the appropriate number of factors that are both parsimonious and representative of the study data, as recommended by Hair and colleagues (2006).

Once factors are retained, scholars suggest rotating the factor matrix in order to effectively interpret factor structures and yield meaningful factor solutions (Hair et al., 2006; Jackson, 1991; Jolliffe, 2002; Tuffery, 2011). The two rotation methods available to researchers include orthogonal and oblique factor rotations, and of these two methods, orthogonal rotation methods are the most commonly used and often preferred (Hair et al., 2006; Ketchen & Shook, 1996; Punj & Stewart, 1983). Specifically, the varimax rotation is the most widely accepted and frequently employed orthogonal rotation (Dunteman, 1989; Tuffery, 2011), and this study will interpret factor structures using the varimax rotational approach.

Factor loadings from the varimax rotation, which represent the correlations between study variables and factors, are then evaluated for significance, as are the communalities of study variables, which indicate the degree to which variables are explained by factor solutions. Significant factor loading values, based upon a 0.05 significance level and a power level of 80 percent, are dependent upon the sample size of the study's taxonomic analysis, and variable communality levels below 0.50 are generally regarded as unacceptable (Hair et al., 2006). Factor loadings from the varimax rotation are also compared to loadings from two other rotation methods in order to assess consistency and comparability in factor analysis results. These comparison rotations include the oblimin rotation, which is a common oblique rotation method, and the promax rotation, which is a "hybrid" rotation method that combines an orthogonal varimax rotation with a subsequent oblique rotation (Tuffery, 2011).

Finally, once factor solutions are established, each factor is evaluated based upon its significant factor loadings and interpreted for the underlying dimensions it may represent. For the purposes of evaluating the appropriateness of classification variables, each classification variable is examined as to its contribution to underlying factors as well as the degree to which it is explained by the factor solutions. Classification variables that lack evidence of significant contribution to underlying factors according to principal components analysis results are considered for removal from the cluster analysis.

Variable standardization. Having analyzed and selected variables for the cluster analysis, an important consideration is whether the data associated with such variables require standardization. For cluster analyses utilizing variables with different measurement units, scholars recommend standardizing study data prior to performing a cluster analysis (Aldenderfer & Blashfield, 1984; Lewis & Alexander, 1986). However, Aldenderfer and Blashfield (1984) note that controversy exists "as to whether standardization should be a routine procedure in cluster analysis" (p. 20). In consideration of this warning, this study adheres to Ketchen and Shook's (1996) recommendation that cluster analyses be performed both using standardized data and not employing standardization, with results compared to determine whether the use of standardized data yields solutions with higher validity. Specifically, the study's primary cluster analysis uses individual, standardized classification variables, with separate cluster analysis results using individual, non-standardized variables evaluated and compared.

Clustering algorithm. Next, a key decision in performing a cluster analysis involves the selection of a clustering algorithm that is used to group observations into cluster solutions. The two predominant categories of clustering algorithms include hierarchical and nonhierarchical procedures (Hair et al., 2006), and of these, hierarchical agglomerative methods are the most commonly applied in cluster analyses (Aldenderfer & Blashfield, 1984). Hierarchical agglomerative methods produce nonoverlapping clusters by sequentially combining single observations into nested clusters based upon levels of similarity (Aldenderfer & Blasfhield, 1984; Hair et al., 2006). As each progressive step in the hierarchical process combines the two clusters with the highest level of similarity, the number of clusters – which originally consisted of all observations as single-member clusters – are reduced until all observations are combined into a single cluster.

A variety of hierarchical clustering procedures exist, with the most popular hierarchical clustering algorithms including the single-linkage method, the complete-linkage method, the average linkage method, and the Ward's method (Aldenderfer & Blashfield, 1984; Hair et al., 2006). Each of these hierarchical clustering algorithms is distinguished in the ways it measures similarity to combine clusters during the agglomeration process. The single-linkage algorithm, also referred to as the nearest-neighbor method, is the most basic of hierarchical clustering algorithms (Aldenderfer & Blashfield, 1984), defining similarity as "the shortest distance from any one object in one cluster to any object in the other" (Hair et al., 2006, p. 586). However, this method often produces less-than-optimal solutions, as a tendency to "chain" or repeatedly nest successive clusters into a single, long group often produces a very large cluster with dissimilar observations and a collection of remaining single-observation clusters (Aldenderfer & Blashfield, 1984; Hair et al., 2006).

In contrast, the complete-linkage method, also known as the farthest-neighbor method, defines similarity by evaluating the maximum possible distances between observations in separate clusters and then combining the two clusters in which this distance, accounting for *all* members of the two clusters, is minimized. The complete-linkage method is viewed as comparable but more rigorous than the single-linkage method, employing opposite logic that eliminates the "chaining" tendencies observed in the single-linkage algorithm (Aldenderfer & Blashfield, 1984; Hair et al., 2006). Whereas the single-linkage and complete-linkage methods apply opposing views of similarity, the average linkage method serves as a balance between these two algorithms, defining similarity between two clusters as the level of similarity between the average similarities of all observations within the respective clusters.

In comparison to these three procedures, the Ward's method avoids applying a single measure of similarity to combine two clusters, but instead seeks to "optimize the minimum variance within clusters" (Aldenderfer & Blashfield, 1984, p. 43). As a result, clusters are sequentially formed and combined by identifying combinations of clusters that produce the smallest increase in the error sum of squares, summed across all variables, when grouped together (Hair et al., 2006, p. 588; Burns & Burns, 2008). As with every hierarchical clustering procedure, Ward's method is not without limitations. Some important criticisms of Ward's method include its tendency to combine smaller clusters and produce similarly sized clusters (Aldenderfer & Blashfield, 1984; Alexander et al., 1996; Hair et al., 2006). However, it is also widely appreciated as an efficient and effective means to cluster observations "when the number and types of groups cannot be determined a priori by the researcher" (Alexander et al., 1996, p. 79; Burns & Burns, 2008). Furthermore, scholars have found that, when outlier observations are appropriately addressed, the Ward's method outperforms other hierarchical algorithms (Punj & Stewart, 1983) and "is superior when the clusters are not well separated in multidimensional space" (Weiner & Alexander, 1993, p. 333; Aldenderfer & Blashfield, 1984). As a result, the Ward's method is a highly popular hierarchical algorithm in cluster analyses (Burns & Burns, 2008; Leask & Parker, 2007; Short, Payne, & Ketchen, 2008).

In each of these hierarchical cluster analyses, another key decision is the selection of a similarity measure with which to group observations into cluster solutions. Of available similarity measures, distance measures are the most widely used, reflecting observations' proximities to one another across the classification variables (Aldenderfer & Blashfield, 1984; Hair et al., 2006). Distance measures are also preferred given their representation of the concept of proximity as well as their ability to effectively compare characteristics measured by metric variables (Hair et al., 2006). Numerous types of distance measures exist, including the straightforward and commonly accepted Euclidean distance (i.e., straight-line distance) and squared Euclidean distance measures. In particular, the squared Euclidean distance is often preferred and more widely used in comparison to the simple Euclidean distance measure as it places "progressively greater weight on objects that are further apart" (Burns & Burns, 2008, p. 557). For these reasons, and because it is the recommended distance measure to use with the Ward's clustering algorithm (Hair et al., 2006), this study applies squared Euclidean distance measures in its hierarchical clustering algorithms.

Adhering to procedures described in other well-regarded cluster analyses (e.g., Alexander et al., 1996; Bauer & Ameringer, 2010; Bazzoli et al., 1999; Dubbs et al., 2004; Lewis & Alexander, 1986; Weiner & Alexander, 1993), this study conducts multiple cluster analyses using each of the previously described clustering algorithms (singe-linkage, complete-linkage, average linkage, and Ward's method), with cluster results retained from the algorithm providing the best representation of the data. Cluster results across the four algorithms are compared according to the number of observations partitioned into each cluster as well as the percentage of observations assigned into the same groupings between pairs of algorithms. In addition, the Hubert-Arabie adjusted Rand index is calculated for each pairing of algorithm solutions, providing a more sophisticated measure from which to compare hierarchical cluster analysis results.

Introduced by Hubert and Arabie (1985), the adjusted Rand index is an adaptation of the original Rand index (Rand, 1971) which is a statistic that compares partitions based on their level of agreement across all possible pairs of solutions. Whereas the Rand index (RI) may be summarized as the number of class agreements between solution pairs in two partitions divided by the total number of solution pairs, Hubert and Arabie (1985) proposed an adjusted Rand index (ARI_{HA}) that corrects the original statistic for partitioning that occurs by chance, summarized as:

$$\frac{Index - Expected\ Index}{Maximum\ Index - Expected\ Index}.$$

The original Rand index is calculated as RI = $\frac{a+d}{a+b+c+d}$, where *a* is the number of pairs of objects in a dataset placed in the same classification group in partition *U* and the same group in partition *V*, *b* is the number of pairs of objects in a dataset placed in the same classification group in partition *U* but different groups in partition *V*, *c* is the number of pairs classified in different groups in partition *U* but the same groups in partition *V*, and *d* is the total pairs classified in different groups in both the *U* and *V* partitions (Steinley, 2004). In contrast, the adjusted Rand index by Hubert and Arabie (1985) adjusts this equation, now calculated as:

$ARI_{HA} = \frac{\binom{N}{2}(a+d) - [(a+b)(a+c) + (c+d)(b+d)]}{\binom{N}{2}^2 - [(a+b)(a+c) + (c+d)(b+d)]}$, where $\binom{N}{2}$ represents all possible pairs of solutions.

Although the original Rand index provides values between 0 and 1, with 0 indicating no agreement between cluster solutions and 1 indicating perfect agreement between two solutions, the ARI_{HA} is bound between -1 and 1, and a value of 0 indicates the agreement between two solutions is equal to the expected value – in other words, the level of agreement expected if groupings were randomly assigned (Hubert & Arabie, 1985). The ARI_{HA} is a "steeper, more discriminating" measure of classification rate agreement, as evident in its lower scores in comparison to other agreement measures, including the original Rand index, and its ability to account for chance classifications as well as its heightened sensitivity to partition overlap makes it a "more informative" measure of agreement between two cluster solutions (Steinley, 2004, pp. 394-395).

Cluster number determination. The determination of the number of clusters that best represents the study data is another critical issue when performing hierarchical cluster analysis. Hair and colleagues (2006) note that "no standard objective selection procedure exists" to determine the appropriate number of clusters (p. 592). However, a popular and simple stopping rule that has been widely recognized and applied in cluster analyses is to calculate the percentage change in agglomeration coefficient with each successive cluster solution. The agglomeration coefficient represents “the increase in heterogeneity that occurs when…two clusters are combined,” and researchers examine agglomeration coefficient change to identify the optimal cluster solution, comparing which cluster solutions yield substantial or marginal changes in heterogeneity while balancing consideration for parsimony (Hair et al., 2006, p. 606; Ketchen & Shook, 1996).

Two other common methods of determining an optimal cluster solution are to visually inspect a dendrogram and an agglomeration plot (Aldenderfer & Blashfield, 1984). A dendrogram visually depicts the sequential combination of clusters within each step of a hierarchical clustering procedure, allowing researchers to determine the appropriate number of clusters by recognizing the major clusters graphically represented. Similar to a scree plot, an agglomeration plot places the number of cluster solutions against their corresponding agglomeration coefficients on a graph, and a “flattening” of the agglomeration curve “suggests that no new information is portrayed by the following mergers” (Aldenderfer & Blashfield, 1984, p. 54). Consistent with Ketchen and Shook’s (1996) recommendation to use multiple cluster determination techniques, this study examines changes in agglomeration coefficients, dendrograms, and agglomeration plots to select the optimal number of clusters in the hierarchical cluster analyses.

Nonhierarchical cluster analysis. Having identified the optimal cluster solution and hierarchical clustering algorithm through multiple hierarchical cluster analyses, this study proceeds to use results from this optimal solution to conduct a nonhierarchical cluster analysis. Experts warn that sole reliance on hierarchical algorithms presents considerable limitations, including the inability to modify poor cluster assignments, the risk of easy distortion by extreme observations, increased difficulty identifying clusters representative of small proportions of the study sample, and instability when data are reordered or cases are dropped (Aldenderfer & Blashfield, 1984; Hair et al., 2006). As recommended by numerous scholars (Burns & Burns, 2008; Hair et al., 2006; Ketchen & Shook, 1996; Punj & Stewart, 1983), this study adopts a two-stage approach, in which "a hierarchical algorithm is used to define the number of clusters and cluster centroids," followed by the application of a nonhierarchical (i.e., iterative) algorithm method (Ketchen & Shook, 1996, p. 446).

Unlike hierarchical algorithms, nonhierarchical clustering procedures assign observations into a prespecified number of clusters. This occurs first by identifying the clusters' initial centroids or "seeds," which are starting points from which observations are then assigned based upon their similarity with a particular cluster's seed (Hair et al., 2006; Ketchen & Shook, 1996). Cluster centroids are continually recalculated with each iteration, and observations may be reassigned to different clusters as the assignment procedure progresses and centroids are recomputed. In such a case, reassignment becomes warranted when an observation's assigned cluster becomes more distant than another cluster centroid, and multiple passes (i.e., iterations) occur in the nonhierarchical clustering procedure until convergence is achieved and no further reassignments occur among study observations (Ketchen & Shook, 1996, p. 446; Aldenderfer & Blashfield, 1984).

Nonhierarchical clustering procedures, often referred to as *K*-means clustering, are admired for their ability to optimize homogeneity within clusters and heterogeneity between clusters (Ketchen & Shook, 1996, p. 446), and they have also been shown to be less affected by outlier observations, distance measures, and inappropriate variables (Hair et al., 2006, p .591). However, their requirement of initially specified cluster centroids presents serious challenges when the researcher has no solid basis from which to specify cluster seeds or begins with random seed points (Hair et al., 2006). Thus, as previously noted, a combination of hierarchical and nonhierarchical clustering methods is strongly advised (Hair et al., 2006; Ketchen & Shook, 1996), with hierarchical clustering results serving as the initial cluster centroids for iterative procedures. In combining these approaches, the nonhierarchical clustering method complements hierarchical cluster methods, allowing for cluster membership to be adjusted and refined while offsetting disadvantages inherent in both procedures (Hair et al., 2006). This study pairs hierarchical cluster methods with a subsequent *K*-means cluster analysis, and SPSS 21 software is used for both hierarchical and nonhierarchical cluster analyses.

Cluster reliability and validity. A critical step in the process of conducting a cluster analysis is to test the reliability and validity of the final cluster solution. Ketchen and Shook (1996) note that before a cluster solution is validated, its reliability must be established, and a common means to address reliability involves the comparison of results from multiple cluster analyses, including solutions from numerous hierarchical algorithms and non-hierarchical methods as well as solutions using different approaches to address issues such as variable standardization or multicollinearity. This study's performance of cluster analyses multiple times – employing numerous hierarchical clustering algorithms, conducting nonhierarchical cluster analyses using centroids from hierarchical cluster analysis results as well as random initial seeds, incorporating standardized and nonstandardized variables, and using uncorrelated factor scores in substitution for original observation values – allows for the evaluation of the reliability of the final cluster solution.

To compare the results across multiple cluster analyses, simple classification agreement rates as well as Hubert-Arabie adjusted Rand index (ARI_{HA}) scores are determined between the final cluster solution and alternate cluster solutions. As previously noted, the ARI_{HA} is recognized as a superior statistic of classification rate agreement between two partitions and is therefore a widely favored measure to validate cluster results (Milligan & Cooper, 1986; Salstone & Stange, 1996; Steinley, 2004). Scholars have noted the frequent inclusion of ARI_{HA} as a validation measure in modern cluster analyses (e.g., Steinley, 2004), including the recent study of national health systems by Bauer and Ameringer (2010).

In addition, a common internal validation technique for cluster analysis solutions includes the use of multiple discriminant analysis methods. Discriminant analysis tests "the hypothesis that the group means of a set of independent variables for two or more groups are equal" (Hair et al., 2006, p. 274; Klecka, 1980). Discriminant scores for study objects – in this case, clusters – are calculated and averaged within specified groups, creating "centroids." These group centroids are then compared and tested to determine whether the distance between centroids is statistically significant – that is, whether the specified groups can be statistically discriminated from one another based upon a set of independent variables (Klecka, 1980). Past taxonomic studies (e.g., Alexander et al., 1996; Bazzoli et al., 1999; Lewis & Alexander, 1986; Weiner & Alexander, 1993) have also utilized the results of discriminant analyses to determine the percentage of observations correctly classified within groups during the cluster analysis.

The first consideration researchers face when conducting discriminant analyses is the adequacy of the sample size, as results may be sensitive to the number of overall observations in the sample as well as the number of observations grouped within each classification category. Hair and colleagues (2006) note that ideal sample sizes maintain a ratio of at least 20 observations for each independent variable, with minimum recommended sample sizes consisting of at least five observations per independent variable. In addition, they suggest that “each category should have at least 20 observations,” and that researchers should “maintain an adequate sample size both overall and for each group” (Hair et al., 2006, p. 289). Prior to the performance of this study’s discriminant analysis, the size of the study sample and groups within the final cluster solution are evaluated to determine whether such criteria are met.

Next, a key assumption within multiple discriminant analysis is that groups maintain equal covariance structures (Hair et al., 2006; Klecka, 1980), and the Box’s M test is performed as an initial step in the discriminant analysis to assess the equality of covariance matrices. If evidence suggests unequal covariance structures, a remedy employed in the discriminant analysis is to conduct the classification test using a separate-groups covariance matrix and compare those to cross-validated results from a discriminant analysis using a within-groups covariance matrix, with cross-validation of the discriminant results using the “leave-one-out” principle (Hair et al., 2006). Another cross-validation technique includes splitting the total sample into two divisions, with one division used to generate discriminant functions and the second “holdout” subsample used to validate findings. However, the size of the overall sample and individual cluster groups is once again important to consider, and generally scholars suggest creating a holdout sample only if the overall sample size is greater than 100 observations (Hair et al., 2006).

This study’s discriminant analysis employs the simultaneous estimation method, given the theoretical basis for inclusion of each of the classification variables (Hair et al., 2006). The statistical significance of the overall discriminant model and the individual discriminant functions is evaluated according to the Wilks’ lambda measure, and the degree to which the multiple discriminant analysis results agree with the final cluster solution is indicated in the hit ratio, which is calculated as the percentage of correctly classified objects within the study sample. The assessment of correct classification depends upon the definition of prior probabilities for group classification, with prior probabilities either equal across the number of clusters or based on the size of the clusters in the final cluster solution (Hair et al., 2006). Assuming that the study sample and the sizes of clusters in the final cluster solution are representative of the group sizes in the population, the prior probabilities are equal to the proportion of observations in each cluster to the overall study sample. However, the stability of the discriminant analysis results will be assessed by conducting a second discriminant analysis defining prior probabilities for group classification as equal across all groups.

In addition, determination of the level of predictive accuracy of the multiple discriminant analysis may be evaluated using the proportional chance criterion, defined as $C_{\text{PRO}} = p_1^2 + p_2^2 + \ldots p_n^2$, where p is the proportion of observations assigned to an individual cluster out of a total n number of clusters (Hair et al., 2006, p. 302). Hit ratios exceeding the proportional chance criterion by 25 percent suggest predictive accuracy at acceptable levels (Hair et al., 2006).

Cluster profiles. After assessing the reliability and validity of the final cluster solution, the characteristics of each cluster are described and compared, allowing for the profiling and interpretation of the solution's clusters. Classification variables serve as the distinguishing characteristics with which to profile clusters, and analysis of variance allows for detailed examination of the degree to which clusters within the final solution differ at statistically significant levels across these clustering variables. Significant differences in the resulting clusters indicate that distinct groups exist across the prespecified constructs that serve as the study's conceptual framework (Aldenderfer & Blashfield, 1984). In this sense, the profiling and interpretation of the solution's clusters also serves as a validation technique of the final cluster solution.

When performing an analysis of variance across numerous classification variables, a researcher may either conduct separate analysis of variance (ANOVA) tests for each variable or a multivariate analysis of variance (MANOVA) that simultaneously examines the collection of classification variables. Scholars note that MANOVA is a beneficial method in several ways over ANOVA, including the ability to "detect combined differences not found in the univariate tests" (Hair et al., 2006, p. 400). However, issues pertaining to important assumptions about sample size and variance-covariance matrices must be accounted for. Specifically, MANOVA is sensitive to the size of not only the total sample, but also the individual groups within a dataset. As a result, each group must include a greater number of observations than the total number of dependent variables (i.e., classification variables) included in the analysis, and scholars suggest at least 20 observations within each group (Hair et al., 2006). Similar to a key assumption in discriminant analysis methods, the MANOVA test assumes that covariance structures are equal across the independent variable groups, and the Box's M test assess the equality of covariance matrices within the dataset. Also, high multicollinearity among dependent variables can strongly influence the statistical power of MANOVA tests, and for this reason any presence of multicollinearity among classification variables must be addressed.

Thus, the appropriateness of a MANOVA test may be dependent upon the size of classification groups as well as whether covariance structures are equal and multicollinearity is present across classification variables. Upon evaluation of these issues, MANOVA or separate ANOVA tests are performed, with the groups identified in the final cluster solution serving as the independent variable and the classification variables serving as dependent variables. Statistical significance tests in either analysis indicate whether the means of classification variables are equal across the independent groups. However, both tests also require post-hoc methods to compare differences *between* groups and identify which differences are observed at statistically significant levels (Hair et al., 2006).

Also referred to as pairwise multiple comparisons (PMC), many different PMC procedures exist, and scholars note different conditions in which certain PMC procedures are favored over others. Specifically, Tukey's honestly significant difference (HSD) method is often preferred under optimal conditions, and the Games-Howell method is recommended for instances of violated assumptions (Games, Keselman, & Rogan, 1981; Jaccard, Becker, & Wood, 1984). Depending upon whether optimal conditions are observed, this study conducts post-hoc tests using either Tukey's HSD or Games-Howell methods, comparing each pair of groups in the final cluster solution across the study's classification variables. From these results, descriptive profiles of each cluster solution are generated.

External validation. Finally, having obtained a final cluster solution, scholars strongly recommend validating the results by performing significance tests using external variables not previously included as classification variables (Aldenderfer & Blashfield, 1984; Hair et al., 2006; Ketchen & Shook, 1996). These variables "should be theoretically related to the clusters, but not used in defining clusters" (Ketchen & Shook, 1996, p. 447), and their significant relationships with clusters is seen as a powerful indicator of a cluster solution's criterion validity and generality (Aldenderfer & Blashfield, 1984). As previously described, the fourth aim of this study is to explain the varied forms of hospital-based clusters, and an analysis of the relationships between common cluster forms – as identified in the final cluster solution – and theoretically derived external variables is pursued to further validate the final cluster solution and fulfill the study's fourth aim. Following the presentation and description of cluster analysis results in the next chapter, the sixth chapter presents the theoretical framework for the external variables and describes the methods and results relating to an analysis of the relationship between cluster forms and external variables.

Summary

Throughout Chapter 4, we have presented the study design, data sources, variable measurements, and analytic methods employed to address the study's first three aims, which collectively seek to identify and describe the common forms assumed by clusters through evaluation of their varied components and configurations. First, a national inventory of hospital-based clusters is updated to reflect urban and regional cluster membership as of 2012. Second, a catalog of clusters' hospital-based and non-hospital-based sites as of 2012 is compiled for a sample of regional clusters from Florida, Maryland, Nevada, Texas, Virginia, and Washington. Third, descriptive analyses of regional clusters are performed to evaluate and provide comparisons across clusters, their components, and the 16 classification variables developed for the study. Finally, a taxonomic analysis is performed to partition hospital-based clusters into groups representing common forms, with the partitioning process informed by measures reflecting the constructs of horizontal differentiation, vertical differentiation, configuration, horizontal integration, vertical integration, and coordination, as presented in the conceptual framework. This taxonomic analysis includes numerous steps – including principal component analysis, hierarchical cluster analysis, nonhierarchical cluster analysis, multiple discriminant analysis, and analysis of variance, among others – to achieve a final, reliable, and valid cluster solution. The resulting groups provided by the final cluster analysis solution are then compared to identify the distinguishing characteristics of these common hospital-based cluster forms. Chapter 5 presents the results of the updated cluster inventory, evaluation of the cluster components catalog, and the taxonomic analysis.

Chapter 5: Taxonomic Analysis Results

This chapter presents the results of the updated inventory of clusters and the catalog of cluster components, in association with the study's first two aims. Results of the study's descriptive and taxonomic analyses are then presented, relating to the third aim, followed by a brief descriptive overview of common cluster forms identified through the taxonomic analysis solution.

Cluster Inventory

Primary data collection efforts yielded an updated inventory of U.S. clusters as of 2012, with counts for clusters using both urban and regional boundary definitions. Results of the updated inventory are summarized in Table 2.

Using an urban boundary definition, which restricts cluster membership to same-system hospitals operating in a single CBSA, there were 538 hospital-based clusters operating across the U.S. as of 2012. These included 1,721 general, acute care hospitals, or 36.20 percent of the population of 4,754 general, acute care hospitals in the U.S. in 2012. By expanding cluster boundaries to a regional definition, in which cluster membership includes same-system hospitals operating within 150 miles of the local lead (i.e., largest) hospital, the number of clusters in the U.S. as of 2012 increases to 682 clusters. This includes 2,704 general, acute care hospitals, or 56.88 percent of the total population of general, acute care hospitals in the U.S. in 2012.

Table 2. *Cluster inventory by urban and regional boundary definitions, 2012*

	Urban Clusters		Regional Clusters	
Cluster Size	*N*	*%*	*N*	*%*
2 Facilities	289	53.72%	267	39.15%
3 to 4 Facilities	158	29.37%	228	33.43%
5 to 7 Facilities	63	11.71%	122	17.89%
8 or More Facilities	28	5.20%	65	9.53%
Cluster Market(s)				
Urban	538	100.00%	291	42.67%
Urban-Urban	0	0.00%	201	29.47%
Urban-Rural	0	0.00%	169	24.78%
Rural	0	0.00%	21	3.08%
Cluster Ownership				
Nonprofit, Government	47	8.74%	63	9.24%
Nonprofit, Religious	100	18.59%	127	18.62%
Nonprofit, Secular	292	54.28%	342	50.15%
For-profit	99	18.40%	150	21.99%
Total	**538**		**682**	

A more detailed examination of clusters within the updated inventory indicates several patterns of interest. Among the 538 urban clusters, a little more than half of all clusters (289) consisted of only 2 general, acute care hospitals, and a little less than one-third of urban clusters (158) included 3 or 4 hospitals. Roughly 17 percent of urban clusters operated 5 or more general, acute care hospitals, with 63 and 28 clusters operating 5 to 7 hospitals and 8 or more hospitals, respectively. However, the pattern of cluster sizes changes considerably when applying a regional boundary. Among regional clusters, 267, or 39.15 percent, operate just 2 general, acute care hospitals, while 228 clusters – essentially one-third of all regional clusters – operate 3 or 4 hospitals. Roughly 18 percent of all regional clusters (122) include between 5 and 7 hospitals, and nearly 10 percent of regional clusters (65) consist of 8 or more general, acute care hospitals. These differences in the sizes of clusters when comparing urban and regional boundaries reflect the tendency of the urban cluster boundary definition to underreport cluster membership, as noted in other studies (Shay et al., 2011, in press).

Examining clusters according to their market types also reveals the value in adopting a regional cluster boundary definition. By definition, urban clusters are restricted to same-system hospitals operating in the same CBSA. However, regional clusters are not bound by such restrictions but instead are defined by radial distance from lead facilities, allowing their market composition to include conjoining CBSAs as well as proximate rural areas. The updated inventory of U.S. clusters in 2012 reveals that less than half of all regional clusters – 291 clusters, or 42.67 percent – are entirely contained within a single CBSA, and nearly one-third of all regional clusters – 201 clusters, or 29.47 percent – include facilities in neighboring CBSAs. Importantly, the regional cluster boundary definition recognizes cluster membership of facilities operating in rural areas, as approximately one-fourth of all regional clusters consist of combinations of urban and rural hospitals. And, roughly 3 percent of regional clusters consist of proximate, same-system hospitals operating entirely in rural areas.

Patterns in cluster ownership also vary by cluster boundary definitions. Among urban clusters, over half – 54.28 percent – are owned and operated by nonprofit, secular organizations. Essentially an equal number of urban clusters – just over 18 percent – are owned and operated by nonprofit, religious organizations and for-profit corporations, respectively. Less than nine percent of urban clusters are owned and operated by government entities. In comparison to urban clusters, a similar share of regional clusters are owned and operated by nonprofit, religious organizations, and the same can be said of government-owned clusters. However, a greater percentage of regional clusters – approximately 22 percent – are for-profit, in comparison to urban clusters, and a smaller percentage of regional clusters – roughly half – are owned by secular, nonprofit organizations.

Having identified the number of clusters operating in the U.S. in 2012, we now focus on the statistics regarding individual hospitals' membership in such clusters. Examination of individual hospitals' membership in urban and regional clusters displays the considerable presence of clusters in markets throughout the U.S. These statistics comparing urban and regional clusters are displayed in Table 3.

Table 3. *Hospitals' cluster membership by CBSA type, 2012*

	Urban Cluster Membership		Regional Cluster Membership		No Cluster Membership	
All Hospitals	*N*	*%*	*N*	*%*	*N*	*%*
METSA Hospitals	1,606	58.83%	1,932	70.77%	798	29.23%
MICSA Hospitals	115	13.53%	399	46.94%	451	53.06%
Rural Hospitals	0	0.00%	373	46.57%	801	53.43%
TOTAL	**1,721**	**36.20%**	**2,704**	**56.88%**	**2,050**	**43.12%**
MHS Hospitals						
METSA Hospitals	1,606	78.61%	1,932	94.57%	111	5.43%
MICSA Hospitals	115	25.27%	399	87.69%	56	12.31%
Rural Hospitals	0	0.00%	373	91.20%	36	8.80%
TOTAL	**1,721**	**59.20%**	**2,704**	**93.02%**	**203**	**6.98%**

Note: MHS = Multi-hospital system; METSA = Metropolitan Statistical Area; MICSA = Micropolitan Statistical Area

Using the urban cluster boundary definition, over 58 percent of all U.S. hospitals in METSAs are cluster members, and over 13 percent of MICSA hospitals participate in local clusters. Expanding cluster boundaries to the regional definition, over 70 percent of all METSA hospitals and nearly 47 percent of all MICSA hospitals in the U.S. operate as members of local clusters. In addition, the regional cluster boundary definition recognizes nearly 47 percent of all rural U.S. hospitals as cluster members. These statistics are even more pronounced among multi-hospital system members. Of the 2,907 U.S. hospitals operating as members of multi-hospital systems, over 59 percent are included in urban clusters, and 93 percent are regional cluster members. Among multi-hospital system members in METSAs, these figures increase to over 78 percent and nearly 95 percent, respectively. In addition, over 87 percent of multi-hospital system members in MICSAs and over 91 percent of multi-hospital system members in rural areas participate in regional clusters. Thus, it is evident that clusters maintain a considerable presence in markets throughout the United States, with the majority of hospitals – and the overwhelming majority of multi-hospital system members – participating as members of regional clusters.

Cluster Catalog

Having updated the inventory of hospital-based clusters as of 2012, in accordance with the study's first aim, the next step is to develop a catalog of clusters' components, including their hospital-based and non-hospital-based service locations. Given the limited availability of data from the Intellimed dataset, which is restricted to six states, the study sample for the cluster catalog consists of clusters operating in Florida, Maryland, Nevada, Texas, Virginia, and Washington. Examination of the 2012 inventory of regional clusters reveals that, of these six states, 520 of a total 840 hospitals (61.90 percent) operate within regional clusters. Table 4 provides additional descriptive statistics comparing hospitals in the study sample's six states to the total population of U.S. general, acute care hospitals.

Table 4. *Characteristics of hospitals in the sample's six states and U.S. hospital population*

State	# of Hospitals	Regional Cluster Members	METSA Location	MICSA Location	Rural Location	Nonprofit	For profit	Average Number of Beds
Florida	206	161 (78%)	176 (85%)	16 (8%)	14 (7%)	121 (59%)	85 (41%)	208
Maryland	45	28 (62%)	39 (87%)	4 (9%)	2 (4%)	45 (100%)	0 (0%)	229
Nevada	32	16 (50%)	22 (69%)	6 (19%)	4 (13%)	17 (53%)	15 (47%)	224
Texas	383	206 (54%)	234 (61%)	49 (13%)	100 (26%)	253 (66%)	130 (34%)	186
Virginia	84	70 (83%)	55 (65%)	5 (6%)	24 (29%)	64 (76%)	20 (24%)	201
Washington	90	39 (43%)	55 (61%)	17 (19%)	18 (20%)	81 (90%)	9 (10%)	142
6-state total	840	520 (62%)*	581 (69%)**	97 (12%)**	162 (19%)**	581 (69%)**	259 (31%)**	192*
U.S. total	4,754	2,704 (57%)	2,730 (57%)	850 (18%)	1,174 (25%)	3,990 (84%)	764 (16%)	175

*Note: t-test comparison of sample and population averages: * p<0.01; **p<0.001*

On average, hospitals in the six states from which the study sample is derived have a slightly higher rate of membership in regional clusters, are more urban, are more likely to be for-profit, and maintain a larger number of beds in comparison to the entire U.S. population of hospitals. Each of these observed differences between sample and population averages are statistically significant at the 0.01 level. From this group of general, acute care hospitals in six states, a sample of regional clusters operating in these same six states is then identified.

Of the 520 cluster members located in the study's six-state sample, 496 participate in regional clusters *based* within these states (i.e., their clusters' lead hospitals also operate in the study sample states). The presence of the lead hospital within the six-state group is critical, as measures for four of the study's classification variables (case mix difference, extreme case share, birth case distribution, and hospital transfer difference) require a comparison of lead to non-lead cluster members using Intellimed data. Therefore, the 24 regional cluster members participating in clusters with lead hospitals based *outside* of the six-state group are excluded from the study sample. The remaining 496 hospitals collectively represent 125 clusters.

Through further examination of these 125 clusters, an additional ten facilities that are non-lead members of one of the 125 clusters but operate outside of the ten sample states are identified, and these include hospitals in: Atmore, Alabama; Hope, Arkansas; Susanville, California; Washington, DC; Waycross, Georgia; Lake Charles, Louisiana; Danbury, North Carolina; Williamston, North Carolina; Romney, West Virginia; and, Berkeley Springs, West Virginia. However, detailed examination also reveals that, for some of these 125 clusters, insufficient data are available through either the AHA Annual Survey or Intellimed datasets in order to develop measures for the study variables previously described. Again, the measures for four classification variables require a comparison of lead to non-lead cluster members using Intellimed data, and for six clusters, each of which consists of only two hospital members, data for the non-lead comparison facility are unavailable. In addition, a number of facilities in the

AHA Annual Survey dataset fail to report their service offerings. For two clusters, none of their hospital members report service offerings in either the 2011 or 2010 AHA Annual Surveys, thereby preventing the development of measures for five of the study's classification variables (hospital services, vertically integrated stages, upstream vertical integration breadth, downstream vertical integration breadth, and duplicated services). Thus, of the 125 clusters based in the study's six-state group, a total of 117 regional clusters provide sufficient data to be included in the study sample. These 117 regional clusters include a total of 489 general, acute care hospitals. A summary of the development of the study sample, including the listing of clusters included in the sample as well as a listing of clusters excluded from the sample, is provided in Appendix 2.

It is important to note that, although sufficient data in the Intellimed and AHA Annual Survey datasets are available to create study measures for 117 regional clusters, there are a number of clusters within this sample with limited data for specific hospital members. Specifically, 5 of the 117 sample clusters each opened a general, acute care hospital in 2012, and therefore AHA Annual Survey data are unavailable for these five facilities. In addition, 28 of the sample clusters operated hospitals for which service data are reported in combination with other facilities in the AHA Annual Survey dataset. This combination of service data for multiple facilities within a single observation in the AHA Annual Survey dataset is observed for a total of 45 of the sample's hospitals. For 12 hospitals, included in 9 of the sample clusters, service data from the AHA Annual Survey dataset are not provided for 2011 but are available for 2010. In these instances, 2010 service data are substituted for the missing 2011 data. And, for 39 hospitals, included in 19 of the sample clusters, service data from the AHA Annual Survey dataset are not provided for 2011 as well as 2010. However, each of these 19 clusters with missing service data for specific cluster members maintain service data for at least one other member of the cluster, allowing for measurement of cluster service provision, albeit partial. Finally, 18 hospitals, which are included in 14 of the sample clusters, lacked data within the Intellimed dataset. As previously noted, 6 of these 18 cluster member facilities are located outside of the six-state group. And, for 8 of these 18 hospitals, the Intellimed dataset combines their admissions data with another cluster member, preventing this study from being able to separate out their individual admissions data. However, the data missing for these 18 facilities in the Intellimed dataset do not prevent the creation of measures as previously described for the remaining member hospitals in their respective clusters.

Thus, a total of 28 clusters lack facility-level data for certain hospital members, though sufficient information is available for the remaining members to develop measures for the study variables. In order to maximize the sample of clusters included in the taxonomic analysis, these clusters are maintained in the sample and noted for their missing data. For an additional 23 clusters, data from the AHA Annual Survey or Intellimed datasets are pooled together for two or more member hospitals into a single observation. In these instances, however, the pooling together of observations in the AHA Annual Survey and Intellimed datasets is consistent with study efforts to combine facility-level observations to the cluster level or examine averages across cluster members, and therefore these pooled observations are incorporated into measures developed for the study sample. Appendix 2 also notes the clusters with missing or pooled facility-level observations in the AHA Annual Survey and Intellimed datasets.

Table 5 compares the 117 clusters in the study sample to the larger groups of clusters maintaining facilities in the six-state group (including non-lead hospitals that are members of clusters based outside of the six-state group) as well as the total population of hospital-based clusters in the U.S.

Table 5. *Characteristics of clusters in the study sample*

State	# of Regional Clusters	Urban Location	Urban-Urban Location	Urban-Rural Location	Rural Location	Nonprofit	For profit	Average Number of Hospitals
Florida	35	20 (57%)	12 (34%)	3 (9%)	0 (0%)	21 (60%)	14 (40%)	4.40
Maryland	5	3 (60%)	1 (20%)	1 (20%)	0 (0%)	5 (100%)	0 (0%)	4.20
Nevada	4	3 (75%)	1 (25%)	0 (0%)	0 (0%)	2 (50%)	2 (50%)	3.50
Texas	48	26 (54%)	11 (23%)	10 (21%)	1 (2%)	25 (52%)	23 (48%)	4.23
Virginia	14	5 (36%)	3 (21%)	6 (43%)	0 (0%)	10 (71%)	4 (29%)	4.36
Washington	11	7 (64%)	2 (18%)	2 (18%)	0 (0%)	9 (82%)	2 (18%)	3.18
Sample	**117**	**64 (55%)[b]**	**30 (26%)**	**22 (19%)**	**1 (1%)[a]**	**72 (62%)[c]**	**45 (38%)[c]**	**4.17**
6 State Clusters	136	69 (51%)	38 (28%)	28 (21%)	1 (1%)	83 (61%)	53 (39%)	4.10
U.S. Clusters	682	291 (43%)	201 (29%)	169 (25%)	21 (3%)	532 (78%)	150 (22%)	3.96

Note: t-test comparison of sample and population averages: ᵃ = $p<0.05$; ᵇ = $p<0.01$; ᶜ = $p<0.001$

When compared to the population of clusters throughout the U.S., the study's sample of 117 clusters includes a significantly higher representation of clusters entirely located in a single CBSA and a lower proportion of rural clusters in comparison to the national cluster population. In addition, the sample's proportion of for-profit clusters is significantly higher than that of the population. However, across other characteristics, the clusters in the study sample are comparable to those in the entire U.S. population, and averages for cluster traits in the study sample do not differ at statistically significant levels in comparison to the total number of clusters operating facilities within the six states of Florida, Maryland, Nevada, Texas, Virginia, and Washington.

Cluster components. Having identified a sample of 117 clusters, a catalog of cluster components – that is, their various service locations – is compiled. Table 6 provides summary statistics regarding the sample's components, including the total number of unique service locations identified for each stage in the continuum of care as well as the number of clusters operating such locations.

As presented in Table 6, a wide variety of unique service locations are provided by the study's sample of 117 clusters. Over 96 percent of sample clusters operate some type of unique service location other than an acute care, general hospital, suggesting that clusters are indeed

Table 6. *Cluster components*

	Number of Individual Facilities		Number of Clusters Represented	
Service Location Stage & Type	*n*	%	*n*	%
Education of Labor	**7**	**0.27%**	**6**	**5.13%**
Health Profession Schools	7	0.27%	6	5.13%
Medical Equipment	**2**	**0.08%**	**2**	**1.71%**
Durable Medical Equipment Vendors	2	0.08%	2	1.71%
Ancillary Services	**166**	**6.52%**	**62**	**52.99%**
Diagnostic Centers	19	0.75%	14	11.97%
Imaging Centers	93	3.65%	39	33.33%
Laboratories	52	2.04%	25	21.37%
Pharmacies	2	0.08%	2	1.71%
Wellness and Health Promotion	**104**	**4.08%**	**27**	**23.08%**
Behavioral Health Schools	8	0.31%	1	0.85%
Fitness & Wellness Centers	66	2.59%	23	19.66%
School Clinics	30	1.18%	3	2.56%
Primary Care	**598**	**23.48%**	**76**	**64.96%**
Primary Care Clinics & Physician Practices	597	23.44%	75	64.10%
Free Clinics	1	0.04%	1	0.85%
Specialty Physician Care	**275**	**10.80%**	**70**	**59.83%**
Dental Clinics	1	0.04%	1	0.85%
Eye Clinics	7	0.27%	5	4.27%
Cancer Clinics & Oncology Practices	25	0.98%	15	12.82%
Heart Care Clinics & Cardiology Practices	41	1.61%	20	17.09%
Orthopedic Clinics & Practices	14	0.55%	10	8.55%
Pediatric Clinics & Practices	44	1.73%	19	16.24%
Women's Health Clinics & OB/GYN Practices	40	1.57%	25	21.37%
Other Specialty Physician Practices & Clinics	103	4.04%	48	41.03%
Acute Outpatient Care	**111**	**4.36%**	**41**	**35.04%**
Ambulatory Surgery Centers	86	3.38%	30	25.64%
Sleep Centers	11	0.43%	7	5.98%
Wound Care Centers	14	0.55%	12	10.26%
Non-Physician Provider Care	**250**	**9.82%**	**68**	**58.12%**
Behavioral Health Outpatient Clinics	26	1.02%	14	11.97%
Dialysis Centers	6	0.24%	4	3.42%
Infusion Service Centers	1	0.04%	1	0.85%
Occupational Health Clinics	10	0.39%	8	6.84%
Outpatient Rehabilitation Clinics	188	7.38%	51	43.59%
Retail Clinics	19	0.75%	11	9.40%
Urgent & Emergency Care	**145**	**5.69%**	**57**	**48.72%**
Freestanding Emergency Departments	44	1.73%	28	23.93%
Urgent Care Clinics	101	3.97%	38	32.48%
Multi-Service Outpatient Centers	**273**	**10.72%**	**78**	**66.67%**
General, Acute Care Hospitals	**489**	**19.20%**	**117**	**100.00%**
Specialty Hospital Inpatient Care	**20**	**0.79%**	**13**	**11.11%**
Pediatric Hospitals	5	0.20%	4	3.42%
Surgical Hospitals	8	0.31%	6	5.13%
Other Specialty Hospitals	7	0.27%	6	5.13%
Short-Term Inpatient Rehabilitation & Nursing	**35**	**1.37%**	**23**	**19.66%**
Behavioral Health Hospitals	19	0.75%	14	11.97%
Inpatient Rehabilitation Facilities	16	0.63%	14	11.97%
Long-Term Inpatient Rehabilitation & Nursing	**36**	**1.41%**	**23**	**19.66%**
Long-term Acute Care Hospitals	7	0.27%	7	5.98%
Skilled Nursing Facilities	29	1.14%	19	16.24%
Outpatient Rehabilitation & Nursing	**0**	**0.00%**	**0**	**0.00%**

Continued on following page

Table 6. *Cluster components (continued)*

	Number of Individual Facilities		Number of Clusters Represented	
Service Location Stage & Type	*n*	%	*n*	%
Extended Care & Living	**36**	**1.41%**	**17**	**14.53%**
Adult Day Care Centers	2	0.08%	2	1.71%
Assisted Living Facilities	3	0.12%	3	2.56%
Continuing Care Retirement Communities	10	0.39%	5	4.27%
Hospice Centers	8	0.31%	7	5.98%
Independent Living Facilities	2	0.08%	2	1.71%
Nursing Homes	4	0.16%	3	2.56%
PACE Centers	7	0.27%	3	2.56%
Total Service Locations	**2,547**	**100.00%**	**117**	**100.00%**
Total Locations Excluding General Hospitals	2,058	80.80%	113	96.58%

more than just hospitals. In fact, over 2,000 – roughly 80 percent – of the service locations identified in the cluster component catalog are non-hospital-based sites (that is, not consisting of a general, acute care hospital).

Of the different stages in the continuum of care represented by the more than 2,500 unique service locations in the study sample's catalog, the most common service location stage is primary care, with nearly 600 sites (over 23 percent) operated by almost two-thirds of the sample clusters. This is followed by general, acute inpatient care, which consists of the sample's 489 hospitals, or roughly 19 percent of the total 2,547 service locations. Other stages of note include specialty physician care, non-physician provider care, and ancillary services, comprising over ten percent, nine percent, and six percent of the sample service locations, respectively. In contrast, stages such as education of labor, medical equipment, and specialty hospital inpatient care, as well as all of the stages commonly referred to as "post-acute care" (i.e., short-term inpatient rehabilitation and nursing, long-term inpatient rehabilitation and nursing, outpatient rehabilitation and nursing, and extended care and living) each account for less than 2 percent of the sample clusters' service locations.

Examining cluster components by the *type* of service location, the most common unique service site observed among the study's sample is the primary care clinic or physician practice, representing nearly a quarter of all clusters' service locations. In fact, primary care clinics and practices outnumbered the general, acute care hospitals in the sample, 597 to 489, respectively. Multi-service outpatient centers are also a significant type of service location, with 273 such facilities (over one-tenth of the sample's service locations) operated by two-thirds of the sample clusters. Other prominent types of service locations include outpatient rehabilitation clinics (188, or over 7 percent of all sites), urgent care clinics (101, or roughly 4 percent of all sites), freestanding imaging centers (93, or 3.65 percent of all sites), ambulatory surgery centers (86, or over 3 percent of all sites), and fitness and wellness centers (66, or 2.59 percent of all sites).

A different perspective on clusters' operation of non-hospital-based sites is provided when looking at the proportion of clusters operating the 2,547 service locations in the study's catalog. As previously noted, approximately two-thirds of the sample's clusters operate multi-service outpatient centers, and the same can be said of primary care clinics and physician practices. Nearly 60 percent of all sample clusters operate some form of specialty physician practice, with the most common including clinics and practices dedicated to women's health (over 21 percent), cardiology (over 17 percent), and pediatric care (over 16 percent). Similarly, nearly 60 percent of all sample clusters operate some form of care site primarily serviced by non-physician providers, including outpatient rehabilitation clinics (over 43 percent), behavioral health outpatient clinics (nearly 12 percent), and retail clinics (over 9 percent). Over half of the sample clusters operate sites dedicated to ancillary services, such as imaging centers (one-third of all clusters), laboratories (over one-fifth of all clusters), and diagnostic centers (over one-tenth of all clusters). Other types of service location sites operated by a considerable number of the study samples include urgent care clinics (over 32 percent), ambulatory surgery centers (over 25 percent), freestanding emergency departments (nearly 24 percent), fitness and wellness centers (almost 20 percent), and wound care centers (over 10 percent). With relation to post-acute care locations, roughly one-fifth of all clusters operate a location in the short-term inpatient rehabilitation and nursing care stage, and an equal proportion operates a long-term inpatient rehabilitation and nursing care location. These include skilled nursing facilities (over 16 percent) as well as inpatient rehabilitation facilities and behavioral health hospitals (approximately 12 percent each). In contrast, a smaller share of clusters – under 15 percent – provide services at unique locations classified within the extended care and living stage of the continuum of care, with the most common site types including hospice centers (under 6 percent) and continuing care retirement communities (over 4 percent).

Classification variables. Having identified a study sample of 117 clusters and compiled a catalog of their respective service locations, the next step in the study's development of a taxonomy of cluster forms is to operationalize the 16 classification variables described in Chapter 4. Using elements of the AHA Annual Survey dataset, the Intellimed dataset, and the primary data collected to generate the study's catalog of cluster components, measures for each of these 16 variables are calculated. Descriptive statistics for these measures are presented in Table 7, including each measure's mean and standard deviation.

With relation to the construct of horizontal differentiation, clusters in the study sample, on average, offer approximately 59 percent of the possible services reported in the AHA Annual Survey (roughly 89 of 151 services). The range of hospital service provision among study clusters is considerable, with Rockwood Health System in Spokane, Washington reporting as low as a 13 percent service provision rate, in contrast to the 92 percent service provision rate

Table 7. *Descriptive statistics of study classification variables*

Variable	Mean	Std. Dev.	Minimum	Median	Maximum
Horizontal Differentiation					
Hospital Services	0.59	0.1536	0.13	0.57	0.92
Service Location Types	6.47	3.3181	1	6	19
Vertical Differentiation					
Case Mix Difference	0.15	0.2414	-0.50	0.13	0.91
Extreme Case Share	0.02	0.0299	-0.07	0.01	0.12
Birth Case Distribution	0.05	0.0296	0.00	0.04	0.13
Configuration					
Locations	21.77	17.2189	2	18	89
Geographic Reach	27.14	20.7123	3.15	19.87	116.00
Geographic Spread	15.88	15.0957	3.50	12.12	116.00
Horizontal Integration					
Hospitals	4.18	2.6347	2	3	16
Horizontally Integrated Stages	2.97	2.0924	0	3	10
Locations Per Horizontally Integrated Stage	4.26	2.7690	0	4	11.25
Vertical Integration					
Vertically Integrated Stages	12.03	1.5025	9	12	15
Upstream Vertical Integration Breadth	0.65	0.1613	0.14	0.66	0.96
Downstream Vertical Integration Breadth	0.33	0.1861	0.00	0.32	0.77
Coordination					
Hospital Transfer Difference	0.02	0.0552	-0.18	0.01	0.21
Duplication of Services	0.70	0.1661	0.34	0.68	1.00

reported by the University of Maryland Medical System based in Baltimore, Maryland. The average number of different service location types operated by clusters in the study sample is 6.47, ranging from one type of location (i.e., the four sample clusters solely operating general, acute care hospitals) to the 19 different types of service locations operated by the Riverside Health System based in Newport News, Virginia.

In terms of vertical differentiation, the average difference between a cluster's case mix at its lead hospital and the average case mix index of its non-lead members is 0.15, suggesting that clusters, on average, differentiate by case complexity to some degree and see a higher proportion of complex and severe patient cases at their lead hospitals. This is supported by the study's second measure of vertical differentiation, the average difference between the percentage of “extreme” severity patients admitted at a cluster’s lead hospital and the average proportions of “extreme” severity cases at its non-lead members. Among sample clusters, the average difference in extreme case share is 0.02. In other words, when examining the percentage of each cluster member’s admissions categorized as “extreme” severity cases, lead hospitals on average admit two percentage points more “extreme” patients as a proportion of their total admissions than their non-lead counterparts. However, not all clusters are observed to direct the most complex and severe patients to their lead hospitals. Among the sample clusters, 29 display a *lower* case mix at their lead hospitals compared to the average case mix index of their non-lead hospital members, and 44 clusters maintain a difference between the proportion of admissions at lead hospitals that are “extreme” severity and the average proportion of “extreme” admissions at non-lead hospitals that is negative or equal to zero.

The third variable of vertical differentiation, birth case distribution, seeks to measure clusters’ differentiation of cases by *type* of service. On average, the standard deviation of hospitals’ percentage of admissions as childbirths across cluster members is 0.05, with observations ranging from a standard deviation of zero to 0.13. For example, two of the sample clusters display no differences in birth admission rates across cluster members, in contrast to two-hospital clusters such as NCH Healthcare System in Naples, Florida or OakBend Medical Center in greater Houston, Texas, where childbirths account for roughly 18 percent of one cluster member’s admissions while representing a minimal proportion of admissions at the other cluster member.

Configuration, or spatial differentiation, is a key construct within this study’s attempt to identify cluster forms. As indicated in Table 7, clusters in the study sample on average operated over 21 unique service locations, and this ranged from four clusters’ operations of two general, acute care hospitals each, to the 89 unique service locations maintained by the Baylor Health Care System in the Dallas-Fort Worth metropolitan area. In terms of clusters' geographic reach, sample clusters averaged a distance of 27.13 miles between their lead hospital and their unique service locations. This compares to the average distance of 15.88 miles between clusters' unique service locations and their *nearest* hospital member, which measures clusters' geographic spread. Clusters in the sample study vary in their geographic reach and spread. For example, the DeTar Healthcare System in Victoria, Texas exhibits the most limited geographic reach and spread, with an average distance of 3.15 miles between its unique service locations and its lead hospital as well as an average distance of 3.50 miles between its varied service locations and the member hospital closest to them. In contrast, the Universal Health Services (UHS) South Texas cluster includes two general, acute care hospitals as its unique service locations, and these two facilities are 116 miles apart. Thus, this cluster's geographic reach and geographic spread both amount to 116 miles, and both figures are the highest observed in the study sample.

Examining the study clusters by their measures of horizontal integration, clusters on average include 4.18 general, acute care hospital members. Nearly one-third (38 of 117) include just two hospitals, and the largest cluster in the study sample, Texas Health Resources in the Dallas-Fort Worth metropolitan area, operates 16 general, acute care hospitals. Looking at cluster facilities other than general, acute care hospitals that operate at stages across the continuum of care, the average cluster in the study sample maintains multiple facilities within a single stage (i.e., horizontally integrated stages) for roughly 3 of the care continuum stages. And, within these horizontally integrated stages, clusters average a total of 4.26 service locations per stage. As is evident in the statistics displayed in Table 7, not all sample clusters engage in horizontal integration activity outside of general, acute care hospitals; in fact, 14 of the 117 study clusters (roughly 12 percent) solely exhibit horizontal integration in their operation of multiple general, acute care hospitals. On the other hand, clusters such as Florida Hospital – Tampa Bay & Heartland and Sentara Hampton Roads exhibit horizontal integration strategies across many stages of the continuum of care (8 and 10, respectively). Furthermore, some clusters operate numerous unique service locations in the specific stages in which they horizontally integrate, such as Baptist Health in Jacksonville, Florida, Covenant Health System in Lubbock, Texas, and Las Palmas Del Sol Healthcare in El Paso, Texas, which each average at least 11 unique service locations per horizontally integrated stage.

Regarding vertical integration, the sample's clusters on average operate service locations or provide services categorized within 12 of the 15 stages across the continuum of care. Seven clusters provide services or operate service locations in only 9 of the 15 stages, whereas three clusters (Covenant Health System, Riverside Health System, and Sentara Hampton Roads) provide services or operate service locations across all 15 of the care continuum stages previously described and depicted in Chapter 4. In addition, differences are observed in regards to the *breadth* of vertical integration activity among sample clusters. On average, clusters offer nearly two-thirds of the 90 services in the AHA Annual Survey dataset categorized in this study as "upstream," or taking place prior to general or specialty inpatient acute care. In contrast, only one-third of the 22 services categorized as "downstream," or taking place following general or specialty inpatient acute care, are offered by clusters in the study sample, on average. Thus, sample clusters are observed to more actively pursue strategies involving the provision of pre-acute services as opposed to post-acute services. Yet wide variation is also observed within the sample observations. Clusters such as Rockwood Health System and Health Management Associates (HMA) Yakima provide less than 20 percent of the 90 "upstream" services, according to responses to the AHA Annual Survey, whereas the University of Maryland Medical System and Shands HealthCare clusters offer well over 90 percent of such services. In terms of downstream service provision, eight of the study clusters provide less than 5 percent of the 22 "downstream" services, compared to Centra Health in Lynchburg, Virginia and Seton Healthcare Family in Austin, Texas, which offer more than 75 percent of the "downstream" services reported in the AHA Annual Survey.

Finally, sample clusters vary in the degree to which they display evidence of coordinated activities. At its lead hospital, the average cluster sees two percent more of its admissions as transfers from other hospitals in comparison to the average of its non-lead members. This figure is in relation to the study's first coordination variable, differences in a cluster's admissions as transfers from other hospitals, with individual measures ranging from -0.18 at Hunt Regional Healthcare System outside of Dallas, Texas to 0.21 at Carilion Clinic in western Virginia. For both of these examples, considerable differences exist between the percentage of admissions at lead hospitals that come as transfers from other hospitals versus the same types of admissions at non-lead members. In contrast, 25 of the study sample's 117 clusters display approximately no difference between lead and non-lead hospitals in the proportion of their admissions that come as transfers from other hospitals. The second coordination variable, average duplication of services, reveals the degree to which cluster members coordinate their activities by reducing their duplication of one another's services, instead focusing specific service lines at specific locations. As exhibited in Table 7, the average cluster in the study sample duplicates its services such that each service, on average, is available at approximately 70 percent of its member hospitals. For 18 of these clusters, each of their reported services is provided at all member hospitals, resulting in a duplicated service average of 100 percent. On the other hand, each hospital service offered throughout the ETMC cluster, which operates in east Texas, is only available on average at roughly one-third of its 13 hospital members, indicating low levels of service duplication and high levels of coordination across the ETMC hospitals.

Taxonomic Analysis

Having updated the inventory of hospital-based clusters throughout the U.S., compiled a catalog of cluster components – including hospital-based and non-hospital-based service sites – using a sample of clusters from six states, and operationalized classification variables from varied data sources, we proceed in this study to conduct a taxonomic analysis of cluster forms. The first step, as described in Chapter 4, is to identify outlier observations that may distort the partitioning process and result in inaccurate clustering configurations.

Identification of outliers. Using Mahalanobis distance measures, the study sample includes three clusters with distance measures significantly different from the remaining sample members at the 0.001 level. These include the Community Health Systems (CHS) cluster in north Texas, the Physician Synergy Group cluster in Dallas, Texas, and the UHS cluster in south Texas. Examining these three clusters across the study's classification variables, one may note similarities as well as differences among the outlier observations. Table 8 summarizes the attributes of these three clusters and compares them to the averages observed across the study sample for each of the classification variables.

As indicated in Table 8, there are several aspects in which the three outlier clusters vary significantly from clusters in the study sample. Results of a *t*-test comparing means of classification variables for the three outlier clusters versus the study sample reveal that these three clusters exhibit significantly less horizontal differentiation than the sample average, including fewer hospital services and fewer types of service locations. In terms of vertical

Table 8. *Outlier observations in the study sample*

Variable	CHS North Texas	Physician Synergy Group	UHS South Texas	Outlier Average	Sample Average
Horizontal Differentiation					
Hospital Services	0.46	0.32	0.42	0.40*	0.59
Service Location Types	5	1	1	2.33*	6.47
Vertical Differentiation					
Case Mix Difference	0.01	-0.50	-0.03	-0.17*	0.15
Extreme Case Share	-0.01	0.09	-0.01	0.02	0.02
Birth Case Distribution	0.02	0.00	0.02	0.01*	0.05
Configuration					
Locations	12	2	2	5.33	21.77
Geographic Reach	105.51	7.70	116.00	76.40	27.14
Geographic Spread	16.06	7.70	116.00	46.59	15.88
Horizontal Integration					
Hospitals	4	2	2	2.67	4.18
Horizontally Integrated Stages	3	0	0	1.00	2.97
Locations Per Horizontally Integrated Stage	2.33	0.00	0.00	0.78*	4.26
Vertical Integration					
Vertically Integrated Stages	10	11	11	10.67	12.03
Upstream Vertical Integration Breadth	0.53	0.40	0.48	0.47	0.65
Downstream Vertical Integration Breadth	0.05	0.09	0.14	0.09*	0.33
Coordination					
Hospital Transfer Difference	0.00	0.00	-0.00	-0.00	0.02
Duplication of Services	0.58	0.64	0.72	0.65	0.70

*Note: t-test comparison of outlier and sample averages: *p<0.05; **p<0.01; ***p<0.001*

differentiation, the outlier clusters on average treat a lower case mix at their lead hospitals than their non-lead members, in contrast to the average sample cluster, and the outlier clusters also exhibit a significantly lower standard deviation on average in childbirths as a percentage of admissions across cluster members. In comparison to the sample, outlier clusters also average significantly fewer locations in the continuum of care stages in which they operate multiple sites. And, the percentage of “downstream” services offered by outlier clusters is significantly less than clusters in the study sample.

However, although the outlier clusters substantially differ from the study sample in these ways, there are also notable differences across the three outlier observations. The CHS North Texas and UHS South Texas clusters are comparable in their proportions of services offered, their differences between lead and non-lead members in shares of "extreme" cases, their distributions of childbirth admissions across member hospitals, their distances between service locations and lead hospitals, and their proportions of "upstream" services offered. However, these two clusters differ in the different types of service locations they operate, the number of service locations they operate, the distances between service locations and their nearest member hospitals, the proportions of "downstream" services they offer, and the average rate of service duplication among member hospitals. Notably, they also differ across all three study measures of horizontal integration. Likewise, the Physician Synergy Group and UHS South Texas clusters are comparable in that they both solely operate two general, acute care hospitals, with identical horizontal integration measures and the same number of vertically integrated stages. However, they are notably dissimilar in terms of the differences in average case mix and "extreme" case shares between their lead and non-lead hospitals, as well as the geographic distances between their facilities. Comparing the CHS North Texas and Physician Synergy Group clusters, there are few measures on which the two outlier observations bear striking similarities. Therefore, based upon the significant differences in their Mahalanobis distance measures from the study sample, and given the considerable differences noted between the outlier observations across different measures, these three clusters are removed from the study sample for the cluster analysis.

Appropriateness of classification variables. The collinearity of classification variables included in the study is evaluated next. Appendix 3 presents the correlation matrix for the classification variables considered in the study's taxonomic analysis. Hair and colleagues (2006) suggest that an absolute correlation value of 0.90 or more is indicative of substantial collinearity between variables, and as depicted in Appendix 3, one pair of classification variables are correlated above this threshold. Specifically, the percentage of services provided by cluster hospitals is highly correlated with clusters' vertical integration breadth for upstream services, displaying a correlation value of 0.969.

Examining each classification variable's VIF score, the collinearity indicated in the correlation matrix is confirmed. Table 9 summarizes results from the calculation of VIF scores among the study's 16 classification variables, as shown in Column A. Four of the sixteen classification variables display VIF values above the prespecified threshold value of 5.3. These include hospital services (38.067), upstream vertical integration breadth (32.086), service locations (9.195), and horizontally integrated stages (6.134). As shown in the correlation matrix, hospital services and upstream vertical integration breadth are highly correlated, which was previously noted, and we also see that service locations and horizontally integrated stages are correlated at a value of 0.825. Comparing the highly correlated variables of hospital services and upstream vertical integration breadth, both variables are also correlated above the 0.7 level with the two other vertical integration variables, vertically integrated stages and downstream vertical integration breadth, although hospital services maintains higher correlation scores with these respective variables. In light of this, and given the higher VIF score for the hospital services variable, we remove this variable and recalculate VIF scores among the remaining 15 variables, as shown in Column B in Table 9.

Excluding the hospital services variable, the recalculated VIF scores indicate that two variables still maintain scores greater than the threshold of 5.3, indicating that substantial

Table 9. *Variance inflation factor (VIF) scores among classification variables*

Variable	A	B	C	D	E	F	G
Horizontal Differentiation							
Hospital Services	**38.067**	--	--	4.428	4.412	4.357	--
Service Location Types	4.380	4.370	4.089	4.377	4.093	3.273	3.273
Vertical Differentiation							
Case Mix Difference	2.471	2.461	2.460	2.462	2.461	2.461	2.459
Extreme Case Share	2.140	2.140	2.138	2.138	2.137	2.093	2.096
Birth Case Distribution	1.247	1.242	1.239	1.238	1.235	1.194	1.196
Configuration							
Locations	**9.195**	**9.155**	--	**9.173**	--	**6.973**	**6.949**
Geographic Reach	3.497	3.492	3.337	3.479	3.323	3.400	3.418
Geographic Spread	4.064	4.041	3.824	4.058	3.836	3.952	3.934
Horizontal Integration							
Hospitals	2.620	2.618	2.231	2.620	2.237	2.612	2.611
Horizontally Integrated Stages	**6.134**	**6.129**	4.652	**6.098**	4.636	--	--
Locations/Horizontally Integrated Stage	3.243	3.241	1.681	3.243	1.693	3.095	3.093
Vertical Integration							
Vertically Integrated Stages	3.229	3.123	3.121	2.989	2.986	2.960	3.103
Upstream Vertical Integration Breadth	**32.086**	3.732	3.726	--	--	--	3.654
Downstream Vertical Integration Breadth	4.972	3.025	3.009	3.691	3.683	3.555	2.922
Coordination							
Hospital Transfer Difference	1.591	1.543	1.543	1.546	1.546	1.538	1.532
Duplication of Services	2.357	2.183	2.183	2.029	2.029	1.934	2.068

Note: VIF Threshold established at VIF=5.3.
A = All 16 Variables
B = 15 Variables, excluding Hospital Services
C = 14 Variables, excluding Hospital Services & Locations
D = 15 Variables, excluding Upstream Vertical Integration Breadth
E = 14 Variables, excluding Upstream Vertical Integration Breadth & Locations
F = 14 Variables, excluding Upstream Vertical Integration Breadth & Horizontally Integrated Stages
G = 14 Variables, excluding Hospital Services & Horizontally Integrated Stages

multicollinearity remains among the 15 variables. Specifically, the service locations (9.155) and horizontally integrated stages (6.129) variables exceed the prespecified threshold value. In addition to their 0.825 correlation with one another, both variables are also correlated above the 0.7 level with the service location types variable. However, this is the only additional correlation score above 0.7 for the horizontally integrated stages variable, whereas the service locations variable also maintains a correlation above 0.7 with the locations per horizontally integrated stage variable (0.773), as exhibited in Appendix 3. Taking this into consideration, as well as its higher VIF score in comparison to the horizontally integrated stages variable, the service locations variable is removed for a subsequent calculation of VIF scores among 14 variables, as shown in Column C in Table 9.

By removing both the hospital services and service locations variables, the VIF scores for the remaining 14 variables are all below the threshold level of 5.3, suggesting that issues of substantial multicollinearity are addressed. To provide comparison, additional VIF scores are calculated by substituting upstream vertical integration breadth and horizontally integrated stages for the previously removed hospital services and service locations variables, respectively. The results of these VIF score calculations are displayed in Columns D, E, F, and G in Table 9. First, by removing upstream vertical integration breadth instead of the hospital services variable (as shown in Column D), substantial multicollinearity is still indicated in the VIF scores of service locations and horizontally integrated stages variables. When the service locations variable is also removed, along with upstream vertical integration breadth (as shown in Column E), all remaining variables' VIF scores are within the 5.3 threshold level. However, in comparison to Column C, the VIF score for upstream vertical integration breadth (3.726) in Column C is lower than the VIF score for hospital services (4.412) in Column E. As a result, the removal of the hospital services variable is favored. Furthermore, by removing the horizontally integrated stages variable instead of the service locations variable, while also removing either the upstream vertical integration breadth or hospital services variables (as shown in Columns F and G, respectively), VIF scores for the service locations variable still exceed the prespecified 5.3 threshold level. Therefore, the removal of the hospital services and service locations variables is favored to address the substantial multicollinearity evident among the study samples.

***Factor analysis*.** We proceed to assess the appropriateness of the study's classification variables by conducting principal components analyses, a form of factor analysis, on the study variables. These analyses are performed for both the full set of 16 variables previously described as well as the reduced group of 14 variables following the removal of the hospital services and service locations variables to address multicollinearity. Separate Bartlett tests of sphericity for both the 16-member and 14-member groups of variables yield statistically significant results at the 0.001 level, indicating that the correlation matrices for both sets of variables include nonzero correlations. In addition, the MSA value for the 14-variable set is 0.735, and for the 16-variable set the overall MSA value is 0.747. Both values are well above the 0.50 MSA threshold, indicating that the sets of variables are appropriate for factor analysis.

The first principal components analysis is performed on the 14-variable set, excluding the hospital services and service location variables. As noted in Chapter 4, several criteria are evaluated to determine the number of factors to retain from the analysis, including the latent root criterion, the cumulative percentage of the variance, and the scree test. To begin, Table 10 and Figure 4 present the criteria evaluated to determine the number of factors to retain from the rotated component matrix.

Table 10. *Total variance explained in the initial component matrix (14 variables)*

Component	Initial Eigenvalues	% of Variance	Cumulative Variance
1	4.802	34.300	34.300
2	2.112	15.085	49.384
3	1.723	12.305	61.689
4	1.067	7.618	69.308
5	0.952	6.799	76.107
6	0.878	6.273	82.380
7	0.567	4.051	86.431
8	0.543	3.880	90.311
9	0.386	2.756	93.067
10	0.294	2.102	95.169
11	0.219	1.565	96.734
12	0.199	1.420	98.155
13	0.143	1.021	99.175
14	0.115	0.825	100.000

Note: 14 variables, excluding Hospital Services and Service Locations variables

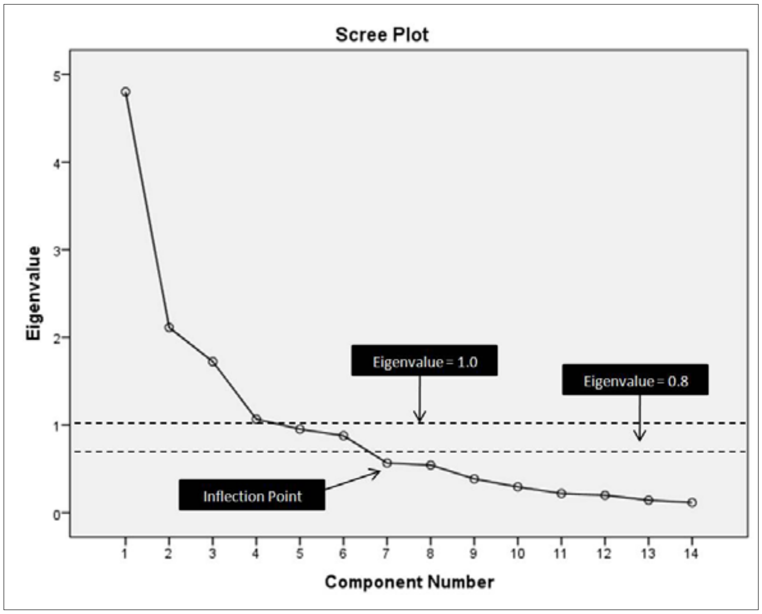


Figure 4. Scree plot (14 variables)

Using a latent root criterion with a cutoff of eigenvalues greater than 1.0, one would retain four components, as displayed in Table 10. However, consideration of the second criterion – evaluating the cumulative percentage of variance – suggests that a four component solution is too restrictive, with the four components explaining less than 70 percent of the variance in the study data. Furthermore, the results of the scree plot, as depicted in Figure 4, also suggest that a four component solution is not optimal, with the inflection point observed at 7 components. However, the disagreement across factor retention criteria is perhaps to be expected. As previously noted, analyses with fewer than 20 variables often produce too few factors when employing a cutoff of eigenvalues greater than 1.0 (Hair et al., 2006). In addition, scree plots often suggest the retention of a greater number of factors than the latent root criterion, as we see in this case. Thus, a compromise across the factor retention criteria is sought.

Returning to the second criterion of a cumulative percentage of the variance in the study data, a cumulative percentage of 80 percent is consistent with other studies (Jolliffe, 2002), including a recent taxonomic analysis by Bauer and Ameringer (2010). As is displayed in Table 10, a cutoff level explaining 80 percent of the cumulative variance allows for 6 components to be retained. These 6 components all have eigenvalues greater than 0.80, and they fall prior to the inflection point on the scree plot. In comparison, the retention of a seventh component, as indicated in the scree plot in Figure 4, requires the addition of a component with an eigenvalue less than 0.60 and only additionally explains roughly 4 percent of the variance. Having considered the various factor retention criteria collectively, we conclude that a six-component solution yields a desirable balance of parsimony and representativeness.

Next, a varimax rotation is applied, and factor loadings and variable communality levels are examined for their significance. With fewer than 120 clusters in the study sample, the absolute values of factor loadings must be greater than or equal to 0.55 in order to be considered statistically significant (Hair et al., 2006, p. 128). Table 11 summarizes each variable's communality value, its loading in each of the six rotated components, and the percentage of variance explained by each component in the rotated solution.

Table 11. *Communality values and rotated component matrix results (varimax rotation)*

Variable	**Communalities**	**Component**					
		1	**2**	**3**	**4**	**5**	**6**
Service Location Types	0.839	**0.866**	0.252	0.010	-0.004	0.158	0.020
Case Mix Difference	0.827	0.107	0.159	**0.861**	-0.152	0.025	0.162
Extreme Case Share	0.787	-0.086	0.173	**0.854**	0.116	0.038	0.075
Birth Case Distribution	0.896	0.140	-0.034	0.137	-0.090	0.030	**0.921**
Geographic Reach	0.914	0.086	0.046	-0.017	**0.921**	0.230	-0.066
Geographic Spread	0.921	-0.248	0.097	0.003	**0.913**	-0.113	-0.047
Hospitals	0.826	0.300	0.135	0.086	-0.054	**0.841**	0.018
Horizontally Integrated Stages	0.911	**0.921**	0.180	0.004	-0.065	0.127	0.096
Locations/Horizontally Integrated Stage	0.532	**0.564**	0.304	0.234	-0.170	0.194	0.011
Vertically Integrated Stages	0.882	0.267	**0.876**	0.131	0.142	0.082	0.025
Upstream Vertical Integration Breadth	0.832	0.378	**0.687**	0.069	0.047	0.457	-0.036
Downstream Vertical Integration Breadth	0.812	0.185	**0.811**	0.221	0.011	0.261	-0.049
Hospital Transfer Difference	0.759	0.345	-0.009	**0.628**	0.025	0.161	-0.468
Duplication of Services	0.794	-0.063	-0.332	-0.040	-0.188	**-0.802**	0.013
Percent of Variance Explained		**17.754**	**16.302**	**14.411**	**13.006**	**12.909**	**7.997**

Note: Bolded values indicate statistically significant loadings (> |0.550|, based upon 0.05 significance level and power level of 80% for sample size less than 120)

As presented in Table 11, all 14 variables have communalities above 0.50, indicating that, for each variable, the six components explain the majority of their variance. In terms of loading values for the six components, each variable has a significant factor loading in a single component; no variables lack a significant loading, and no variables have significant loadings in multiple components (i.e., "cross-loading"). The six components combined explain over 82 percent of the total variance in the dataset, with the first component explaining under 18 percent of the total variance and the sixth component explaining roughly 8 percent. Collectively, these results suggest a strong factor solution and support the appropriateness of the study's classification variables, with each variable making a significant contribution to one of the underlying factors.

The results of the varimax rotation are then compared to loadings from two other rotations of the six components previously identified. Both rotations yield fairly consistent results in comparison to the varimax rotation, with a few important differences. The oblimin rotation provides significant factor loadings for each variable in a single component, with one exception in the case of the sites per horizontally integrated stage variable. Aside from this variable, all other variables maintain significant loadings, and the same groups of variables load into separate components as in the varimax rotation. However, the variance explained by the individual components differs in the oblimin rotation, with the second component in the varimax rotation (explaining 16.302 percent of the total variance) serving as the first component in the oblimin rotation (explaining over 34 percent of the total variance). A second comparison rotation, the promax rotation, also yields consistent results in comparison to the varimax rotation. Like the varimax rotation, significant loading values from the promax rotation are identified for each variable in a single component, with no cross-loading variables or variables without a significant loading. However, like the oblimin rotation, the percentage of total variance explained by individual components is not as evenly distributed as the results from the varimax rotation. For example, the first component in the promax rotation explains over 34 percent of the total variance, whereas the fifth and sixth components each explain less than 7 percent of the total variance. At the same time, all of the variables grouped together as having significant loadings in a single component match the groups of variables that shared significant loadings in a common component in the varimax rotation. Thus, in total, the results of the oblimin and promax rotations support the component solutions identified in the varimax rotation.

A second principal components analysis is then performed on the larger, original set of 16 variables to compare results for consistency. The results are very similar to those obtained with the reduced set of 14 variables. Evaluating the various criteria for determining the number of factors to retain, a cutoff level of eigenvalues greater than 1.0 yields a five-component solution, but these five components fail to collectively account for 80 percent of the total variance in the dataset. By retaining six components, over 80 percent of the total variance is explained by the component solutions, and these components each have eigenvalues greater than 0.90. Evaluating a third criterion for factor retention, the scree plot's inflection point is less pronounced in the principal component analysis incorporating all 16 variables, but an argument can be made that it suggests retaining 7 components. However, the seventh component explains less than 4 percent of the total variance and has an eigenvalue less than 0.6. Thus, similar to the principal component analysis incorporating 14 variables, the 16-variable analysis also retains six components in its solution. These analysis results relating to factor retention criteria are available in Appendix 4.

In addition, the results of a varimax rotation in the principal component analysis using 16 variables are consistent with the results of the rotated principal component analysis using 14 variables. All 16 variables have communalities greater than 0.50, and each variable has a significant factor loading in a single component, with no variables lacking a significant loading or having significant loadings in multiple components. Moreover, the variables grouped together into various components in the 14-variable analysis maintain significant loadings in components with the same groups of variables in the 16-variable analysis. In other words, component members are consistent across the 14-variable and 16-variable analyses, with the hospital services variable and service locations variable each added to a component that had previously included three variables with significant loadings, forming two four-variable components. The six components combined explain approximately 83 percent of the total variance in the dataset, with the first component explaining over 21 percent of the total variance and the sixth component explaining nearly 7 percent. Results of the principal components analysis using all 16 classification variables are presented in Appendix 4. Considering the consistent results obtained across these different principal components analyses, the classification variables developed in this study are well-supported.

Returning to the results of the 14-variable principal components analysis, an evaluation of the significant factor loadings (with absolute loading values greater than 0.55) allows for the interpretation of underlying dimensions supported by the component solutions. Table 12 rearranges the results depicted in Table 11 and presents the significant loadings of the six components, with non-significant loadings removed in order to more clearly examine underlying dimensions.

Table 12. *Significant component loadings (14-variable varimax rotation)*

Underlying Dimension and Variables with Significant Loadings	**Components and Loading Values 1**	**2**	**3**	**4**	**5**	**6**
Non-Hospital Horizontal Strategies						
Horizontally Integrated Stages	0.921					
Locations/Horizontally Integrated Stage	0.564					
Service Location Types	0.866					
Vertical Integration Strategies						
Vertically Integrated Stages		0.876				
Upstream Vertical Integration Breadth		0.687				
Downstream Vertical Integration Breadth		0.811				
Differentiation by Case Complexity						
Case Mix Difference			0.861			
Extreme Case Share			0.854			
Hospital Transfer Difference			0.628			
Spatial Differentiation Strategies						
Geographic Reach				0.921		
Geographic Spread				0.913		
Hospital-Focused Horizontal Integration						
Hospitals					0.841	
Duplication of Services					-0.802	
Differentiation by Service Type						
Birth Case Distribution						0.921
Number of significant loadings	3	3	3	2	2	1

Note: Component loading values only include statistically significant loadings (> |0.550|, based upon 0.05 significance level and power level of 80% for sample size less than 120)

The first component includes three variables with significant factor loadings: horizontally integrated stages (0.921), service location types (0.866), and locations per horizontally integrated stage (0.564). Two of these variables (horizontally integrated stages and locations per horizontally integrated stage) are developed to indicate the level of a cluster's horizontal integration activities, and the service location types variable indicates a cluster's horizontal differentiation. Together, these three variables represent an underlying dimension of horizontal strategies, particularly focusing upon horizontal activities beyond the general, acute care hospital and including different stages and sites throughout the continuum of care.

The second and third components also include three variables with significant factor loadings. For the second component, these variables include vertically integrated stages (0.876), upstream vertical integration breadth (0.687), and downstream vertical integration breadth (0.811). All three of these variables were developed to represent a cluster's vertical integration strategies, and the principal component analysis results strongly support vertical integration as an underlying dimension within the dataset. In the third component, variables with significant factor loadings include case mix difference, extreme case share, and hospital transfer difference. Both case mix difference and extreme case share are included in the dataset as indicators of vertical differentiation, and hospital transfer difference is included as a measure of coordination. Together, these three variables may represent an underlying dimension of clusters' differentiation by case complexity. That is, clusters with larger differences in the average case mix between their lead and non-lead hospitals, with larger differences in the amount of extreme severity cases as a percentage of total admissions between lead and non-lead members, and with larger differences in the amount of patients transferred from other hospitals as a percentage of total admissions between lead and non-lead hospitals may be described as differentiating member facilities according to the complexity of cases they treat and are assigned. Such differentiation by case complexity requires both a commitment to vertical differentiation strategies as well as coordination across cluster members.

The fourth and fifth components include two significant factor loadings each. In the fourth component, variables with significant factor loadings include geographic reach and geographic spread. Both of these variables are included in the taxonomic analysis to indicate a cluster's configuration, and thus the construct of configuration, or spatial differentiation, is strongly supported as an underlying dimension according to these principal component analysis results. The fifth component includes hospitals (0.841) and duplication of services (-0.802). As a classification variable, a cluster's number of general, acute care hospitals is included to represent a form of clusters' horizontal integration activities, specifically focusing at the general, acute care hospital setting. Duplication of services is included as a classification variable to represent clusters' coordination activities across hospital members, with higher service duplication percentages indicative of lower levels of coordination. Together, these variables may represent an underlying dimension of clusters' hospital-focused horizontal integration strategies. Specifically, clusters with a greater number of hospital members and lower levels of duplicated services across hospital members may be described as integrating or coordinating their hospital-based activities.

Finally, the sixth component maintains one variable with a significant factor loading: birth case distribution (0.921). This classification variable is included in the taxonomic analysis as an indicator of vertical differentiation, and its sole loading into the sixth component may represent an underlying dimension of clusters' differentiation by *service type*, as opposed to differentiation by case complexity. In other words, clusters with large variances between hospital members in terms of the number of childbirths as a percentage of their admissions may also differentiate among hospital members according to other types of cases such as specialized surgery, cancer care, or cardiac and stroke care.

Collectively considering these components and the underlying dimensions they may represent, we suggest that the results of the principal component analysis support the conceptual framework previously presented for the study's taxonomic analysis. That is, within the study dataset, variation is observed across clusters in terms of their differentiation, configuration, integration, and coordination.

Hierarchical cluster analysis. With three outliers and two variables removed from the study sample, we proceed to perform cluster analyses, first by applying various hierarchical clustering algorithms to the dataset. To begin, standardized values for each of the 14 remaining classification variables are obtained given their different measurement units. Next, four hierarchical clustering analyses are performed using the single-linkage, complete-linkage, average linkage, and Ward's method algorithms, and for each of these analyses, the squared Euclidean distance measure is used as the algorithm's similarity measure. Recognizing that "a natural increase in heterogeneity comes from the reduction in number of clusters" (Hair et al., 2006, p. 592), the percentage changes in agglomeration coefficients with each cluster solution are calculated. This allows for the identification of large increases in heterogeneity in comparison to other steps in the agglomeration process. Such an increase indicates that the previous cluster solution is preferred, as the subsequent step in the agglomeration process substantially increases heterogeneity within the clusters (Hair et al., 2006). Table 13 summarizes the agglomeration results of these four hierarchical cluster analyses.

Table 13. *Change in agglomeration coefficients in hierarchical cluster analyses*

	Hierarchical Algorithm							
	Single Linkage		Complete Linkage		Average Linkage		Ward's Method	
Clusters Combined	*Agglomeration Coefficient*	*Percent Change*	*Agglomeration Coefficient*	*Percent Change*	*Agglomeration Coefficient*	*Percent Change*	*Agglomeration Coefficient*	*Percent Change*
12 to 11	9.611	2.136	34.138	2.470	14.437	3.536	630.948	4.670
11 to 10	9.772	1.675	38.938	**14.061**	14.551	0.790	663.328	5.132
10 to 9	10.257	**4.963**	40.111	3.012	15.547	**6.845**	698.339	5.278
9 to 8	10.451	1.891	46.525	**15.991**	16.193	4.155	740.504	**6.038**
8 to 7	11.410	**9.176**	48.290	3.794	17.591	**8.633**	782.848	5.718
7 to 6	11.497	0.762	52.463	8.642	17.754	0.927	832.864	6.389
6 to 5	13.176	**14.604**	55.013	4.861	18.090	1.893	891.653	7.059
5 to 4	13.245	0.524	67.615	**22.907**	19.010	**5.086**	978.905	**9.785**
4 to 3	14.680	**10.834**	73.281	8.380	20.222	6.376	1066.873	8.986
3 to 2	15.387	4.816	108.480	**48.033**	22.821	**12.852**	1203.383	**12.795**
2 to 1	26.595	**72.841**	138.356	27.541	28.000	**22.694**	1582.000	**31.463**

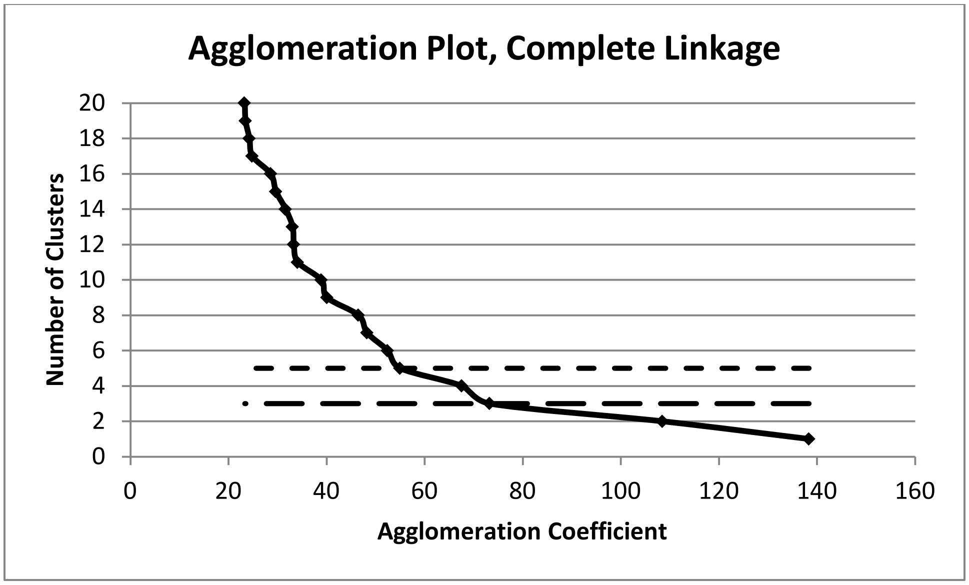
Note: Bolded values indicate markedly larger percentage increases in the agglomeration coefficient than occurred at other steps

Having obtained cluster analysis results using four different hierarchical algorithms, we proceed to evaluate agglomeration coefficients, dendrograms, and agglomeration plots to determine the most representative cluster solution. Beginning with an initial examination of dendrograms, which are included in Appendix 5, we see that the "chaining effect" is observed across cluster solutions using the single-linkage algorithm, as described in Chapter 4 and noted as a common problem by numerous scholars (e.g., Aldenderfer & Blashfield, 1984; Bauer & Ameringer, 2010; Hair et al., 2006; Ketchen & Shook, 1996). Given this observed effect, the results of the single-linkage cluster analysis are deemed uninformative.

As shown in Table 13, all three of the remaining algorithm solutions (complete-linkage, average linkage, and Ward's method) produce high changes in the agglomeration coefficients when progressing from a three-cluster solution to a two-cluster solution. A five-cluster solution is also supported by all three of these hierarchical cluster analyses, and this level of agreement across the hierarchical algorithms is not observed in cluster solutions occurring earlier in the agglomeration process, as exhibited in Table 13. In other words, cluster solutions ranging from the twelve-cluster solution to the six-cluster solution do not include consensus among the three algorithms, although a nine-cluster solution does include agreement between *two* algorithms in terms of large agglomeration coefficient changes (i.e., agreement between complete-linkage and Ward's method on a nine-cluster solution).

Examination of the dendrograms and agglomeration plots for the hierarchical cluster analyses supports the three-cluster and five-cluster solutions indicated by analysis of the changes in agglomeration coefficients. As previously noted, dendrograms depicting hierarchical cluster analyses' solutions are provided in Appendix 5. Figure 5 presents the agglomeration plots for the complete-linkage, average linkage, and Ward's method hierarchical cluster analyses.

Across the three dendrograms for the complete-linkage, average linkage, and Ward's method algorithms, the agglomerative processes are different, yet we see that the complete-



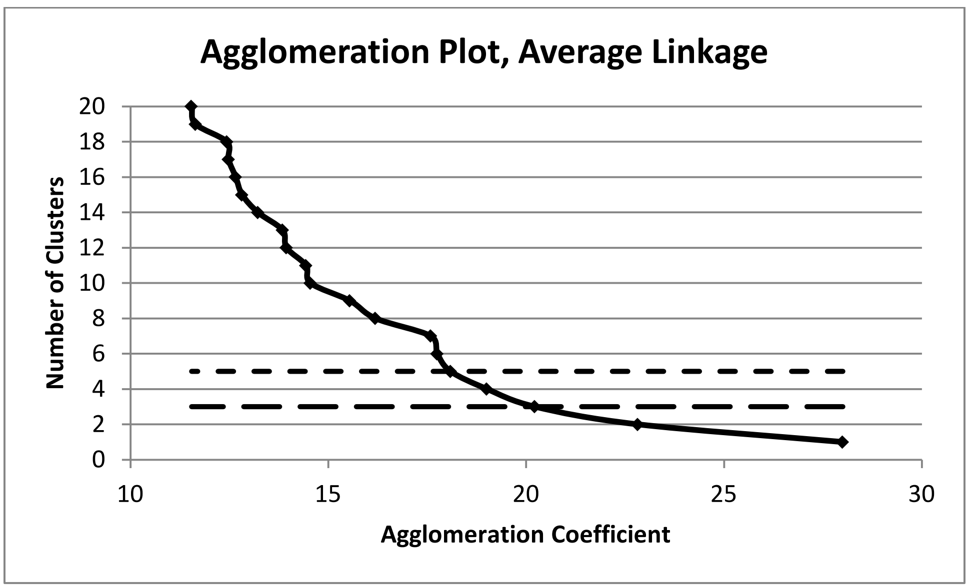


Figure 5. Agglomeration plots (hierarchical cluster analyses)

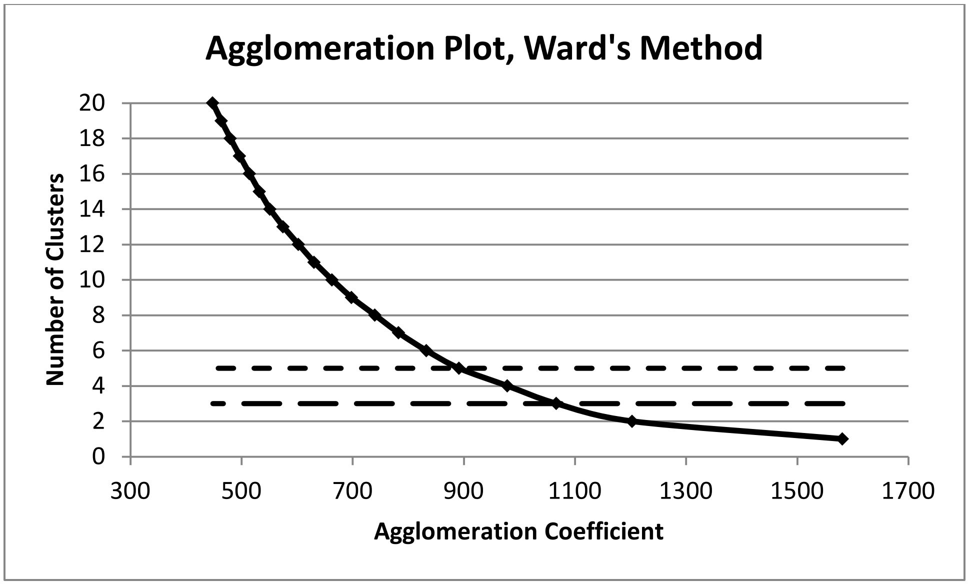


Figure 5 (continued). Agglomeration plots (hierarchical cluster analyses)

linkage algorithm produces a single-member cluster throughout the agglomeration process until the final cluster solution. This is an undesirable solution (Hair et al., 2006), and for this reason the average linkage and Ward's method algorithms are favored over the complete-linkage solutions. The average linkage and Ward's method algorithms produce different dendrograms but similar results in terms of cluster solutions: both dendrograms support five- and three-cluster solutions.

Evaluating the agglomeration plots, we observe some "flattening" of the agglomeration curve at the five- and three-cluster solutions. In the average linkage agglomeration curve, this flattening is more pronounced than in the Ward's method agglomeration curve, which displays a more gradual slope. However, both agglomeration curves suggest optimal cluster solutions that are consistent with evaluations of changes in the agglomeration coefficients and the dendrograms.

Next, we compare the agreement in cluster assignments across the hierarchical cluster analyses for both the five-cluster and three-cluster solutions, as depicted in Table 14.

Table 14. *Hierarchical cluster analyses solutions*

Five-Cluster Solution	Single Linkage	Complete Linkage	Average Linkage	Ward's Method
Number of Cluster Members				
Cluster 1	110	17	52	47
Cluster 2	1	63	41	39
Cluster 3	1	8	7	13
Cluster 4	1	1	9	10
Cluster 5	1	25	5	5
Cluster Solution Agreement (%)				
Single-Linkage	--	18%	46%	44%
Complete-Linkage	18%	--	53%	54%
Average Linkage	46%	53%	--	89%
Ward's Method	44%	54%	89%	--
Hubert-Arabie Adjusted Rand Index				
Single-Linkage	--	0.04	0.02	0.01
Complete-Linkage	0.04	--	0.30	0.32
Average Linkage	0.02	0.30	--	0.75
Ward's Method	0.01	0.32	0.75	--
Three-Cluster Solution	**Single Linkage**	**Complete Linkage**	**Average Linkage**	**Ward's Method**
Number of Cluster Members				
Cluster 1	112	42	57	52
Cluster 2	1	71	48	52
Cluster 3	1	1	9	10
Cluster Solution Agreement (%)				
Single-Linkage	--	38%	51%	47%
Complete-Linkage	38%	--	73%	75%
Average Linkage	51%	73%	--	96%
Ward's Method	47%	75%	96%	--
Hubert-Arabie Adjusted Rand Index				
Single-Linkage	--	0.03	0.02	0.02
Complete-Linkage	0.03	--	0.33	0.41
Average Linkage	0.02	0.33	--	0.85
Ward's Method	0.02	0.41	0.85	--

As shown in Table 14, the average linkage and Ward's method hierarchical algorithms produce high levels of agreement for both the five-cluster and three-cluster solutions, with 89 and 96 percent agreement, respectively. Looking at the ARI_{HA} values for these two pairs of solutions, which provides a more rigorous assessment of classification agreement, both the five-and three-cluster solutions between the average linkage and Ward's method algorithms generate ARI_{HA} values indicating an acceptable level of agreement (Steinley, 2004). A more detailed comparison of the two solutions reveals that, for both the average linkage and Ward's method analyses, the first cluster in the three-cluster solution combines the first and fifth clusters in the five-cluster solution, the second cluster in the three-cluster solution combines the second and third clusters in the five-cluster solution, and the third cluster in the three-cluster solution is the same as the fourth cluster in the five-cluster solution.

Within the five-cluster solution, the primary areas of disagreement between the average linkage and Ward's method results involve the first, second, and third clusters. Four local systems assigned to the second cluster in the Ward's method solution are grouped within the first cluster in the average linkage solution, and another system in the second cluster using the Ward's method is identified in the third cluster in the average linkage solution. Seven local systems assigned to the third cluster in the Ward's method solution are grouped within the second cluster in the average linkage solution, and one system in the fourth cluster using the Ward's method is included in the first cluster using the average linkage algorithm. In comparison, the primary areas of disagreement between the average linkage and Ward's method results in the three-cluster solution involve the first and second clusters, as some of the disagreements observed in the five-cluster solution are remedied through the agglomeration process. Again, four local systems shown in the second cluster of the Ward's method algorithm are grouped in the first cluster of the average linkage solution, and one local system in the third cluster of the Ward's method solution is included in the first cluster of the average linkage solution.

Thus, many similarities exist between the average linkage and Ward's method results for the three-cluster and five-cluster solutions. Evidence in favor of a three-cluster solution as well as a five-cluster solution could be argued upon examination of the hierarchical cluster analyses' changes in agglomeration coefficients, dendrograms, and agglomeration plots. However, although three-cluster solutions may be described as parsimonious, they may also allow for too much heterogeneity within cluster solutions, failing to adequately recognize homogeneous groups that are representative of groupings within the population. Therefore, the five-cluster solution is favored. In addition, having dismissed the single-linkage results and identified concerns with the complete-linkage cluster solutions, and given the widespread support for the Ward's method in hierarchical cluster analysis (e.g., Bazzoli et al., 1999; Burns & Burns, 2008; Lewis & Alexander, 1986; Punj & Stewart, 1983; Weiner & Alexander, 1996), the five-cluster solution using the Ward's method algorithm is the favored result from the hierarchical cluster analyses.

Nonhierarchical cluster analysis. Having obtained a favored five-cluster solution from the Ward's method hierarchical algorithm, average values of the 14 standardized classification variables for each of the solution's five groups are calculated to use as initial seeds for a subsequent nonhierarchical cluster analysis. Specifically, a *K*-means cluster analysis is performed to obtain a five-cluster solution using the initial centroids derived from the favored hierarchical cluster analysis solution, and the 14 standardized classification variables included in the hierarchical cluster analyses are once again used in the nonhierarchical cluster analysis. The resulting cluster solution includes a 45-member cluster, a 39-member cluster, a 16-member cluster, a 9-member cluster, and a 5-member cluster. A detailed listing of the five partitioned groups identified in the *K*-means cluster analysis and their cluster members is provided in Appendix 6.

Cluster validation. With a final cluster analysis solution identified from a two-stage cluster analysis (using hierarchical and nonhierarchical methods in tandem), the resulting solution is validated through comparison to other cluster analyses, including results from hierarchical methods in the first stage, results of cluster analyses using nonstandardized classification variables, results from nonhierarchical cluster analyses developed from random initial seeds, and results using factor scores in substitution of classification variables. Table 15 presents a summary of this comparison, including the ARI_{HA} values and simple classification agreement rates calculated for each comparison to the final cluster solution.

Table 15. *Comparison of final cluster solution to alternate solutions*

Comparison Solution	ARI_{HA}	1	2	3	4	5	Cluster Solution Agreement
Ward's Method	0.84	47	39	13	10	5	94%
Average Linkage	0.66	52	41	9	7	5	84%
Complete Linkage	0.32	63	25	17	8	1	66%
K-Means I[a]	0.45	47	35	26	5	1	67%
K-Means II[a]	0.93	46	36	18	9	5	97%
K-Means III[a]	0.79	44	36	18	9	7	92%
Ward's Method[b]	0.16	56	28	24	5	1	37%
K-Means[b]	0.11	37	31	22	18	6	41%
Ward's Method[c]	0.39	38	36	26	9	5	73%
K-Means[a,c]	0.41	45	28	26	10	5	73%
Final Cluster Solution (K-Means)	--	45	39	16	9	5	--

Notes: Cluster solutions compared to final cluster solution of K-means cluster analysis with initial seeds derived from Ward's method hierarchical cluster solution

[a] = derived using randomly selected initial seed points

[b] = derived using nonstandardized classification measures

[c] = derived using varimax-rotated factor scores as classification measures

$ARI_{HA} > 0$ indicates agreement greater than expected value; $ARI_{HA} = 1$ indicates perfect agreement

As depicted in Table 15, the final cluster solution, obtained by using the Ward's hierarchical method and *K*-means nonhierarchical method in tandem, maintains a high degree of agreement with the 5-cluster solution provided by the Ward's method algorithm. The final solution also exhibits moderate agreement with the 5-cluster solution from the average linkage algorithm. As recommended by Hair and colleagues (2006), an additional nonhierarchical analysis (*K*-means I) is conducted without prespecified centroids and compared to the final cluster solution. In this analysis, initial seed points are randomly selected by the *K*-means partitioning program, and as a result, initial seeds may be affected by the order of observations in the dataset, thereby affecting partitioning results (Hair et al., 2006). Therefore, two additional *K*-means analyses are performed (*K*-means II and *K*-means III), sorting cases in different random orders with each analysis. Results provided in Table 15 indicate that the results of *K*-means analyses without prespecified cluster centers indeed vary due to the order of observations in the dataset, although their agreement levels with the final cluster solution range from moderate to excellent.

Poor agreement is observed between the final cluster solution and additional cluster analyses utilizing nonstandardized measures. However, acknowledging the differences in measurements and ranges across the classification variables, we suggest that the poor agreement is a reflection of the lack of validity for cluster analyses incorporating nonstandardized measures, as variables with larger ranges may cause unequal weighting during the partitioning process and distort cluster solutions (Ketchen & Shook, 1996). In addition, only moderate agreement is observed between the final cluster solution and cluster analyses substituting six factor scores for the previously defined classification measures. These factor scores are derived from the previously described principal components analysis with varimax rotation that identified six components from the 14 variable set. Although this lower level of agreement may indicate a lower degree of stability in the final cluster solution, the higher levels of agreement observed in other comparative analyses may instead suggest that the clustering overlap between these solutions could be the result of excluded information inherent in the use of factor scores, which in turn yields less-than-optimal results (Aldenderfer & Blashfield, 1984; Hair et al., 2006; Ketchen & Shook, 1996).

Collectively, these results illustrate the importance of adhering to previous steps recommended by scholars within the cluster analysis, including the standardization of variables, correction for multicollinearity, assessment of multiple hierarchical algorithms, and the combined use of hierarchical and nonhierarchical methods to achieve a final cluster solution. The results also point to a reliable final cluster solution, with high levels of agreement across many of the compared solutions. In particular, Groups 3, 4, and 5 were fairly consistent across many of the cluster analysis solutions, with any clustering overlap primarily occurring among observations assigned to either Groups 1 or 2.

As a second and commonly employed internal validation technique, we perform a multiple discriminant analysis using the groupings of the final cluster solution as the dependent variable and the 14 standardized classification measures as the independent variables, comparing the classifications within the multiple discriminant analysis to the final cluster solution. First, concerns regarding the size of the study sample must be acknowledged. As noted in Chapter 4, scholars recommend a minimum sample size of five observations for each predictor variable, with an ideal ratio of 20 observations per independent variable (Hair et al., 2006). With a total sample size of 114 hospital-based clusters and 14 classification variables, the ratio of observations to independent variables in this study is over 8 observations for each variable, which is less than the ideal ratio but meets minimum requirements for the overall sample size. However, with the final cluster solution consisting of five groups with 45, 39, 16, 9, and 5 observations, respectively, three of the groups are smaller than the ideal of at least 20 observations per group, and two of the groups fail to meet the minimum recommended level of including at least one more member per group than the total number of predictor variables (Hair et al., 2006), which in this study is 14 variables. Given the small sizes of several cluster solution groups as well as the small overall sample size, the final results of the discriminant analysis may lack stability and should be interpreted with caution.

Next, the results of the Box's M test generated a statistically significant value at the 0.01 level, suggesting that the assumption of equal covariance structures across study groups is violated. Therefore, the separate-groups covariance matrix is used for the classification process, with cross-validation performed on results obtained using a within-groups covariance matrix (Hair et al., 2006). The Wilks' lambda measures for both the overall discriminant model and the individual discriminant functions are all statistically significant at the 0.01 level, indicating a good overall fit of the discriminant functions.

Defining prior probabilities according to cluster group size, the proportional chance criterion to assess the predictive accuracy of the discriminant analysis solution is calculated as $C_{PRO} = 0.395^2 + 0.342^2 + 0.140^2 + 0.079^2 + 0.044^2 = 0.301$. Therefore, a discriminant analysis solution with an acceptable level of predictive accuracy should have a hit ratio greater than 0.376, or 25 percent more than the proportional chance criterion (Hair et al., 2006). The actual hit ratio calculated from the multiple discriminant analysis is 0.991, indicating a 99.1 percent correct classification rate. As noted in Chapter 4, a separate discriminant analysis is performed defining prior probabilities as equal across cluster groups (i.e., probability = 0.20), and the results from this analysis are identical to those obtained with prior probabilities defined by group size. Furthermore, given the results of the Box's M test previously noted, the 99.1 percent correct classification rate is compared to original and cross-validated classification rates obtained using a within-groups covariance matrix during the classification process. Defining prior probabilities according to group size, the results of this separate discriminant analysis yield an original correct classification rate of 98.2 percent and a cross-validated correct classification rate of 87.7 percent. Finally, to cross-validate results of the original discriminant analysis using a separate-groups covariance matrix, a holdout sample is created, with 65 observations (57 percent of the total sample) randomly selected for inclusion in the original grouping process and the remaining 49 observations (43 percent) held out for split-sample validation. The results of this comparative discriminant analysis include an original correct classification rate of 98.5 percent for the 65 randomly selected observations and a cross-validated correct classification rate of 79.6 percent for the unselected subsample.

In sum, each of the classification rates obtained from these multiple discriminant analyses greatly exceed the recommended classification accuracy, indicating that the groupings are internally valid and offering further support to the final cluster solution. Although concerns regarding the sample size and unequal covariance structures call for caution in interpreting discriminant analysis results, the high classification rates observed across discriminant analysis results are consistent with the high levels of agreement noted between the final cluster solution and several of the comparison solutions presented in Table 15. Collectively, these findings support the final cluster solution as internally valid and reliable.

Cluster profiles. Using results from the final cluster solution, the distinct groups of hospital-based clusters identified within the study sample are now profiled through analysis of the variance of group means across classification variables. As explained in Chapter 4, the first decision to be made in this section of the study is whether a MANOVA test is appropriate or whether separate ANOVA tests for each classification variable must be conducted. With two of the groups in the final cluster solution consisting of fewer than 10 observations, the MANOVA requirement that each group include more observations than the total number of dependent variables is violated. In addition, the dataset violates an important assumption of the MANOVA test, as results of the Box's M test indicate that covariance matrices within the dataset are not equal, as previously noted. Although multicollinear relationships among the original 16 classification variables were addressed through the removal of two variables earlier in the study, the two noted violations of key assumptions suggest that suboptimal conditions exist for a MANOVA test.

Given these conditions, separate ANOVA tests are performed for each of the 14 classification variables employed in the final cluster solution, with the groups identified in the solution serving as the independent variable and the original, nonstandardized measures of the classification variables serving as the respective dependent variables for each ANOVA test. In addition, the two classification variables previously excluded in the cluster analysis due to issues of multicollinearity are included in the ANOVA analysis. Two additional tests – the Welch test and the Brown-Forsythe test – are run as robust tests of the equality of group means, accounting for the violated assumption of homogenous variances. And, in light of the evidence of unequal variances as well as disparate group sizes, the Games-Howell test is employed as the preferred post-hoc procedure (Jaccard et al., 1984), evaluating each pair of cluster solution groups for differences across each classification variable. The results of the ANOVA and Games-Howell tests are presented in Table 16, which includes the average value of each nonstandardized classification measure for each of the five groups in the final cluster solution and notes which group values are statistically significant in comparison to other groups. In addition, Appendix 7 provides detailed results of the ANOVA and Games-Howell tests.

Table 16. *Cluster solution group mean values for classification variables*

Variable	Group 1 (*n*=45)	Group 2 (*n*=39)	Group 3 (*n*=16)	Group 4 (*n*=9)	Group 5 (*n*=5)
Horizontal Differentiation					
Hospital Services*	$0.48^{b,c}$	$0.69^{a,d,e}$	$0.76^{a,d,e}$	$0.52^{b,c}$	$0.38^{b,c}$
Service Location Types*	$4.96^{b,c}$	$8.74^{a,d,e}$	$8.19^{a,d}$	$3.67^{b,c}$	4.40^{b}
Vertical Differentiation					
Case Mix Difference*	$0.05^{c,e}$	$0.14^{c,e}$	$0.47^{a,b,d}$	$0.00^{c,e}$	$0.64^{a,b,d}$
Extreme Case Share*	$0.00^{c,e}$	$0.01^{c,e}$	$0.06^{a,b}$	0.02	$0.06^{a,b}$
Birth Case Distribution*	$0.04^{b,e}$	$0.05^{a,e}$	0.04^{e}	0.04^{e}	$0.11^{a,b,c,d}$
Configuration					
Locations*	$11.84^{b,c,d}$	$33.05^{a,d,e}$	$37.44^{a,d,e}$	$6.44^{a,b,c}$	$10.40^{b,c}$
Geographic Reach*	$17.80^{b,c,d}$	$26.11^{a,d,e}$	$30.12^{a,d,e}$	$64.65^{a,b,c,e}$	$12.85^{b,c,d}$
Geographic Spread*	12.30^{d}	$11.38^{c,d}$	$15.55^{b,d}$	$45.90^{a,b,c,e}$	11.89^{d}
Horizontal Integration					
Hospitals*	$2.89^{b,c}$	$5.28^{a,d,e}$	$6.88^{a,d,e}$	$2.67^{b,c}$	$2.20^{b,c}$
Horizontally Integrated Stages*	$2.00^{b,c,d}$	$4.46^{a,d}$	$3.94^{a,d}$	$0.78^{a,b,c}$	2.00
Locations / Horizontally Integrated Stage*	$3.02^{b,c}$	$5.78^{a,d,e}$	$6.73^{a,d,e}$	$1.50^{b,c}$	$2.72^{b,c}$
Vertical Integration					
Vertically Integrated Stages*	$10.98^{b,c,d}$	$12.97^{a,e}$	$13.13^{a,e}$	$12.56^{a,e}$	$10.60^{b,c,d}$
Upstream Vertical Integration Breadth*	$0.54^{b,c}$	$0.76^{a,d,e}$	$0.82^{a,d,e}$	$0.59^{b,c}$	$0.40^{b,c}$
Downstream Vertical Integration Breadth*	$0.21^{b,c}$	$0.43^{a,e}$	$0.54^{a,d,e}$	0.31^{c}	$0.20^{b,c}$
Coordination					
Hospital Transfer Difference*	-0.00^{c}	0.02^{c}	$0.10^{a,b,d}$	0.00^{c}	0.00
Duplication of Services*	$0.79^{b,c,e}$	$0.64^{a,c,e}$	$0.53^{a,b,d,e}$	$0.68^{c,e}$	$1.00^{a,b,c,d}$

*Note: ANOVA test of significant differences in group means within dependent variable: *p<0.01*
Games-Howell post-hoc test of significant differences in means between individual groups at p<0.05 level:
a=different from Group 1;
b=different from Group 2;
c=different from Group 3;
d=different from Group 4;
e=different from Group 5.

As shown in Table 16, results of the ANOVA tests for separate classification variables reveal that each of the 16 variables is significantly different across the final cluster solution groups. In addition, both of the robust tests of equality of means, the Welch and Brown-Forsythe tests, support these results, with 15 of 16 classification variables obtaining statistically significant results at the 0.01 level. For the lone exception, the Duplication of Services variable, the Welch and Brown-Forsythe tests could not be performed due to one of the groups having no variance in values for Duplication of Services. Furthermore, the results of the Games-Howell test reveal that in only three instances did an individual variable comparison of one group's mean to means of each of the other groups lack a statistically significant difference between at least one of the compared pairs.

Acknowledging the suboptimal conditions for a MANOVA test observed earlier, which led to focused efforts to profile the final cluster solution using separate ANOVA tests, the results of a MANOVA test are evaluated with caution to consider how they compare to the ANOVA results. Within the MANOVA test for significance across the collective set of dependent variables, four common measures of differences across dependent variable dimensions include Pillai's trace, Hotelling's trace, Wilks' lambda, and Roy's greatest characteristic root. Of these, Pillai's trace is the more robust measure and is recommended in suboptimal conditions that include small sample size, unequal group sizes, or heterogeneous covariance structures (Hair et al., 2006, p. 414). A MANOVA test performed on the final cluster solution groups using the same set of 14 variables as was included in the cluster analysis yields statistically significant results at the 0.001 level for the Pillai's trace measure as well as for the other three measures. Thus, although the results of the MANOVA test should be viewed with caution, they suggest statistically significant differences across the collective set of dependent variables as well as within each individual variable.

With these results, descriptions of each group in the final cluster solution can be generated. Table 17 provides descriptions of the groups according to the study classification variables, using the statistically significant results presented in Table 16 to categorize each group's mean values across the classification variables as either "high," "moderate," or "low." For each group, when no other groups' means for a specific classification variable are observed as higher averages at statistically significant levels, their level for that classification variable is

Table 17. *Categories of cluster solution group means for classification variables*

Variable	Group 1 (*n*=45)	Group 2 (*n*=39)	Group 3 (*n*=16)	Group 4 (*n*=9)	Group 5 (*n*=5)
Horizontal Differentiation					
Hospital Services	LOW	HIGH	HIGH	LOW	LOW
Service Location Types	LOW	HIGH	HIGH	LOW	LOW
Vertical Differentiation					
Case Mix Difference	LOW	LOW	HIGH	LOW	HIGH
Extreme Case Share	LOW	LOW	HIGH		HIGH
Birth Case Distribution	LOW	MODERATE	LOW	LOW	HIGH
Configuration					
Locations	MODERATE	HIGH	HIGH	LOW	MODERATE
Geographic Reach	LOW	MODERATE	MODERATE	HIGH	LOW
Geographic Spread	LOW	LOW	MODERATE	HIGH	LOW
Horizontal Integration					
Hospitals	LOW	HIGH	HIGH	LOW	LOW
Horizontally Integrated Stages	MODERATE	HIGH	HIGH	LOW	
Locations / Horizontally Integrated Stage	LOW	HIGH	HIGH	LOW	LOW
Vertical Integration					
Vertically Integrated Stages	LOW	HIGH	HIGH	HIGH	LOW
Upstream Vertical Integration Breadth	LOW	HIGH	HIGH	LOW	LOW
Downstream Vertical Integration Breadth	LOW	HIGH	HIGH	LOW	LOW
Coordination					
Hospital Transfer Difference	LOW	LOW	HIGH	LOW	
Duplication of Services	MODERATE	MODERATE	LOW	MODERATE	HIGH

described as "high." Similarly, when no other groups' means for a specific classification variable are observed as lower averages at statistically significant levels, the cluster's observed level for a given classification variable is described as "low." And, when one or more of the other groups' means for a specific classification variable are higher at statistically significant levels, while at least one other group's mean for a specific classification variable is lower at a statistically significant level, a cluster's observed level for that classification variable is described as "moderate."

From these categorizations, we profile each group according to their differences across the classification variables and underlying constructs from which the study's conceptual framework is based.

***Group one: Lowly differentiated and integrated clusters*.** We label the first group identified in the final cluster solution, with 45 observations, as "Lowly Differentiated and Integrated Clusters." This group includes the largest share of clusters – just under 40 percent – in the study sample, with examples including Halifax Health in the Deltona-Daytona Beach-Ormond Beach, Florida area and Dimensions Healthcare System in the greater Washington, D.C. area.

"Lowly Differentiated and Integrated Clusters" maintain relatively low levels of horizontal differentiation activity, with significantly lower horizontal differentiation measures in comparison to Groups 2 and 3. These local systems average just less than five different types of service locations and, on average, offer a little less than half of the total services surveyed in the AHA Annual Survey among member hospitals. They also exhibit low levels of *vertical* differentiation activity, with significantly lower vertical differentiation by case complexity (as measured by the Case Mix Difference and Extreme Case Share variables) in comparison to Groups 3 and 5. Similarly, "Lowly Differentiated and Integrated Clusters" are less vertically differentiated by case type (as measured by the Birth Case Distribution variable) than Groups 2 and 5 at statistically significant levels. Though not observed as differing at statistically significant levels across all other groups, the Group 1 members average the lowest values for both the Extreme Case Share and Birth Case Distribution measures.

In terms of configuration, these systems maintain a moderate number of locations, averaging slightly fewer than 12 service locations. This is significantly less than the number of sites maintained by systems in Groups 2 and 3 while significantly greater than the number of sites operated by Group 4 members. "Lowly Differentiated and Integrated Clusters" have a significantly more limited reach in comparison to clusters in Groups 2, 3, and 4, with an average distance of 17.8 miles between service locations and clusters' lead hospital. In addition, these clusters maintain an average distance of 12.3 miles between service locations and their nearest hospital members, indicating a fairly concentrated geographic spread. However, this is only shown to be less than the geographic spread observed in Group 4 at statistically significant levels.

Examining measures of horizontal integration, "Lowly Differentiated and Integrated Clusters" on average operate just under three general, acute care hospitals. This is comparable to clusters in Groups 4 and 5 and significantly less than clusters in Groups 2 and 3. Furthermore, the average cluster in this group exhibits horizontal integration activity in two stages of the continuum of care, and within these two stages, averages approximately three service locations per stage. Both figures are significantly less than values observed in Groups 2 and 3, although "Lowly Differentiated and Integrated Clusters" integrate horizontally in significantly more stages than systems in Group 4. On average, clusters in Group 1 also exhibit low levels of vertical integration, including significantly fewer vertically integrated stages than Groups 2, 3, and 4, as well as significantly fewer upstream and downstream services than Groups 2 and 3.

Averages among "Lowly Differentiated and Integrated Clusters" for the Hospital Transfer Difference and Duplication of Services variables suggest that these systems display relatively low levels of coordination. The average cluster in Group 1 realizes practically no difference across hospital members in the percentage of admissions transferred from other hospitals, which is comparable to averages observed in Groups 4 and 5 and significantly less than Group 3's average Hospital Transfer Difference value. For the average cluster in the "Lowly Differentiated and Integrated Cluster" category, nearly 80 percent of its hospital members duplicate a given service, and this reflects a moderate to low level of coordination, as it is a significantly greater value than the averages observed for Groups 2 and 3 but significantly less than the average observed for Group 5.

Thus, "Lowly Differentiated and Integrated Clusters" exhibit low levels of horizontal and vertical differentiation and at best are moderately spatially differentiated, with average configurations consisting of limited geographic reach and fairly concentrated geographic spread. In addition, these clusters exhibit low levels of horizontal and vertical *integration*, and measures of coordination are relatively low to moderate in comparison to other groups.

Group two: Integrated and concentrated clusters. We label the second cluster solution group, with 39 observations, as "Integrated and Concentrated Clusters." This group includes the second-largest share of clusters – just over one-third – in the study sample, with examples such as Renown Health in Reno, Nevada and Swedish Health System in Seattle, Washington.

"Integrated and Concentrated Clusters" display high levels of horizontal differentiation, averaging the highest number of different service location types (8.74) among the solution groups. Horizontal differentiation measures are significantly higher than those observed in Groups 1, 4, and 5. In contrast, relatively low levels of vertical differentiation are observed within this category, including significantly smaller differences between lead and non-lead hospitals in case mix and shares of "extreme" severity patients in comparison to Groups 3 and 5. Although its average measure of vertical differentiation by case type (Birth Case Distribution) is significantly greater than that of Group 1, this group maintains a substantially lower level of vertical differentiation by case type than Group 5.

"Integrated and Concentrated Clusters" display moderate levels of spatial differentiation. They operate significantly more service locations than clusters in Groups 1, 4, and 5, averaging over 33 sites per cluster. In addition, they average a distance of 26.11 miles between member hospitals and lead facilities, which is significantly more than Group 1 but significantly less than Groups 4 and 5, indicating a moderately extensive reach. However, they also display the shortest average distance between cluster service locations and their nearest hospital members, which is significantly less than the average spread measured in Groups 3 and 4. Thus, their configuration is fairly concentrated across a moderate distance range.

High levels of horizontal integration are observed among "Integrated and Concentrated Clusters," with significantly more hospitals on average (5.28) than Groups 1, 4, and 5, significantly more horizontally integrated stages (4.46) than Groups 1 and 4, and significantly more locations per horizontally integrated stage (5.78) than average clusters in Groups 1, 4, and 5. These hospital-based clusters also display high levels of vertical integration, averaging significantly more vertically integrated stages (12.97) than Groups 1 and 5, significantly more upstream services (0.76) than Groups 1, 4, and 5, and significantly more downstream services (0.43) than Groups 1 and 5. In terms of measures of coordination, "Integrated and Concentrated Clusters" average only a small difference across hospital members in the percentage of admissions transferred from other hospitals, which is significantly less than Group 3's average Hospital Transfer Difference value. Almost two-thirds of hospital members in these clusters duplicate a given service on average, and this reflects a moderate to high level of coordination, as it is a significantly greater value than the average observed for Group 3 but significantly less than the averages observed for Groups 1 and 5.

Considering these results collectively, "Integrated and Concentrated Clusters" are moderately differentiated, with high levels of horizontal differentiation but relatively low to moderate levels of vertical differentiation. In regard to their configurations, these systems maintain a high number of service locations, reach out to a moderate distance within their local markets, and exhibit a concentrated spread, with relatively short average distances from service locations to member hospitals. "Integrated and Concentrated Clusters" are also highly integrated in both horizontal and vertical terms, but they display only moderate levels of coordination.

***Group three: Highly differentiated and integrated clusters*.** We label the Group 3 clusters, with 16 observations, as "Highly Differentiated and Integrated Clusters." This category comprises roughly 14 percent of the study sample, and examples include Baylor Health Care System in the Dallas-Fort Worth Metroplex and Carilion Clinic in western Virginia.

This group maintains high levels of horizontal differentiation activity, similar to Group 2. "Highly Differentiated and Integrated Clusters" average the highest percentage of possible services (76 percent), which is significantly higher than that of Groups 1, 4, and 5. These local systems also average more than eight different types of service locations, a number significantly greater than Groups 1 and 4. In terms of vertical differentiation, "Highly Differentiated and Integrated Clusters" exhibit high levels of vertical differentiation by case complexity, with the highest average case mix difference between lead and non-lead hospitals as well as a high average difference between lead and non-lead hospitals in their percentage of admissions categorized as "extreme" severity. Both of these measures are significantly greater than those for Groups 1 and 2, and Group 3's average Case Mix Difference is also significantly higher than that for Group 4. In contrast, clusters in this category are less vertically differentiated by case type (as measured by the Birth Case Distribution variable), with a significantly lower average for Birth Case Distribution than Group 5.

On average, "Highly Differentiated and Integrated Clusters" operate the most number of service locations, averaging more than 37 sites. This is significantly greater than the number of sites maintained by systems in Groups 1, 4, and 5. Clusters in this group also have a significantly more extensive reach in comparison to clusters in Groups 1 and 5, with an average distance of over 30 miles between service locations and clusters' lead hospital. However, this figure is significantly less than the average distance between lead hospitals and service locations observed among Group 4 systems. In addition, "Highly Differentiated and Integrated Clusters" maintain an average distance of 15.55 miles between service locations and their nearest hospital members, indicating a fairly moderate geographic spread. This is shown to be significantly less than the geographic spread observed in Group 4 and significantly greater than the concentrated spread averaged among Group 2 clusters.

Examining measures of horizontal integration, "Highly Differentiated and Integrated Clusters" on average operate nearly seven general, acute care hospitals, a figure significantly greater than the average number of hospitals operated by Groups 1, 4, and 5. Furthermore, the average cluster in this group exhibits horizontal integration activity in approximately four stages of the continuum of care, which is comparable to Group 2 and significantly greater than Groups 1 and 4. In each of its horizontally integrated stages, Group 3 members average the highest number of service locations (6.73), and this is observed as greater than Groups 1, 4, and 5 at statistically significant levels. For each of the study measures of vertical integration, "Highly Differentiated and Integrated Clusters" maintain the highest average values. These systems, on average, provide services or operate service locations in at least 13 stages throughout the continuum of care, which is significantly more than Groups 1 and 5. In addition, the average cluster in this group provides over 80 percent of the services identified in the AHA Annual Survey as "upstream," and over 50 percent of the services identified as "downstream." In comparison to Groups 1, 4, and 5, these figures are greater at statistically significant levels.

Averages among "Highly Differentiated and Integrated Clusters" for the Hospital Transfer Difference and Duplication of Services variables suggest that these systems display high levels of coordination. The average difference across hospital members in the percentage of admissions transferred from other hospitals (10 percent) is substantially greater than that observed among the other Groups, and it is greater at a statistically significant level than Groups 1, 2, and 4. For the average cluster in this category, just over 50 percent of its hospital members duplicate a given service. This low rate of duplication is less than all other Groups at a statistically significant level, reflecting a high level of coordination.

Thus, "Highly Differentiated and Integrated Clusters" exhibit high levels of horizontal differentiation as well as high levels of vertical differentiation by case complexity. They are also spatially differentiated, operating many service locations that are moderately dispersed and extend to an average distance greater than 30 miles from their lead hospitals. In addition, these clusters consistently exhibit high levels of horizontal integration, vertical integration, and coordination across all of the integration-coordination measures. We observe that "Highly Differentiated and Integrated Clusters" are horizontally integrated at multiple stages of the continuum of care, beyond just general, acute care hospitals, and that across their multiple sites, a diverse range of services throughout the continuum of care are offered and coordinated.

Group four: Dispersed and hospital-focused clusters**.** We label the fourth cluster solution group, with nine observations, as "Dispersed and Hospital-Focused Clusters." This group includes the second-smallest share of clusters – just under 8 percent – in the study, with examples such as the clusters of Community Health Systems hospitals in Virginia, east Texas, and west central Texas, among others.

"Dispersed and Hospital-Focused Clusters" display relatively low levels of horizontal differentiation, averaging the lowest number of different service location types (3.67) among the solution groups. Both of the horizontal differentiation measures for this group are significantly lower than those observed in Groups 2 and 3. Similarly, relatively low levels of vertical differentiation are observed within this category, including the lowest average for the Case Mix Difference, which is significantly less than the Case Mix Difference displayed by Groups 3 and 5. In fact, "Dispersed and Hospital-Focused Clusters" presented approximately no difference on average between the case mix of patients at lead hospitals versus those at non-lead cluster members. In terms of vertical differentiation by case type, these clusters present a low Birth Case Distribution value, which is less than that observed in Group 5 at a statistically significant level.

"Dispersed and Hospital-Focused Clusters" display unique configurations in comparison to other Groups. They operate significantly fewer service locations than clusters in Groups 1, 2, and 3, with the lowest overall average across all Groups, averaging 6.44 sites per cluster. In addition, their small numbers of locations are widely dispersed and maintain an extensive reach. They average a distance of nearly 65 miles between member hospitals and lead facilities, and the average distance between their service locations and each site's nearest member hospital is nearly 46 miles. Both distances are significantly greater than those for averaged for all other Groups in the study.

Low levels of horizontal integration are observed among "Dispersed and Hospital-Focused Clusters," with significantly fewer hospitals on average (2.67) than Groups 2 and 3. Clusters in this group average the fewest number of horizontally integrated stages (0.78) and the fewest number of locations per horizontally integrated stage (1.50). Both figures are less than those observed in Groups 2 and 3 at statistically significant levels. When considered along with Group 4 clusters' low average of different types of service locations, these figures indicate a primary focus on general, acute care hospital sites. In contrast, these hospital-based clusters display more moderate levels of vertical integration. For each measure of vertical integration, "Dispersed and Hospital-Focused Clusters" average higher values than two Groups and lower values than the other two Groups. In terms of statistically significant differences, "Dispersed and Hospital-Focused Clusters" provide services and operate sites across more vertically integrated stages (12.56) than Groups 1 and 5, they provide fewer "upstream" services than Groups 2 and 3 (0.59), and they provide fewer "downstream" services than Group 3 (0.31). And, with regard to coordination measures, these systems on average maintain essentially no difference across hospital members in the percentage of admissions transferred from other hospitals, which is less than Group 3's average Hospital Transfer Difference value at a statistically significant level. Approximately two-thirds of hospital members in "Dispersed and Hospital-Focused Clusters" duplicate a given service on average, and this reflects a moderate level of coordination, as it is a significantly greater value than the average observed for Group 3 but significantly less than the average observed for Group 5.

Considering these results collectively, "Dispersed and Hospital-Focused Clusters" display low levels of differentiation and extremely dispersed configurations. These clusters also present low levels of horizontal integration but are more moderately integrated in vertical terms, and they display low to moderate levels of coordination.

Group five: Vertically differentiated and lowly integrated clusters. Finally, we label the fifth cluster solution group, including only 5 observations, as "Vertically Differentiated and Lowly Integrated Clusters." This is the smallest group in the final cluster solution, representing just over four percent of the sample clusters, and examples include the PeaceHealth cluster in northwest Washington and NCH Healthcare System in Naples, Florida.

Clusters in this group display low levels of horizontal differentiation, averaging the lowest percentage of hospital services provided (38 percent) among the solution groups. In addition, they average 4.4 different types of service locations, which is significantly lower than Group 2. Although "Vertically Differentiated and Lowly Integrated Clusters" display low levels of horizontal differentiation, they also present very high levels of *vertical* differentiation. For each of the vertical differentiation measures, Group 5 includes the highest average values among the groups identified in the final cluster solution. "Vertically Differentiated and Lowly Integrated Clusters" are both vertically differentiated by case complexity – including an average case mix difference of 0.64 between lead and non-lead hospitals, which is greater than Groups 1,2, and 4 at statistically significant levels – and case type, with an average Birth Case Distribution value of 0.11, which is significantly greater than all other Groups.

Hospital-based clusters in this group display low levels of spatial differentiation. They operate significantly fewer service locations than clusters in Groups 2 and 3, averaging 10.4 sites per cluster. In addition, they average a distance of roughly 13 miles between member hospitals and lead facilities, which is the lowest average value among the final cluster solution groups and is significantly less than Groups 2, 3, and 4, indicating a limited geographic reach. They also display a limited average distance between cluster service locations and their nearest hospital members, nearly 12 miles, which is significantly less than the average spread measured in Group 4. Thus, their configuration is concentrated within a limited distance range.

We observe low levels of horizontal integration among "Vertically Differentiated and Lowly Integrated Clusters," including the lowest average number of hospital members – just over two hospitals per cluster. Although the clusters in this category average two horizontally integrated stages, this value is not found to be different at statistically significant levels than the values observed across the other Groups. However, Group 5's average of 2.72 locations per horizontally integrated stage is significantly lower than Groups 2 and 3. These systems also display low levels of vertical integration, averaging significantly fewer vertically integrated stages (10.6) than Groups 2, 3, and 4, and a significantly lower percentage of "upstream" and "downstream" services (0.40 and 0.20, respectively) than Groups 2 and 3. In terms of measures of coordination, "Vertically Differentiated and Lowly Integrated Clusters" average practically no difference across hospital members in the percentage of admissions transferred from other hospitals, although this value is not observed to be different from other Groups at statistically significant levels. A striking characteristic of the clusters in this group is that offered services are duplicated across all hospital members, which is a much higher average Duplication of Services rate than other Groups. Furthermore, this difference is statistically significant, reflecting a low level of coordination.

Considering these results collectively, "Vertically Differentiated and Lowly Integrated Clusters" exhibit low levels of horizontal differentiation but are highly vertically differentiated. They maintain concentrated configurations with a low to moderate number of locations and limited geographic reach. Finally, these clusters are also lowly integrated in both horizontal and vertical terms, and they display low levels of coordination.

Comparing groups. Evaluating these five groups collectively, one may note that "Lowly Differentiated and Integrated Clusters" present many similarities to "Vertically Differentiated and Lowly Integrated Clusters," and "Integrated and Concentrated Clusters" maintain several similar characteristics as "Highly Differentiated and Integrated Clusters." Specifically, Groups 1 and 5 are similar in their low levels of horizontal differentiation, horizontal integration, vertical integration, and coordination. And, Groups 2 and 3 are similar in their high levels of horizontal differentiation, horizontal integration, and vertical integration. As previously noted, comparing the three-cluster and five-cluster solutions from the average linkage and Ward's method hierarchical cluster analyses, members of Group 3 and Group 5 in the five-cluster solutions were often included in the same clusters as Group 2 and Group 1 members, respectively, in the three-cluster solutions.

However, key differences between these pairs of Groups are important to note, and they illustrate the lost homogeneity that would result in a three-cluster solution. For Groups 1 and 5, the key difference is that "Lowly Differentiated and Integrated Clusters" exhibit low levels of vertical differentiation, whereas "Vertically Differentiated and Lowly Integrated Clusters" are highly vertically differentiated. "Vertically Differentiated and Lowly Integrated Clusters" also maintain a much higher rate of duplicated services than those categorized as "Lowly Differentiated and Integrated Clusters." Regarding the key differences between Group 2 and Group 3 clusters, "Highly Differentiated and Integrated Clusters" present high levels of vertical differentiation by case complexity, and this is not observed among "Integrated and Concentrated Clusters." Furthermore, "Highly Differentiated and Integrated Clusters" are more dispersed in their geographic spread than those categorized as "Integrated and Concentrated Clusters," and "Highly Differentiated and Integrated Clusters" also display significantly higher levels of coordination than "Integrated and Concentrated Clusters." Table 18 summarizes these differences among the five groups identified in the final cluster solution.

Table 18. *Comparisons of cluster solution groups by underlying constructs*

GROUP LABEL		COMPARISON OF INTERPRETED DIFFERENCES WITH OTHER GROUPS
Group 1 "Lowly Differentiated and Integrated Clusters" (*n* = 45; 39.5% of sample)	Group 2	Less horizontally differentiated Less vertically differentiated by case type Less spatially differentiated, less extensive reach Less horizontally integrated, less vertically integrated, less coordinated
	Group 3	Less horizontally differentiated Less vertically differentiated by case complexity Less spatially differentiated, less extensive reach Less horizontally integrated, less vertically integrated, less coordinated
	Group 4	More physical locations, less extensive reach, more condensed spread More horizontally integrated, less vertically integrated
	Group 5	Less vertically differentiated, more coordinated
Group 2 "Integrated and Concentrated Clusters" (*n* = 39; 34.2% of sample)	Group 1	More horizontally differentiated More vertically differentiated by case type More spatially differentiated, more extensive reach More horizontally integrated, more vertically integrated More coordinated
	Group 3	Less vertically differentiated by complexity More concentrated configuration, less coordinated
	Group 4	More horizontally differentiated More spatially differentiated, more concentrated configuration More horizontally integrated, more vertically integrated
	Group 5	More horizontally differentiated, less vertically differentiated More spatially differentiated More horizontally integrated, more vertically integrated More coordinated
Group 3: "Highly Differentiated and Integrated Clusters" (*n* = 16; 14.0% of sample)	Group 1	More horizontally differentiated, more vertically differentiated More spatially differentiated More horizontally integrated, more vertically integrated More coordinated
	Group 2	More vertically differentiated by complexity More dispersed configuration, more coordinated
	Group 4	More horizontally differentiated More vertically differentiated by complexity More spatially differentiated, more concentrated configuration More horizontally integrated, more vertically integrated More coordinated
	Group 5	More horizontally differentiated Less vertically differentiated by case type More spatially differentiated More horizontally integrated, more vertically integrated More coordinated

Continued on following page

Table 18 (continued). *Comparisons of cluster solution groups by underlying constructs*

GROUP LABEL		COMPARISON OF INTERPRETED DIFFERENCES WITH OTHER GROUPS
Group 4 "Dispersed and Hospital-Focused Clusters" (*n* = 9; 7.9% of sample)	Group 1	Fewer physical locations, more extensive reach, more dispersed spread Less horizontally integrated, more vertically integrated
	Group 2	Less horizontally differentiated Less spatially differentiated, more dispersed configuration Less horizontally integrated, less vertically integrated
	Group 3	Less horizontally differentiated Less vertically differentiated by complexity Less spatially differentiated, more dispersed configuration Less horizontally integrated, less vertically integrated Less coordinated
	Group 5	Less vertically differentiated, more dispersed configuration More vertically integrated, more coordinated
Group 5: "Vertically Differentiated and Lowly Integrated Clusters" (*n* = 5; 4.4% of sample)	Group 1	More vertically differentiated, less coordinated
	Group 2	Less horizontally differentiated, more vertically differentiated Less spatially differentiated Less horizontally integrated, less vertically integrated, less coordinated
	Group 3	Less horizontally differentiated More vertically differentiated by case type Less spatially differentiated Less horizontally integrated, less vertically integrated, less coordinated
	Group 4	More vertically differentiated, more concentrated configuration Less vertically integrated, less coordinated

Summary

This chapter presents the results of an updated inventory of urban and regional hospital-based clusters as of 2012, a catalog of clusters' hospital-based and non-hospital-based components compiled from a six-state sample of clusters as of 2012, numerous descriptive analyses, and a taxonomic analysis, all in relation to the study's first three aims. In fulfillment of aim one, an updated inventory of hospital-based clusters reveals that clusters maintain a considerable presence in markets throughout the United States, particularly when evaluated according to regional rather than urban boundaries. A catalog of cluster components fulfills the study's second aim, depicting hospital-based clusters as truly more than just hospitals, with a wide variety of non-hospital-based sites throughout the continuum of care.

Finally, through a progression of multiple analyses, a taxonomic analysis yields a five-member cluster solution, satisfying the third aim of the study. A detailed comparison of these five groups reveals that, as anticipated, cluster forms vary according to the constructs of horizontal differentiation, vertical differentiation, configuration, horizontal integration, vertical integration, and coordination. These five groups are characterized as: "Lowly Differentiated and Integrated Clusters"; "Integrated and Concentrated Clusters"; "Highly Differentiated and Integrated Clusters"; "Dispersed and Hospital-Focused Clusters"; and, "Vertically Differentiated and Lowly Integrated Clusters." Furthermore, results of validation tests suggest that this final cluster solution is internally valid and reliable.

However, as noted in Chapter 4, rigorous efforts to externally validate the final cluster solution require significance tests using external variables that are theoretically related to the taxonomic groups. Therefore, in fulfillment of the study's fourth aim to explain hospital-based clusters' varied forms, we proceed in Chapter 6 to develop and test a theoretical framework for the external validation of the five cluster groups.

Chapter 6: Explanatory Analysis of Taxonomic Groups

In the previous chapter, the results of a detailed taxonomic analysis of hospital-based clusters were presented, identifying five common forms assumed by clusters in the study sample. Collectively, these five groups may *describe* the common forms assumed by hospital-based clusters, but the need to *explain* clusters' adoption of these common forms, as specified in the study's fourth aim, remains unfulfilled. Furthermore, an important method of externally validating taxonomic analysis results is to test the significance of the final cluster solution with theoretically motivated variables separate from those employed in defining common taxonomic groups (Aldenderfer & Blashfield, 1984; Ketchen & Shook, 1996; Hair et al., 2006).

To fulfill the study's fourth aim and externally validate the results of the study's taxonomic analysis, this chapter includes the development and application of a multi-theoretical perspective from which independent variables are developed and then tested for significance across the taxonomic groups of hospital-based clusters. The chapter begins with the development of a multi-theoretical perspective, followed by the description of methods and presentation of analysis results.

Theoretical Framework

To explain the diversity of cluster forms, we turn to organization theory, which provides "a coherent explanation of a set of observed phenomena" and allows for the development of logical assumptions and predictions pertaining to organizations (Shapira, 2011, p. 1313).

Furthermore, organization theory may serve as a tool with which we can understand today's clusters and explain their varied forms and activities, recognizing the historical, economic, institutional, cultural, social, and political contexts in which they are embedded (Greenwood & Miller, 2010; Walsh, Meyer, & Schoonhoven, 2006). These different contexts are emphasized to varying degrees in the different perspectives that comprise the organization theory canon, reflecting the considerable diversity that characterizes organization theory (Azevedo, 2002). Perspectives labeled within the canon include structural contingency theory, institutional theory, resource dependence theory, transaction cost economics, population ecology, and complexity theory, among others (Mick & Shay, in press).

From this canon of diverse theories, we may ask: What theory do we apply in our effort to explain cluster forms? However, this question poses a problem when one considers that by selecting and applying a single theory to explain cluster forms, one may be narrowly restricting the consideration of contexts that influence organizations' behaviors and activities. Indeed, the shortcomings of examining organizations using a single paradigm approach have been acknowledged by scholars both within (e.g., Balotsky, 2005; Luke & Walston, 2003; Mick & Shay, in press; Shortell, 1999; Zinn & Brannon, in press) and outside of the health care organization discipline (e.g., Lewis & Grimes, 1999; Poole & Van de Ven, 1989).

Organizations are widely recognized as rich, diverse, and multifaceted, and critics of the dogmatic application of a single theory to examine organizations suggest that such conventional analysis oversimplifies organizations' complex conditions and varied actions (Balotsky, 2005; Begun, Zimmerman, & Dooley, 2003; Lewis & Grimes, 1999; Shortell, 1999; Zinn & Brannon, in press). Poole and Van de Ven (1989) go so far as to depict individual theories as limited in nature given their pursuit of parsimonious explanations, labeling scholars' attempts to apply individual theories as "essentially incomplete" because they "attempt to capture a multifaceted reality with a finite, internally consistent statement" (p. 562). Simply put, no single theory adequately explains organizational phenomena (Luke & Walston, 2003; Martinez & Dacin, 1999; Mick & Shay, in press; Poole & Van de Ven, 1989; Stiles, Mick, & Wise, 2001; Zinn & Brannon, in press). Such criticism has led to calls for the synthesis and application of multiple theoretical perspectives in organizational analysis. By integrating numerous organization theories into a multi-theoretical perspective, scholars may use organization theory to greatest effect, benefitting from a greatly improved understanding of complex and, at times, paradoxical organizational phenomena (Azevedo, 2002; D'Aunno & Zuckerman, 1987; Greenwood & Miller, 2010; Haveman, 2000; Lewis & Grimes, 1999; Luke & Walston, 2003; Mick & Shay, in press; Poole & Van de Ven, 1989; Scott & Davis, 2007; Shortell, 1999; Zinn & Brannon, in press).

Just after the turn of the century, Scott (2004) described a growing embrace of multiple theoretical perspectives among organizational scholars, who he saw taking "steps toward developing more integrative frameworks" (p. 14). Some examples of these efforts to integrate theoretical perspectives were highlighted ten years earlier by Bluedorn and colleagues (1994) in their review of strategic management and organizational environment literature. These authors noted the synthesis of elements of institutional theory with other theoretical perspectives – particularly population ecology, resource dependence theory, contingency theory, and strategic management theory – which when combined provide an enhanced explanation of subjects such as "the diffusion of innovation, organizational death rates, performance, the 'liability of newness,' board involvement, organizational structure, isomorphism, and interorganizational relations" (Bluedorn et al., 1994, p. 234). Two classic examples of the synthesis of individual theoretical perspectives include Oliver's (1991) integration of resource dependence theory and institutional theory to predict organizations' strategic responses to institutional pressures as well as Martinez and Dacin's (1999) synthesis of institutional theory and transaction cost economics to explain organizations' decision behaviors in specific situations.

More recently, Goldberg and Mick (2010) noted the growing application of multi-theoretical perspectives to explain the responses of health care organizations to their environmental influences (p. 433). Examples of multi-theoretical frameworks applied by health care researchers include the integration of institutional and network theories (Burns & Wholey, 1993; Westphal, Gulati, & Shortell, 1997), institutional theory and population ecology (D'Aunno, Succi, & Alexander, 2000), institutional and resource dependence theories (Balotsky, 2005; Campbell & Alexander, 2005; Goldberg & Mick, 2010; Proenca, Rosko, & Zinn, 2000; Zinn, Weech, & Brannon, 1998), institutional and strategic management theories (Arndt & Bigelow, 1992; Hanlon, 2001), institutional and structural contingency theories (Fennell, Clauser, & Plavin-Masterman, in press), network theory and transaction cost economics (Shay & Mick, 2013), population ecology and network theory (Mascia & Di Vincenzo, 2011), resource dependence and strategic management theories (Zinn et al., 2007a), resource dependence theory and transaction cost economics (Dansky, Milliron, & Gamm, 1996; Fareed & Mick, 2011), and strategic management theory and transaction cost economics (Diana, 2009; Mick, 1990).

However, attempts such as these to synthesize theoretical perspectives in health care organization studies have typically involved pairs of theories, as noted by Mick and Shay (in press). Far less frequent have been efforts to develop and apply multi-theoretical perspectives integrating three or more organization theories. Rare examples include Cook and colleagues' (1983) examination of hospitals' responses to regulation, D'Aunno and Zuckerman's (1987) analysis of hospital federations' emergence, Kaluzny and Hurley's (1987) application of theory towards the study of multi-institutional systems, Starkweather and Carman's (1988) study of hospitals' competitive behaviors in local markets, Fennell and Alexander's (1993) review of change in U.S. medical care organizations during the 1980s, Krein's (1999) examination of rural hospitals' adoption of provider-based rural health clinics, Luke and Walston's (2003) assessment of health care organization strategies and industry changes during the 1990s, Chou's (2009) study of hospital-provided home health services following the Balanced Budget Act of 1997, Zinn and Flood's (2009) commentary on slack resources in health care organizations, and Shay and colleagues' (in press) depiction of clusters as differentiated and integrated forms. Yet even among these, only a few studies (Chou, 2009; Krein, 1999; Starkweather & Carman, 1988) included empirical analyses to test the assumptions and assertions yielded from their respective multi-theoretical frameworks.

Thus, there exists a paucity of health care organization studies that include both the development and empirical application of multi-theoretical perspectives. In light of this, and given the repeated calls for the integration and application of multiple organization theories in the health care organization literature, this study applies a multi-theoretical perspective in its empirical analysis of factors that may explain the diverse forms displayed among hospital-based clusters.

A multi-theoretical perspective. Having considered the merits of applying a multi-theoretical perspective to achieve this study's fourth aim, individual theories must then be selected and synthesized into a conceptual framework that may explain clusters' pursuit of varied forms. As discussed in Chapter 3 and supported in the results presented in Chapter 5, the common forms exhibited by clusters are defined and distinguished by their differentiation-configuration and integration-coordination strategies.

In a related reflection on health care organizations' restructuring activities and pursuit of varied strategies during the 1990s, including the development of clusters, Luke and Walston (2003) called for the application of perspectives that account for health care organizations' economic rationality as well as the sociopolitical dynamics and sociological underpinnings influencing their strategic decisions. Similarly, scholars have suggested that health care organizations' integration decisions are informed by both economic and sociological factors, with the tension between these two forces varying according to their local market characteristics (Rundall, Shortell, & Alexander, 2004; Zinn & Brannon, in press). Efforts such as these which seek to account for both economic and sociological factors are important, as they address two prominent, contrasting conceptions of organizations in which contemporary organization theories are often grouped: rational system perspectives and natural system perspectives (e.g., Baum & Rowley, 2002; Scott, 2004; Scott & Davis, 2007).

Theories categorized as rational system perspectives view organizations as collectivities that act in a purposeful and formalized fashion to achieve specified goals, whereas natural system theorists view organizations as collectivities that "are more than instruments for attaining defined goals," but rather "social groups attempting to adapt and survive in their particular circumstances" (Scott & Davis, 2007, p. 60). By incorporating and integrating theories from both conceptualizations in a multi-theoretical framework, organization scholars may obtain a more thorough and adequate explanation of organizations' behaviors (Baum & Rowley, 2002; Luke & Walston, 2003). Therefore, this study follows the example set by previous works by incorporating both rational- and natural-system perspectives in its multi-theoretical framework.

Furthermore, the theories selected for the study's multi-theoretical framework include perspectives previously integrated in other health care organization studies' applications of multiple perspectives. Within the natural-system conceptualization, these include population ecology (Chou, 2009; Cook et al., 1983; D'Aunno & Zuckerman, 1987; Fennell & Alexander, 1993; Kaluzny & Hurley, 1987; Zinn & Flood, 2009) and institutional theory (Chou, 2009; D'Aunno & Zuckerman, 1987; Fennell & Alexander, 1993; Kaluzny & Hurley, 1987; Krein, 1999; Luke & Walston, 2003; Zinn & Flood, 2009). Within the rational-system view, these include industrial organization economics (Krein, 1999; Luke & Walston, 2003; Zinn & Flood, 2009) and transaction cost economics (Chou, 2009; D'Aunno & Zuckerman, 1987; Luke & Walston, 2003; Zinn & Flood, 2009). A fifth theory, resource dependence theory, has been acknowledged in various works for including arguments claimed by both the natural-system and rational-system camps, and thus may be considered a "natural/rational" perspective (Baum & Rowley, 2002). A popular and oft-applied perspective in health services literature (Kaluzny, 1987), resource dependence theory has been included in many of the previously noted applications of multi-theoretical perspectives in health care organization studies (Chou, 2009; Cook et al., 1983; D'Aunno & Zuckerman, 1987; Fennell & Alexander, 1993; Kaluzny & Hurley, 1987; Luke, 2003). Using these five theories, we now develop and apply a multi-theoretical framework to explain cluster forms.

Population ecology. Extending from the well-known work by Hannan and Freeman (1977), population ecology theory focuses upon the question, "Why are there so many kinds of organizations?" (p. 936). According to population ecologists, the environment plays a primary role in determining the evolution of organizational forms (Aldrich, 1987; Alexander & Amburgey, 1987; Baum & Rowley, 2002; Fennell, 1980; Lewin, Weigelt, & Emery, 2004;

Lewis & Alexander, 1986; Renshaw, Kimberly, & Schwartz, 1990). As a result, organizational diversity is explained by relating the strategies and structures of organizational populations to environmental conditions. Organizational forms that best "fit" their surrounding environment are retained, and those that are not well-suited to the environment are selected out (Christianson, Sanchez, Wholey, & Shadle, 1991; Lewin et al., 2004; Renshaw et al., 1990).

Although at first glance the importance of "fit" appears to be consistent with contingency theory, population ecology is much more deterministic, asserting that organizations experience great difficulty adapting to environmental changes due to structural inertia and bounded rationality (Christianson et al., 1991; Baum & Rowley, 2002; Lewin et al., 2004; Renshaw et al., 1990). Transformation of organizational forms is chiefly the result of an evolutionary selection process rather than managerial discretion, in which fundamental change yields new organizational forms that challenge incumbent firms, and the environment retains only those organizational forms best suited to survive (Lewin et al., 2004; Scott, 2004). Thus, population ecology regards an organization's environment as an active force that shapes the population of organizational forms through processes such as selection and retention (Aldrich, 1979; Fennell, 1980; Hannan & Freeman, 1977; Oliver, 1988).

Through the natural selection process, organizations with characteristics that fit environmental demands survive while those lacking such fit die away, leading to the emergence of populations of surviving organizations that share common characteristics (Hannan & Freeman, 1977; Kaluzny, Alexander, Hurley, & Galloway, 1987; McKelvey & Aldrich, 1983; Oliver, 1988). As one environment varies from another, the forms observed across retained populations also vary, and a common form that is optimally adapted to one environment's demands may not be well-suited for survival in another environment (Fennell, 1980, p. 486;

Hannan & Freeman, 1977, p. 939). Thus, the population ecology perspective suggests that an array of different organizational forms – such as the different forms of hospital-based clusters identified in this study – are the result of different environments exerting different demands. At the same time, organizations existing within the same or similar environments and requiring similar resources may tend to share common forms as "like external circumstances create like organizations," a phenomenon referred to as isomorphism (Oliver, 1988, p. 545; Hannan & Freeman, 1977; Mascia & Di Vincenzo, 2011; Podolny, Stuart, & Hannan, 1996). Applying this explanation of isomorphism to hospital-based clusters, we expect that clusters operating in the same markets face similar environmental demands and constraints, and therefore they are more likely to exhibit the same cluster forms. In light of this, the following hypothesis is generated:

- *H1: Clusters operating in the same market are more likely to share the same cluster form, all other things being equal.*

Population ecologists view environments as resource pools that determine population survival and growth through the availability of resources (Aldrich, 1979; Jiang & Begun, 2002). Within these pools, varied combinations of resources allow for certain organizational forms to be supported while other forms are constrained or excluded due to limiting factors, creating what population ecologists refer to as niches (Aldrich, 1979, 1987; Geroski, 2001; Hannan & Freeman, 1977; Ricketts, Konrad, Stein, & DeFriese, 1987; Sorenson, McEvily, Ren, & Roy, 2006). Populations operating within their niche are able to outperform other populations in acquiring needed resources, which in turn impacts their survival (Aldrich, 1987; Hannan & Freeman, 1977; Ulrich & Barney, 1984; Yarbrough & Powers, 2006).

A niche dimension that population ecologists have paid particular attention to is often referred to as "niche width," which addresses varied ways that organizations exploit the available and changing resource supplies in their niches to survive (Aldrich, 1987; Freeman & Hannan, 1983; Hannan & Freeman, 1989; Sorenson et al., 2006). Niche width distinguishes organizations as "generalists" or "specialists" according to the array of resources they utilize and the range of services or products they offer (Dobrev, Kim, & Hannan, 2001; Geroski, 2001; Hannan & Freeman, 1989). Specialist organizations engage in selective strategies such as pursuing a narrow range of functions in concentrated market segments or limited geographical areas, whereas generalist organizations are characterized by the breadth of their services, the diversity of their activities, and their appeal to larger market areas (Hurley & Kaluzny, 1987; Kaluzny et al., 1987; Yarbrough & Powers, 2006). In comparison to specialists, generalists occupy a broader niche width and display a greater tolerance for diverse circumstances, yet they also require a greater supply of resources, making them more likely to survive in highly munificent environments with abundant resource pools (Dobrev et al., 2001; Freeman & Hannan, 1983; Hurley & Kaluzny, 1987; Sorenson et al., 2006).

In addition to relying on environments that are characterized by munificence – that is, by an abundant and broad pool of resources – generalists also rely upon environments that are characterized by their diversity. Diverse environments exhibit "differentiation among elements of a given type of resource" and thereby encourage differentiation of organizational activities, whereas homogeneous environments tend to promote simplification, specialization, and standardization of organizations' forms and activities (Jiang & Begun, 2002, p. 1529; Geroski, 2001). In explaining the diversity of structures and services observed in populations of locally grouped hospitals, Fennell (1980, 1982) suggested that, in health care organization studies, an environment's diversity may be described according to the environment's patient diversity and supplier diversity. According to this logic, a more diverse population of patients presents a more diverse range of demands upon health care providers, prompting health care organizations to "match patient diversity with a diverse range of services" (Fennell, 1980, p. 487; Comstock & Schrager, 1979). Similarly, Fennell (1980) observed that hospitals' diversity of services was related to the diversity of physicians within their communities, as a wide range of specialty physicians are able to offer and promote a wide range of specialty services. Therefore, as generalist organizations are characterized as offering a more diverse range of services, they are also more likely to thrive in environments with a more diverse supply of patients and providers.

Furthermore, generalist forms are frequently associated with larger organizational size, leaving the periphery of their niches to smaller specialist organizations (Aldrich, 1987; Carroll, 1985; Rundall, 1987; Sorenson et al., 2006; Swaminathan, 2001). For generalist organizations, the variety of activities pursued to address environmental demands require an expansion of organizational size and even tend to encourage vertical forms (Carroll, 1985).

Many studies applying the population ecology perspective have examined the concept of niche width according to the range of products, services, or activities observed within a firm, which corresponds to an organization's product or service differentiation strategies (Sorenson et al., 2006). Applying the concepts of generalism and specialism to hospital-based clusters, those clusters that engage in high levels of horizontal differentiation and vertical integration, such as the "Integrated and Concentrated Clusters" and the "Highly Differentiated and Integrated Clusters," may be described as generalist organizations given their wide range of services and service location types throughout the continuum of care. In contrast, clusters displaying lower levels of differentiation with a more limited range of services and locations, such as the "Lowly Differentiated and Integrated Clusters," could be regarded as specialized organizations given their narrow breadth of services and their focus on smaller market areas.

Considering that an organization's form is related to its population's niche width (Kaluzny et al., 1987), the population ecology perspective suggests that the forms assumed by hospital-based clusters are likely related to their organization's stance as generalists or specialists. In light of previous scholars' arguments that generalist organizations are better suited for survival in larger market areas characterized by higher levels of munificence and diversity, we expect that the "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms, which correspond with descriptions of generalism, are more likely to be observed in larger markets, in environments with abundant resource pools, and in markets with greater levels of patient and supplier diversity when compared to other cluster forms. A common indicator of an environment's supply of resources is the population's level of economic wealth, reflecting the ability to afford a wide range of health care services such as "basic preventive care [or] expensive high-technology procedures" (Jiang & Begun, 2002, p. 1528). And, a useful indicator of supplier diversity in health care communities is the abundance of specialty physicians relative to general practitioners (Fennell, 1980, 1982). In addition, recognizing the previously observed association between large organization size and generalist forms, we anticipate a positive relationship between organization size and the "Highly Differentiated and Integrated Clusters" form. Thus, we hypothesize the following:

- *H2: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in larger markets, all other things being equal.*
- *H3: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of economic wealth, all other things being equal.*

- *H4: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of patient diversity, all other things being equal.*
- *H5: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of supplier diversity, all other things being equal.*
- *H6: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by larger clusters, all other things being equal.*

Institutional theory. Another popular perspective in organization theory – viewed by some as complementary to population ecology – is institutional theory (Lewin et al., 2004). Whereas population ecology originated to address the question of why so many different kinds of organizations exist, institutional theory developed from the question of why so many organizations look the same. Institutional theory is often traced to the early works of Selznick (1949, 1957), who suggested that organizations seek to respond to environmental pressures by adhering to institutionalized norms and rules. Decades later, "new" institutionalism emerged through contributions by Meyer and Rowan (1977) and DiMaggio and Powell (1983), noting the influence of cultural-cognitive pressures in institutional environments.

Both the "old" and "new" conceptualizations of institutional theory acknowledge two conflicting environments which organizations face: institutional environments and technical environments (Alexander & D'Aunno, 1990, 2003; Scott, 1987; Scott & Meyer, 1983; Zucker, 1987). Within technical environments, organizations are influenced by the logic of technical rationality, which favors performance and efficiency, whereas institutional environments promote the logics of institutional norms and beliefs, which value legitimacy and adherence to social rules or expectations, even in the absence of rational explanation (Lounsbury, 2007; Scott & Meyer, 1983). From such thinking, institutional theory provides an explanation for instances in which organizations behave in ways that contradict economic motivations or may even lack rational reasoning. In these instances, rather than pursue strategic changes to realize improved efficiency or effectiveness, institutional theorists contend that organizations adopt structures or behaviors in order to be seen as legitimate by the institutional environment and thereby ensure stability and survival (Baum & Rowley, 2002; DiMaggio & Powell, 1983; Lewin et al., 2004; Meyer & Rowan, 1977). Health care organizations in particular are recognized for the strong institutional pressures and conflicting institutional logics and demands they endure (Arndt & Bigelow, 1992, 2000; D'Aunno et al., 2000; Pache & Santos, 2010; Reay & Hinings, 2005, 2009).

As organizations respond to environmental pressures and uncertainty by conforming to institutionalized rules and practices imbued with legitimacy, organizations begin to appear more and more similar, resulting in isomorphism (DiMaggio & Powell, 1983). Although both population ecology and institutional theory account for isomorphism within organizational populations, their explanations of isomorphism differ in that population ecologists view isomorphism as the result of organizations competing for survival, whereas institutional theory suggests institutional isomorphism occurs as interconnected organizations yield to institutional pressures that produce homogeneity (Oliver, 1988). Each source of institutional pressure promotes a different mechanism for isomorphism to occur, and each mechanism of isomorphism grants legitimacy to those organizations that conform to legitimated practices, even when such practices are not regarded as technically appropriate or rational (DiMaggio & Powell, 1983;

Mizruchi & Fein, 1999; Souitaris, Zerbinati, & Liu, 2012). The sources of institutional pressure include cultural-cognitive, normative, and regulative pressures, and their corresponding forms of isomorphism are mimetic isomorphism, normative isomorphism, and coercive isomorphism, respectively.

Under environments characterized by uncertainty, cultural-cognitive pressures lead organizations to imitate or adopt the modeled practices, strategies, and structures of peer and rival firms perceived as legitimate or successful, with such perceptions often based on higher performance levels or stronger reputations (DiMaggio & Powell, 1983). This phenomenon has certainly been witnessed in the health care industry, as scholars have repeatedly observed the powerful influence of industry fads and competitors' activities on health care systems' strategic behaviors, as opposed to a careful assessment of the organization's needs, capabilities, or future plans (e.g., Arndt & Bigelow, 1992; Burns & Pauly, 2002; Kaissi & Begun, 2002; Mick & Conrad, 1988; Topping, Hyde, Barker, & Woodrell, 1999; Walston, Kimberly, & Burns, 2001). For example, studies have illustrated how health care organizations' pursuit of matrix management structures (Burns & Wholey, 1993), reengineering (Walston et al., 2001), and total quality management (TQM) practices (Westphal et al., 1997) were initially driven by efforts to gain efficiency among "early adopters" but later occurred as imitative and ceremonial behavior among "later adopters" desiring to gain legitimacy.

For health care provider organizations in the U.S., the past 25 years have been marked by considerable turbulence and uncertainty (Scott, Ruef, Mendel, & Caronna, 2000). It is during this period that many of the nation's hospital-based clusters have emerged as dominant providers within their local markets, as explained earlier in Chapter 2 and illustrated in Chapter 5. The institutional theorist's explanation of mimetic isomorphism suggests that, as clusters operate in such uncertain conditions, they may emulate the activities and structures displayed by other clusters in their local markets that are recognized as legitimate and successful. One easily identifiable measure of success in a local market is a cluster's market share, and therefore we anticipate that clusters are more likely to adopt the cluster form exhibited by the cluster with the largest market share in their local market. This results in the following hypothesis:

- *H7: Clusters are more likely to share the same cluster form with the cluster having the largest market share in their same local market, all other things being equal.*

In contrast to cultural-cognitive pressures, normative pressures shape organizations' practices and structures to meet commonly held societal values, ultimately contributing to normative isomorphism (DiMaggio & Powell, 1983). Health care organization scholars have noted that, for hospitals and hospital systems, strong normative pressures and logics have conflicted with pressures from technical environments (Alexander & D'Aunno, 1990, 2003; Scott, 2003; White, 2003). In particular, continual tension exists between the traditional institutional logic of health care as a philanthropic, physician-focused social good and the more recently developed logic of health care as a commodity subject to commercial considerations, income-focused philosophies, and corporate influence (Reay & Hinings, 2009; Scott, 2003; White, 2003). During the latter half of the 20th century, and continuing into the 21st century, hospital providers have experienced increasing technical pressures to maximize efficiency, profitability, and overall economic performance as a result of the "corporatization" of health care (Alexander & D'Aunno, 1990, 2003; Bazzoli, 2004; Gray, 1991; Potter, 2001; Starr, 1982; Stevens, 1989; White, 2003). On the other hand, these providers also operate within an institutional environment that has traditionally promoted health care as a public service rather than a corporate product (Alexander & D'Aunno, 1990, 2003).

Such normative pressures are particularly felt by providers connected to faith-based or charitable principles, including religious hospitals, secular nonprofit hospitals, and public hospitals, and as a result, society often expects that they behave in accordance with their foundational values and charitable traditions (Gray, 1991; White, 2000, 2003). Nonprofit health care organizations that do not cater to these normative pressures risk the loss of *moral* legitimacy, which is based upon an audience's evaluation of whether an organization's activity "effectively promotes societal welfare" and represents "the right thing to do" (Suchman, 1995, p. 579). Conversely, a nonprofit health care organization that generates moral legitimacy may gain others' approval "because [its] structural characteristics locate it within a morally favored taxonomic category," indicating it maintains the capacity to perform socially desirable work (Suchman, 1995, p. 581; Meyer & Rowan, 1991; Scott, 1977).

Thus, although nonprofit hospitals experience continued pressures to "resemble the management of for-profit firms" in an increasingly corporatized industry (DiMaggio & Powell, 1983, p. 156), they are also expected to act in a manner consistent with values of "social obligation and moral virtue" rather than "the profit ethos" (Stevens, 1989, p. 361). As a result, these health care organizations display a "hybridization" of philanthropic and corporate behaviors (Alexander & D'Aunno, 2003, p. 68; Potter, 2001; White, 2003). In comparison, for-profit providers are less subject to criticism for opportunistically structuring assets and pursuing strategies that advance their business interests and generate corporate profits (D'Aunno et al., 2000). For example, nonprofit hospitals and hospital systems are expected to provide a reasonable level of community services to justify their tax-exempt status, with community services including a range of medical care programs valued for their benefit to the community rather than whether or not they generate revenue or profit (Potter, 2001). On the other hand, for-profit hospitals and hospital systems face less pressure to offer a wide array of differentiated services that meet community needs, but instead may "avoid high-cost, low-profit services…in an effort to increase hospital profits and stockholder returns" (Potter, 2001, p. 18; Ginzberg, 1988).

Applying these concepts to hospital-based clusters, normative pressures may influence nonprofit clusters' differentiation-configuration strategies, leading them to offer a wide range of services and service locations – including those that offer little profit generation opportunity – that comprehensively meet the health care needs of their communities, as exhibited by forms such as the "Integrated and Concentrated Clusters" and the "Highly Differentiated and Integrated Clusters." Even more, as nonprofit clusters continue to feel the growing influence of commercial values and patterns of corporatization (Potter, 2001), their ability to respond to such technical pressures through rational, economically motivated strategies may be limited by normative barriers (Balotsky, 2005; Luke & Walston, 2003). In contrast, for-profit clusters may realize less incentive and reduced pressure to pursue strategies of high differentiation-configuration and integration-coordination, as a focus on profit maximization and revenue generation may deem certain services within the continuum of care or certain locations within the local market undesirable and untenable relative to their organization's goals. For these clusters, the institutional logic of health care as a commodity is a higher-order logic compared to the competing institutional logic of health care as a social good, which is ultimately reflected in their differentiation-configuration and integration-coordination strategies (Thornton, 2002). Therefore, we hypothesize:

- *H8: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be owned by nonprofit organizations than for-profit organizations, all other things being equal.*

Another example of normative pressures observed among certain hospital groups includes the expectations and values tied to teaching hospitals and academic medical centers. Teaching hospitals have traditionally distinguished themselves from other general, acute care hospitals by their high levels of commitment to tertiary patient care, teaching, and research (Zuckerman, D'Aunno, & Vaughan, 1990, p. 106), and these values as well as the powerful influence of professional groups such as physicians, researchers, and faculty members place strong normative pressures upon teaching hospitals to operate in ways consistent with the traditional missions of academic medical centers. Therefore, clusters with teaching hospital members would likely maintain normative values within the organization that emphasize a broad provision of patient services, including highly complex services, as well as wide-ranging interests throughout the continuum of care which would support their teaching and research missions. They may also be subjected to increased normative pressures from external stakeholders in the form of heightened expectations to extend their social benefits by offering a diverse range of services throughout the continuum of care, regardless of whether or not such services have traditionally been deemed profitable service lines. And, clusters with teaching hospitals may also face increased normative and cognitive pressures to adopt a "hub-and-spoke" model that vertically differentiates between the teaching hospital member and other member hospitals and coordinates care provided within the cluster based upon the influence and capabilities of its teaching hospital member. Therefore, clusters with teaching hospital members may experience increased pressures to engage in high levels of differentiation-configuration and integration-coordination, as exhibited by clusters adopting the "Highly Differentiated and Integrated Cluster" form. In light of this, we hypothesize:

- *H9: Clusters with teaching hospital members are more likely to adopt "Highly Differentiated and Integrated Cluster" forms, all other things being equal.*

Finally, institutional theorists suggest that regulations serve as instruments of coercion which organizations must comply with in order to maintain legitimacy and ensure survival (Scott & Davis, 2007). As varied laws and rules apply regulative pressure, organizations conform to the same established practices and structures that meet regulatory requirements (DiMaggio & Powell, 1983). In addition, certain strategies that may seem desirable to an organization may not be possible if rules and regulations do not permit them, in which case regulative pressures serve as an institutional barrier to desired strategies (Luke & Walston, 2003). For hospital-based clusters, their ability to engage in differentiation-configuration or integration-coordination strategies may be influenced by varied regulatory limits imposed at the state level, such as certificate of need and scope of practice laws.

Certificate of need (CON) laws include state-level restrictions on health care organizations' construction or renovation of new facilities, purchase of major health care equipment, or development of new health care services. In this way, CONs represent "a regulatory hurdle that must be overcome before a provider can begin to offer services," but such hurdles are not uniformly experienced by health care organizations across the country, as states vary in their requirement of CONs as well as the scope of facilities or services that are covered under CON laws (Madison, Jacobson, & Young, 2012, p. 366). As a result, some states have CON laws that are more restrictive than those found in other states, and numerous states do not require CON approval for health care organizations to build new facilities or establish new services. In states without CON laws, clusters would face less resistance towards expanding and differentiating services and service location types throughout the continuum of care. In contrast, states with strict and comprehensive CON laws that apply to a wide array of health care settings and services would place considerable restrictions upon clusters' abilities to expand into differentiated service lines or service location types, as such laws have been shown to effectively limit growth (Hellinger, 2009). In light of this, we expect that clusters exhibiting strategies of high differentiation-configuration and integration-coordination are more likely to exist in states with less restrictive CON laws, whereas clusters operating in states with more stringent CON regulation are less likely to achieve highly differentiated and integrated forms due to CON restrictions. This leads to the following hypothesis:

- *H10: "Highly Differentiated and Integrated Cluster" forms are more likely to operate in states with less restrictive CON laws, all other things being equal.*

Similarly, scope of practice laws include state-level restrictions on the types of medical services that may be performed by different clinicians and health care professionals (Dower, Moore, & Langelier, 2013). In states with more restrictive scope of practice laws, health care organizations are limited in their ability to utilize non-physician professionals to provide varied services or staff different service location types in an efficient and cost-effective manner, including primary care and preventive care clinics (Dower et al., 2013; Kuo, Loresto, Rounds, & Goodwin, 2013). In contrast, states with less restrictive scope of practice laws foster both a higher supply and utilization of services from non-physician providers (Kuo et al., 2013; Reagan & Salsberry, 2013). Applying the issue to clusters, hospital-based clusters operating in states with restrictive scope of practice laws may be limited in their ability to adequately or cost-effectively staff services and settings that benefit from non-physician providers, such as retail clinics or primary care clinics (Krein, 1999; Spetz, Parente, Town, & Bazarko, 2013). In these settings, the scope of practice laws result in higher operation costs (Spetz et al., 2013) and may discourage their development among hospital-based providers (Krein, 1999), thereby presenting a barrier towards differentiation-configuration and integration-coordination strategies. In light of this, we hypothesize:

- *H11: "Lowly Differentiated and Integrated Cluster" forms are more likely to operate in states with more restrictive scope of practice laws, all other things being equal.*

Both population ecology and institutional theory perspectives represent sociological models of firm behavior, as opposed to economic perspectives that focus on exchange-related motivations for organizations. Wells and Banaszak-Holl (2000) call for a balance between sociological and economic theories in health care research, and consistent with this sentiment, we consider key perspectives developed within economic principles. In their explanation of the strategic behaviors health care organizations pursued during the 1990s in the midst of consolidation and restructuring trends, Luke and Walston (2003) identify three conceptual frameworks that illustrate "economic rationality" and may be considered most prominent in attempts to understand the behavior of organizations: industrial organization (IO) economics, transaction cost economics (TCE), and resource dependence theory (RDT).

***Industrial organization economics*.** Though not originally developed to specifically address how individual organizations adapt to environmental changes or how individual organizational forms emerge, IO economics provides arguments that address organizations' strategic responses to environmental conditions and explain the diversity of organizational forms (Baum & Rowley, 2002; Lewin et al., 2004). Traditional IO economics stems from the seminal works of Mason (1939, 1949, 1959) and Bain (1956, 1968), who collectively established the structure-conduct-performance (SCP) paradigm as the most prominent and influential approach within IO economics, such that "industrial economists all over the world…regard SCP as the natural way of proceeding" (Reid, 1987, p. 11; Baum & Rowley, 2002; Porter, 1981). Simply stated, the SCP paradigm suggests that market structures influence market conduct, which in turn affects market performance (Reid, 1987).

Although the original SCP paradigm was applied at the market level, a "new" IO economics paradigm, most frequently associated with the works of Porter (1979a, 1980, 1981, 1985), emerged and directed attention to the level of the individual firm (Baum & Rowley, 2002; Luke & Walston, 2003; Porter, 1981). "New" IO economics suggests that organizations gain competitive advantage and maximize performance by adopting structures and pursuing strategies (e.g., integration, differentiation) in accordance with their strategic groups (Hoskisson et al., 1999; Jacquemin, 1987; Lewin et al., 2004; Luke & Walston, 2003). In short, market structure also affects *individual firm* conduct, which in turn drives *firm* performance (Autrey & Thomas, 1986; Clement, 1987; Porter, 1981; Rosko, 1996; Zinn & Flood, 2009). "New" IO economics additionally recognizes the feedback effects that are possible in the SCP paradigm, with organizations' conduct and strategies influencing market structures as well as organizations' conduct and strategies affected by past performance (Jacquemin, 1987; Porter, 1981).

Organizations position themselves to gain competitive advantage by considering market structure elements that include competitive scope, entry and exit conditions, product composition and substitutability, degree of vertical integration, risk, and geographic location (Jacquemin, 1987, pp. 1-2; Lewin et al., 2004, p. 124). Porter (1980) famously categorized these market forces as existing competitors, potential entrants, substitutes, buyers, and suppliers, which collectively define a market's structure and in turn shape organizations' strategies (Autrey &

Thomas, 1986; Luke & Walston, 2003; Rosko, 1996). These market structure elements then influence firm strategy, or conduct as referred to by IO economists, which may include strategies regarding pricing, cooperation, differentiation, and integration, among others (Jacquemin, 1987).

Of the varied market structure characteristics, the IO economics perspective suggests that direct competition and competitive intensity play the greatest and most important role in influencing organizational strategy (Luke & Walston, 2003; Porter, 1979b, 1980). One particular strategy organizations find incentive to pursue in highly competitive environments is product or service differentiation (Geroski, 2001), and health care organization scholars have observed service differentiation as a common strategic response for hospitals operating in markets characterized by intense competitiveness (Mobley, 1997; Zuckerman et al., 1990). In such environments, expansion into services throughout the continuum of care allows hospitals and hospital-based systems to support their core mission and activities, "build new sources of revenue in areas that may be profitable," subsidize services that were traditionally offered but lacking in profitability, and "spread financial risks more broadly across several services or products" (Zuckerman et al., 1990, p. 112).

In addition to differentiation, hospitals have also responded to increased competitiveness in their markets by expanding and integrating horizontally, allowing them to gain market power as well as create economies of scale (Zuckerman et al., 1990). Applying these concepts to hospital-based clusters, the IO economics perspective may suggest that clusters operating in intensely competitive markets would more readily adopt differentiation-configuration and integration-coordination strategies – such as those evident among "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms – to "efficiently meet the demand for a wide spectrum of services" and be recognized by patients and payors alike as the market's preferred provider (Mobley, 1997, p. 189). Furthermore, coordination and expansion into pre-acute care services in particular allows a hospital-based cluster "to maintain or increase referrals for patient care that are…threatened by competing providers" (Zuckerman et al., 1990, p. 113). In contrast, a cluster operating in a less competitive market faces less threat to its core business – the hospital – and as a result may find less incentive to develop services and service location types throughout the continuum of care. This leads to the following hypothesis:

- *H12: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in more highly competitive markets, all other things being equal.*

Another contending force affecting firm strategy is pressure from substitute products, which can limit an organization's potential success, particularly if they present advantages in terms of price or performance (Porter, 1979b, 2008). When faced with such threats, organizations may respond by expanding into and directly competing with substitutable product or service categories. In the health care industry, scholars identify ambulatory surgery centers, home health agencies, and skilled nursing facilities as examples of substitute providers that compete with services offered in general, acute care hospitals (Balotksy, 2005; Klingensmith, 1988; Zuckerman et al., 1990). Thus, in markets with an increased supply of such settings, hospital-based clusters would feel increased competitive pressure to expand their services and location types into these substitute categories (Zuckerman et al., 1990), creating forms that exhibit higher levels of service differentiation. We therefore hypothesize:

- *H13: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of ambulatory surgery centers, all other things being equal.*

- *H14: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of home health agencies, all other things being equal.*
- *H15: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of skilled nursing facilities, all other things being equal.*

The threat of entry by new competitors acts as another important market force that influences organization strategy. In markets where barriers to entry are low and incumbent organizations are limited in their ability to forcefully retaliate, the threat of entry is high. Conversely, the threat of entry is low when entry barriers are high and incumbent firms can react aggressively and effectively against new competitors (Porter, 2008). Organization scholars have identified various potential barriers to entry in competitive markets, and a significant barrier is restrictive government policies and regulations (Porter, 2008; Rosko, 1996; Zuckerman et al., 1990). In health care markets, CON laws serve as a pertinent example of government regulation that acts as a competitive barrier and discourages new entrants (Rosko, 1996; Zuckerman et al., 1990).

Applying this example to clusters, the health services markets in states without CON laws may be characterized by a high threat of entry, incentivizing clusters to pursue more aggressive differentiation-configuration and integration-coordination strategies to gain market power and dissuade new competitors. In other states, restrictive CON laws serve as a significant barrier against new competitors that would introduce or expand services in the market. IO economists suggest that in markets with higher barriers to entry, organizations face weakened incentives to adapt and pursue competitive strategies that distinguish them from competitors (Geroski, 2001).

Therefore, hospital-based clusters in regulatory environments that provide higher barriers to entry – such as those with restrictive CON laws – may be shielded from competitive threats and have less incentive to aggressively pursue strategies such as differentiation-configuration or integration-coordination (Rosko, 1996). Consequently, we anticipate that clusters actively engaging in differentiation-configuration and integration-coordination strategies – such as those exhibiting the "Highly Differentiated and Integrated Cluster" form – are more likely to operate in states with less restrictive CON laws, which is consistent with the previously derived Hypothesis 10.

Transaction cost economics**.** Whereas IO economics examines *markets* to determine how market forces may direct the conduct of firms, another economic perspective known as transaction cost economics (TCE) examines *transactions* of goods or services between economic actors to determine whether such transactions would be more efficiently governed externally in the marketplace or internally within organizations, otherwise referred to as hierarchies (D'Aunno & Zuckerman, 1987; Mick & Shay, in press; Williamson, 1975). Developed from the works of Williamson (e.g., 1975, 1979, 1985, 1996), who built upon Coase's (1937) inquiry as to why firms exist given the opportunity for market exchange, TCE explores the issue of diverse organizational forms from the perspective of firm boundaries, assessing the efficiency of hierarchical versus market exchanges (Hoskisson et al., 1999; Santos & Eisenhardt, 2005).

The TCE perspective begins with the assertion that transactions ideally occur exclusively in markets, but that organizations become necessary when market imperfections arise due to behavioral problems of opportunism and bounded rationality (Martinez & Dacin, 1999; Mick & Shay, in press; Williamson, 1975). Of course, health care organizations are ubiquitous in the modern health care industry, which economists would suggest provides evidence of market failure as well as substantial transaction costs associated with the production of health care services and goods (Coase, 1937; Donaldson, 2012; Stiles et al., 2001; Zinn & Flood, 2009). Transaction costs are often defined as the non-production costs required to adequately produce a service or product and overcome problems of opportunism and bounded rationality. When transactions are internalized within an organization through vertical integration, these costs include the expenses of planning, establishing, monitoring, and administering the varied hierarchical steps in a production process, and when transactions occur externally through market-based exchange, these costs include the expenses of acquiring information, contracting, coordinating, monitoring, and negotiating with external entities (Mick & Conrad, 1988, p. 354; Donaldson, 2012). TCE advocates believe that organizations seek to minimize costs and maximize production efficiencies in their exchanges, and they will select the avenue of conducting exchanges – either through integration or deintegration – based upon the strategy that maximizes efficiency, reduces uncertainty, and minimizes transaction costs (Bluedorn et al., 1994; Luke & Walston, 2003; Martinez & Dacin, 1999; Mick, 1990; Stiles et al., 2001).

Williamson (1979) described transactions according to three key dimensions: their asset specificity (also referred to as "investment idiosyncrasy"), their frequency, and their uncertainty (p. 254). Collectively, these exchange characteristics determine the impact of opportunism and bounded rationality upon transaction relationships and affect transaction costs, and ultimately they influence the decision to conduct exchanges internally or externally (Martinez & Dacin, 1999; Oliver, 1990; Stiles & Mick, 1997). In addition, although TCE's arguments are often generalized to suggest that organizations simply face a "make-or-buy decision," the perspective allows for more than just two possible outcomes in terms of organizational forms. Rather, TCE offers an "explanation for organizational variety" by acknowledging that organizations' structures and forms will differ given varied transaction types, exchange characteristics, and resources required for governance (Scott, 2004, p. 6; Williamson, 2005). In other words, the degree to which activities in the production of a service or product are integrated within an organization varies given the nature of the market, the organization, and the transactions themselves.

Argued by some to be the most significant determinant of vertical integration among the exchange characteristics described in the TCE perspective (Coles & Hesterly, 1998; Gulbrandsen, Sandvik, & Haugland, 2009; Ludwig, Grote, & Van Merode, 2009; Sawant, 2012), asset specificity pertains to durable and specialized investments that are made and customized to support a specific transaction (Williamson, 1981, 1985, 1996; Fareed & Mick, 2011). Where services are characterized by low asset specificity, transactions are favored in the market, but circumstances characterized by high asset specificity tend to favor internal exchange (Williamson, 1996). Furthermore, in the presence of asset specificity, increases in exchange frequency or the uncertainty and complexity of transactions motivate hierarchical, integrated structures (Coles & Hesterly, 1998; Joskow, 2008; Martinez & Dacin, 1999; Stiles & Mick, 1997; Williamson, 1979). As the number of transactions increases between two market actors, organizations find incentive to integrate such exchanges in order to minimize monitoring costs (Martinez & Dacin, 1999). And, under uncertain and complex conditions, hierarchical structures allow organizations to control the sequence of exchanges that occur in the provision of a service or product (Coles & Hesterly, 1998).

As depicted in the concept of the continuum of care, the delivery of health care may be viewed as a chain of individual services (i.e., transactions) offered by providers to patients, and health care providers face the decision of whether they will offer services throughout the continuum of care *internally* as an integrated delivery system or whether they will exchange with external providers to meet patients' needs for certain services (Stiles & Mick, 1997; Stiles et al., 2001). For example, multihospital systems that care for patients who require inpatient rehabilitation services after their general, acute care stay face the options of either providing inpatient rehabilitation within the organization by vertically integrating post-acute care offerings or referring such patients to external inpatient rehabilitation providers, thereby completing an "exchange" in the market. A similar example could be made with pre-acute services and their "exchanges" with general, acute care hospitals (e.g., wellness centers, primary care clinics, ambulatory surgery centers). Thus, TCE provides a useful perspective from which to examine and explain integration activity throughout the continuum of care among health care organizations (Ludwig et al., 2009; Luke, Ozcan, & Olden, 1995; Mick & Shay, in press). Luke and colleagues (1995) argued that TCE can specifically be applied to explain the formation and integration strategies of hospital-based clusters, as integration yielded efficiency within "diverse exchange relationships complicated by increasingly turbulent external environments" (p. 558).

Beginning with the exchange characteristic of asset specificity, numerous health care organization scholars have described hospitals' provision of health care services as highly asset specific given the customized and time-sensitive services delivered to individual patients and the considerable amount of unique information required for each episode of care (e.g., Clement, 1988; Diana, 2009; Fareed & Mick, 2011). Furthermore, past studies have indicated that the high levels of asset specificity observed in hospital care affect integration decisions for medical as well as non-medical services (Coles & Hesterly, 1998; Ludwig et al., 2009). With hospital-based providers characterized by high levels of asset specificity, the TCE perspective suggests they will find incentive to integrate if either they engage in frequent exchanges with other providers along the continuum of care or they engage in more complex and uncertain transactions (Zinn et al., 2003). In terms of frequent exchanges with other providers along the continuum of care, one may consider both the exchanges involved in patient admissions – in which a cluster's hospitals may admit patients from external health care facility settings such as clinics, skilled nursing facilities, or other hospitals – as well as the exchanges involved in patient discharges – in which cluster hospitals may discharge patients to post-acute care settings such as inpatient rehabilitation facilities, skilled nursing facilities, or home health care. Additionally, regarding a cluster's provision of health care services, the uncertainty and complexity of its transactions may vary according to the level of care complexity required by its patients (Zinn et al., 2003, p. 1471).

Stiles and Mick (1997) proposed that as a health care organization's activities or services increase in number, complexity, and uncertainty for individual patient care episodes, the transaction costs associated with such activities increase and vertical integration is favored. This study applies similar thinking to the forms assumed by hospital-based clusters, anticipating that clusters characterized by high levels of integration – such as those exhibiting the "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms – may offer integrated services throughout the continuum of care due to more frequent exchanges with alternative provider settings as well as higher levels of complexity and uncertainty in patient care. Therefore, we hypothesize:

- *H16: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to have higher percentages of admissions from external health care facilities, all other things being equal.*

- *H17: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to have higher percentages of discharges to post-acute care facilities, all other things being equal.*
- *H18: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to care for patients requiring greater complexity of care, all other things being equal.*

Resource dependence theory. The fifth perspective included in this study's multi-theoretical framework is resource dependence theory (RDT), an open systems perspective that recognizes organizations lack the ability to self-maintain solely through internal processes and resources, and as a result they must engage elements of their external environments to secure required resources and survive (Aldrich & Pfeffer, 1976; Pfeffer & Salancik, 1978). Both TCE and RDT address resource exchanges between economic actors (Casciaro & Piskorski, 2005). However, where TCE suggests that managers view such exchanges with the goals of maximizing efficiency and reducing transaction costs, RDT argues that managers approach exchanges with the goals of securing necessary resources and maximizing an organization's power and autonomy in its environment (D'Aunno & Zuckerman, 1987; Lewin et al., 2004; Scott, 2004). In light of this, organizational strategies such as differentiation and integration are seen in terms of their ability to control resources and manage exchange relationships and competitive positions (Luke, 1991; Luke et al., 1995).

Resource dependence scholars believe that organizations prefer autonomy, but when critical resources become scarce or threatened, they will sacrifice autonomy and develop interdependent relationships with other organizations to ensure stable access to these resources (Alexander & Morrisey, 1989; Fennell & Alexander, 1993). At the same time, dependence upon other organizations for necessary resources creates uncertainty. To address this problem, organizations strive to reduce their dependence on external entities wherever possible, and they approach the task of resource acquisition by influencing their external environments and managing interdependent relationships in ways that maximize power and minimize autonomy loss (Bluedorn et al., 1994; Kaluzny & Hurley, 1987; Pfeffer, 1981). Thus, managers work to establish control over needed resources, with the intent to either reduce *their organization's* dependence and increase its autonomy, or increase *other organizations'* dependence on them to gain power (Bluedorn et al., 1994; Pfeffer, 1981). According to the RDT perspective, organizations' activities and structures are the result of competition for finite resources, and managers are expected to not only direct the internal aspects of their organizations but to also actively engage and rationally manage their external environments by "reducing dependencies and seeking adequate power advantages" so that they may enhance their organizations' stability and adaptability (Scott, 2004, p. 6; Aldrich & Pfeffer, 1976; D'Aunno & Zuckerman, 1987; Fennell & Alexander, 1993; Kaluzny & Hurley, 1987; Zinn, Weimer, Spector, & Mukamel, 2010). Resource dependence scholars typically define the market environment according to three characteristics: munificence, complexity, and dynamism (Dess & Beard, 1984; Mick et al., 1993a; Yeager et al., 2014).

A term that is also an important construct within population ecology, as previously described, munificence refers to an environment's supply of available and accessible resources (Kazley & Ozcan, 2007; Mick et al., 1993a; Yeager et al., 2014). Organizations operating in environments with abundant resources face less threat to their survival and face more opportunity to pursue needed resources without relying upon relationships that sacrifice autonomy and power. In contrast, environments with scarce resources force organizations to aggressively compete over the resource supply and place those entities that control the limited resources in positions of considerable power.

Numerous studies have applied RDT specifically to the health care industry, providing examples of how the construct of munificence relates to health care organizations' activities and strategies (Yeager et al., 2014). Common measures of an environment's munificence in these studies include a population's unemployment rate, rurality, and per capita income (Kazley & Ozcan, 2007; Mick et al., 1993a; Yeager et al., 2014). These measures signify the degree to which local patients have the financial means to access health care services, and a community's collective financial abundance indicates its ability to support a range of high-cost services and medical technologies (Kazley & Ozcan, 2007). Thus, markets that are rich in resources may attract and better support a more diverse array of health services (Balotsky, 2005), such as those offered by clusters exhibiting high levels of differentiation-configuration and integration-coordination. On the other hand, Gamm and colleagues (1996) suggested that hospitals and hospital systems "functioning under scarce resource assumptions may seek ownership of only a limited number of services" (p. 242). For example, rather than adopt expansive service differentiation or vertical integration strategies throughout the continuum of care, health care organizations in less munificent environments may focus on ownership of a particular segment of the care continuum and strive for efficiencies in that focused area. We therefore hypothesize:

- *H19: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with higher levels of munificence, all other things being equal.*

One tactic pursued by dependent organizations to secure valued resources in environments of low munificence is referred to as "constraint absorption," in which an organization integrates with an external organization that possesses the dependent organization's needed resource (Casciaro & Piskorski, 2005, p. 168; Pfeffer & Salancik, 1978). Casciaro and Piskorski (2005) developed a revised model of constraint absorption based upon evidence they obtained that constraint absorption activities are more likely to occur between firms that are mutually dependent rather than between firms with relationships characterized by a power imbalance. A simple example of constraint absorption among health care organizations relates to clusters' integration of critical access hospitals in rural areas.

Hospitals in rural areas – particularly those deemed critical access hospitals – face environmental challenges such as limited resources and heightened social pressures, and in numerous instances they may be the only feasible source for immediate health care services in their markets (Kazley & Ozcan, 2007). Their struggle to obtain access to necessary resources in environments of low munificence – for example, specialist providers – contrasts with the experiences of a typical hospital in urban settings, which are larger and more munificent (Balotsky, 2005; Kazley & Ozcan, 2007; Yeager et al., 2014). To reduce uncertainty and secure access to specialists and other needed resources, critical access hospitals may desire membership in regional clusters that maintain an expansive geographic presence in both urban and surrounding non-urban areas. Membership with clusters could offer improved access to resources that are typically scarce in rural communities. At the same time, clusters with a dispersed spatial configuration across a local market – such as those exhibiting the "Highly Differentiated and Integrated Cluster" form – may depend upon hospitals in rural locations to maintain an expansive geographic presence and gain status as a regional care provider for a broader population, even offering a potential source of future referrals for rural patients requiring specialty services. In this sense, critical access hospitals' membership in hospital-based clusters serves as an example of constraint absorption. However, clusters with concentrated spatial configurations in urban areas may find little interest in operating critical access hospitals that are unequally distant from other cluster members, as their focus is upon a specific area within a local market, and therefore they would resist consolidation with such facilities. Given this, we hypothesize the following:

- *H20: "Highly Differentiated and Integrated Cluster" forms are more likely to operate critical access hospitals, all other things being equal.*

In addition to munificence, resource dependence scholars suggest environmental uncertainty profoundly influences organizations' activities, as heightened uncertainty motivates organizations to more aggressively secure needed resources from the external environment (Kazley & Ozcan, 2007). Two key constructs are regarded within RDT as sources and elements of uncertainty: complexity and dynamism (Mick et al., 1993a; Yeager et al., 2014). Complex environments, which are often characterized by high levels of competition, complicate decision-makers' abilities to assess the current environment and predict future decisions (Mick et al., 1993a; Yeager et al., 2014). Likewise, dynamic environments, which are often characterized by turbulent patterns and fluctuations across important environment characteristics such as munificence, render managers more uncertain regarding the information with which they are tasked to make decisions (Mick et al., 1993a; Yeager et al., 2014).

Over the past thirty years, health care markets across the country have become "increasingly hostile" and characterized by increased complexity and intense resource competition (Balotsky, 2005, p. 337). Competition in a local market affects an organization's ability to acquire critical resources, and therefore the RDT perspective suggests that the competitiveness of an organization's local environment influences its strategies and activities

(Kazley & Ozcan, 2007). Specifically, highly competitive markets challenge organizations to compete for a finite supply of resources, which generates increased pressure upon organizations to distinguish themselves from their competition and cater to entities from which needed resources flow (Fareed & Mick, 2011; Kazley & Ozcan, 2007; Pfeffer & Salancik, 1978; Ulrich & Barney, 1984; Zinn et al., 2010). Thus, clusters can distinguish themselves from competitors as well as cater to numerous entities responsible for critical resources is by offering a wide array of differentiated services and service locations. And, in addition to differentiation, organizations may also pursue integration strategies in highly competitive environments in order "to deny [competitors] the use of raw materials" and "restrict competition" (Aldrich & Pfeffer, 1976, p. 83).

For example, a cluster that decides to develop a multi-service outpatient center (including a freestanding emergency department, ambulatory surgery center, outpatient therapy clinic, and fitness center) in a new, emerging area of its local market without a nearby hospital may engage in such differentiation-configuration and integration-coordination activities in order to: 1) distinguish itself from competing clusters that may not offer such a range of services in a convenient and accessible location; 2) cater to stakeholders desiring health care services in a growing area of the market; and, 3) preempt competitors from establishing the first presence in an emerging area as well as direct referrals for hospital care from the multi-service outpatient center to cluster-member hospitals. Another example of health care organizations managing resources in response to complex and competitive environments is provided by Shah and colleagues (2001) who studied acute care hospitals' adoption of long-term care and skilled nursing services in the turbulent period following the introduction of prospective payment. They noted that heightened levels of competition prompted acute care hospitals to secure command over sources of long-term care, leading to additional control of facilities for patient placement following an acute care stay, expanded service offerings, and control over additional referral sources for general, acute care services (Shah et al., 2001). Consistent with these examples, we anticipate that clusters in highly complex and competitive markets are more likely to engage in high levels of differentiation-configuration and integration-coordination, such as clusters exhibiting the "Highly Differentiated and Integrated Cluster" form. This prediction is consistent with Hypothesis 12.

With regard to dynamic environments, organizations are more likely to integrate vertically and expand their service offerings and locations under conditions of dynamism in order to "decrease the need to make risky adaptations that could threaten the organization's survival" as well as defend "against the vagaries of change" such as potential losses from current sources of revenue (Mick et al., 1993a, pp. 102-103). Santos and Eisenhardt (2005) explain that an organization's expansion into new services and geographic areas helps to buffer the organization's core position and reduce dependence on limited service domains or a single market area, and these strategies serve as firm attempts to address dynamic and uncertain environments. Furthermore, in dynamic environments, such strategies also provide increased power and serve as an offensive maneuver in order to "tip emergent markets in [an organization's] favor," particularly for services or locations that complement an organization's established operations (Santos & Eisenhardt, 2005, p. 496). Provan (1984) cited hospitals' attempts to reduce uncertainty and address a dynamic environment as a key reason why they began engaging in horizontal integration strategies to form multihospital systems (p. 499). And, D'Aunno and Zuckerman (1987) offer the example of hospitals that depend upon outpatient clinics for patient referrals that, to manage dependencies under conditions of dynamism and uncertainty, either acquire such clinics or establish clinics of their own in order to reduce their dependence on external clinics and secure reliable referral sources (pp. 326-327). Therefore, we anticipate that clusters in highly dynamic markets are more likely to engage in high levels of service differentiation, spatial differentiation, and integration, such as clusters exhibiting the "Highly Differentiated and Integrated Cluster" or "Integrated and Concentrated Cluster" forms. This leads to the following hypothesis:

- *H21: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with higher levels of dynamism, all other things being equal.*

Thus, consistent with resource dependence theory, we anticipate that as a cluster's environment realizes changes to its levels of munificence, complexity, or dynamism, the uncertainty under which that cluster manages its interdependent relationships also changes, which in turn dictates its strategies and survival (Yeager et al., 2014).

In consideration of this study's application of multiple theoretical perspectives to explain cluster forms, Figure 6 summarizes the arguments developed from this study's multi-theoretical framework, graphically depicting the range of factors predicted to influence clusters' adoption of varied forms. In summary, we anticipate that cluster forms are associated with factors relating to clusters' external environments, including competitive and market factors, as well as aspects relating to their individual organization and operations, as illustrated in Figure 6. Incorporating each of the study's 21 hypotheses, these factors represent a diverse array of elements, including ecological conditions, institutional pressures, competitive forces, sources of uncertainty, external relationships, and market phenomena, among others. We now proceed to discuss and apply analytical methods to test these hypotheses.

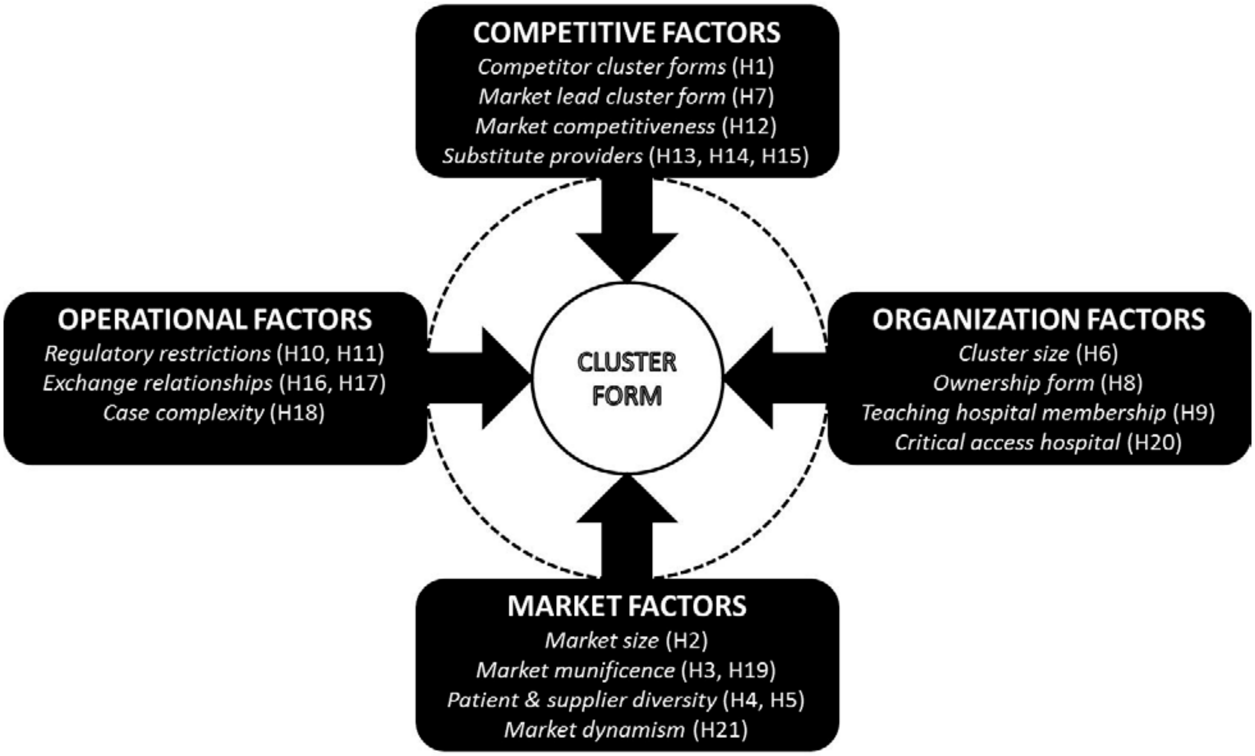


Figure 6. The Multi-Theoretical Framework

Methodology

Whereas this study's taxonomic analysis required a non-experimental, descriptive design, the analysis involved in fulfilling the study's fourth aim to *explain* common cluster forms uses a non-experimental, correlational design, which allows for examination of the association between variables (Polit & Beck, 2008). As previously explained, the unit of analysis for the study is the hospital-based cluster defined according to regional boundaries.

The primary data sources used to fulfill the study's fourth aim include those identified and described in Chapter 4: primary data collected as part of the inventory of clusters and catalog of cluster components, as well as facility-level data aggregated to the cluster level from the AHA Annual Survey and Intellimed databases. In addition, county-level data are obtained from the 2010 Area Resource File (ARF), which is aggregated to the core based statistical area

(CBSA) level to reflect the local markets in which clusters' hospitals operate. For example, the Covenant Health cluster operates three general, acute care hospitals in the cities of Lubbock, Levelland, and Plainview, Texas. Together, these three cities represent three separate CBSAs, which collectively comprise five counties: Hale County (containing the Plainview, Texas MICSA), Hockley County (containing the Levelland, Texas MICSA), and Lubbock, Crosby, and Lynn Counties (containing the Lubbock, Texas METSA). Thus, market-level data for the Covenant Health cluster consist of ARF data combined from these five counties. County-level data for specific measures are also obtained from the U.S. Census Bureau's 2010 Census, which are also aggregated to the CBSA level for the statistical areas that each cluster's local market consist of. Finally, data sources for measures pertaining to state-level regulations include rankings of regulatory severity in each state. Detailed descriptions of these rankings as well as additional measures relating to the study's hypotheses follow.

Variable specification. The dependent variable in this chapter's analysis is a cluster's assignment to a category of common cluster forms, as identified from the study's taxonomic analysis. The five forms identified and subsequently described include "Lowly Differentiated and Integrated Clusters," "Integrated and Concentrated Clusters," "Highly Differentiated and Integrated Clusters," "Dispersed and Hospital-Focused Clusters," and "Vertically Differentiated and Lowly Integrated Clusters."

Measures of cluster forms also relate to the study's first hypothesis (H1), which addresses the forms exhibited by clusters' competitors in their local markets. In this study, a cluster's local market is measured as the CBSAs (i.e., metropolitan statistical areas and micropolitan statistical areas) in which its hospitals are located, and as a result it may include a single CBSA or multiple CBSAs, as noted in the previous example of Covenant Health. For hospitals that do not operate in a CBSA but instead are identified as operating in rural locations, their local market is considered as the county in which they are located. For each cluster, we calculate the number of competing clusters in its market that assume each of the five common cluster forms identified in the taxonomic analysis.

Market size (H2) is commonly measured as the market's total population, which is obtained at the county level from the 2010 U.S. Census and aggregated to reflect clusters' local markets. In addition, this study adopts a second measure of market size as the number of CBSAs included in a cluster's local market, and this measure is based upon primary data collected for the study's cluster inventory and catalog. The economic wealth of each cluster's local market (H3) is measured as its collective per capita income, aggregated from the 2010 ARF county-level data.

Additional hypotheses developed from a population ecology perspective relate to the levels of patient and supplier diversity in clusters' markets (H4 and H5). Fennell (1980, 1982) included a market's percentage of population under 5 years of age and over 65 years of age, together, as well as its percentage of nonwhite residents as measures of patient diversity, and these same measures are adopted for this study. In addition, Fennell (1980, 1982) utilized the market's ratio of specialist physicians to general practice physicians as a measure of supplier diversity, which is also incorporated in this study. Each of these measures is obtained from county-level data from the 2010 ARF dataset. Cluster size (H6) is measured as the total number of general, acute care beds offered across a cluster's hospitals, and this measure is obtained from primary data collection, as described in Chapter 4.

Five hypotheses stem from this study's application of an institution theory perspective. To measure clusters with the largest market share in their respective markets (H7), hospital admissions from 2012 (and, for Texas hospitals, from July 2011 through June 2012) are aggregated to the cluster level, and these admissions figures are obtained from the Intellimed dataset. Clusters with the highest admission totals in each market are identified as having the largest market share, and these leading clusters' forms are then compared to the forms exhibited by other competing clusters in their local markets to determine whether or not they are of the same category. Both clusters' ownership (H8) and inclusion of at least one teaching hospital (H9) are measured using data from the AHA 2011 Annual Survey. In terms of ownership, clusters are measured as to whether they are owned by for-profit or nonprofit organizations, which include government-owned, religious not-for-profit, and secular not-for-profit entities. Similarly, teaching hospitals' membership in clusters is included as a dichotomous measure, identifying clusters that operate one or more teaching hospitals versus those that do not include any teaching hospital members.

The level of restrictions imposed by states' CON laws (H10) is measured through a ranking of the number of CON restrictions across different types of services or service locations in each state. The National Conference of State Legislatures (2013), using data from the American Health Planning Association's (2011) National Directory, lists the various facility types and services regulated by CON laws by state. From this listing, the six states represented in the study sample are then ranked and grouped according to the number of facility and service types that are restricted by CON laws. Such groups include the nine following categories: acute, general hospital beds; ambulatory surgery centers; subacute services; swing beds; post-acute care (i.e., rehabilitation facilities and long-term acute care hospitals); nursing home and long-term care beds; home care (i.e., home health and hospice services); specialty services; and, imaging services. Texas is the sole state represented within the study sample that maintains no current

CON programs. Clusters operating in Florida and Nevada are assigned to a second CON restriction category, representing a moderate level of CON restriction, as the two states maintain regulations for five and three of the facility type and service categories, respectively. Finally, clusters in Maryland, Virginia, and Washington are assigned to a third CON restriction category representing the most restrictive CON programs, as these states have adopted CON laws for six or more of the nine facility and service type categories.

In addition to state CON laws, the level of restrictions imposed by states' scope of practice laws (H11) is also measured by ranking. However, this ranking is adopted from studies that have previously rated the degree to which a state's scope of practice regulations restrict nurse practitioners' practices (Kuo et al., 2013; Lugo, O'Grady, Hodnicki, & Hanson, 2007, 2010). In these studies, states were ranked according to three dimensions affecting nurse practitioners' practices that comprised 12 measures. From these rankings, states were then grouped into categories based upon the level of restrictions created by their scope of practice regulations. Among the states represented in this study's sample, Florida and Maryland are identified as being among those states with the most restrictive scope of practice regulations, while Nevada, Texas, and Virginia are classified as either confining or moderately restricting patient choice as a result of their scope of practice laws. In contrast, Washington is recognized as "exemplary" for patient choice and ranks among the least restrictive states in regards to its scope of practice regulations (Lugo et al., 2007, p. 16). In this study, these rankings serve as measures for a categorical variable relating to the level of restriction imposed by state scope of practice laws.

Through incorporation of an IO economics perspective, this study's multi-theoretical framework calls for measures of markets' levels of competitiveness (H12) and numbers of substitute providers (H13, H14, and H15). Health services researchers often measure the competitiveness of health care markets using the Herfindahl- Hirschman Index (HHI), which indicates the degree to which a market is concentrated and is generally calculated as the total sum of each firm's squared share of a given market (Baker, 2001; Wong, Zhan, & Mutter, 2005; Yeager et al., 2014; Young, Desai, & Hellinger, 1999). In health care organization studies, HHI is often calculated using either hospital admissions or hospital beds as indicators of a hospital's market share, with both measures shown to be very highly correlated (Gresenz, Rogowski, & Escarce, 2004). Because AHA Annual Survey data are not restricted to the six states to which Intellimed data are limited, but can instead incorporate activity in local markets that extend past state boundaries such as the greater Washington, DC market, this study employs hospital beds in its measurement of market concentration. Specifically, we identify the hospital-based competitors in each cluster's local market and determine their number of beds from the 2011 AHA Annual Survey. For independent hospitals, their number of beds serves as their market share, whereas an individual cluster's market share is calculated as the aggregated total of hospital beds operated by its member hospitals. Thus, this study calculates HHI – specific for each cluster's local market (Lindrooth, 2008) – as the squared market share of clusters and independent hospitals based on hospital beds, which serves as a measure for market competitiveness with lower HHI scores indicative of less concentrated and more competitive markets.

As previously described, ambulatory surgery centers (H13), home health agencies (H14), and skilled nursing facilities (H15) may all be considered substitutable providers to general, acute care hospitals (Balotksy, 2005; Klingensmith, 1988; Zuckerman et al., 1990). This study measures the number of ambulatory surgery centers, home health agencies, and skilled nursing facilities in a cluster's local market by calculating the sum of such providers operating in the counties, as reported in the 2010 ARF dataset, that comprise each cluster's local market.

To measure clusters' frequent exchanges with external health care facilities that serve as sources of hospital admissions (H16), as developed from application of TCE, this study utilizes Intellimed data and calculates each cluster's total percentage of admissions (aggregated across hospital members) that are either from physician clinics, other hospitals, skilled nursing facilities, or other health care facilities. Similarly, the measure of clusters' frequent exchanges with post-acute care providers (H17) is calculated by summing the percentage of discharges to home health, inpatient rehabilitation facilities, skilled nursing facilities, long-term acute care hospitals, hospice, or other hospitals across each cluster's hospital members, as reported through Intellimed data. And, to measure the average complexity of care required by cluster patients (H18), we calculate the total percentage of a cluster's hospital admissions that is categorized within the Intellimed dataset at the highest (i.e., "extreme") severity level.

Finally, application of the RDT perspective requires measures pertaining to munificence (H19), critical access hospital operation (H20), and market dynamism (H21). As previously noted, the degree of a community's economic wealth, applied from a population ecology perspective as an aspect of the community's munificence (H2), is measured as a market's per capita income. Scholars applying a RDT framework have likewise measured a market's munificence according to its per capita income (e.g., Balotsky, 2005; Hsieh, Clement, & Bazzoli, 2010; Kazley & Ozcan, 2007; Menachemi, Shin, Ford, & Yu, 2011; Menachemi, Mazurenko, Kazley, Diana, & Ford, 2012; Trinh & Begun, 1999; Zinn, Proenca, & Rosko, 1997). In addition, past health care organization studies that have utilized RDT as a theoretical framework have measured market munificence as the rate of unemployment (e.g., Banaszak-Holl, Zinn, &

Mor, 1996; Ginn & Young, 1992; Hsieh et al., 2010) or the percentage of residents living in urban areas (e.g., Kazley & Ozcan, 2007; Menachemi et al., 2011; Menachemi et al., 2012; Zinn et al., 1997), with lower unemployment rates and higher percentages of urban residents indicative of munificent environments. This study measures the rate of unemployment across markets using 2010 ARF data aggregated to the level of each cluster's local market. Similarly, the percentage of a market's population living in urban areas (i.e., its "urbanicity" or "rurality") is calculated by aggregating county-level data from the 2010 U.S. Census to reflect each cluster's local market.

In addition, critical access hospital operation is calculated as a dichotomous measure, identifying whether or not any members in an individual cluster are designated as critical access hospitals within the 2011 AHA Annual Survey. Two measures of the degree to which clusters' markets are dynamic are also calculated: change in unemployment rate and change in total population. Both of these measures have been employed to reflect market dynamism in several previous health care organization studies applying the RDT perspective (Yeager et al., 2014), and both measures are calculated using ARF datasets. Specifically, a market's change in unemployment is calculated as the difference between the total unemployment rate across its counties in 2000 and its total unemployment rate in 2008. Similarly, a market's change in total population is calculated as the percentage change between the sum of its county-level populations in 2000 and the sum of its county-level populations in 2010.

Collectively, this study develops a total of 21 variables to explain clusters' adoption of common forms. A listing and description of these variables, their measures, their data sources, and their theoretical basis is provided in Table 19.

Table 19. *Cluster variables for correlation study*

Theory	Variable	Measures	Data Source
Population Ecology	*Competitor Cluster Form*	The number of competing clusters adopting Form 1 ("Lowly Integrated & Differentiated Clusters")	Taxonomic Analysis Results
		The number of competing clusters adopting Form 2 ("Integrated and Concentrated Clusters")	Taxonomic Analysis Results
		The number of competing clusters adopting Form 3 ("Highly Differentiated and Integrated Clusters")	Taxonomic Analysis Results
		The number of competing clusters adopting Form 4 ("Dispersed and Hospital-Focused Clusters")	Taxonomic Analysis Results
		The number of competing clusters adopting Form 5 ("Vertically Differentiated and Lowly Integrated Clusters")	Taxonomic Analysis Results
Population Ecology	*Market Size*	The total population of a cluster's local market.	2010 U.S. Census
		The number of core-based statistical areas in a cluster's local market	Primary Data Collection
Population Ecology & Resource Dependence Theory	*Market Economic Wealth (Munificence)*	The per capita income of a cluster's local market	ARF
Population Ecology	*Patient Diversity*	The percentage of population aged less than 5 years and greater than 65 years in a cluster's local market	ARF
		The percentage of non-white residents in a cluster's local market population	ARF
Population Ecology	*Supplier Diversity*	The ratio of specialist physicians to general practice physicians in a cluster's local market	ARF
Population Ecology	*Cluster Size*	The total number of general, acute care hospital beds operated by a cluster's member hospitals	Primary Data Collection
Institutional Theory	*Form Mimicry of Market's Leading Cluster*	A binary measure where 0 = the cluster exhibits a different form than the cluster in its local market with the largest market share, and 1 = the cluster either exhibits the same form as the cluster in its local market with the largest market share or the cluster maintains the largest market share	Taxonomic Analysis Results & Intellimed
Institutional Theory	*Ownership Form*	A binary measure where 0 = nonprofit ownership, and 1 = for-profit ownership	AHA Annual Survey
Institutional Theory	*Teaching Hospital Member*	A binary measure where 0 = the cluster does not operate a teaching hospital, and 1 = the cluster includes at least one teaching hospital member	AHA Annual Survey
Institutional Theory & Industrial Organization Economics	*Level of State Certificate of Need Restrictions*	A categorical measure where 1 = least restrictive (Texas), 2 = moderately restrictive (Florida & Nevada), and 3 = most restrictive (Maryland, Virginia, & Washington)	National Conference of State Legislatures
Institutional Theory	*Level of State Scope of Practice Restrictions*	A categorical measure where 1 = least restrictive (Washington), 2 = moderately restrictive (Nevada, Texas, & Virginia), and 3 = most restrictive (Florida & Maryland)	Lugo et al., 2007

Table 19 (continued). *Cluster variables for correlation study*

Theory	Variable	Measures	Data Source
Industrial Organization Economics & Resource Dependence Theory	*Market Competitiveness*	The Herfindahl-Hirschman Index of a cluster's local market	AHA Annual Survey
Industrial Organization Economics	*Substitutable Ambulatory Surgery Centers*	The total number of ambulatory surgery centers in a cluster's local market	ARF
Industrial Organization Economics	*Substitutable Home Health Agencies*	The total number of home health agencies in a cluster's local market	ARF
Industrial Organization Economics	*Substitutable Skilled Nursing Facilities*	The total number of skilled nursing facilities in a cluster's local market	ARF
Transaction Cost Economics	*Admissions from External Health Facilities*	The total percentage of a cluster's admissions from physician clinics, other hospitals, skilled nursing facilities, or other health care facilities	Intellimed
Transaction Cost Economics	*Discharges to Post-Acute Care Providers*	The total percentage of a cluster's discharges to home health agencies, inpatient rehabilitation facilities, skilled nursing facilities, long-term acute care hospitals, hospice, and other hospitals	Intellimed
Transaction Cost Economics	*Complexity of Care*	The total percentage of a cluster's admissions categorized as "extreme" cases	Intellimed
Resource Dependence Theory	*Market Munificence*	The unemployment rate of a cluster's local market	ARF
		The total percentage of residents in a cluster's local market living in urban areas	ARF
Resource Dependence Theory	*Critical Access Hospital Member*	A binary measure where 0 = the cluster does not operate a critical access hospital, and 1 = the cluster includes at least one critical access hospital member	AHA Annual Survey
Resource Dependence Theory	*Market Dynamism*	The difference in each cluster's local market unemployment rate from 2000 to 2008	ARF
		The percentage change in each cluster's local market population from 2000 to 2010	ARF & 2010 U.S. Census

Analytic methods. As noted in Chapter 4, an important step in externally validating the taxonomic analysis results is performing significance tests such as ANOVA using theoretically derived external variables not included as classification variables (Aldenderfer & Blashfield, 1984; Hair et al., 2006; Ketchen & Shook, 1996). In fulfillment of the study's fourth aim, we perform a descriptive analysis of the 29 theoretically-motivated measures identified in Table 19 as well as significance tests to determine whether the means of these 29 measures differ across cluster forms. Significant differences across these means would suggest that "the cluster solution reflects the underlying structure of a data set" and would externally validate the results of the taxonomic analysis (Ketchen & Shook, 1996, p. 450). In addition, a multinomial logistic regression is performed to identify organizational and environmental characteristics that may explain cluster forms.

When performing significance tests across groups, scholars suggest the selection of tests is governed by the nature of the variables examined. Specifically, when examining different values of dependent variables across groups identified in an independent categorical variable, the analysis of variance (ANOVA) procedure is appropriate for continuous dependent variables and the Chi-square test is advised for categorical dependent variables (Keller & Warrack, 2003; Hair et al., 2006; Parab & Bhalerao, 2010). Given the development of both continuous and categorical variables from the multi-theoretical framework, both ANOVA and Chi-square tests are performed in conjunction with descriptive analyses to assess the significance of variable means across cluster forms.

As a commonly used significance test, the ANOVA procedure "tests to determine whether differences exist between two or more" sample groups (Keller & Warrack, 2003, p. 472). Due to the limited number of observations in the fourth and fifth cluster forms, which each include fewer than 10 observations, sample size requirements for a MANOVA test are violated, leading to the application of separate ANOVA tests for each continuous dependent variable. Post-hoc pairwise multiple comparisons (PMCs) are also performed for each of these variables in order to compare and identify statistically significant differences between pairs of cluster forms. For this study, as described in Chapters 4 and 5, the Games-Howell post-hoc method is the preferred PMC procedure.

The Chi-square test "is one of the most useful statistics for testing hypotheses" involving two categorical variables (McHugh, 2013, p. 143). This test is applied for each categorical variable from the multi-theoretical framework. However, one of the key assumptions of the Chi-square test is that, when examining individual cell values in a contingency table of the dependent and independent variables, cell values must be greater than zero and are preferred at values of 5 or more (Keller & Warrack, 2003; McHugh, 2013). When this assumption is violated, statisticians advise the use of the Fisher's exact test (Agresti, 1992), which we in turn will perform in variable comparisons involving observations that violate this Chi-square assumption.

In addition to the ANOVA, Chi-square, and Fisher's exact tests, a regression analysis is performed to model the relationship between cluster forms and multiple variables on different measurement scales (Hosmer & Lemeshow, 2000). The dependent measure in this analysis is clusters' assignment to taxonomic groups as identified in the cluster analysis, and given this multinomial outcome variable (i.e., cluster groups), multinomial logistic regression methods are appropriate, indicating the probability of a cluster's adoption of a specific cluster form (Hosmer & Lemeshow, 2000).

Logistic regression methods allow for the development of a model that describes the relationship between a dichotomous or nominal dependent variable and a set of independent variables, providing maximum likelihood estimates (i.e., logistic coefficients) for each independent variable (Hair et al., 2006; Hosmer & Lemeshow, 2000). Odds ratios are then calculated based upon these coefficients, presenting estimates of the likelihood of a specific outcome being observed for a given independent variable (Hosmer & Lemeshow, 2000). These odds ratios are the outcome of a logistic regression model typically presented within studies employing logistic regression methods. The following model specification, building upon the study's multi-theoretical framework, depicts the proposed multinomial logistic regression model:

$$\text{Prob}(CF_i = k) = \beta_0 + \beta_1 PE_i + \beta_2 INST_i + \beta_3 IOE_i + \beta_4 TCE_i + \beta_5 RDT_i + \varepsilon_i,$$

where CF_i = probability of individual cluster *i* exhibiting cluster form *k* (where *k* = taxonomic groups identified in cluster analysis); PE_i = a vector of independent variables associated with the population ecology perspective; $INST_i$ = a vector of independent variables associated with the institutional theory perspective; IOE_i = a vector of independent variables associated with the industrial organization economics perspective; TCE_i = a vector of independent variables associated with the transaction cost economics perspective; RDT_i = a vector of independent variables associated with the resource dependence theory perspective; β = regression coefficients; and, ε_i = error term.

However, important assumptions and criteria must be considered when performing the multinomial logistic regression analysis. First, the number of observations in each category of the dependent variable must be adequate. Too few observations in a single category can lead to an unstable model, and for that reason, scholars suggest utilizing cell sizes that are greater than 5 (Garson, 2012), and preferably greater than 10 (Courvoisier, Combescure, Agoritsas, Gayet-Ageron, & Perneger, 2011). Recognizing that the fourth and fifth categories of cluster forms ("Dispersed and Hospital-Focused Cluster" forms and "Vertically Differentiated and Lowly Integrated Cluster" forms) include fewer than 10 clusters in the study sample, we withhold these observations from the multinomial logistic regression analysis, instead strictly testing the association of environmental and organizational characteristics to cluster forms for the first three groups ("Lowly Differentiated and Integrated Cluster," "Integrated and Concentrated Cluster," and "Highly Differentiated and Integrated Cluster" forms).

Second, multinomial logistic regression utilizes a maximum likelihood estimation method and requires a sufficient sample size in relation to the number of independent variables included in the analysis. Researchers cite a recommended number of "events per variable" (EPV) to describe the desirable ratio of variables to observations, however disagreement exists as to the minimum EPV that is required for multinomial logistic regression methods (Hosmer & Lemeshow, 2000). Some suggest that fewer than 10 observations per variable is acceptable (e.g., Vittinghoff & McCulloch, 2007), while others call for a minimum EPV of 10 and prefer 20 or more observations per variable (e.g., Burns & Burns, 2008b; Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996; Petrucci, 2009). To balance these experts' suggestions, and recognizing the small sample ($n = 100$) when clusters in the fourth and fifth groups are withheld from the study sample, our final multinomial logistic regression model includes no more than 10 independent variables, in compliance with the recommended 10 EPV threshold.

Additional assumptions pertaining to multinomial logistic regression methods include a lack of multicollinearity among the independent variables as well as an assumption of non-perfect separation, such that the dependent variable groups are not perfectly separated (also referred to as complete or quasi-complete separation) by an independent variable (Starkweather & Moske, 2011). Violation of these assumptions may produce unstable results that could generate unrealistic coefficients and effect sizes (Starkweather & Moske, 2011). Therefore, independent variables are examined for indications of multicollinearity during the model building process, and variables are also assessed as to whether they exhibit complete or quasi-complete separation of dependent variable groups. Evidence of multicollinearity may be obtained using methods previously described in Chapter 4, including calculation of VIF scores.

With a limit of 10 variables to comply with the EPV threshold, variables must be carefully selected for the final multinomial logistic regression model. Scholars advise various steps in the selection of variables and development of logistic regression models. First, univariable analysis is performed for each independent variable to determine the significance of differences across dependent variable categories, which allows for consideration of which variables may be prioritized for inclusion in the final multivariable model (Hosmer & Lemeshow, 2000, pp. 95-96). Categorical independent variables and continuous variables with few integer values are also examined for the presence of zero cell counts as indicated in a contingency table of the independent variable categories versus the dependent variable categories. Variables with zero cell counts can lead to substantial problems with the regression model and create "undesirable numerical outcomes" (Hosmer & Lemeshow, 2000, p. 93). To correct the problem of a zero cell count, the independent variable will either be collapsed to fewer categories or will be removed from consideration for the multivariable model.

During the model building process, independent variable candidates are assessed according to their contribution to the multinomial logistic regression model, as indicated by their Wald statistics and estimated coefficients, and large estimated standard errors (commonly viewed as standard errors greater than 2.0) also suggest the existence of numeric problems stemming from multicollinearity, complete or quasi-complete separation, or zero cell counts (Hosmer & Lemeshow, 2000). Variables that indicate the presence of such problems or that offer no contribution to the model are recommended for removal (Hosmer & Lemeshow, 2000). We follow these advised steps in the development of a multinomial logistic regression model.

To conduct the ANOVA, Games-Howell test, Chi-square, and multinomial logistic regression procedures, SPSS 21 software is used. However, as this software does not allow for

Fisher's exact tests of categorical variables with more than 2 responses, STATA 12 software is used to complete exact tests comparing observations that violate Chi-square assumptions. Collectively, these analyses allow for the external validation of the taxonomic analysis results and also address the study's fourth aim of explaining clusters' varied forms.

Results

The presentation of results begins with descriptive analyses of the independent variables developed from the multi-theoretical perspective. Table 20 presents descriptive statistics for measures associated with the study's 21 independent variables, including mean and standard deviation values for continuous measures as well as percentages for categorical variables. Summarized results of ANOVA, Games-Howell, and Fishers' exact tests are also included in the presented findings. Each of the study's categorical variables violated the Chi square assumption that their contingency tables' individual cells contain at least 5 observations, and therefore the exact test results are presented rather than Chi-square test results.

The results displayed in Table 20 indicate that 21 of the 29 measures exhibit significant differences across the five cluster forms. Collectively, these results provide additional support to the final cluster solution obtained in the taxonomic analysis and externally validate the grouping of sample clusters into five common forms. In addition, results of the Games-Howell tests identify significant differences in means between groups for specific variables, including clusters with competitors assuming the "Integrated and Concentrated Cluster" form, market population size, number of CBSAs represented in a cluster's local market, number of hospital beds, ambulatory surgery centers, skilled nursing facilities, percentage of "extreme" case admissions, per capita income, unemployment rate, and percentage change in population. We discuss these

Table 20. *Descriptive analysis & tests for significant differences across cluster forms*

Variable	Group 1 (*n*=45)	Group 2 (*n*=39)	Group 3 (*n*=16)	Group 4 (*n*=9)	Group 5 (*n*=5)
			Mean (SD) or Percentage (Count)		
Competitor Cluster Form					
Group 1 competitors**	1.16 (0.93)	0.90 (1.07)	1.69 (1.08)	1.44 (1.33)	0.40 (0.89)
Group 2 competitors***	0.78^{b} (1.13)	2.21^{a,e} (1.67)	1.38 (1.50)	1.11 (1.36)	0.40^{b} (0.89)
Group 3 competitors	0.60 (1.01)	0.56 (1.05)	1.00 (0.89)	1.11 (1.27)	0.80 (1.30)
Group 4 competitors	0.29 (0.55)	0.26 (0.55)	0.63 (0.81)	0.44 (0.53)	0.40 (0.89)
Group 5 competitors**	0.04 (0.21)	0.05 (0.22)	0.25 (0.45)	0.22 (0.44)	0.00 (0.00)
Market Size					
Market population (in 100,000)**	18.87^{b} (19.25)	33.01^{a} (22.21)	35.85 (30.23)	28.04 (27.61)	14.26 (25.14)
Number of CBSAs***	1.39^{e} (0.69)	1.44^{e} (0.82)	2.38^{e} (1.31)	1.89 (0.93)	1.00^{a,b,c} (0.00)
Patient Diversity					
% population < 5 and > 65 years old	20.65 (4.46)	19.72 (2.92)	18.41 (2.19)	18.75 (2.54)	21.56 (5.84)
% population non-white	25.83 (10.13)	30.44 (7.73)	30.54 (10.32)	30.74 (7.49)	24.77 (12.27)
Supplier Diversity					
Specialist/General practice physicians	2.85 (1.12)	3.39 (1.43)	3.15 (1.61)	2.62 (0.77)	2.55 (1.67)
Cluster Size					
Number of hospital beds***	651.36^{b,c} (355.29)	1503.44^{a,d,e} (888.86)	1515.69^{a,d,e} (810.94)	478.44^{b,c} (259.16)	421.80^{b,c} (223.64)
Form Mimicry					
Different form than lead cluster†††	40.00% (18)	7.69% (3)	18.75% (3)	55.56% (5)	40.00% (2)
Same form as lead cluster, or Lead cluster†††	60.00% (27)	92.31% (36)	81.25% (13)	44.44% (4)	60.00% (3)
Ownership Form					
For profit†††	55.60% (25)	20.50% (8)	0.00% (0)	77.80% (7)	40.00% (2)
Nonprofit†††	44.40% (20)	79.50% (31)	100.00% (16)	22.20% (2)	60.00% (3)
Teaching Hospital					
No teaching hospital members†††	100.00% (45)	82.10% (32)	43.80% (7)	100.00% (9)	100.00% (5)
One or more teaching hospital members†††	0.00% (0)	17.90% (7)	56.20% (9)	0.00% (0)	0.00% (0)
Certificate of Need Restrictions					
Least restrictive (TX) †††	44.44% (20)	15.38% (6)	62.50% (10)	77.78% (7)	40.00% (2)
Moderately restrictive (FL, NV) †††	40.00% (18)	48.72% (19)	6.25% (1)	0.00% (0)	20.00% (1)
Most restrictive (MD, VA, WA) †††	15.56% (7)	35.90% (14)	31.25% (5)	22.22% (2)	40.00% (2)
Scope of Practice Restrictions					
Least restrictive (WA) ††	4.44% (4)	12.82% (6)	6.25% (3)	11.11% (1)	40.00% (2)
Moderately restrictive (NV, TX, VA) ††	57.78% (26)	38.46% (15)	75.00% (12)	88.89% (8)	40.00% (2)
Most restrictive (FL, MD) ††	37.78% (15)	48.72% (18)	18.75% (1)	0.00% (0)	20.00% (1)
Market Competitiveness					
Herfindahl-Hirschman Index***	0.3244 (0.22)	0.2178 (0.18)	0.2374 (0.16)	0.2760 (0.21)	0.6120 (0.39)
Substitutable Providers in Market					
Ambulatory surgery centers**	35.62^{b} (41.13)	68.28^{a} (50.83)	83.50 (107.47)	40.67 (41.43)	24.40 (31.78)
Home health agencies	98.00 (155.59)	185.90 (233.98)	187.69 (236.30)	229.56 (278.12)	127.80 (258.22)
Skilled nursing facilities***	56.33^{b} (51.69)	97.10^{a} (58.92)	105.38 (74.99)	84.56 (72.52)	36.40 (51.40)
Exchange Relationships					
% admissions from external facilities	17.53 (13.09)	13.53 (11.52)	21.41 (11.25)	21.36 (10.88)	20.23 (17.24)
% discharges to post-acute providers	25.48 (8.47)	23.85 (6.01)	24.23 (3.38)	24.30 (5.84)	22.87 (6.34)
Complexity of Care					
% admissions categorized as "extreme"***	6.35^{c} (1.57)	6.54^{c} (1.54)	8.65^{a,b,d,e} (2.00)	5.35^{c} (1.79)	5.27^{c} (0.90)
Market Munificence					
Per capita income (in $1,000)**	25.71^{b} (6.49)	29.65^{a} (4.92)	28.94 (6.42)	26.33 (3.51)	27.28 (6.45)
Unemployment rate (%)***	9.57^{c,d} (2.39)	9.36^{c,d} (1.82)	7.74^{a,b} (1.14)	7.93^{a,b} (0.70)	9.06 (1.33)
% residents in urban areas*	85.43 (16.05)	90.70 (9.59)	82.78 (14.12)	78.02 (17.29)	84.14 (10.93)
Critical Access Hospital (CAH)					
No CAH members††	86.67% (39)	89.74% (35)	56.25% (9)	88.89% (8)	100.00% (5)
One or more CAH members††	13.33% (6)	10.26% (4)	43.75% (7)	11.11% (1)	0.00% (0)
Market Dynamism					
Change in unemployment rate, 2000-08*	1.30 (2.42)	1.85 (1.29)	1.05 (1.11)	0.51 (1.64)	-0.44 (2.57)
% change in population, 2000-10*	21.58^{b} (10.56)	15.41^{a} (7.48)	18.76 (8.71)	19.27 (8.33)	17.88 (9.80)

*Note: ANOVA test of significant differences in group means within dependent variable: ***=p<0.01; **=p<0.05; *=p<0.10.*
Games-Howell post-hoc test of significant differences in means between individual groups at p<0.05 level:
a=Group 1; b=Group 2; c=Group 3; d=Group 4; e=Group 5.
Fisher's exact test of significant associations between dependent and independent classifications: †††=p<0.01; ††=p<0.05; †=p<0.10.

results in relation to the study's hypotheses following a description of the multinomial logistic regression analysis results.

Multinomial logistic regression. Development of a multinomial logistic regression model begins with the removal of clusters categorized in the fourth and fifth groups (i.e., "Dispersed and Hospital-Focused Cluster" and "Vertically Differentiated and Lowly Integrated Cluster" forms) given that both groups include fewer than 10 observations, thereby reducing the study's sample from 114 to 100 clusters. Recognizing the need to reduce the number of variables included in the multinomial logistic regression model to meet the 10 EPV limit, we first perform univariable multinomial logistic regression analyses with each independent variable, examining the significance of differences across the three remaining dependent variable categories. For each independent variable, two univariable logistic regression models are performed: one in which the Group 3 clusters (categorized as "Highly Differentiated and Integrated Clusters") serve as the comparison group, and a second in which the Group 2 clusters (categorized as "Integrated and Concentrated Clusters") serve as the comparison group. This allows for a paired comparison between each of the three cluster categories in the multinomial logistic regression analysis. Results of univariable logistic regression models are included in Appendix 8.

Next, we proceed to examine evidence of zero cell counts, multicollinearity or complete or quasi-complete separation among the independent variables. Independent variables with zero cell counts when combined in a contingency table with the dependent variable include for-profit ownership and teaching hospital members, and because both variables are binary, neither variable is collapsible into fewer categories. Instead, both are removed from consideration for the multivariable model. In addition, five variables are removed from the model due to evidence of multicollinearity, as indicated by VIF scores greater than 5.3, and these variables include total population, per capita income, ambulatory surgery centers, skilled nursing facilities, and unemployment rate.

From the remaining variables, a multinomial logistic regression model is developed. Hosmer and Lemeshow (2000) advise that, when a dataset is limited in sample size or representation in each outcome group among candidate variables, inclusion of all relevant variables into a multivariable model may result in numerically unstable results, and instead development of a model from a "subset of variables based on results of the univariable analyses" is preferred (p. 96). Therefore, model development begins with five variables that yielded the most significant outcomes in the univariable analyses: FORM2 = Group 2 competitor cluster forms (i.e., "Integrated and Concentrated Clusters"); BEDS = number of hospital beds; SAMELEAD = whether or not a cluster's form differed from the market's lead cluster; CON = certificate of need restrictions; and, EXTREME = percentage of admissions categorized as "extreme." From this initial model, we observe a likelihood ratio chi-square of 92.028 with a *p*-value less than 0.001, indicating that the model fits significantly better than a model without predictor variables. In addition, likelihood ratio tests for the independent variables yield results for each variable that are significant at the 0.10 level, and significant at the 0.05 level for four of the five variables (excluding FORM2). However, examination of the parameter estimates reveals that standard error scores for the EXTREME variable are greater than 2.0, indicating the possible existence of numeric problems that need attention.

To address this potential problem, we assess the initial model's continuous variables to determine whether they should remain continuous or whether categorical variables should be created to refine, refit, and improve the model. Following methods strongly recommended by scholars (e.g., Hosmer & Lemeshow, 2000; Zinn et al., 2003; Zwanziger & Khan, 2006), the EXTREME, FORM2, and BEDS variables are tested for linearity of their effects using quartile values to divide each continuous variable into four categories. Separate regression models are run replacing individual continuous variables with their four-level categorical substitutes, and estimated coefficients for the categorical variable from each of these models is plotted against the midpoints of the continuous variable's quartiles. Visual inspection of the plots indicates the relationship between the logit and continuous variables (Hosmer & Lemeshow, 2000), and results support division into categorical groupings for both the EXTREME and BEDS variables. In addition, insignificant differences between adjacent categories within these converted measures suggest that categories should be combined to create binary measures (Zwanziger & Khan, 2006). As a result, the EXTREME variable is transformed into two categories: clusters admitting a high percentage of "extreme" cases (representing the third and fourth quartiles), and clusters admitting a low percentage of "extreme" cases (representing the first and second quartiles). Similarly, the BEDS variable is converted into two categories: clusters operating a high number of beds (representing the third and fourth quartiles), and clusters operating a low number of beds (representing the first and second quartiles).

Using these converted variables, a revised model is created that yields a likelihood ratio chi square of 82.784 with a *p*-value less than 0.001, and likelihood ratio tests for the independent variables all yield *p*-values less than 0.05. Furthermore, none of the parameter estimates' standard error scores exceed 2.0, and the revised model correctly classifies 71 percent of the sample cases, an improvement over the proportional chance criterion of 47.53 percent (calculated as 25 percent more than the sum of the squared probabilities according to group size). Thus, this revised model provides an improvement over the initial model and supports the inclusion of all five independent variables.

We proceed to add another variable to the model: CBSA, which indicates the number of CBSAs included in a cluster's local market. This variable also produced significant results in the univariable analysis, and analysis suggests that it may be appropriately applied to the model as a continuous variable. Following its inclusion in the multivariate model, we observe a likelihood ratio chi square of 101.49 with a *p*-value less than 0.001, and likelihood ratio tests for individual independent variables are all significant at the 0.05 level. Furthermore, the model's correct classification rate improves to 73.7 percent, supporting the inclusion of CBSA as the model's sixth independent variable.

A seventh possible independent variable is examined next, which is identified as POPCHANGE, representing the percentage change in population from 2000 to 2010. Its inclusion in the revised model is based upon its significant results in the univariate analysis, however the revised multivariate model results reveal the possibility of numeric problems due to its inclusion, as indicated by standard error scores greater than 2.0. The POPCHANGE variable is then divided into quartiles, which are included in an additional multivariate model. From this model, high standard error scores continue to exist, and the four categories are collapsed into two categories: clusters operating in markets characterized by very high growth (representing the fourth quartile), and clusters that are not (representing the first, second, and third quartiles). Using this binary measure, the revised multivariate model yields a likelihood ratio chi square of 107.78, which is significant at the 0.001 level. Additionally, all seven of the revised model's independent variables yield likelihood ratio test results that are significant at the 0.05 level, and the model's correct classification rate improves to 85.9 percent. Thus, the inclusion of the binary POPCHANGE variable is supported.

Next, we attempt to separately add two categorical variables representing critical access hospital membership (CAH) and state scope of practice restrictions (SOP), but both variables create numeric problems when added to the model, as indicated by unacceptably high standard error scores. We then introduce HHI as a continuous variable, representing the calculated Herfindahl-Hirschman Index for each cluster's local market. However, further analysis suggests that the HHI variable would benefit from conversion into categories, and therefore a four-level categorical measure is created based upon the HHI variable's quartiles. Once again, analysis supports the collapse of HHI into a dichotomous variable that indicates clusters operating in competitive markets (representing the first and second quartiles) and less competitive markets (representing the third and fourth quartiles). With the binary HHI variable included in the refined model, we observe a likelihood ratio chi square of 112.69 with a *p*-value less than 0.001. Seven of the eight independent variables yield likelihood ratio test results that are significant at the 0.05 level, and the exception – HHI – is significant at the 0.10 level. The model's correct classification rate also improves to 86.9 percent, supporting the inclusion of the binary HHI measure in the revised model.

Following the addition of an eighth independent variable, subsequent attempts to increase the number of variables included in the multinomial logistic regression model led to extremely high standard error scores and thus could not be supported. However, recognizing the marginally significant likelihood ratio test results for HHI as the eighth variable (*p*-value less than 0.10), we attempted to include alternative variables that also merit consideration based upon their univariable analysis results. Thus, we attempted revised models that separately included

FORM1 (i.e., Group 1 competitor clusters exhibiting the "Lowly Differentiated and Integrated" form), NONWHITE (i.e., the percentage of non-white residents in a cluster's local market), and URBAN (i.e., the percentage of residents living in urban areas in a cluster's local market) variables. The inclusion of FORM1 increased standard error scores above the 2.0 threshold, and was therefore removed from consideration for the final model. The NONWHITE variable also increased standard error scores, which were remedied after transforming the variable into a categorical measure that indicates clusters operating in more diverse (representing the third and fourth quartiles) and less diverse markets (representing the first and second quartiles). However, results from the revised model including the dichotomous NONWHITE variable rather than the dichotomous HHI variable were not as informative and less accurately predicted clusters' forms. As a result, we favor the HHI variable over the NONWHITE variable. Finally, attempts to include the URBAN variable, including transforming URBAN into four categories and then collapsing those categories to create a dichotomous measure, all led to models with standard errors that exceeded the 2.0 threshold.

In light of these results, we establish the study's final multinomial logistic regression model that includes eight variables: FORM2, BEDS, SAMELEAD, CON, EXTREME, CBSA, POPCHANGE, and HHI. As previously noted, this model satisfies classification accuracy criteria and suggests a significant relationship between the dependent variable and both the combination of independent variables as well as each independent variable separately. Furthermore, with fewer than 10 variables included in the final model, it satisfies the 10 EPV limit previously described. Table 21 provides descriptive statistics regarding the variables included in the final model.

Table 21. *Descriptive statistics, final logistic regression model variables*

Variables	**Mean (SD) or Percentage (Count)**		
	Group 1 (n = 45)	*Group 2 (n = 39)*	*Group 3 (n = 16)*
FORM2	0.78 (1.126)	2.21 (1.673)	1.38 (1.500)
CBSA	1.39 (0.689)	1.44 (0.821)	2.38 (1.310)
BEDS			
Low number of beds (≤ 875)	82.22% (37)	28.21% (11)	18.75% (3)
High number of beds (> 875)	17.78% (8)	71.79% (28)	81.25% (13)
SAMELEAD			
Different form than lead cluster	40.00% (18)	7.69% (3)	18.75% (3)
Lead or same form as lead	60.00% (27)	92.31% (36)	81.25% (13)
CON			
Least restrictive (TX)	44.44% (20)	15.38% (6)	62.50% (10)
Moderately restrictive (FL, NV)	40.00% (18)	48.72% (19)	6.25% (1)
Most restrictive (MD, VA, WA)	15.56% (7)	35.90% (14)	31.25% (5)
EXTREME			
Low % "extreme" cases (< 6.5%)	53.33% (24)	58.97% (23)	18.75% (3)
High % "extreme" cases (≥ 6.5%)	46.67% (21)	41.03% (16)	81.25% (13)
POPCHANGE			
Moderate, low, or no growth (< 26%)	66.67% (30)	89.74% (35)	62.50% (10)
High population growth (≥ 26%)	33.33% (15)	10.26% (4)	37.50% (6)
HHI			
Competitive markets (< 0.20)	37.78% (17)	64.10%(25)	50.00% (8)
Less competitive markets (≥ 0.20)	62.22% (28)	35.90% (14)	50.00% (8)

Next, Table 22 presents the findings of the final multinomial logistic regression analysis, which combines results from two models: one model in which Group 3 serves as the comparison group, and a second model with Group 2 as its comparison. As evident in the results displayed in Table 22, significant differences exist across the three categories of cluster forms included in the multinomial logistic regression model. Such outcomes lend further support and external validation to the cluster solution identified in the taxonomic analysis. Furthermore, with results from ANOVA, Games-Howell, Fisher's exact, and multinomial logistic regression procedures, we are able to evaluate whether the study's theoretically motivated hypotheses are supported by

Table 22. *Multinomial logistic regression analysis results*

Variable	Odds Ratios (Standard Errors)		
	Group 1 vs. Group 3	*Group 2 vs. Group 3*	*Group 1 vs. Group 2*
FORM2[b]	0.184 (0.760) **	0.475 (0.710)	0.388 (0.472) **
CBSA[d]	0.154 (0.616) ***	0.136 (0.625) ****	1.130 (0.462)
BEDS[d]			
Low	47.248 (1.313) ***	1.683 (1.296)	28.070 (0.942) ****
High	*Reference*	*Reference*	*Reference*
SAMELEAD[b]			
Different form	2.657 (1.214)	0.200 (1.323)	13.290 (0.991) ***
Same/Lead form	*Reference*	*Reference*	*Reference*
CON[d]			
Least restrictive	0.377 (1.581)	0.030 (1.667) **	12.46 (1.144) **
Moderately restrictive	28.608 (1.914) *	11.090 (1.900)	2.579 (0.953)
Most restrictive	*Reference*	*Reference*	*Reference*
EXTREME[d]			
Low % "extreme" cases	51.549 (1.707) **	153.700 (1.778) ***	0.335 (0.774)
High % "extreme" cases	*Reference*	*Reference*	*Reference*
POPCHANGE[b]			
Moderate, low, or no growth	3.743 (1.267)	17.860 (1.364) **	0.209 (0.942) *
High growth	*Reference*	*Reference*	*Reference*
HHI[a]			
Competitive market	38.710 (1.989) *	29.960 (1.993) *	1.292 (1.041)
Less competitive market	*Reference*	*Reference*	*Reference*

Note: -2 Log Likelihood = 85.496, Chi-square = 112.690 (p < 0.001), Correct classification rate = 86.90%
*=$p \leq 0.10$; **=$p \leq 0.05$; ***=$p \leq 0.01$; ****=$p \leq 0.001$
Likelihood ratio tests for individual variables: [a]=$p \leq 0.10$; [b]=$p \leq 0.05$; [c]=$p \leq 0.01$; [d]=$p \leq 0.001$

findings from the study analyses. We provide detailed discussion of these results and their relation to study hypotheses in the following section.

Hypothesis evaluation.

Hypothesis 1. The study's first hypothesis predicts that clusters are more likely to adopt forms that are the same as those of their competitors in their local markets, and the analysis results provide partial support for this hypothesis. Specifically, results from the multinomial logistic regression model suggest that each additional cluster in a local market that exhibits an "Integrated and Concentrated Cluster" form is associated with a 61 percent decrease in the relative log odds of a competing cluster exhibiting the "Lowly Differentiated and Integrated Cluster" form versus the "Integrated and Concentrated Cluster" form (odds ratio = 0.388). To put it differently, clusters are significantly more likely to assume the "Integrated and Concentrated Cluster" form when competing clusters in their local markets also exhibit the same form, as compared to markets in which competitors exhibit the "Lowly Differentiated and Integrated Cluster" form. Additionally, the existence of a cluster exhibiting the "Integrated and Concentrated Cluster" form in a local market also is associated with a significantly lower likelihood of a cluster adopting a "Lowly Differentiated and Integrated Cluster" form versus adoption of a "Highly Differentiated and Integrated Cluster" form (odds ratio = 0.184). Collectively, these results suggest that, when local markets include competitors that display an "Integrated and Concentrated Cluster" form, competing clusters are more likely to exhibit forms that are characterized by higher levels of differentiation and integration.

Results from ANOVA tests also support the association between clusters with "Integrated and Concentrated Cluster" forms and the number of competitors in their local markets that share the same form. For these Group 2 clusters, their average number of Group 2 competitors (2.21) is significantly more than the number of Group 2 competitors averaged by clusters assuming the "Lowly Differentiated and Integrated Cluster" form (0.78, $p < 0.001$) or clusters assuming the "Vertically Differentiated and Lowly Integrated Cluster" form (0.40, $p = 0.032$). For other groups, the difference in means across cluster forms is found to be significant for markets with Group 1 competitors (i.e., "Lowly Differentiated and Integrated" clusters) and Group 5 competitors (i.e., "Vertically Differentiated and Lowly Integrated" clusters). However, differences in means between individual groups are not identified through Games-Howell test results for these two independent variables. And, significant differences in means across cluster forms are not observed for variables regarding Group 3 competitors (i.e., "Highly Differentiated and Integrated" clusters) or Group 4 competitors (i.e., "Dispersed and Hospital-Focused" clusters). Thus, the study's first hypothesis is partially supported.

Hypothesis 2. The second hypothesis suggests that clusters operating in large markets are more likely to adopt "Highly Differentiated and Integrated" or "Integrated and Concentrated" forms. Two measures are used to evaluate market size: the total population in a cluster's local market, and the number of CBSAs that comprise a cluster's local market. Within the multinomial logistic regression model, the population size variable was removed during the model building process due to evidence of substantial multicollinearity with the other independent variables. However, ANOVA results indicate that significant differences exist across cluster forms in terms of the population sizes of their local markets ($p = 0.020$). Among the five cluster forms, clusters exhibiting the "Highly Differentiated and Integrated" and "Integrated and Concentrated" forms operate in markets with the highest average total population (3.585 million and 3.301 million individuals, respectively), and "Lowly Differentiated and Integrated" and "Vertically Differentiated and Lowly Integrated" clusters maintain the lowest average population sizes in their local markets (1.887 million and 1.426 million individuals, respectively). Games-Howell post-hoc tests reveal that these differences in average population sizes are statistically significant between "Integrated and Concentrated" clusters and "Lowly Differentiated and Integrated" clusters ($p = 0.022$).

The second measure of market size – the number of CBSAs included in a cluster's local market – is included in the final multinomial logistic regression model. Results indicate that as the number of CBSAs represented in a cluster's local market increase, clusters are significantly more likely to exhibit "Highly Differentiated and Integrated Cluster" forms compared to "Lowly

Differentiated and Integrated Cluster" or "Integrated and Concentrated Cluster" forms. Examining ANOVA test results for the CBSA variable, we observe statistically significant differences in means across the five cluster forms (p = 0.001). Individual comparisons between cluster forms, as indicated by Games-Howell tests, are statistically significant for three pairs: the average number of CBSAs represented in "Vertically Differentiated and Lowly Integrated" clusters' local markets is significantly less than that of "Lowly Differentiated and Integrated" (p = 0.005), "Integrated and Concentrated" (p = 0.016), and "Highly Differentiated and Integrated" clusters (p = 0.006). This suggests that clusters exhibiting the "Vertically Differentiated and Lowly Integrated" form, which is characterized by the lowest levels of coordination among cluster groups, may tend to operate in smaller markets. In collective consideration of these findings, the study's second hypothesis is partially supported.

***Hypothesis 3*.** The study's third hypothesis examines local market munificence specifically from the perspective of a local market's economic wealth. Markets with higher per capita incomes are anticipated to be associated with "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms. However, the per capita income variable was removed from the multinomial logistic regression model as a result of multicollinearity. ANOVA test results reveal significant differences across cluster forms in their markets' average per capita income (p = 0.032), and the "Integrated and Concentrated Cluster" and "Highly Differentiated and Integrated Cluster" forms averaged the highest per capita incomes in their local markets ($29,654 and $28,940, respectively). Games-Howell test results show the average per capita income of "Integrated and Concentrated" clusters' local markets to be significantly greater than the $25,713 per capita income of "Lowly Differentiated and

Integrated" clusters' local markets (p = 0.018). Therefore, we consider the study's third hypothesis to be partially supported.

Hypotheses 4 and 5. The fourth and fifth hypotheses relate to measures of patient and supplier diversity in a cluster's local market. Hypothesis 4 pertains to two measures: the percentage of a cluster's local market population younger than 5 years old and older than 65 years old, and the percentage of non-white individuals in a cluster's local market population. Hypothesis 5 relates to a local market's supplier diversity as measured in its specialist to general practice physician ratio. Collectively, these hypotheses anticipate that more diverse markets (i.e., those with higher percentages of individuals in the two outermost age groups, those with higher percentages of non-white individuals, and those with higher specialist to general practice physician ratios) are associated with "Highly Differentiated and Integrated" or "Integrated and Concentrated" cluster forms. However, none of these variables were included in the final multinomial logistic regression model given their relatively weaker univariable analyses and their contribution to numerically unstable results when introduced during the model building process. Furthermore, none of these variables produce statistically significant differences in means across cluster forms. Thus, analysis results fail to support the study's fourth and fifth hypotheses.

Hypothesis 6. Organizational size is the subject of the study's sixth hypothesis, which anticipates that larger clusters are associated with "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms. Results of the multinomial logistic regression are consistent with this hypothesis, revealing that the likelihood of exhibiting a "Lowly Differentiated and Integrated Cluster" form versus a "Highly Differentiated and Integrated Cluster" form is significantly higher for smaller clusters (i.e., operating 875 beds or less) in comparison to larger clusters (i.e., operating more than 875 beds). Similarly, the likelihood of exhibiting a "Lowly Differentiated and Integrated Cluster" form versus an "Integrated and Concentrated Cluster" form is significantly higher for smaller clusters than larger clusters.

Results from the ANOVA procedure also support the association between cluster size and cluster form. Differences in clusters' average number of beds are significant across the different cluster forms ($p < 0.001$), and the average number of beds operated by "Highly Differentiated and Integrated" clusters (1,516 beds) and "Integrated and Concentrated" clusters (1,503 beds) are significantly greater than the bed average of "Lowly Differentiated and Integrated" clusters (651 beds), "Dispersed and Hospital-Focused" clusters (478 beds), and "Vertically Differentiated and Lowly Integrated" clusters (422 beds), as indicated by Games-Howell test results ($p < 0.01$). In light of these results, the study's sixth hypothesis is strongly supported.

Hypothesis 7. The concept of mimetic isomorphism underlies the study's seventh hypothesis, which predicts that clusters are more likely to exhibit the same cluster forms as those exhibited by their local market leaders, as measured by the cluster with the largest market share. Multinomial logistic regression results for the SAMELEAD variable indicate that the odds of assuming a "Lowly Differentiated and Integrated Cluster" form rather than an "Integrated and Concentrated Cluster" form are significantly higher for clusters operating different forms than those exhibited by clusters with the largest share in their local markets when compared to clusters that either share the same form as their market leaders or that maintain the largest share of their local market. This suggests that, in comparison to "Lowly Differentiated and Integrated" clusters, "Integrated and Concentrated" clusters are more likely to either operate in markets with leaders who share the same cluster form, or they may be the market leaders themselves. However, such comparisons in the multinomial logistic regression between "Lowly

Differentiated and Integrated" clusters and "Highly Differentiated and Integrated" clusters as well as "Integrated and Concentrated" clusters and "Highly Differentiated and Integrated" clusters lack statistically significant results.

Evaluating the Fisher's exact test results, we observe significant associations between cluster form classifications and whether a cluster adopts the same form as its market leader (p = 0.001). We note that both "Integrated and Concentrated Cluster" and "Highly Differentiated and Integrated Cluster" forms have higher percentages of clusters that either share the same form as market leaders or have the largest share in their local markets (92.31 percent and 81.25 percent, respectively) in comparison to "Lowly Differentiated and Integrated" clusters (60 percent), "Dispersed and Hospital-Focused" clusters (44.44 percent), and "Vertically Differentiated and Lowly Integrated" clusters (60 percent). Thus, it appears that mimicry of leaders' forms is more common to "Highly Differentiated and Integrated" and "Integrated and Concentrated" clusters, and we conclude that Hypothesis 7 is partially supported.

***Hypothesis 8*.** The study's eighth hypothesis anticipates greater ownership by nonprofit organizations than for-profit organizations among "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms. Ownership form was not included in the final multinomial logistic regression model due to zero cell counts in the contingency table, as all "Highly Differentiated and Integrated" clusters in the study sample operate as nonprofit organizations. However, Fisher's exact test results offer strong support for significant associations between cluster forms and ownership forms ($p < 0.001$). In addition to 100 percent ownership of clusters classified as "Highly Differentiated and Integrated," nonprofit organizations also operate 79.5 percent of clusters classified as "Integrated and Concentrated." In comparison, for-profit organizations operate 55.6 percent of "Lowly Differentiated and

Integrated" clusters, 77.8 percent of "Dispersed and Hospital-Focused" clusters, and 40 percent of "Vertically Differentiated and Lowly Integrated" clusters. These findings provide support for the study's eighth hypothesis.

Hypothesis 9. The study's ninth hypothesis suggests that "Highly Differentiated and Integrated Cluster" forms are more likely to be displayed by clusters with teaching hospital members. Similar to the ownership form variable, the teaching hospital variable was removed from the multinomial logistic regression model due to zero cell counts in the contingency table, as none of the "Lowly Differentiated and Integrated," "Dispersed and Hospital-Focused," or "Vertically Differentiated and Lowly Integrated" clusters in the study sample include a teaching hospital member. Results from Fisher's exact tests indicate a significant association between cluster form and teaching hospital membership ($p < 0.001$), and "Highly Differentiated and Integrated" clusters maintain the highest inclusion of teaching hospital members among the five groups, as 56.2 percent of clusters within this category operate at least one teaching hospital. In comparison, fewer than 18 percent of "Integrated and Concentrated" clusters – the only other cluster form shown to include teaching hospital members – operate one or more teaching hospitals. Therefore, we consider the study's ninth hypothesis to be supported.

Hypothesis 10. The influence of regulative pressures on cluster forms are addressed in Hypothesis 10, which suggests that "Highly Differentiated and Integrated Cluster" forms are more likely to be exhibited by clusters in states with less restrictive CON laws. The CON variable is included in the multinomial logistic regression model, and results show that the likelihood of exhibiting a "Lowly Differentiated and Integrated Cluster" form versus a "Highly Differentiated and Integrated Cluster" form is higher – though at a marginally significant level ($p = 0.08$) – for clusters in states with moderately restrictive CON regulations in comparison to clusters in states with the most restrictive CON regulations. At the same time, the likelihood of exhibiting an "Integrated and Concentrated Cluster" form versus a "Highly Differentiated and Integrated Cluster" form is significantly lower ($p = 0.036$) for clusters operating in states with the least restrictive CON regulations in comparison to clusters in the most restrictive CON states. Additionally, the likelihood of exhibiting a "Lowly Differentiated and Integrated Cluster" form versus an "Integrated and Concentrated Cluster" form is significantly higher ($p = 0.027$) in states with the least restrictive CON regulations compared to those with the most restrictive CON rules.

These patterns are consistent with findings from the Fisher's exact test, which identified significant associations between cluster form classifications and state CON regulation groupings ($p < 0.001$). Examining clusters with "Highly Differentiated and Integrated" forms, 62.5 percent operate in the state with the least CON restrictions, whereas 6.25 percent operate in states with moderate CON restrictions and 31.25 percent operate in the states with the most restrictive CON rules. Thus, the majority of "Highly Differentiated and Integrated Cluster" forms are observed in the state that lacks CON restrictions, supporting Hypothesis 10, but nearly one-third of such cluster forms are identified in clusters operating under the most restrictive CON rules. An additional finding of interest is the strong representation of "Lowly Differentiated and Integrated" clusters in the least restrictive CON environments. Specifically, over 44 percent of "Lowly Differentiated and Integrated" clusters operate in the state that lacks CON restrictions, whereas 40 percent operate in states with moderate CON restrictions, and 15.56 percent operate in the most restrictive CON states. In comparison, the smallest representation of "Integrated and Concentrated" clusters (15.38 percent) is in the least restrictive CON state, as nearly half of the "Integrated and Concentrated" clusters operate in states with moderate CON restrictions and over one-third operate in states with the most restrictive CON rules.

In light of these findings, we suggest that the study's tenth hypothesis is partially supported by the analysis results, although we acknowledge that additional consideration of the findings is warranted. The tenth hypothesis focuses upon the influence of CON restrictions on clusters' abilities to pursue differentiation-configuration and integration-coordination strategies, expecting that clusters would be better able to pursue such strategies in states with fewer CON restrictions. However, we also observe that clusters that are *not* observed to pursue aggressive differentiation-configuration and integration-coordination strategies relative to other clusters (i.e., "Lowly Differentiated and Integrated" clusters) also have a higher likelihood of operating in states with lower CON restrictions. In contrast, clusters that are characterized by high degrees of integration but more moderate degrees of differentiation (i.e., "Integrated and Concentrated" clusters) are observed to more commonly operate in states with more restrictive CON rules.

Hypothesis 11. Similar to the tenth hypothesis, Hypothesis 11 examines the association of cluster forms to scope of practice regulations, and it anticipates that "Lowly Differentiated and Integrated Cluster" forms are more likely to be observed in states with more restrictive scope of practice laws. Due to its introduction of numeric problems during the model building process, the scope of practice restrictions variable was excluded from the multinomial logistic regression model. A Fisher's exact test reveals significant associations between cluster forms and states' levels of scope of practice restrictions, with a p-value of 0.011. Among the "Lowly Differentiated and Integrated" clusters, only 4.44 percent operate under the least restrictive scope of practice environment, whereas 57.78 percent and 37.78 percent operate in states with moderate to most restrictive scope of practice rules, respectively. In comparison, 12.82 percent of "Integrated and Concentrated" clusters operate under the least restrictive scope of practice rules, 38.46 percent operate under moderate scope of practice regulations, and 48.72 percent operate in states with the most scope of practice restrictions. Furthermore, 6.25 percent of "Highly Differentiated and Integrated" clusters operate in the state with the fewest scope of practice restrictions and 18.75 percent operate under the most scope of practice restrictions, whereas 75 percent operate under moderate scope of practice restrictions. Thus, a lower percentage of "Lowly Differentiated and Integrated" clusters operate in the least restrictive scope of practice environment compared to "Integrated and Concentrated" or "Highly Differentiated and Integrated" clusters. In light of these findings, we suggest that Hypothesis 11 is partially supported.

Hypothesis 12. The twelfth hypothesis considers the association of market competitiveness with cluster forms, predicting that "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in local markets characterized by high levels of competitiveness. Multinomial logistic regression analysis results reveal that, in comparison to clusters in less competitive, more concentrated markets, the likelihood of exhibiting either a "Lowly Differentiated and Integrated Cluster" form or an "Integrated and Concentrated Cluster" form as opposed to a "Highly Differentiated and Integrated Cluster" form is higher for clusters in more competitive, less concentrated markets. These results are observed at marginally significant levels ($p = 0.066$ and $p = 0.088$, respectively). Furthermore, the model's estimates of the likelihood of exhibiting a "Lowly Differentiated and Integrated Cluster" form versus an "Integrated and Concentrated Cluster" form based upon market competitiveness are not statistically significant. At the same time, ANOVA test results indicate significant differences in average Herfindahl-Hirschman Index (HHI) scores across the five cluster groups ($p = 0.001$). However, although "Integrated and Concentrated" clusters exhibit the lowest average HHI scores (0.2178), Games-Howell test results do not identify statistically significant differences between pairs of cluster forms. Considering these results, Hypothesis 12 is not supported.

Hypotheses 13, 14, and 15**.** The study's thirteenth, fourteenth, and fifteenth hypotheses respectively relate to ambulatory surgery centers, home health agencies, and skilled nursing facilities as substitutable competitors to clusters' hospital-based services. Collectively, these hypotheses predict that both "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in local markets with greater numbers of these substitutable settings. Within the multinomial logistic regression model, the ambulatory surgery center and skilled nursing facility variables were removed during the model building process due to evidence of substantial multicollinearity with other independent variables. Additionally, the home health agency variable was excluded from the final logistic regression model upon consideration of the limited number of independent variables to include, as it displayed weaker univariable analysis results and yielded little contribution to the model in comparison to other independent variables.

Examination of results from the ANOVA procedures reveals significant differences in ambulatory surgery center and skilled nursing facility means across the five cluster groups (p = 0.015 and p = 0.005, respectively). Furthermore, Games-Howell test results identify "Integrated and Concentrated" clusters as operating in markets with significantly higher average numbers of ambulatory surgery centers (68.3, p = 0.017) and skilled nursing facilities (97.1, p = 0.011) in comparison to "Lowly Differentiated and Integrated" clusters (35.6 and 56.3, respectively). Additionally, although "Highly Differentiated and Integrated" clusters maintained higher averages of market ambulatory surgery centers (83.5) and skilled nursing facilities (105.4) than other groups, these averages were not different at statistically significant levels when individually compared to other cluster forms' averages, according to Games-Howell test results. However, significant differences are not observed in the average number of home health agencies in local markets across or between cluster categories. Given such findings, the study analyses offer partial support for Hypotheses 13 and 15, while Hypothesis 14 is not supported.

Hypotheses 16 and 17. Exchanges between admissions sources and discharge settings are the subject of the sixteenth and seventeenth hypotheses. Collectively, they predict that "Highly Differentiated and Integrated" and "Integrated and Concentrated" clusters are more likely to have higher percentages of admissions from external health care facilities as well as higher percentages of discharges to post-acute care facilities. However, both variables are excluded from the final multinomial logistic regression model due to their weak univariable analysis results. Furthermore, ANOVA test results indicate a lack of statistically significant differences across cluster group means for both variables. Therefore, the study's analysis fails to support hypotheses 16 or 17.

Hypothesis 18. The eighteenth hypothesis predicts that "Highly Differentiated and Integrated" and "Integrated and Concentrated" clusters are more likely to average a higher percentage of patients classified as "extreme" cases. Multinomial logistic regression analysis results of the binary EXTREME variable suggest that the likelihood of exhibiting either a "Lowly Differentiated and Integrated Cluster" form or an "Integrated and Concentrated Cluster" form versus a "Highly Differentiated and Integrated Cluster" form is significantly higher for clusters with lower percentages of "extreme" admissions in comparison to clusters with higher percentages of "extreme" admissions (p = 0.021 and 0.005, respectively). However, odds ratios obtained from comparisons of clusters with "Lowly Differentiated and Integrated Cluster" forms to clusters with "Integrated and Concentrated Cluster" forms are not observed at statistically significant levels.

Results of the ANOVA procedure are consistent with those of the multinomial logistic regression analysis. Across the five cluster groups, the ANOVA test suggests significant differences in means of "extreme" case admissions ($p < 0.001$). Furthermore, results of the Games-Howell post-hoc tests identify statistically significant differences between the average percentage of "extreme" case admissions at "Highly Differentiated and Integrated" clusters and all four of the other cluster forms. In contrast, Games-Howell tests do not reveal statistically significant differences between any of the other possible cluster form pairs. Thus, we observe strong support for the prediction that "Highly Differentiated and Integrated" clusters admit a higher percentage of patients classified as "extreme" cases, but such results are not supported for "Integrated and Concentrated" clusters. In other words, the eighteenth hypothesis is partially supported.

Hypothesis 19. Hypothesis 19 relates to market munificence and includes two measures: the unemployment rate and the percentage of individuals residing in urban areas in a cluster's local market. Using these two measures, the nineteenth hypothesis suggests that clusters displaying "Highly Differentiated and Integrated Cluster" forms as well as "Integrated and Concentrated Cluster" forms operate in markets characterized by lower unemployment rates and higher percentages of urban populations. Both the unemployment rate and "urbanicity" measures are excluded from the study's final multinomial logistic regression model, as the unemployment rate variable exhibits evidence of multicollinearity, and the urban population variable exhibits evidence of numeric problems, even when collapsed into a dichotomous categorical variable, when included during the model building process.

Evaluating the results of the ANOVA tests, we observe statistically significant differences across cluster forms in terms of their average unemployment rates ($p = 0.008$), whereas differences across cluster forms are marginally significant in terms of their "urbanicity" ($p = 0.081$). The results of Games-Howell tests indicate that "Highly Differentiated and Integrated" clusters and "Dispersed and Hospital-Focused" clusters operate in markets with significantly lower unemployment rates (7.74 and 7.93 percent, respectively) than "Lowly Differentiated and Integrated" clusters and "Integrated and Concentrated" clusters (9.57 and 9.36 percent, respectively). In contrast, the results of the Games-Howell tests fail to identify statistically significant differences between individual cluster forms in terms of their markets' average percentage of individuals residing in urban areas. Upon consideration of these results, we observe partial support for Hypothesis 19.

Hypothesis 20. The study's twentieth hypothesis suggests that "Highly Differentiated and Integrated" clusters are more likely to operate critical access hospitals. Results of the univariable analysis, as presented in Appendix 8, indicate that the likelihood of exhibiting either a "Lowly Differentiated and Integrated Cluster" form or an "Integrated and Concentrated Cluster" form versus a "Highly Differentiated and Integrated Cluster" form is significantly higher for clusters without critical access hospital members in comparison to clusters operating critical access hospitals. However, attempts to include this variable in the final multinomial logistic regression model during the model building process create numeric problems, and therefore the categorical variable representing clusters' operations of critical access hospitals is excluded from the final multinomial logistic regression model.

A Fisher's exact test of the association between cluster form categories and critical access hospital operation reveals a significant relationship between the two classifications ($p = 0.045$), and evaluation of their contingency table shows that, other than “Highly Differentiated and Integrated” clusters, all other cluster forms include fewer than 15 percent of clusters that operate one or more critical access hospitals. In comparison, 43.75 percent of “Highly Differentiated and Integrated” clusters operate one or more critical access hospitals. Collectively, these findings lend support to Hypothesis 20.

Hypothesis 21. Finally, two measures are included in the study to test Hypothesis 21, which anticipates that clusters with “Highly Differentiated and Integrated Cluster” forms and “Integrated and Concentrated Cluster” forms are more likely to operate in local markets characterized by high levels of dynamism. The first measure, change in a local market’s unemployment rate from 2000 to 2008, is excluded from the final multinomial logistic regression model as it provided a relatively weak contribution during the model building process, as evident in its univariable analysis. The ANOVA test of significant differences in unemployment rate change across the five cluster forms suggests a marginally significant difference ($p = 0.06$), but no statistically significant differences in average unemployment rate change is observed between individual cluster forms based upon Games-Howell test results.

The second measure, percentage change in a local market’s population, is included as a dichotomous categorical variable in the study’s final multinomial logistic regression model, indicating whether a cluster’s local market population experienced high growth from 2000 to 2010 (i.e., 26 percent or more) or moderate, low, or no growth (i.e., less than 26 percent). According to the analysis results, the likelihood of exhibiting an “Integrated and Concentrated Cluster” form versus either a “Lowly Differentiated and Integrated Cluster” form or a “Highly Differentiated and Integrated Cluster” form is significantly higher for clusters operating in markets characterized by moderate, low, or no population growth as opposed to clusters in high growth markets (p = 0.097 and 0.035, respectively). Such odds are not observed at statistically significant levels when comparing clusters with "Lowly Differentiated and Integrated Cluster" forms to clusters with "Highly Differentiated and Integrated Cluster" forms. In addition, clusters forms' averages for population change are shown to differ at marginally significant levels according to ANOVA test results (p = 0.054), but the Games-Howell post-hoc test only identifies a statistically significant difference in average population change between "Lowly Differentiated and Integrated" and "Integrated and Concentrated" clusters. In this case, the average change in population for "Integrated and Concentrated" clusters (15.41 percent) is observed to be significantly less than the average change in population for clusters exhibiting the "Lowly Differentiated and Integrated Cluster" form (21.58 percent). Collectively, the results of these two measures fail to support Hypothesis 21.

Summary of hypothesis testing results. Considering each of the study's 21 hypotheses, the ANOVA, Games-Howell test, Fisher's exact test, and multinomial logistic regression procedures produced results that supported 4 hypotheses, offered partial support to 10 hypotheses, and failed to support 7 of the study's hypotheses. Table 23 summarizes the results of these hypothesis tests, including the theoretical perspectives from which the hypotheses are developed.

Summary

This chapter presents the results of an explanatory analysis of the five cluster forms identified in the final solution of the study's taxonomic analysis. A multi-theoretical perspective – including population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory – is applied to identify organizational and environmental factors associated with clusters' varied forms, and 21

Table 23. *Summary of hypothesis testing results*

Theoretical Basis	Hypothesis	Support
Population Ecology	H1: Clusters operating in the same market are more likely to share the same cluster form.	Partial
Population Ecology	H2: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in larger markets.	Partial
Population Ecology & Resource Dependence Theory	H3: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of economic wealth.	Partial
Population Ecology	H4: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of patient diversity.	No
Population Ecology	H5: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of supplier diversity.	No
Population Ecology	H6: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by larger clusters.	Yes
Institutional Theory	H7: Clusters are more likely to share the same cluster form with the cluster having the largest market share in their same local market.	Partial
Institutional Theory	H8: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be owned by nonprofit organizations than for-profit organizations.	Yes
Institutional Theory	H9: Clusters with teaching hospital members are more likely to adopt "Highly Differentiated and Integrated Cluster" forms.	Yes
Institutional Theory & Industrial Organization Economics	H10: "Highly Differentiated and Integrated Cluster" forms are more likely to operate in states with less restrictive CON laws.	Partial
Institutional Theory	H11: "Lowly Differentiated and Integrated Cluster" forms are more likely to operate in states with more restrictive scope of practice laws.	Partial
Industrial Organization Economics & Resource Dependence Theory	H12: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in more highly competitive markets.	No
Industrial Organization Economics	H13: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of ambulatory surgery centers.	Partial
Industrial Organization Economics	H14: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of home health agencies.	No

Continued on next page

Table 23 (continued). *Summary of hypothesis testing results*

Theoretical Basis	Hypothesis	Support
Industrial Organization Economics	H15: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of skilled nursing facilities.	Partial
Transaction Cost Economics	H16: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to have higher percentages of admissions from external health care facilities.	No
Transaction Cost Economics	H17: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to have higher percentages of discharges to post-acute care facilities.	No
Transaction Cost Economics	H18: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to care for patients requiring greater complexity of care.	Partial
Resource Dependence Theory	H19: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with higher levels of munificence.	Partial
Resource Dependence Theory	H20: "Highly Differentiated and Integrated Cluster" forms are more likely to operate critical access hospitals.	Yes
Resource Dependence Theory	H21: "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with higher levels of dynamism.	No

hypotheses are developed to predict differences across cluster forms. These hypotheses are then tested using descriptive and multivariate analyses, including ANOVA, Games-Howell test, Fisher's exact test, and multinomial logistic regression procedures.

Although the ANOVA, Games-Howell test, and Fisher's exact test procedures are applied across the total cluster sample, including clusters classified as exhibiting "Dispersed and Hospital-Focused Cluster" and "Vertically Differentiated and Lowly Integrated Cluster" forms, low sample sizes for these two groups result in a multinomial logistic regression model that is solely applied to clusters classified within the "Lowly Differentiated and Integrated Cluster," "Integrated and Concentrated Cluster," and "Highly Differentiated and Integrated Cluster" forms. Analysis results offer further support for the five cluster categories identified within the taxonomic analysis, distinguishing between cluster forms based upon characteristics and factors such as competitors' cluster forms, market size, organization size, restrictive regulations, complexity, market munificence, market competitiveness, ownership form, and types of hospital members.

Thus, in fulfillment of the study's fourth aim, this chapter's findings identify organizational and environmental factors that may *explain* clusters' adoption of diverse forms, and furthermore, its findings serve as an important external validation of clusters' taxonomic groups previously identified in the study. The following chapter provides further discussion of the study findings, including study implications and limitations.

Chapter 7: Conclusions

In light of the study results presented in the fifth and sixth chapters, the final chapter of the dissertation provides a discussion of the study's overall findings and the implications of its results for health care managers, policymakers, and scholars. This chapter also includes consideration of key study limitations, and it identifies related areas for future research.

Discussion of Study Findings

This study sought to describe and explain the diversity observed across hospital-based clusters, and this purpose was addressed through four specific aims. The first aim related to an updated national inventory of urban and regional hospital-based clusters as of 2012. The second aim consisted of completing a catalog of clusters' components and configurations, and the third aim utilized this catalog to conduct a taxonomic analysis of cluster forms. Finally, the fourth aim addressed organizational and environmental factors associated with different cluster forms. We now summarize the study findings by considering these aims separately.

Aim #1: A national inventory of clusters. Using primary data collection techniques to update a U.S. cluster inventory previously reflecting cluster membership as of 2009 (e.g., Luke et al., 2011), the national inventory of hospital-based clusters as of 2012 shows clusters to maintain a dominant presence in their local markets, particularly in large metropolitan areas. Additionally, the updated inventory reveals the importance of defining clusters' local markets according to regional boundary definitions, supporting arguments previously made by scholars examining cluster growth (Luke & Ozcan, 2012; Shay et al., 2011, in press).

Adopting an urban boundary definition, the updated inventory shows that the majority of clusters consist of two hospitals, with nearly another third consisting of three or four hospitals. Less than 17 percent of "urban" clusters operate more than four hospitals. In addition, over one third of all hospitals in the U.S. are identified as cluster members, and when solely considering hospitals that are multi-hospital system members, cluster membership increases to over 59 percent. Similarly, over 58 percent of all U.S. hospitals operating in metropolitan statistical areas (METSAs) are cluster members, and among multi-hospital system members in METSAs, over 78 percent operate within clusters. In comparison to previous inventories of clusters across the U.S., these statistics show a consistent increase in the number of cluster-member hospitals over the past two decades. Among hospitals in METSAs, cluster membership has increased from 33 percent in 1995 to 43 percent in 2000 (Cuellar & Gertler, 2003), to nearly 60 percent observed within this study. Solely examining multi-hospital system members in METSAs, the growth trends are likewise remarkable. In 1989, approximately 56 percent of multi-hospital system members participated in clusters (Trinh et al., 2014), and as of 2012 that figure has risen to nearly 80 percent. Together, these trends are consistent with recent studies evaluating the growth of urban hospital-based clusters from 1989 to 2009 (e.g., Luke et al., 2011; Shay et al., in press; Trinh et al., 2014). Clearly, over the past two decades, urban markets have witnessed the emergence of hospital-based clusters as the dominant form among hospital-based providers. Furthermore, the growth of clusters was not simply a phenomenon of the 1990s but continued as a strong trend that also marked the first decade of the new millennium.

However, this study's inventory of clusters also applies an expanded "regional" boundary definition, which identifies 144 additional clusters that were not recognized using urban cluster boundaries. Among regionally-defined clusters, less than 40 percent include just two hospitals, and one-third operate three or four hospitals. In comparison to the roughly 17 percent of all urban clusters that maintain 5 or more hospitals, nearly 18 percent of all regional clusters consist of five to seven hospitals, and nearly 10 percent include eight or more hospital members. These figures illustrate the fact that an urban cluster boundary definition misrepresents the size of hospital-based clusters, as measured in their number of hospital members. Furthermore, the urban cluster boundary definition misrepresents the types of markets and the ownership forms observed among clusters. Whereas the urban boundary definition restricts all clusters to operating within a single urban market, the expanded regional boundary definition recognizes that only 43 percent of clusters operate strictly within a single urban market. Over 29 percent operate across two urban markets, nearly 25 percent operate in a combination of urban and rural markets, and even 3 percent (i.e., 21 clusters) operate entirely in rural areas. Examining clusters' ownership, an expansion of cluster boundaries from urban to regional definitions realizes an increase in the percentage of government-owned clusters from 8.74 percent to 9.24, and the share of hospital-based clusters owned by for-profit entities increases from over 18 percent to approximately 22 percent. Thus, an urban boundary definition of clusters tends to underrepresent the numbers of government and for-profit clusters.

Urban cluster boundaries also underrepresent the number of hospitals in micropolitan statistical areas (MICSAs). And, as their name suggests, they completely disregard the number of rural hospitals participating in clusters. In total, the adoption of a regional cluster boundary allows for the recognition of 983 additional cluster-member hospitals. Of these, approximately

38 percent (373) operate in rural areas, and roughly 29 percent (284) operate in MICSAs. Additionally, another third (326) operate in METSAs. Overall, more than 70 percent of all U.S. hospitals in METSAs participate in regional clusters, and for both hospitals operating in MICSAs and in rural areas, approximately 47 percent are regional cluster members. When solely considering multi-hospital system members, over 90 percent of rural hospitals, nearly 88 percent of MICSA hospitals, and nearly 95 percent of METSA hospitals belonging to multi-hospital systems participate in clusters. These statistics suggest that multi-hospital systems primarily organize and operate across local markets through clusters, which may foster cooperative relationships and clinical interdependence among proximate same-system facilities (Luke et al., 2011; Trinh et al., 2014).

In sum, the presence of clusters in local markets is even more remarkable when an expanded "regional" boundary definition is applied. Considering hospitals' membership in regionally-defined clusters, nearly 57 percent of all hospitals in the U.S. were organized in clusters in 2012, and 93 percent – the overwhelming majority – of multi-hospital system members participated in regional clusters. Once again, these figures are consistent with recent studies that have examined the growth of regionally-defined clusters (Luke & Ozcan, 2012; Shay et al., in press). Collectively, the updated inventory of hospital-based clusters as of 2012 confirms clusters' growing presence in local markets over the past two decades, leading to their current dominance particularly in large local markets. It also yields evidence that the regional boundary definition of clusters is preferred to the urban boundary definition, as it more accurately represents hospitals' cluster membership and avoids underrepresentation of clusters' size and operation in smaller markets.

Aim #2: A catalog of cluster components and configurations. From the updated inventory of U.S. clusters as of 2012, a sample of regional clusters operating in six states – Florida, Maryland, Nevada, Texas, Virginia, and Washington – was identified and examined using primary data collection methods to create a catalog of their components. This catalog identified clusters' unique service locations, including their hospital-based sites as well as their non-hospital-based sites. From the catalog, a more complete picture of clusters was obtained that identified clusters' activities beyond hospital walls.

The study's 117 sample clusters comprise a total of 489 general, acute care hospitals, averaging just over four hospitals per cluster. Of these 117 clusters, 113 – or approximately 97 percent – operated service locations other than general, acute care hospitals. The most common non-hospital-based service locations were identified as primary care sites (i.e., primary care clinics, primary care physician practices, and free clinics) and multi-service outpatient centers. Nearly two-thirds of the sample clusters operated physician-centered primary care sites (76 clusters, or 65 percent), with an average of approximately eight primary care locations for each cluster operating a primary care service location. Two-thirds of the sample clusters (78 clusters) also operated an average of 3.5 multi-service outpatient centers, which can include a variety of ambulatory care services throughout the continuum of care. In addition, approximately 60 percent of all sample clusters operate specialty care clinics or physician practices, averaging roughly 4 sites each. Together, these statistics correspond to anecdotal observations regarding hospital-based systems' increasing control and operation of physician practices (e.g., Fellows, 2013; Kocher & Sahni, 2011; McCarthy, 2011; Tocknell, 2012) as well as the growth of multi-service outpatient centers (e.g., Fellows, 2013; Yanci, 2006). For hospitals, ownership of primary care and specialty physician clinics allows them "to influence the flow of referrals" to their facilities, to gain local market power, and to position themselves to "retain maximum flexibility" and "compete under various reimbursement scenarios" possible under health care reform (Kocher & Sahni, 2011, pp. 1791-1792). Similarly, the prevalence of multi-service outpatient center operation among hospital-based clusters reflects observed trends of hospital systems developing networks of ambulatory care sites that may attract patients by offering a range of services such as physician care, diagnostic imaging, urgent care, and ancillary services in strategic locations, which in turn may allow these organizations to "direct referrals for more complex specialty and inpatient care to existing flagship hospitals" (Felland et al., 2011, p. 2; Fellows, 2013).

Other fairly common types of non-hospital-based service locations observed among the sample clusters include ancillary service centers providing diagnostic imaging or laboratory services (approximately 53 percent, averaging 2.7 per cluster), outpatient rehabilitation clinics (roughly 44 percent, averaging 3.7 per cluster), urgent care clinics (nearly 33 percent, averaging 2.7 per cluster), ambulatory surgery centers (over 25 percent, averaging 2.9 per cluster), freestanding emergency departments (approximately 24 percent, averaging 1.6 per cluster), and fitness and wellness centers (nearly 20 percent, averaging 2.9 per cluster). Industry observers have recently followed the growth of hospital-based providers in these physically separate, non-hospital-based settings, noting their desire to move outpatient care closer to the patient rather than require patients to come to the hospital to engage with the system (Kutscher, 2012). Thus, the study's catalog of cluster components reflects hospital-based providers' increased emphasis and shift towards outpatient services (Felland et al., 2011; Kutscher & Selvam, 2012; Shi & Singh, 2013).

In contrast, fewer clusters in the study sample operated freestanding post-acute care sites. Of such sites, the most common include skilled nursing facilities (almost 20 percent, averaging 1.5 per cluster), behavioral health hospitals (roughly 12 percent, averaging 1.4 per cluster), and inpatient rehabilitation facilities (roughly 12 percent, averaging 1.1 per cluster). Rather than quickly conclude that this figure indicates clusters do not frequently engage in post-acute care, however, it is important to consider that the lower prevalence of freestanding post-acute care sites among clusters may or may not indicate a cluster's provision of such services. For example, rather than operate *freestanding* skilled nursing facilities or inpatient rehabilitation facilities, clusters may offer skilled nursing or inpatient rehabilitation services within units of their general, acute care hospitals. Alternatively, clusters may choose not to offer such services within their organization but instead may contract or affiliate with external post-acute care providers. Whether or not post-acute care services are offered within clusters' general, acute care hospitals is a question separately answered through measures of service differentiation incorporated within the taxonomic analysis. Instead, the reasonable conclusion that one may make in light of clusters' lower prevalence of freestanding post-acute care facilities is that clusters' *spatial* differentiation – or configuration – strategies primarily consist of general, acute care hospitals and pre-acute, ambulatory care sites such as primary care clinics and multi-service outpatient centers.

Overall, this study's catalog of cluster components and configurations identifies a wide range of non-hospital-based sites operated by hospital-based clusters, from primary care clinics to specialty physician practices, from ancillary service centers to ambulatory surgery centers, from urgent care clinics to freestanding emergency departments, and from fitness and wellness centers to post-acute care sites, to name a few. The overwhelming majority of clusters operate at least one non-hospital-based service location, and of the 2,547 total service locations represented across the sample's clusters, over 80 percent (2,058) are non-hospital-based sites located separately throughout a cluster's local market. These results collectively illustrate the "geographic expansion race" that industry observers have described over the past ten years, as hospital-based providers have paired service development strategies with geographic expansion strategies to develop non-hospital-based sites that may attract patients, expand referral bases, and support clusters' core facilities (Carrier et al., 2012; Devers et al., 2003; Felland et al., 2011). In other words, clusters are indeed more than just hospitals.

Aim #3: A taxonomy of cluster forms. Using variables related to the constructs of differentiation-configuration and integration-coordination, a taxonomic analysis was performed on a sample of clusters operating in the six states of Florida, Maryland, Nevada, Texas, Virginia, and Washington. The analysis identified five common cluster forms, which we termed "Lowly Differentiated and Integrated Clusters," "Integrated and Concentrated Clusters," "Highly Differentiated and Integrated Clusters," "Dispersed and Hospital-Focused Clusters," and "Vertically Differentiated and Lowly Integrated Clusters." As these terms indicate, differences and commonalities among clusters were successfully identified along dimensions of the differentiation-configuration and integration-coordination constructs. Within the larger, synthesized constructs of differentiation-configuration and integration-coordination, variables relating to horizontal differentiation, vertical differentiation, configuration (i.e., spatial differentiation), horizontal integration, vertical integration, and coordination distinguished between cluster forms. These dimensions are strongly supported by principal component analysis results, which grouped classification variables according to underlying dimensions of non-hospital-based and hospital-based horizontal strategies, vertical integration strategies, spatial differentiation strategies, and vertical differentiation strategies according to case complexity and service type.

Specifically, groups of cluster forms were distinguished as those displaying high levels of horizontal differentiation ("Integrated and Concentrated Clusters" and "Highly Differentiated and Integrated Clusters") versus those displaying lower levels of horizontal differentiation ("Lowly Differentiated and Integrated Clusters," "Dispersed and Hospital-Focused Clusters," and "Vertically Differentiated and Lowly Integrated Clusters"). Similarly, some groups were observed as highly vertically differentiated ("Highly Differentiated and Integrated Clusters" and "Vertically Differentiated and Lowly Integrated Clusters"), whereas others displayed lower levels of vertical differentiation (e.g., "Lowly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters"). The taxonomy also distinguishes clusters that are highly spatially differentiated in terms of their number and geographic reach of physical locations (e.g., "Highly Differentiated and Integrated Clusters") versus those more limited in their spatial differentiation (e.g., "Lowly Differentiated and Integrated Clusters" and "Vertically Differentiated and Lowly Integrated Clusters"). One important distinction of the "Dispersed and Hospital-Focused Clusters" form compared to other forms is its low level of spatial differentiation in terms of its number of locations and its high level of spatial differentiation in terms of its extensive geographic reach within a local market. Additionally, cluster forms' configurations differ according to whether they are more concentrated (e.g., "Integrated and Concentrated Clusters") or more dispersed (e.g., "Dispersed and Hospital-Focused Clusters").

In terms of integration-coordination strategies, the taxonomy identified cluster forms that were highly integrated along horizontal and vertical dimensions (e.g., "Highly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters") versus those with low levels of horizontal or vertical integration (e.g., “Lowly Differentiated and Integrated Clusters” and “Vertically Differentiated and Lowly Integrated Clusters”). Finally, cluster forms were identified as those with high levels of coordination (“Highly Differentiated and Integrated Clusters”) versus those with low levels of coordination (e.g., “Lowly Differentiated and Integrated Clusters” and “Vertically Differentiated and Lowly Integrated Clusters”).

Not only did the taxonomic groups vary according to dimensions of differentiation-configuration and integration-coordination, the taxonomic groups also varied in size. The two largest groups were clearly identified as “Lowly Differentiated and Integrated Clusters” and “Integrated and Concentrated Clusters,” with 45 and 39 clusters classified in these groups, respectively. Together, these two groups represented approximately 74 percent – nearly three-fourths – of the study’s sample. The third largest group, “Highly Differentiated and Integrated Clusters,” included 16 clusters, representing 14 percent of the study’s sample. Finally, the groups labeled “Dispersed and Hospital-Focused Clusters” and “Vertically Differentiated and Lowly Integrated Clusters” were much smaller, representing 7.9 and 4.4 percent of the study’s sample, respectively.

Thus, the study’s taxonomic analysis produced results that successfully categorized cluster forms according to the conceptual framework’s dimensions of differentiation-configuration and integration-coordination. The results of the taxonomic analysis were also shown to be internally valid and reliable, and external validation techniques were subsequently applied in the form of descriptive and regression analyses based upon theoretically-motivated external variables. These external validation procedures fulfill the study’s fourth aim and serve to explain organizational and environmental factors associated with diverse cluster forms, as subsequently described. We then provide individual profiles and general comparisons of the study's five cluster forms.

Aim #4: An explanation of cluster forms. Attempts to fulfill the study's fourth aim build upon the results of the taxonomic analysis on the six-state sample of clusters. Applying a multi-theoretical framework including hypotheses developed from population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory perspectives, cluster forms were examined across a total of 29 variables using ANOVA, Games-Howell test, and Fisher's exact test procedures. From these analyses, statistically significant differences were observed across the five cluster forms for 21 of the 29 variables (72 percent), and significant differences were observed *between* pairs of cluster forms, as indicated by Games-Howell test results, for 10 variables. Together, these results externally validate the final five-cluster solution of the study's taxonomic analysis. In addition, a multinomial logistic regression analysis was performed, examining the association between three of the cluster forms ("Lowly Differentiated and Integrated Clusters," "Integrated and Concentrated Clusters," and "Highly Differentiated and Integrated Clusters") and eight independent variables. This analysis correctly classified a substantial percentage of sample clusters – 86.9 percent, greatly exceeding the proportional chance criterion of 47.5 percent – and distinguished the three most common cluster forms according to factors such as competitors' cluster forms, market size, organizational size, regulatory restrictions, case complexity, market dynamism, and market competitiveness.

Considering the results of these descriptive and logistic regression analyses, 4 of the study's 21 hypotheses were regarded as fully supported. As predicted, clusters displaying higher levels of horizontal differentiation and vertical integration were associated with larger organizational size and nonprofit ownership. In addition, clusters engaging in high levels of differentiation-configuration and integration-coordination strategies (i.e., “Highly Differentiated and Integrated Clusters”) were observed to be more likely to include teaching hospital members as well as critical access hospital members. These results were consistent with hypotheses developed from population ecology, institutional theory, and resource dependence theory perspectives.

Partially supported hypotheses. In addition to the four fully supported hypotheses, ten hypotheses obtained partial support. We proceed to examine the study’s partially supported hypotheses, considering their implications as well as any explanations for their results.

Competitor cluster form. Clusters operating in the same market as other clusters exhibiting the “Integrated and Concentrated Cluster” form were more likely to display the same form rather than a “Lowly Differentiated and Integrated Cluster” form, in support of the study’s first hypothesis. However, when its competing clusters exhibit the “Integrated and Concentrated Cluster” form, a cluster is also observed to be more likely to exhibit the “Highly Differentiated and Integrated Cluster” form than the “Lowly Differentiated and Integrated Cluster” form, which was not included in the study’s predictions. Applying concepts of isomorphism, one may consider that the presence of one or more “Integrated and Concentrated Clusters” in a local market may promote the adoption of either “Integrated and Concentrated Cluster” *or* “Highly Differentiated and Integrated Cluster” forms, as both forms favor higher degrees of integration and horizontal differentiation activity, as opposed to forms that are associated with lower levels of differentiation and integration strategies.

At the same time, statistically significant results are not observed from ANOVA tests in terms of the association of competitors exhibiting the “Highly Differentiated and Integrated

Cluster" form and the prevalence of either the same form or alternative forms, and the same can be said of competitors exhibiting the "Dispersed and Hospital-Focused Cluster" form. And, although the means across the five cluster groups are shown to be statistically significant in ANOVA tests for markets with "Lowly Differentiated and Integrated Cluster" or "Vertically Differentiated and Lowly Integrated Cluster" competitors, Games-Howell test results fail to identify significant differences *between* pairs of cluster forms. One may consider that, in light of these results, patterns of cluster form isomorphism appear more prevalent in local markets with competitors adopting the "Integrated and Concentrated Cluster" form. We revisit this point in a subsequent discussion of results relating to the study's hypothesis concerning form mimicry.

Market size. In support of the second hypothesis, clusters operating in local markets that comprised multiple CBSAs were more likely to exhibit "Highly Differentiated and Integrated Cluster" forms compared to "Lowly Differentiated and Integrated Cluster" or "Integrated and Concentrated Cluster" forms. However, significant differences were not observed in the number of CBSAs comprising a cluster's local market and its adoption of either a "Lowly Differentiated and Integrated Cluster" form or an "Integrated and Concentrated Cluster" form, unlike the second hypothesis predicted. At the same time, ANOVA and Games-Howell test results indicated a significant difference between "Lowly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters" in terms of their market size, when market size is measured by market population, with "Integrated and Concentrated Clusters" operating in markets with over 3.3 million individuals as opposed to the average market size of 1.9 million individuals for "Lowly Differentiated and Integrated Clusters."

In addition, "Vertically Differentiated and Lowly Integrated Clusters" all existed in local markets that consisted of a single CBSA, which was a significantly lower average than "Lowly

Differentiated and Integrated Clusters," "Integrated and Concentrated Clusters," and "Highly Differentiated and Integrated Clusters." At the same time, these clusters exhibited the smallest average market size in terms of total population (1.4 million individuals), but Games-Howell test results did not show this average to be significantly different from averages of other cluster forms. Games-Howell test results also failed to show significant differences in terms of market size between other cluster forms and "Dispersed and Hospital-Focused Clusters," which averaged over 2.8 million individuals in their local markets as well as the second-highest average number of CBSAs (1.89). For these, Games-Howell test results may not have been identified as statistically significant in part due to the small sample sizes of both the "Vertically Differentiated and Lowly Integrated Cluster" and "Dispersed and Hospital-Focused Cluster" forms.

Thus, from these results we can reasonably conclude that "Highly Differentiated and Integrated Clusters" tend to operate in larger markets, with less convincing evidence that "Integrated and Concentrated Clusters" also operate in larger markets. In contrast, evidence suggests that "Vertically Differentiated and Lowly Integrated Clusters" operate in smaller markets on average than other cluster forms when measured by the number of CBSAs included in a local market. Such conclusions, however, stem from different measures of market size and different analysis methods.

Market economic wealth. The third hypothesis anticipated that both "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to be adopted by clusters in markets with greater levels of economic wealth. Consistent with this hypothesis, "Integrated and Concentrated Clusters" operated in markets with significantly higher average per capita income than "Lowly Differentiated and Integrated Clusters." However, although "Highly Differentiated and Integrated Clusters" maintained the second-highest average per capita income in their local markets, this average was not different at statistically significant levels from the average per capita incomes observed across other clusters' markets. In this instance, a larger sample size would have been desirable to increase the statistical power of the analysis and identify potentially significant differences at more minute levels.

Form mimicry. Form mimicry is the subject of the study's seventh hypothesis. Consistent with this prediction, "Integrated and Concentrated Clusters," when compared to "Lowly Differentiated and Integrated Clusters," are more likely to operate in markets in which either they maintain the largest market share or the market share leader also exhibits the "Integrated and Concentrated Cluster" form. However, this was the only significant finding regarding mimicry market leader forms from the study's multinomial logistic regression. Examining descriptive analysis results, we see that the strong majority – over 80 percent – of "Integrated and Concentrated Clusters" and "Highly Differentiated and Integrated Clusters" operate in markets in which either the market share leader exhibits their same form or they operate as the market share leader themselves. These compare to rates of 60 percent, 44 percent, and 60 percent for the "Lowly Differentiated and Integrated Clusters," "Dispersed and Hospital-Focused Clusters," and "Vertically Differentiated and Lowly Integrated Clusters," respectively.

Further examination of these rates reveals that, when solely examining clusters that share the same forms as their market share leaders (*not* including clusters that maintain the market share lead themselves), over 51 percent of "Integrated and Concentrated Clusters" (20 clusters) mimic the forms of their market share leaders. This compares to 22.2 percent of "Lowly Differentiated and Integrated Clusters" (10 clusters), 25 percent of "Highly Differentiated and Integrated Clusters" (4 clusters), and no clusters in either the "Dispersed and Hospital-Focused

Cluster" or "Vertically Differentiated and Lowly Integrated Cluster" groups. On the other hand, 37.8 percent of "Lowly Differentiated and Integrated Clusters" (17 clusters), 41 percent of "Integrated and Concentrated Clusters (16 clusters), 56 percent of "Highly Differentiated and Integrated Clusters (9 clusters), 44.4 percent of "Dispersed and Hospital-Focused Clusters" (4 clusters), and 60 percent of "Vertically Differentiated and Lowly Integrated Clusters" (3 clusters) serve as their local market share leaders. Collectively, these statistics suggest that leader form mimicry is most prevalent among "Integrated and Concentrated Clusters."

We consider this finding to be consistent with the results pertaining to the study's first hypothesis, as isomorphic patterns seem to be more prevalent among "Integrated and Concentrated Clusters." But, one may reasonably ask, if cluster form isomorphism characterizes markets with "Integrated and Concentrated Clusters," why is the same not as readily apparent for markets led by clusters with other forms such as "Lowly Differentiated and Integrated Clusters"? To briefly address this question, we recognize that, according to institutional theorists, organizations operate in competing technical and institutional environments, and from these environments come conflicting pressures and logics that influence organizational activity and, in some instances, serve as barriers to specific strategies (Luke & Walston, 2003).

Thus, "Lowly Differentiated and Integrated Clusters" may choose not to pursue higher levels of differentiation or integration when their market share leaders exhibit the "Integrated and Concentrated Cluster" form due to technical or institutional barriers. Conversely, noting the high degree of nonprofit ownership among "Integrated and Concentrated Clusters," and acknowledging the normative pressures previously described in Chapter 6 regarding increased expectations that nonprofit clusters would display increased differentiation and integration activities, perhaps nonprofit "Lowly Differentiated and Integrated Clusters" operating in markets with “Integrated and Concentrated Cluster” leaders would face increased pressures to adopt the “Integrated and Concentrated Cluster” form. These isomorphic pressures may stem from pressures to conform to normative expectations associated with nonprofit health care organizations as well as cultural-cognitive pressures to mimic the forms of other successful entities, as institutional theorists would argue.

Regulatory restrictions. The tenth and eleventh hypotheses both address the role that regulatory environments may play on clusters’ adoption of varied forms. Anticipating that “Highly Differentiated and Integrated Clusters” would more likely operate in states with less restrictive certificate-of-need (CON) laws, the multinomial logistic regression results as well as the Fisher’s exact test results indicate that “Lowly Differentiated and Integrated Clusters” are actually more prone to operating in states with less restrictive CON regulations, with 44 percent and 40 percent of such clusters identified in lowly restrictive and moderately restrictive states, respectively. In comparison, although the majority of “Highly Differentiated and Integrated Clusters” operate in states with the least restrictive CON laws, which supports the tenth hypothesis, nearly one-third operate in states with the *most* restrictive CON laws, and only 6.25 percent are identified in states with moderate CON restrictions, which is not consistent with study predictions.

Similarly, the eleventh hypothesis predicted that “Lowly Differentiated and Integrated Clusters” would be more common in states with more restrictive scope of practice (SOP) laws. Although a lower percentage of “Lowly Differentiated and Integrated Clusters” were found to operate in states with the least restrictive SOP rules in comparison to “Integrated and Concentrated Clusters” or “Highly Differentiated and Integrated Clusters,” we also found the majority of “Lowly Differentiated and Integrated Clusters” to operate in states with *moderate*

SOP restrictions. Furthermore, the "Integrated and Concentrated Clusters" had a higher representation of clusters in states with the most restrictive SOP rules.

To assess the implications of these findings, we consider the proportion of clusters represented in the states assigned to each of the CON and SOP restriction categories. For state CON restrictions, 39.5 percent of clusters operate in the state with the lowest CON restrictions (Texas), 34.2 percent operate in states with moderate CON restrictions (Florida and Nevada), and 26.3 percent operate in states with the most restrictive CON rules (Maryland, Virginia, and Washington). In light of this, we see that "Integrated and Concentrated Clusters" have a greater representation in states with more restrictive CON rules than the overall sample, as well as a considerably smaller representation in Texas, a state without CON restrictions. At the same time, "Highly Differentiated and Integrated Clusters" have a much greater representation in Texas than the overall sample and a much smaller representation than the overall sample in the moderately restrictive CON states (Florida and Nevada).

As one possible explanation of these findings, we recognize that "Integrated and Concentrated Clusters" and "Highly Differentiated and Integrated Clusters" are most alike in comparison to other cluster forms, with the main differences including the higher levels of vertical differentiation, coordination, and dispersed configuration displayed by "Highly Differentiated and Integrated Clusters" compared to "Integrated and Concentrated Clusters." In light of these results, and given the similarity between the "Integrated and Concentrated Cluster" and "Highly Differentiated and Integrated Cluster" forms, perhaps the presence of more restrictive CON rules serves as a barrier for "Integrated and Concentrated Clusters" to build facilities or introduce services that would enhance coordination or vertical differentiation throughout their clusters or even expand their geographical presence in a local market, which would be more consistent with “Highly Differentiated and Integrated Cluster” forms. Such a relationship between CON restrictions and strategic decisions would require much further empirical investigation and analysis in order to be verified.

Similarly, for state SOP restrictions, 9.6 percent of clusters operate in the state with the lowest SOP restrictions (Washington), 55.3 percent operate in states with moderate SOP restrictions (Nevada, Texas, and Virginia), and 35.1 percent operate in states with the most restrictive SOP rules (Florida and Maryland). We observe that “Integrated and Concentrated Clusters” have a greater representation in states with more restrictive SOP rules than the overall sample, as well as a smaller representation in moderately restrictive SOP states. In addition, “Highly Differentiated and Integrated Clusters” have a much greater representation in moderately restrictive SOP states than the overall sample and a smaller representation in states with the most restrictive SOP rules. Meanwhile, “Lowly Differentiated and Integrated Clusters” exhibit representation in the three SOP restriction categories that is fairly similar to that of the overall sample.

Comparing the patterns across these two variables, we observe that “Integrated and Concentrated Clusters” have a fairly low representation in Texas and higher representation in Florida and Virginia in comparison to the study sample. In contrast, “Highly Differentiated and Integrated Clusters” have a much lower representation in Florida and a considerably higher representation in Texas than the study sample. Furthermore, among the study’s six states, “Dispersed and Hospital-Focused Clusters” are primarily located in Texas. On the other hand, the representation of “Lowly Differentiated and Integrated Clusters” across the six states appears to be fairly similar to that of the overall sample, in general. Recognizing these patterns, we consider that another possibility for the outcomes relating to state-level regulatory practices is that state-level factors *other than* CON or SOP restrictions affect clusters' adoption of various forms. For example, perhaps other state-level factors contribute to the higher prevalence of "Integrated and Concentrated Clusters" and the lower prevalence of "Highly Differentiated and Integrated Clusters" in Florida, or the reverse observations in Texas. Once again, these are possibilities that merit further investigation in future studies.

Substitutable providers. Addressing the threat of substitutable providers, the thirteenth and fifteenth hypotheses predict that "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to operate in markets with greater numbers of ambulatory surgery centers and skilled nursing facilities, respectively. Consistent with these predictions, "Integrated and Concentrated Clusters" operated in markets with significantly more ambulatory surgery centers and skilled nursing facilities than "Lowly Differentiated and Integrated Clusters." However, this was the only pairwise comparison found to be statistically significant according to Games-Howell test results, even though the average numbers of ambulatory surgery centers and skilled nursing facilities in local markets were highest for the "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms. For these findings, we suspect that a lack of statistically significant results is more attributable to the small sample sizes observed within the study.

Complexity of care. "Highly Differentiated and Integrated Clusters" were observed to admit a significantly higher percentage of "extreme" cases in comparison to all other cluster forms, in support of the study's eighteenth hypothesis. However, no significant differences were observed between the percentage of "extreme" cases admitted by "Integrated and Concentrated Clusters" and those of other cluster forms, although "Integrated and Concentrated Clusters" maintained the second-highest average percentage of "extreme" admissions. Hypothesis 18 was developed from the expectation that, because both “Highly Differentiated and Integrated Cluster” and “Integrated and Concentrated Cluster” forms exhibit relatively higher levels of integration activity, they would both be more likely to foster such integration due to high levels of complexity, as argued from a transaction cost economics perspective. However, in light of these results, we also recall that a noted difference between these two forms is the significantly higher levels of coordination observed among “Highly Differentiated and Integrated Clusters.” To explain these findings, we consider that perhaps highly complex tasks not only promote integration by structure, but also integration by activity, as *coordination* across integrated units – not simply integration by name – is required to adequately respond to more complex circumstances, as suggested by Gulati and colleagues (2005).

Market munificence. The study’s nineteenth hypothesis predicted that “Highly Differentiated and Integrated Clusters” as well as “Integrated and Concentrated Clusters” would be more likely to operate in markets with higher levels of munificence, which was measured according to each market’s unemployment rate and population residing in urban areas. Consistent with this prediction, “Highly Differentiated and Integrated Clusters” were observed in markets with significantly lower unemployment rates than “Lowly Differentiated and Integrated Clusters.” However, their average market unemployment rate was also significantly lower than that of “Integrated and Concentrated Clusters,” and in a result not expected, “Dispersed and Hospital-Focused Clusters” also were observed in markets with significantly lower unemployment rates than either “Lowly Differentiated and Integrated Clusters” or “Integrated and Concentrated Clusters.” In terms of the second measure of market munificence, Games-Howell test results did not identify any significant differences in pairwise comparisons of clusters’ “urbanicity,” thereby failing to support Hypothesis 19.

As observed in Chapter 5, the "Highly Differentiated and Integrated Clusters" and "Dispersed and Hospital-Focused Clusters" exhibit considerable differences across varied dimensions of differentiation-configuration and integration-coordination. Thus, it is initially unclear as to why both forms would be more prevalent in markets with lower unemployment rates. However, upon comparison of the study's different measures of munificence, we see that in some instances these measures provide conflicting portrayals of market munificence, particularly when a market's economic wealth (Hypothesis 3) is also included in considerations of market munificence. For example, "Integrated and Concentrated Clusters" were observed in markets with higher average unemployment rates – which would indicate lower levels of munificence – as well as the highest average per capita income and proportion of residents in urban areas – which would indicate high levels of munificence. Conversely, "Dispersed and Hospital-Focused Clusters" were observed in markets with lower per capita income and "urbanicity" averages, suggesting low munificence levels, while at the same time averaging low unemployment rates, which would suggest higher munificence levels.

Comparing these results, we consider that the construct of munificence is complicated and multifaceted, and upon reflection we question whether the construct is adequately measured employing one or even a handful of market measures developed from aggregated county-level data. Perhaps munificence requires more sophisticated and intricate measures to adequately capture the abundance or lack of resources in a health care organization's local environment. Indeed, this is not the first study to find weak support for general measures of munificence such as "urbanicity" or unemployment rates (e.g., Fennell, 1980, 1982; Kazley & Ozcan, 2007; Mick et al., 1993a; Zinn et al., 1998).

Overall, the ten partially supported hypotheses represent predictions derived from population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory perspectives. In other words, each of the perspectives included in the study's multi-theoretical framework yielded explanations for organizational activity that were, at least in some ways, consistent with that observed among cluster forms. We believe this common ability for the study's diverse theoretical perspectives to speak to the realities observed among cluster forms as evidence of the value and importance of organization theory to explain the complex activities and phenomena surrounding health care organizations.

Hypotheses lacking support. On the other hand, seven of the study's hypotheses, developed from several of the perspectives included in the multi-theoretical framework, lacked support when compared to the study's findings. We proceed to consider possible implications and explanations for these results.

Patient and supplier diversity. The study's fourth and fifth hypotheses predicted that the "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms would be more likely exhibited among clusters in markets characterized by high levels of patient and supplier diversity. However, each of the variables included to reflect patient and supplier diversity failed to exhibit significant differences in means across or between the five cluster forms.

In light of these results, we consider that Fennell (1980) also observed a lack of statistically significant evidence for measures such as the market's percentage of nonwhite residents and ratio of specialist to general practice physicians when attempting to explain the diversity of services among groups of proximate, competing hospitals in local markets.

Furthermore, although differences in group means across these three variables were not shown to be statistically significant, we note that the “Highly Differentiated and Integrated Cluster” and “Integrated and Concentrated Cluster” forms displayed higher averages for their market’s percentage of nonwhite residents and ratio of specialist to general practice physicians in comparison to “Lowly Differentiated and Integrated Clusters,” which would be indicative of more diverse patient and supplier populations. At the same time, the “Highly Differentiated and Integrated Cluster” and “Integrated and Concentrated Cluster” forms displayed *lower* averages than “Lowly Differentiated and Integrated Clusters” in terms of their average market’s percentage of residents younger than 5 and older than 65 years of age, which would be indicative of *less* diverse patient populations.

Thus, as was noted for findings of market munificence, we question whether the measures included in the study provide conflicting portrayals of patient and supplier diversity. And, we also question whether more sophisticated measures would better identify the influence of patient and supplier diversity on cluster forms, as predicted according to population ecology theory. As measures for patient and supplier diversity were obtained through the aggregation of county-level data, we consider that the influence of patient and supplier diversity on cluster forms may require more precise measurement of specific areas within local markets that clusters strategically target, recognizing that patient and supplier diversity measures are likely not uniform across various sections of a single local market.

Market competitiveness. Hypothesis 12 predicted that “Highly Differentiated and Integrated Cluster” and “Integrated and Concentrated Cluster” forms would be more likely to operate in highly competitive markets, as indicated by lower Herfindahl-Hirschman Index scores of market concentration. However, multinomial logistic regression results indicate that, when controlling for other organizational and environmental factors, clusters are *less* likely to adopt "Highly Differentiated and Integrated Cluster" forms in highly competitive, less concentrated markets compared to either "Lowly Differentiated and Integrated Cluster" or "Integrated and Concentrated Cluster" forms. This result contradicts the twelfth hypothesis, and furthermore, significant differences were not observed in the likelihood of exhibiting "Lowly Differentiated and Integrated Cluster" or "Integrated and Concentrated Cluster" forms based upon market competitiveness.

Although these results may seem to conflict with arguments made from an industrial organization economics perspective, further consideration of industrial organization economics suggests that the perspective may yield an alternative explanation that is actually consistent with these findings. Scholars applying an industrial organization economics perspective to explain organizational activity and strategy have suggested that highly competitive environments promote strategies of differentiation and horizontal integration (Mobley, 1997; Zuckerman et al., 1990), as explained in Chapter 6. However, we also observe that an alternative strategic response identified by some industrial organization economists is specialization, in which organizations respond to intense competition by focusing "on a particular geographic segment…on a segment of hospital services…[or] on a special type of medical patient" (Autrey & Thomas, 1986, p. 11; Geroski, 2001). In this sense, organizations may pursue strategies that are in the opposite direction of differentiation, and this study's results indicate that perhaps such is the case for clusters in highly competitive environments. In other words, rather than pursue highly differentiated and integrated strategies, as we originally predicted, perhaps clusters in highly competitive markets choose to narrow their range of services and service locations in order to target specific populations and geographic segments within their local markets. Thus, we suggest that despite the lack of support for the study's twelfth hypothesis, these findings are not in conflict with an industrial organization economics perspective.

Home health agencies. Whereas the study's predicted relationships between cluster forms and market supplies of ambulatory surgery centers and skilled nursing facilities were partially supported, the fourteenth hypothesis, predicting that "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms would be more likely to operate in markets with greater numbers of home health agencies, was not supported. Significant differences were not observed across or between the five cluster forms in terms of the average number of home health agencies in their local markets, in contrast with that observed for ambulatory surgery centers or skilled nursing facilities.

Reflecting upon this finding, we consider that home health agencies are distinct from many other service types in that they are provided within a patient's home rather than in a separate physical facility. Thus, it is possible that, from a strategic standpoint, hospital-based providers do not view home health agencies as substitutable competitors given their lack of a permanent physical location as well as their provision of less intensive services. But, although possible, we believe this is an unlikely explanation. Even if home health care is not viewed as substitutable to the services offered within a general, acute care hospital, the services provided through home health are substitutable with those offered in other ambulatory and post-acute care sites – such as outpatient rehabilitation clinics or skilled nursing facilities – that have been previously identified as common cluster components (Cotterill & Gage, 2002).

Perhaps a more likely explanation may stem from *who* is providing home health care services within a cluster's local market. We observe that the number of home health agencies, on average, greatly exceed those of ambulatory surgery centers or skilled nursing facilities in local markets. As such, home health agencies may range from organizations operated by larger, hospital-based providers, or they may be very small entities that hospital-based clusters would perceive as little threat to their operations. Future studies may examine the degree to which home health agencies in a local market influence cluster forms by capturing more detailed descriptions of these agencies, including whether they are offered by competing clusters or whether they tend to be very small, independent providers.

Exchange relationships. The sixteenth and seventeenth hypotheses predict that "Highly Differentiated and Integrated Cluster" and "Integrated and Concentrated Cluster" forms are more likely to have higher percentages of admissions from external health care facilities and higher percentages of discharges to post-acute care facilities, respectively. However, these predictions were not supported based upon ANOVA test results, which failed to show a significant difference across group means for these two variables.

As noted by Shay and colleagues (in press), measures of such exchanges do not designate which facilities sent patients that served as cluster admissions, nor do they specify which individual facilities to which patients are discharged. Thus, these exchanges could occur between same-system members, or they could occur with providers outside of a cluster's organization. We question whether more precise measures that would identify specific admissions sources and specific discharge destinations would reveal relationships that are consistent with this study's hypotheses. In other words, perhaps hospitals in "Highly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters" are indeed more likely to have higher percentages of admissions from external health care facilities and discharges to post-acute care facilities when those settings are same-system members, but such specific data was not available for this study.

Market dynamism. Finally, we predicted that "Highly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters" would be more likely to operate in markets with higher levels of dynamism. However, one of the measures for market dynamism (change in unemployment rate) lacked statistically significant differences in pairwise comparisons of cluster forms. The second measure, percentage change in a local market's population, produced results that suggested "Lowly Differentiated and Integrated Clusters" and "Highly Differentiated and Integrated Clusters" are more likely than "Integrated and Concentrated Clusters" to operate in highly dynamic environments, which is not consistent with the study's final hypothesis.

Why "Integrated and Concentrated Clusters" would be more prevalent in markets characterized by lower levels of dynamism is a question that merits further investigation. Similar to considerations for the results relating to market munificence, we note that market dynamism may be a complex and multifaceted construct that requires more precise and comprehensive measurement in order to be adequately assessed. Mick and colleagues (1993a) also observed a lack of theoretically-supported results in their examination of the relationship between market dynamism and rural hospitals' horizontal and vertical integration/diversification strategies, and they suggested that methodological issues and substantive issues may have been cause for their results. Specifically, they pointed to the potential lack of appropriate variables, the potential inability of county-level data to adequately capture local market conditions, the potential need for more specific measures to capture underlying strategic dimensions or activities, and the potential influence of institutional pressures as possible explanations for the lack of supportive findings (Mick et al., 1993a, pp. 114-115). In terms of this study's explanation of cluster forms according to market dynamism, such may be the case for the lack of support for Hypothesis 21 in this study as well.

Profiles of cluster forms. To summarize the study's findings from both the taxonomic and regression analyses, we provide general profiles of each of the five cluster forms. These profiles highlight characteristics of each form that distinguish them from other cluster groups.

***Lowly differentiated and integrated clusters*.** "Lowly Differentiated and Integrated Clusters" serve as the sample's most common cluster form. These clusters exhibit relatively low levels of horizontal or vertical differentiation, and they are less spatially differentiated with limited geographic reach. They also exhibit relatively low levels of horizontal or vertical integration, and they show limited coordination of activities across cluster members, particularly in comparison to "Highly Differentiated and Integrated Clusters" and "Integrated and Concentrated Clusters."

"Lowly Differentiated and Integrated Clusters" tend to be smaller in size than "Integrated and Concentrated Clusters" or "Highly Differentiated and Integrated Clusters," and the majority of them are owned by for-profit organizations. Among clusters in the study sample, none of the "Lowly Differentiated and Integrated Clusters" operate a teaching hospital, and few operate critical access hospitals. Compared to "Highly Differentiated and Integrated Clusters," a smaller proportion of patients characterized as "extreme" severity are treated by "Lowly Differentiated and Integrated Clusters."

These clusters tend to operate in smaller markets, and compared to "Integrated and Concentrated Clusters," their markets include fewer substitutable providers (i.e., ambulatory surgery centers and skilled nursing facilities) while averaging a lower per capita income. Clusters are less likely to assume a "Lowly Differentiated and Integrated Cluster" form if other competitors in their local market exhibit an "Integrated and Differentiated Cluster" form. Clusters exhibiting the "Lowly Differentiated and Integrated Cluster" form also operate in markets with higher population growth rates compared to "Integrated and Concentrated Clusters," while their average unemployment rates are higher than those of "Highly Differentiated and Integrated Clusters" as well as "Dispersed and Hospital-Focused Clusters." In other words, they tend to operate in markets characterized as more dynamic and less munificent. Compared to "Highly Differentiated and Integrated Clusters," clusters in more competitive and less concentrated markets are more likely to display a "Lowly Differentiated and Integrated Cluster" form. Finally, "Lowly Differentiated and Integrated Clusters" are more likely to operate in states with moderate to low levels of regulatory restrictions, as measured by CON and SOP laws.

Integrated and concentrated clusters. "Integrated and Concentrated Clusters" serve as the sample's second most common cluster form, with only six fewer clusters than those in the "Lowly Differentiated and Integrated Cluster" category. These clusters exhibit relatively high levels of horizontal differentiation, and they operate many locations with a moderately extensive reach, though with more concentrated configurations. Compared to "Highly Differentiated and Integrated Clusters" as well as "Vertically Differentiated and Lowly Integrated Clusters," they exhibit lower levels of vertical differentiation. At the same time, they also exhibit relatively high levels of horizontal and vertical integration, and they display moderate levels of coordination across cluster members.

"Integrated and Concentrated Clusters" tend to be larger in size, comparable to "Highly Differentiated and Integrated Clusters," and the majority of them are owned by nonprofit organizations. However, a small percentage of these clusters operate teaching hospitals or critical access hospitals. Compared to "Highly Differentiated and Integrated Clusters," they also care for a smaller proportion of patients characterized by "extreme" severity.

These clusters tend to operate in moderate to large markets with more substitutable providers (i.e., ambulatory surgery centers and skilled nursing facilities) while averaging the highest per capita income among cluster forms. They are also more likely to operate in local markets with other "Integrated and Concentrated Clusters," as opposed to "Lowly Differentiated and Integrated Clusters." Clusters exhibiting this form also operate in markets with lower population growth rates and relatively high unemployment rates, indicating less dynamic or munificent environmental conditions. Compared to "Highly Differentiated and Integrated Clusters," clusters in more competitive and less concentrated markets are more likely to display an "Integrated and Concentrated Cluster" form. Finally, the majority of "Integrated and Concentrated Clusters" operate in states with moderate to high levels of regulatory restrictions, as indicated by CON and SOP laws.

Highly differentiated and integrated clusters. "Highly Differentiated and Integrated Clusters" serve as the sample's third most common cluster form, constituting 14 percent of the study sample. These clusters are characterized by high levels of horizontal differentiation as well as high levels of vertical differentiation by case complexity. "Highly Differentiated and Integrated Clusters" are also spatially differentiated, with many locations, a moderate geographic reach, and moderately dispersed configurations. In terms of integration-coordination, these clusters are highly integrated, both horizontally and vertically, and they exhibit the highest degree of coordination among cluster forms.

"Highly Differentiated and Integrated Clusters" tend to be large organizations, and all of them are owned by nonprofit entities. The majority of these clusters include teaching hospital members, and many also include critical access hospitals. Compared to all other cluster forms, they also treat a significantly higher proportion of patients characterized by “extreme” severity levels.

Clusters exhibiting the “Highly Differentiated and Integrated Cluster” form tend to operate in large local markets that extend beyond typical CBSA boundaries, with comparatively high averages of substitutable providers. Compared to the “Lowly Differentiated and Integrated Cluster” form, clusters are more likely to adopt a “Highly Differentiated and Integrated Cluster” form if other competitors in their local market exhibit an “Integrated and Differentiated Cluster” form. Clusters exhibiting the “Highly Differentiated and Integrated Cluster” form also operate in markets with lower unemployment rates on average than those of “Lowly Differentiated and Integrated Clusters” or “Integrated and Concentrated Clusters.” Compared to “Lowly Differentiated and Integrated Clusters” and “Integrated and Concentrated Clusters,” clusters in less competitive and more concentrated markets are more likely to display a “Highly Differentiated and Integrated Cluster” form. Finally, the majority of this sample’s “Highly Differentiated and Integrated Clusters” were identified from Texas, which maintains no CON restrictions and relatively moderate SOP restrictions.

Dispersed and hospital-focused clusters. “Dispersed and Hospital-Focused Clusters” are the sample’s second least common cluster form. These clusters exhibit relatively low levels of horizontal or vertical differentiation. However, their configurations are unique in that they operate relatively few locations, which are typically hospitals, and these facilities are highly dispersed with an extensive geographic reach in their local markets. They also exhibit low levels of horizontal or vertical integration, and they show limited coordination of activities across cluster members.

"Dispersed and Hospital-Focused Clusters" are typically smaller in size than "Integrated and Concentrated Clusters" or "Highly Differentiated and Integrated Clusters," and the majority of them are owned by for-profit organizations. Among these clusters in the study sample, none operate a teaching hospital, and most do not include critical access hospitals. Compared to "Highly Differentiated and Integrated Clusters," the "Dispersed and Hospital-Focused Clusters" treat a smaller proportion of "extreme" severity patients.

Clusters exhibiting the "Dispersed and Hospital-Focused Cluster" form were found to operate in markets with average unemployment rates that were lower than those of "Lowly Differentiated and Integrated Clusters" or "Integrated and Concentrated Clusters," suggesting they operate in more munificent environments. The majority of "Dispersed and Hospital-Focused Clusters" in the study sample are located in Texas, with one operating in Washington and another in Virginia. Thus, the majority of these clusters operate in environments characterized by low to moderate regulatory restrictions, as measured by CON and SOP laws.

Vertically differentiated and lowly integrated clusters. "Vertically Differentiated and Lowly Integrated Clusters" comprise the sample's smallest group. These clusters exhibit relatively low levels of horizontal differentiation, but they are highly vertically differentiated in terms of both case complexity and service type. They operate a fewer number of locations compared to "Integrated and Concentrated Clusters" or "Highly Differentiated and Integrated Clusters," and they are less spatially differentiated with limited geographic reach and more concentrated configurations. They also exhibit relatively low levels of horizontal or vertical integration, and they show the lowest levels of coordination across cluster members in comparison to other cluster forms.

“Vertically Differentiated and Lowly Integrated Clusters” tend to be small in size, particularly in comparison to “Integrated and Concentrated Clusters” or “Highly Differentiated and Integrated Clusters.” Three of these clusters in the study sample were nonprofit organizations, and two were controlled by for-profit entities. In addition, none of the “Vertically Differentiated and Lowly Integrated Clusters” in the sample operate a teaching hospital or a critical access hospital. Compared to “Highly Differentiated and Integrated Clusters,” a smaller proportion of patients characterized as “extreme” severity are treated by “Vertically Differentiated and Lowly Integrated Clusters.”

These clusters tend to operate in smaller markets that fit within a single CBSA boundary. Within the study sample, two of these clusters operate in Texas, two operate in Washington, and one operates in Florida. Due to their small sample number, statistically significant differences between the “Vertically Differentiated and Lowly Integrated Clusters” and other cluster forms were limited in this study.

Study Limitations

With any analysis, limitations exist which must be considered in tandem with the findings, and this study is no exception. We consider a number of important limitations within this study that give pause when considering its results.

To describe and explain common forms of hospital-based clusters, we first had to define clusters and their boundaries using both urban and regional boundary definitions. The difficulty of specifying cluster boundaries has been well-documented in previous studies (e.g., Luke, 1992; Luke & Ozcan, 2012; Sikka et al., 2009; Shay et al., in press). Luke (1992) argues that clusters’ spatial formations and configurations are directly related to strategic and clinical interdependencies. He proceeds to explain that, because these interdependencies “vary by area and type of organization," no standard exists "by which to determine the reach of such interdependencies" (Luke, 1992, p. 17). In other words, a "cookie-cutter" approach that establishes a consistently defined radius in which same-system providers may be classified in the same cluster is contrary to the variation of cluster member interdependencies throughout local markets. In light of this, attempts to define urban or regional cluster boundaries within this study risk being too broad or too restrictive, thereby posing a limitation to this study's findings. Although the process of identifying cluster members adheres to practices modeled in previous studies (e.g., Luke et al., 2011; Sikka et al., 2009; Trinh et al., 2014), this study acknowledges that the difficulty presented in assigning hospitals to urban and regional clusters provides room for error.

In addition to clusters' organizational boundaries, the boundaries of local markets in which clusters operate also required definition in order to measure environmental factors that may influence the adoption of various cluster forms. This study defined clusters' local markets by aggregating county-level data to reflect the CBSAs and counties in which each cluster's hospitals were located. Baker (2001) acknowledges that, although common, this method of defining a market area may exclude relevant competitors, inappropriately assume patients' equal willingness to travel to firms throughout the defined market, and fail to accurately correspond to the local market which an individual cluster would view itself as competing in, particularly if a firm is situated near the border of a defined market (p. 229). For example, in varying situations, a cluster may view its local market as an entire CBSA, or as the CBSA as well as additional communities outside of the defined CBSA, or as only certain communities and segments within a CBSA. In other words, the potential exists that the local markets measured for clusters within this study do not accurately reflect the actual markets that influence cluster activity and in which they identify themselves as operating within. However, scholars also recognize that, "sometimes, data limitations leave the use of standard geographic areas as the only feasible option" (Baker, 2001, p. 231), and such is the case for this study's use of CBSA- and county-level data to measure clusters' environmental conditions.

Next, efforts to obtain information regarding cluster components and configurations through primary data collection relied upon providers to accurately report their services and service locations through company websites and materials. In the event that these sources failed to report all service locations, or in the event that these sources inaccurately reported service locations of organizational affiliates that are not owned or operated by the cluster, cluster data could have been subject to inaccuracies and error. Similarly, we consider that the secondary data obtained through various datasets, including the AHA Annual Survey, ARF, and Intellimed datasets, may have included inaccuracies that would introduce error into the study's analyses. At the same time, these datasets have been employed and validated in numerous health services studies and, in general, are valued for their reliability and utility.

Other problems with the secondary datasets merit evaluation. As explained in Chapter 5, a number of clusters were excluded from the sample due to various factors, including the location of a cluster's lead hospital outside of the sample's six states as well as missing data in the AHA Annual Survey or Intellimed datasets that prevented necessary comparisons between cluster members. In other instances, clusters were retained in the sample that lacked data for specific hospital members, including 5 facilities that opened in 2012 and 28 clusters with missing service data for certain hospital members. In order to maximize the study's sample, these clusters were retained, but we acknowledge that measures of their overall cluster operations are limited given such missing data. The AHA Annual Survey and Intellimed datasets also pooled together data for certain combinations of cluster hospital members, which limited our ability to fully compare each of those clusters' facility operations for certain measures. Furthermore, the years represented across the study's data sources are not consistent. As previously described, primary data relating to clusters' components and configurations reflects cluster activity as of 2012. In comparison, data included from the AHA Annual Survey represents clusters' services and operations as of 2011, and in some instances, requires substitution of 2010 data. Intellimed data for five of the six states represented in the study sample reflects hospital-level operations in 2012, with the exception of Texas, for which the most recent available data spanned from July 2011 through June 2012. County-level data are also included from the 2010 ARF dataset and 2010 U.S. Census. Thus, we observe that the time represented across the study's data sources is not consistent, which serves as a notable limitation.

Another limitation pertains to this study's incorporation of differentiation-configuration and integration-coordination as key dimensions in the taxonomic analysis. Specifically, such complex concepts present a considerable challenge to adequately operationalize and measure these constructs from the study's theoretical framework. Thus, we consider that aspects of a cluster's differentiation-configuration or integration-coordination strategies may not have been accurately or comprehensively captured in this study's classification variables. For example, we incorporated birth case distribution as an indicator of vertical differentiation by service type based upon data availability, but this may have limited our study's ability to identify other evidence of vertical differentiation by service type. At the same time, we again note that principal component analysis results support the study's classification variables and the underlying dimensions they represent, and as we subsequently argue in the following section, the results of the taxonomic analysis also clearly distinguished cluster forms across the differentiation-configuration and integration-coordination dimensions.

On a similar note, limitations for specific measures within the study may be identified. To evaluate inter-hospital coordination, this study compared transfer admissions between a cluster's lead hospital and its non-lead facilities, yet the data sources utilized in the study did not distinguish transfers and admissions from non-cluster hospitals, a limitation noted in previous work by Shay and colleagues (in press). The same issue serves as a limitation for the measure of clusters' admissions from other health care organizations, as included in the study's analyses related to Aim 4. And, as previously noted, measures of clusters' discharges to post-acute care sites also did not indicate whether such patients were sent to facilities internal or external to the cluster's operations.

In addition, we recognize that organizations' adoption of integration activities ranges from formal to informal, and from vertical to virtual. Mick and Conrad (1988) argue that practically all health care organizations exhibit some form of vertical integration, and this argument is difficult to counter when one applies Harrigan's (1985) "form" dimension of vertical integration that allows for shared ownership and contractual arrangements across the stages of a production chain. In light of this, we consider that this study's definition of cluster membership that requires same-system ownership may serve as a limitation that disregards clusters' *virtually* integrated activities and potentially underrepresents their levels of integration-coordination. However, to adequately measure such integration or coordination activities would require a significant amount of data that exceeds the resources and capabilities of this study. Additionally, we acknowledge that the study's evaluation of integration is limited to clusters' health care services and does not include consideration of insurance products or financial services that may be integrated into a cluster's operations.

Another important limitation to be considered is the restriction of the study sample in the taxonomic and regression analyses to clusters in six states, which limits the generality of this study's results. Clusters from these same set of states were examined in a recent study by Luke and colleagues (2011), and though they note that these states "provide a good mix of clusters and of their levels of penetration," they also acknowledge that the six states' hospital populations "are larger, more urban, more likely to be profit, and more likely to be members of multihospital chains" in comparison to the total U.S. hospital population (p. 1744). Although our preferences would have been to include a greater representation of states in the study sample, particularly states from the Midwest and Northeast, our access to available data limited the number of states included in the study sample.

Related to this, we acknowledge that the study's small sample size serves as a limitation, as evident in our exclusion of "Dispersed and Hospital-Focused Clusters" and "Vertically Differentiated and Lowly Integrated Clusters" from the study's multinomial logistic regression analysis. As previously noted, the study's small sample, particularly for individual cluster taxonomic groups, may have contributed to the lack of statistically significant results for certain findings. At the same time, every effort was made to include as many clusters in the study sample as reasonably allowed given the limited data and resources available to the study author.

Finally, the study design in relation to the descriptive and multinomial logistic regression analyses limits our ability to make causal inferences in our attempt to explain cluster forms. In other words, it would be imprudent to conclude that the organizational and environmental factors found significantly associated with specific cluster forms actually *cause* clusters to adopt those forms.

Contributions, Implications, and Future Research

Although we do not deny important limitations present within this study, we also believe its results are nonetheless of considerable interest and significance, and they contribute in numerous ways to the extant literature. In this section, we proceed to identify key contributions and implications of the study's findings while incorporating considerations for future research.

Health services research. This study answers calls for future research issued in a number of previous studies. First, a number of scholars have called for an increased examination of hospital-based clusters in light of their dramatic growth in the past couple decades (Cuellar & Gertler, 2003; Luke, 1992; Luke et al., 2011; Shay et al., in press; Sikka et al., 2009). Heeding such calls, this study provides a foundational understanding of cluster forms, including an updated inventory and catalog of their hospital-based and non-hospital-based components.

In addition, this study answers previous calls to categorize health care organizations and recognize both the common and distinct aspects that may be observed among them. Explaining the purpose behind their seminal taxonomy of hospital systems and networks, Bazzoli and colleagues (1999) cite the "immense" need and value of "research that categorizes and classifies newly emerging health organizations" (p. 1685). Similarly, other scholars have cited the importance of subdividing populations of organizations into groups that share common characteristics, recognizing that not all organizations are homogeneous but that not all organizations adopt a singularly unique form either (McKelvey & Aldrich, 1983; Ricketts et al., 1987). Taxonomies are widely appreciated for their ability to foster more detailed understanding of organizational forms through identification of subgroups that share common characteristics.

Luke (2006b) specifically called for a separate taxonomy of local clusters, which to date had not been performed, and this study's efforts attempt to fulfill this unmet need. By cataloging and categorizing cluster forms with common features, this study provides a practical foundation for future data collection and empirical analysis, enabling more detailed examination of clusters (Ruef, 2000).

To build upon this taxonomy, future studies should periodically update the taxonomy, which would ensure the relevance and validity of the cluster forms as well as allow for longitudinal evaluation of changes in cluster forms. For example, given the relatively small sizes of "Dispersed and Hospital-Focused Clusters" and "Vertically Differentiated and Lowly Integrated Clusters," one may ask whether these forms over time would grow in their representation or even decline to the point where clusters no longer can be characterized according to their group. Also, does the industry's growing emphasis on population health threaten the "Dispersed and Hospital-Focused Cluster" form, given their limited differentiation and integration as well as their relatively low number of locations and location types? Similar questions relate to whether "Highly Differentiated and Integrated Clusters," which offer services throughout the continuum of care in a diverse array of locations, are poised for future growth, particularly in an environment that increasingly emphasizes the value of population health. Additionally, future studies that build upon this taxonomy would benefit from an expansion of the study sample to include more clusters representing more states, particularly in the Midwest and Northeast regions.

This study's expanded consideration of cluster components and boundaries is also an important contribution to health services research. Shortell (1999) convincingly argued that analysis of health care organizations must expand beyond the hospital. Expressing similar sentiments, Luke (1992) highlighted the need for future research of clusters to consider and assess components other than general, acute care hospitals, including long-term care facilities, single-specialty hospitals, and ambulatory care facilities. Later, Luke and colleagues (2011) called for examination of *regional* hospital-based clusters in addition to urban clusters, and Shay and colleagues (in press) highlighted the importance of adopting regional cluster boundaries in future empirical analyses of cluster activity. This study builds upon the extant literature by examining the activity of local hospital systems that takes place beyond hospital walls and by expanding consideration of cluster activities that, in past studies, has often been confined to urban boundaries.

As the study's title suggests, and as the study results clearly indicate, clusters are indeed "more than just hospitals," and their presence in local markets is felt beyond urban boundaries. Future studies of clusters would benefit by accounting for their non-hospital-based components and by adopting regional boundary definitions, which together provide a more complete and accurate picture of clusters' activities and positions in their local markets. At a more basic level, we suggest that health services researchers would benefit from an increased understanding of clusters, which have generally been an overlooked and understudied organizational form in health care studies (Luke et al., 2011; Luke & Ozcan, 2012; Shay et al., in press; Sikka et al., 2009). As clusters, not individual hospitals, are now the dominant health care providers in the majority of U.S. markets, they demand our attention and merit our future study efforts.

Health policy. This study also contributes to the assessment and application of health policy issues, and it presents important implications relating to health policy. Cuellar and Gertler (2003) cited "an urgent need for policymakers and regulators to understand how hospital system formation affects health care markets and consumers" (p. 85). Having defined and categorized the configurations of clusters, future research may build upon this study by examining the association between cluster forms and key issues such as medical care spending, clinical efficiency, access to care, and quality of care, among others. These issues are certainly of interest to health policymakers and providers alike who continually wrestle with the "iron triangle" of health care. This study also lends support to previous calls for policy to pay greater attention to clusters and place less emphasis on individual hospitals, recognizing the role that clusters may play in organizing regionalized systems of care (Luke, 2010; Luke et al., 2011).

Luke (2010) suggests that clusters display great potential to usher in regionalized health care in the U.S. as they "now form the basis for regional organization and management of acute care and other services" (p. 194). The roots of regionalization in medical care are traced to 1920, when Lord Dawson proposed a regionally coordinated system for British health care services, and this model included teaching hospitals, secondary hospitals, and primary care clinics as different levels of a "hub-spoke" arrangement. In relation to this model, the study's findings suggest that certain cluster forms (particularly "Highly Differentiated and Integrated Clusters") are more consistent with Lord Dawson's model, including a range of hospital-based and non-hospital-based settings that are geographically dispersed and hierarchically differentiated according to care complexity. Relating to more recent studies and calls for health care industry change, Porter and Lee (2013) currently argue that, as part of an overall strategy of maximizing value for patients in the U.S. health care system, providers should organize and operate on a regionalized basis. Health policy that endeavors to promote regionalized care may benefit from an appreciation of the varied cluster forms and whether their arrangements are suitable for regionalized models of health care services.

Given their scale and importance as health care providers at the local level, clusters are also an organizational form well-positioned to respond to recent health policy reform efforts, including the accountable care organization (ACO) model. Proponents of ACOs value the consideration of health services organization from a local perspective, believing improvements in efficiency and cost control may best be achieved through coordination among defined groups of local hospitals and health care service providers (Molpus, 2011). Such groups are very similar to clusters in their description. In addition, Shortell and Casalino (2008) call for accountable care systems to coordinate patient treatment across the care continuum as opposed to current health care service "silos." Similarly, Fisher and colleagues (2009) argue that health care reform must "foster local organizational accountability for the continuum of patients' care (p. w221).

Clusters displaying configurations with service components throughout the continuum of care, including "Highly Differentiated and Integrated Clusters," exemplify such esteemed ACO models. Indeed, the future of ACOs may be closely linked to the continued growth of clusters, as they may have the requisite power and resources to either adopt and promote accountable care models or to resist their advancement (Meyer, 2011). In support of this notion, recent reports anticipate an increase in mergers and acquisitions by hospital-based systems in response to the promotion of ACOs and health care reform, including additions of acute care hospitals as well as growth beyond hospital walls, such as physician practices, ambulatory surgery centers, diagnostic imaging centers, long-term care, and skilled nursing facilities (Commins, 2013, 2014; Tocknell, 2012).

Recent health care reform has also focused on containing costs through innovative health care delivery models, such as patient-centered medical homes (PCMHs), as well as payment models such as bundled payments. These reform efforts place emphasis on the coordination of services across health care settings and throughout the continuum of care. Given their highly differentiated and coordinated services and settings, future studies may examine whether "Highly Differentiated and Integrated Clusters" are ideally structured to succeed in attempts to improve the coordination of patient care such as ACOs, PCMHs, or bundled payments, or whether other cluster forms are observed to more effectively implement such health care reform models. Similarly, as nearly two-thirds of the study's sample clusters operate primary care practices or clinics, future studies may examine the degree to which certain cluster forms adopt PCMH models in their primary care settings, and for those that do, the levels of performance observed within these PCMH settings.

Another important policy issue related to clusters is the heightened scrutiny they have received due to their competitive dominance in local markets. Past studies have raised concerns that the widespread consolidation of hospitals into local hospital systems contributed to increased hospital market power and increased prices (Robinson, 2011; Dafny, 2009; Cuellar & Gertler, 2005; Harrison & McDowell, 2005; Porter & Teisberg, 2004). In a comprehensive review of literature studying the effects of hospital consolidation, Vogt and Town (2006) observed that "the great weight of the literature shows that hospital consolidation leads to price increases" (p. 4). At the same time, they observed evidence that increased hospital concentration leads to lower quality, although they also noted that such consolidation also can produce cost savings (Vogt & Town, 2006). In contrast, Dranove and Lindrooth (2003) saw no cost savings among hospitals that consolidated into systems. Related to this, Abraham and colleagues (2007) called for increased scrutiny of hospital consolidation, observing lower costs when competition in local markets increases. In contrast, Spang and colleagues (2009) found the association between consolidation and efficiency to be sensitive to organizational and market factors, with efficiency gains realized in certain circumstances. Similarly, Ho and Hamilton (2000) saw variation in the association between consolidation and quality based upon the types of hospitals involved.

Recently, attention from Congress and the Federal Trade Commission has focused on local health care delivery systems and their impact on competition following a wave of hospital mergers and acquisitions (Young, 2012; Cunningham, 2011). Meanwhile, the American Hospital Association adamantly insists that hospital consolidation largely is “pro-competitive” and leads to improved quality and access to health care while reducing costs (Center for Healthcare Economics and Policy, 2013). With a better understanding of clusters and their varied forms, future studies may ask: Do different cluster forms vary in relation to antitrust behavior? What is the relation of different cluster *forms* to prices, and has consolidation and reduced competition in local markets negatively affected access to services? Or, do clusters maintain or even increase patients’ access to needed services, and if so, are there certain cluster forms that are associated with varying access levels?

Organization theory. In the process of describing and explaining cluster forms, including taxonomic and regression analyses, this study applied arguments, constructs, and perspectives from seven widely-regarded organization theories: structural contingency theory, strategic management theory, population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory.

First, the study’s taxonomic analysis synthesized perspectives from contingency theory and strategic management theory, specifically applying Lawrence and Lorsch’s (1967b) arguments pertaining to differentiation and integration as well as Porter’s (1986) arguments relating to configuration and coordination. The results of the taxonomic analysis and the variation observed across cluster forms in terms of their differentiation and integration strongly support the original argument by Lawrence and Lorsch (1967b) that differentiation and integration are key dimensions of organizational structure, serving as "environmentally required states" that confront each organization and influence effectiveness (p. 132). Specifically, measures relating to horizontal differentiation, vertical differentiation, horizontal integration, and vertical integration significantly varied across and between cluster forms and serve as important dimensions from which clusters' forms may be described. In other words, Lawrence and Lorsch's (1967b) seminal work continues to describe and relate to the activities exhibited by today's dominant health care provider organizations.

At the same time, considerations for geography, or *spatial* differentiation, were not addressed in Lawrence and Lorsch's original work (Luke & Ozcan, 2012; Shay et al., in press). In contrast, Porter's (1986) descriptions of configuration and coordination as key dimensions that characterize firms' strategic activities mirror the concepts of differentiation and integration while incorporating spatial considerations (Luke & Ozcan, 2012). In support of arguments and predictions made by Luke and Ozcan (2012), this study's taxonomy reveals that, in addition to the classic dimensions of differentiation and integration, their equivalent dimensions of configuration and coordination are also key dimensions of clusters' organizational structures. Specifically, measures relating to spatial differentiation (i.e., configuration) and coordination significantly varied across and between cluster forms. Collectively, the synthesized constructs of differentiation-configuration and integration-coordination are supported in the results of the taxonomic analysis, lending support to classic works by Lawrence and Lorsch (1967a, 1967b) and Porter (1986) while also highlighting the importance of geographic considerations in the conceptualizations of health care organizational forms.

In the reissue of the classic text, *The External Control of Organizations*, Pfeffer (2003) acknowledges that the major organization theories tend to ignore the importance of physical location and geography in their examination of organizational phenomena, citing supportive arguments from Kono and colleagues (1998) and Friedland and Palmer (1984). Although Pfeffer (2003) counters this criticism with the defense that "space probably matters more or less depending on the time period" given the advancement of communication technologies (p. xx), this study maintains that the importance of physical location is crucial to consider in health care organization studies in light of the physicality and personal nature of health services. By recognizing the importance of geography in defining hospital systems at local and regional levels (i.e., clusters), and by evaluating clusters' spatial configurations of hospitals and non-hospital-based service locations in their respective markets, this study contributes to theoretically-driven examinations of health care organizations in its consideration of the importance of place. Future health care organizations studies would do well to account for geographic proximity in their examinations of health system activity and strategy, and recent works acknowledging the importance of spatial arrangements (e.g., Burns et al., 2012; Shay et al., in press) further emphasize this point.

In addition to the application of contingency theory and strategic management theory to describe cluster forms through the study's taxonomic analysis, five separate theories are employed in a multi-theoretical perspective to explain these cluster forms. As presented in Chapter 6, results relating to numerous hypotheses provide at least partial support for each of these theories. Given these results, we find value in applying a multi-theoretical perspective to address varying organizational and environmental factors that may explain organizations' activities.

When evaluating the study's multi-theoretical perspective, we also consider that certain hypotheses derived from specific organization theories lacked support, and a reasonable question one may ask in response is, "Which organization theories may *best* explain the activities and forms observed across clusters?" In light of study findings, we suggest that perhaps the most fitting response is – at least to organization theorists – a very familiar one: "It depends." Indeed, in the same way that organization theorists apply contingency thinking to identify which structures and strategies best fit organizations' tasks and environments, we may consider that certain organization theories best explain certain factors or conditions that are associated with clusters' diverse forms. For example, isomorphism trends predicted by population ecology and institutional theories, as measured in Hypotheses 1 and 7, appeared to apply more for "Integrated and Concentrated Clusters," whereas clusters' operation of teaching and critical access hospitals, predicted by institutional and resource dependence theories, is a distinguishing trait of "Highly Differentiated and Integrated Clusters" but fails to distinguish other cluster forms. Thus, the contingent nature of varied perspectives' abilities to explain cluster activity and forms based upon certain factors and conditions supports the adoption of multi-theoretical perspectives that, through the collective application of a range of organization theories, may more adequately speak to a range of phenomena facing organizations.

As noted in Chapter 6, numerous scholars have called for the increased application of multi-theoretical perspectives in the study of organizations, arguing that no organization theory has been identified that singularly explains the complex behaviors of organizations (Mick & Shay, in press). However, despite this repeated argument, it seems as though the application of multi-theoretical perspectives tends to be the exception rather than the rule within health care organization studies. Even among notable efforts to synthesize numerous complementary perspectives from organization theory (e.g., D'Aunno & Zuckerman, 1987; Luke & Walston, 2003; Shay et al., in press), these works typically lack empirical testing of their integrated theoretical models. This study has built upon these previous efforts and contributes to the extant literature through its integration of numerous theoretical perspectives and its empirical testing of a multi-theoretical model to explain diverse cluster forms. Echoing calls by other scholars (e.g., Azevedo, 2002; D'Aunno & Zuckerman, 1987; Greenwood & Miller, 2010; Haveman, 2000; Lewis & Grimes, 1999; Mick & Shay, in press; Poole & Van de Ven, 1989; Scott & Davis, 2007; Shortell, 1999; Zinn & Brannon, in press), we promote the continued development and application of multi-theoretical perspectives in health care organization studies.

In keeping with the call to explore and apply multiple theoretical perspectives, we consider that additional perspectives may be of interest in future studies of clusters. For example, the concept of network embeddedness as explained by network theory (Dacin, Ventresca, & Beal, 1999; Podolny & Page, 1998; Uzzi, 1997) may serve as an alternative to integration for cluster forms. In this sense, clusters that wish to offer an expanded array of services or service locations may do so on a virtual basis by fostering strong network relationships, and through these embedded relationships with network partners clusters may connect to services and service locations outside of their organization (Shay & Mick, 2013; Shay et al., in press). A future examination of cluster forms may investigate whether clusters identified as exhibiting lower levels of integration are in fact *virtually* integrated with high levels of network embeddedness, or whether they are neither integrated nor embedded.

Health care management. Given this study's results, health care managers may consider the common forms and strategies apparent among clusters and the varied organizational and environmental factors associated with such forms. Such an understanding may assist managers in the formulation of their own organization's strategies as well as the characterization and assessment of competitors' strategic activities. In addition, managers' awareness of cluster forms may assist their evaluation of growth opportunities, competitive and environmental threats, and organizational weaknesses, and identifying the desirable characteristics of certain cluster forms may provide managers with a better recognition of other organizations that would be suitable for partnership or emulation. This becomes a particularly important endeavor as observers describe an industry that continues to consolidate, that applies increased pressures for providers to grow throughout the continuum of care, and that increasingly calls for providers to adopt population health models and care for their local communities outside of hospital walls (Betbeze, 2013; Commins, 2013, 2014).

Another important and interesting implication of the study results relates to cluster forms and nonprofit ownership. Nonprofit hospitals have long been subject to scrutiny for their tax-exempt status, which is often perceived as a concession for the provision of charitable care. However, recent news has shined a spotlight on such scrutiny, as some strongly question whether nonprofit hospitals provide more charitable care than their for-profit competitors, while others question whether nonprofit hospitals merit tax exemption in the wake of health care reform that seeks to dramatically reduce the nation's uninsured population (e.g., Doyle, 2014; Rosenthal, 2013). This study's results suggest that clusters exhibiting highly differentiated and integrated strategies (e.g., "Highly Differentiated and Integrated Clusters") tend to be nonprofit organizations. Such entities may offer services throughout the continuum of care at locations throughout a local market, including services and locations that are deemed less attractive from a financial standpoint. In the face of intense scrutiny over their merit of tax exemption, nonprofit clusters, particularly those categorized as "Highly Differentiated and Integrated Clusters," may benefit by communicating to their local publics and stakeholders the extent to which they offer highly differentiated and integrated services throughout their local communities.

Future studies of clusters that may be of interest to health care managers include examinations of performance levels across cluster forms and determinations of whether certain forms consistently perform better or worse than others. Such performance could include a variety of measures, such as efficiency, financial performance, quality of care, or even population health, among others. Additionally, managers may find interest in questions of the degree to which clusters' non-hospital-based endeavors support their core business, and whether such support varies according to cluster form. Inquiries of this nature acknowledge that clusters are primarily driven and identified by their core hospital functions, while recognizing that they also engage in non-hospital-based endeavors – as illustrated in this study's findings – that may serve as outposts or satellites to the clusters' hospitals.

Conclusion

During the wave of consolidation that swept the hospital industry in the late 1980s and 1990s, a small group of industry observers and scholars noted that such consolidation occurred primarily in specific patterns. That is, consolidation of hospitals occurred "less through national expansions and more through the creation of small, local firms and clustered extensions of larger firms," leading to the development of what we now refer to hospital-based clusters (Luke, 1991, p. 209). These clustered entities quickly grew into powerful forces in their respective markets, capturing considerable market share and gaining competitive advantage. However, as early as 1991, Luke remarked that, despite their importance, "little is known about the patterns and forms of such consolidation" (p. 209). In the twenty years following that statement, only a limited number of studies attempted to shed light on these significant and emergent organizational forms, even as they continued to grow and dominate their local environments. As a result, Luke's statement largely rings true today, and in response, this study has sought to describe and explain the diversity observed across hospital-based clusters.

At the same time, as the hospital industry witnessed the increased formation of multi-hospital systems during the latter part of the 20th century, it also saw hospital systems expand their service offerings into ambulatory care and post-acute care settings, even beyond hospital walls. Furthermore, health care systems have engaged in a "geographic expansion race" as they attempt to establish multiple sites and capture attractive locations throughout local markets, including hospital-based and non-hospital-based settings.

Considering these trends, this study has not only updated a national inventory of hospital-based clusters, but it has also compiled a catalog of cluster components and developed a taxonomy of cluster forms that considers their provision of services within and outside of hospital walls as well as their spatial configurations. Applying arguments from contingency theory and strategic management theory, five cluster forms are identified that significantly vary according to dimensions of differentiation-configuration and integration-coordination. In addition, descriptive and regression analyses explain various organizational and environmental factors that are associated with different cluster forms. These factors are identified through a multi-theoretical perspective, synthesizing arguments from population ecology, institutional theory, industrial organization economics, transaction cost economics, and resource dependence theory. Through its conceptual framework, this study offers an important contribution with regards to organization theory, displaying the utility and value of a multi-theoretical perspective to examine and explain complex organizational forms.

Overall, this study fills a significant gap and contributes to our understanding of clusters, providing a taxonomy of common cluster forms that may serve as a foundation for future studies. In an era of accountable care, regional expansion, and corporatized health services, hospital-based providers are increasingly expected to be more than just hospitals. Indeed, we suggest that these providers are increasingly expected to be *clusters*, and the forms identified in this study reveal the manner in which hospital-based providers strategically respond to such expectations.

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Appendix 1: Service Variable Assignments in the Care Continuum

Appendix 1. *Service Variable Assignments in the Care Continuum*

Continuum of Care Stage	2011 AHA Annual Survey Service Variable	Service Location Types
Education of Labor[1]	Service variable assignments: 0	Service location types: 1 SCH: Health professions school
Medical Equipment[1]	Service variable assignments: 1 C80d: Prosthetic and orthotic services	Service location types: 1 DME: Durable medical equipment vendor
Ancillary Services[1]	Service variable assignments: 20 C32: Breast cancer screening/mammograms C46a: Optical colonoscopy C46b: Endoscopic ultrasound C46c: Ablation of Barrett's esophagus C46d: Esophageal impedance study C46e: Endoscopic retrograde cholangiopancreatography C80b: Electrodiagnostic services C83a: Computed-tomography (CT) scanner C83b: Diagnostic radioisotope facility C83c: Electron beam computed tomography (EBCT) C83d: Full-field digital mammography C83e: Magnetic resonance imaging (MRI) C83f: Intraoperative magnetic resonance imaging C83g: Multislice spiral computed tomography <64 slice C83h: Multislice spiral computed tomography 64+ slice C83i: Positron emission tomography (PET) C83j: Positron emission tomography/CT (PET/CT) C83k: Single photon emission computerized tomography C83l: Ultrasound C98: Virtual colonoscopy	Service location types: 4 DC: Diagnostic center IC: Imaging center LAB: Laboratory PHAR: Pharmacy
Wellness & Health Promotion[1]	Service variable assignments: 22 C28: Auxiliary C31: Blood donor center C37: Children's wellness program C39: Community outreach C42: Crisis prevention C45: Enabling services C47: Enrollment assistance program C50: Fitness center C53: Health fair C54: Community health education C56: Health screenings C63: Immunization program C65: Linguistic/translation services C66: Meals on wheels C67: Mobile health services C78: Patient education center C79: Patient representative services C89: Social work services C91: Support groups C93: Teen outreach services C94: Tobacco treatment services C96: Transportation to health services	Service location types: 5 BHS: Behavioral health school BLOOD: Blood donation center DAYC: Day care FW: Fitness & wellness center SCHC: School clinic

Appendix 1 (continued). *Service Variable Assignments in the Care Continuum*

Continnum of Care Stage	2011 AHA Annual Survey Service Variable	Service Location Types
Primary Care[1]	Service variable assignments: 5 C51: Freestanding outpatient center C62: Hospital-based outpatient care center/services C64: Indigent care clinic C81: Primary care department C87: Rural health clinic	Service location types: 3 PC: Primary care clinic PP: Primary care physician practice FREEC: Free care clinic
Specialty Physician Care[1]	Service variable assignments: 20 C26: Arthritis treatment center C36: Chemotherapy C43: Dental services C52: Geriatric services C55: Genetic testing/counseling C57: Health research C59: HIV-AIDS services C68: Neurological services C69: Nutrition program C71: Oncology services C72: Orthopedic services C74: Pain management program C77: Patient controlled analgesia C84a: Image-guided radiation therapy C84b: Intensity-modulated radiation therapy (IMRT) C84c: Proton beam therapy C84d: Shaped beam radiation system C84e: Stereotactic radiosurgery C90: Sports medicine C100: Women's health center/services	Service location types: 4 DENT: Dental clinic EYE: Eye clinic HEAR: Hearing clinic SC: Specialty physician practice & clinic
Acute Outpatient Care[1]	Service variable assignments: 7 C25: Ambulatory surgery center C29: Bariatric/weight control services C48: Extracorporeal shock waved lithotripter C49: Fertility clinic C73: Outpatient surgery C88: Sleep center C101: Wound management services	Service location types: 3 ASC: Ambulatory surgery center SLEEP: Sleep center WC: Wound care center
Non-Physician Provider Care[1]	Service variable assignments: 12 C22: Alcohol/drug abuse or dependency outpatient services C33k: Cardiac rehabilitation C38: Chiropractic services C40: Complementary and alternative medicine services C58: Hemodialysis C70: Occupational health services C80c: Physical rehabilitation outpatient services C80e: Robot-assisted walking therapy C82a: Psychiatric child/adolescent services C82b: Psychiatric consultation/liaison services C82c: Psychiatric education services C82f: Psychiatric outpatient services	Service location types: 6 BH: Behavioral health clinic DIAL: Dialysis center INF: Infusion services center OCC: Occupational health clinic ORC: Outpatient rehabilitation clinic RC: Retail clinic

Appendix 1 (continued). *Service Variable Assignments in the Care Continuum*

Continnum of Care Stage	2011 AHA Annual Survey Service Variable	Service Location Types
Urgent & Emergency Care[1]	Service variable assignments: 3 C24: Ambulance services C44c: Freestanding/satellite emergency department C97: Urgent care center	Service location types: 2 ER: Freestanding emergency department UC: Urgent care clinic
Multi-Service Outpatient Centers[1]	Service variable assignments: 0	Service location types: 1 MSOC: Multi-service outpatient center
General Hospital Inpatient Care	Service variable assignments: 7 C1: General medical and surgical care (adult) C21: Airborne infection isolation room C34: Case management C35: Chaplaincy/pastoral care services C44a: Emergency department C44e: Certified trauma center C99: Volunteer services department	Service location types: 1 ACH: General, acute care hospital
Specialty Hospital Inpatient Care	Service variable assignments: 32 C2: General medical and surgical care (pediatric) C3: Obstetrics care C4: Medical/surgical intensive care C5: Cardiac intensive care C6: Neonatal intensive care C7: Neonatal intermediate care C8: Pediatric intensive care C9: Burn care C10: Other special care C11: Other intensive care C19: Other care C30: Birthing room/LDR room/LDRP room C33a: Adult cardiology services C33b: Pediatric cardiology services C33c: Adult diagnostic catheterization C33d: Pediatric diagnostic catheterization C33e: Adult interventional cardiac catheterization C33f: Pediatric interventional cardiac catheterization C33g: Adult cardiac surgery C33h: Pediatric cardiac surgery C33i: Adult cardiac electrophysiology C33j: Pediatric cardiac electrophysiology C41: Computer assisted orthopedic surgery C44b: Pediatric emergency department C86: Robotic surgery C95a: Bone marrow transplant services C95b: Heart transplant C95c: Kidney transplant C95d: Liver transplant C95e: Lung transplant C95f: Tissue transplant C95g: Other transplant	Service location types: 1 SH: Specialty hospital

Appendix 1 (continued). *Service Variable Assignments in the Care Continuum*

Continnum of Care Stage	2011 AHA Annual Survey Service Variable	Service Location Types
Short-term Inpatient Rehab & Nursing[2]	Service variable assignments: 8 C12: Physical rehabilitation care C13: Alcohol/drug abuse or dependency inpatient care C14: Psychiatric care C80f: Simulated rehabilitation environment C82d: Psychiatric emergency services C82e: Psychiatric geriatric services C82g: Psychiatric partial hospitalization program C82h: Psychiatric residential treatment	Service location types: 2 BHH: Behavioral health hospital IRF: Inpatient rehabilitation facility
Long-term Inpatient Rehab & Nursing[2]	Service variable assignments: 3 C15: Skilled nursing care C17: Acute long term care C92: Swing bed services	Service location types: 2 LTCH: Long-term acute care hospital SNF: Skilled nursing facility
Outpatient Rehabilitation & Nursing[2]	Service variable assignments: 2 C60: Home health services C80a: Assistive technology center	Service location types: 1 CORF: Comprehensive outpatient rehabilitation facility
Extended Care & Living[2]	Service variable assignments: 9 C16: Intermediate nursing care C18: Other long-term care C20: Adult day care program C23: Alzheimer Center C27: Assisted living services C61: Hospice program C75: Palliative care program C76: Inpatient palliative care unit C85: Retirement housing	Service location types: 6 ADC: Adult day care ALF: Assisted living facility CCRC: Continuing care retirement community HSPC: Hospice center NH: Nursing home PACE: Program of all-inclusive care for the elderly

Notes:
1 = "Upstream" services in the continuum of care
2 = "Downstream" services in the continuum of care

Appendix 2: Development of the Study Sample of Clusters

Appendix 2. *Development of the Study Sample of Clusters*

Cluster Name	*No. of Hosps.*	*Facility Opened in 2012*	*2010 AHA Data*	*Missed AHA Data*	*Missed IM Data*	*Pooled AHA Data*	*Pooled IM Data*	*Outlier*	*Removed from Study Sample*	*Included in Final Sample*
1. Adventist HealthCare – Mid Atlantic	**2**		**2**							**X**
2. Ascension Health – Mid Atlantic*	**2**			**1**	**1**				**X**	
3. Ascension Health – Pacific Northwest*	**2**				**1**				**X**	
4. Banner Health – Nevada/California	**2**				**1**				**X**	
5. Baptist Health	**4**					**1**				**X**
6. Baptist Health Care	**4**				**1**					**X**
7. Baptist Health South Florida	**6**									**X**
8. Baptist Health System	**5**					**4**				**X**
9. Baptist Hospitals of Southeast Texas	**2**									**X**
10. BayCare Health System	**8**		**1**	**5**		**1**				**X**
11. Baylor Health Care System	**11**	**1**		**1**	**1**					**X**
12. Bon Secours Hampton Roads Health System	**3**									**X**
13. Bon Secours Richmond Health System	**4**		**2**							**X**
14. Broward Health	**4**									**X**
15. Carilion Clinic	**7**									**X**
16. Centra Health	**3**					**1**	**1**			**X**
17. Central Florida Health Alliance	**2**									**X**
18. CHRISTUS Health Houston	**2**									**X**
19. CHRISTUS Health Texas/Louisiana	**4**				**1**	**1**				**X**
20. CHRISTUS Santa Rosa	**3**									**X**
21. CHRISTUS Spohn	**6**					**2**				**X**
22. CHS Dothan Alabama*	**4**				**3**				**X**	
23. CHS East Texas	**2**									**X**
24. CHS Eastern New Mexico*	**4**				**3**				**X**	
25. CHS North Texas	**4**							**X**	**X**	
26. CHS South Texas	**2**									**X**
27. CHS Southeast Texas	**2**									**X**
28. CHS Virginia	**4**			**1**	**1**					**X**
29. CHS West Central Texas	**4**									**X**
30. CHC Southeast Texas	**2**									**X**
31. Confluence Health	**2**									**X**
32. Corpus Christi Medical Center	**3**					**2**				**X**
33. Covenant Health System	**3**									**X**
34. DeTar Healthcare System	**2**					**1**				**X**
35. Dimensions Healthcare System	**2**									**X**
36. Duke LifePoint Healthcare*	**3**				**2**				**X**	
37. East Texas Medical Center [ETMC]	**13**									**X**
38. Florida Hospital – Tampa Bay & Heartland	**8**	**1**		**1**		**1**				**X**
39. Florida Hospital – Flagler/Volusia	**5**					**1**				**X**
40. Florida Hospital - Orlando	**8**					**6**				**X**
41. Franciscan Health System	**5**									**X**
42. Good Shepherd Health System	**3**									**X**
43. Halifax Health	**2**					**1**				**X**
44. Harris Health System	**2**					**1**				**X**
45. Harrison Medical Center	**2**				**1**	**1**			**X**	

Appendix 2 (continued). *Development of the Study Sample of Clusters*

Cluster Name	*No. of Hosps.*	*Facility Opened in 2012*	*2010 AHA Data*	*Missed AHA Data*	*Missed IM Data*	*Pooled AHA Data*	*Pooled IM Data*	*Outlier*	*Removed from Study Sample*	*Included in Final Sample*
46. HCA East Florida	**3**		**1**	**2**						**X**
47. HCA Houston	**7**					**2**				**X**
48. HCA Jacksonville	**2**			**1**						**X**
49. HCA Miami	**10**		**1**	**4**						**X**
50. HCA North Florida	**4**			**1**						**X**
51. HCA North Texas	**9**									**X**
52. HCA Northeast Florida	**5**					**1**				**X**
53. HCA Orlando	**2**									**X**
54. HCA South Texas	**2**									**X**
55. HCA Tampa	**10**		**1**	**3**						**X**
56. HCA Virginia	**7**			**1**		**3**	**3**			**X**
57. HCA West Florida	**4**			**1**						**X**
58. Health First	**4**									**X**
59. HMA Central Florida	**5**		**1**	**1**	**1**					**X**
60. HMA North Port	**4**									**X**
61. HMA Shands	**3**									**X**
62. HMA West Florida	**4**			**1**						**X**
63. HMA Yakima	**2**			**1**						**X**
64. Hunt Regional Healthcare System	**2**									**X**
65. IASIS Florida	**3**			**3**					**X**	
66. IASIS Houston	**2**									**X**
67. Inova Health System	**5**									**X**
68. Jackson Health System	**3**					**2**				**X**
69. Johns Hopkins Health System	**5**				**1**					**X**
70. Las Palmas Del Sol Healthcare	**2**					**1**				**X**
71. Lee Memorial Health System	**4**					**1**				**X**
72. Legacy Health System*	**5**				**4**				**X**	
73. LewisGale Regional Health System	**4**		**1**	**2**						**X**
74. LifeBridge Health	**2**									**X**
75. LifePoint Hospitals – Northeast Texas	**3**									**X**
76. LifePoint Hospitals – South Virginia	**2**		**2**							**X**
77. LifePoint Hospitals – West Virginia*	**4**				**2**				**X**	
78. Manatee Health System	**2**			**1**						**X**
79. Martin Memorial Health System	**2**					**1**				**X**
80. Mary Washington Healthcare	**2**									**X**
81. Mayo Clinic Jacksonville	**2**				**1**				**X**	
82. MedStar Health*	**9**				**2**				**X**	
83. Memorial Health System of East Texas	**3**									**X**
84. Memorial Healthcare System	**5**									**X**
85. Memorial Hermann Healthcare System	**9**					**3**				**X**
86. Methodist Health System	**5**									**X**
87. Methodist Healthcare System	**5**									**X**
88. Metroplex Health System	**2**									**X**
89. Midland Memorial Health Care	**2**			**1**	**1**				**X**	
90. Mountain States Health Alliance*	**10**				**5**				**X**	

Appendix 2 (continued). *Development of the Study Sample of Clusters*

Cluster Name	*No. of Hosps.*	*Facility Opened in 2012*	*2010 AHA Data*	*Missed AHA Data*	*Missed IM Data*	*Pooled AHA Data*	*Pooled IM Data*	*Outlier*	*Removed from Study Sample*	*Included in Final Sample*
91. MultiCare Health System	**4**					**1**	**1**			**X**
92. NCH Healthcare System	**2**					**1**				**X**
93. OakBend Medical Center	**2**					**1**				**X**
94. Orlando Health	**6**			**1**		**2**	**1**			**X**
95. PeaceHealth – Northwest Washington	**2**	**1**		**1**						**X**
96. Physician Synergy Group	**2**							**X**	**X**	
97. Physicians Regional Healthcare System	**2**					**1**			**X**	
98. Pioneer – Virginia/North Carolina	**2**				**1**				**X**	
99. Prime Healthcare Services – South Texas	**2**									**X**
100. Providence Health – Western Washington	**3**									**X**
101. Providence Health Care	**4**									**X**
102. Renown Health	**3**									**X**
103. Riverside Health System	**4**									**X**
104. Rockwood Health System	**2**			**1**						**X**
105. Sacred Heart Health System	**4**									**X**
106. Scott & White Healthcare	**6**									**X**
107. Sentara Hampton Roads	**7**									**X**
108. Sentara Northern Virginia	**3**									**X**
109. Seton Healthcare Family	**11**	**1**		**1**	**2**					**X**
110. Shands HealthCare	**2**									**X**
111. Sierra Providence Health Network	**3**									**X**
112. South Texas Health System	**3**					**1**				**X**
113. Southwest Washington Health System	**2**			**1**						**X**
114. St. David's Healthcare	**5**					**1**				**X**
115. St. Joseph Health System	**4**									**X**
116. St. Luke's Episcopal Health System	**5**									**X**
117. St. Rose Dominican Hospitals	**3**									**X**
118. St. Vincent's HealthCare	**2**									**X**
119. Sunrise Health	**3**									**X**
120. Swedish Health System	**5**				**1**	**1**				**X**
121. Tahoe Forest Health System*	**2**				**1**				**X**	
122. Tenet Dallas	**3**									**X**
123. Tenet Florida	**10**			**7**						**X**
124. Tenet Houston	**3**									**X**
125. Texas Health Resources	**16**	**1**		**1**	**1**					**X**
126. The Methodist Hospital System	**5**									**X**
127. The Valley Health System	**5**			**4**						**X**
128. Trinity Mother Frances Hospitals	**3**									**X**
129. UHS South Texas	**2**							**X**	**X**	
130. University of Maryland Medical System	**10**									**X**
131. UW Medicine Health System	**4**									**X**
132. Valley Baptist Health System	**2**									**X**
133. Valley Health System	**6**				**2**					**X**
134. Wadley Regional Medical Center	**2**				**1**				**X**	
135. Wellmont Health System*	**8**		**1**	**1**	**5**				**X**	
136. Wuesthoff Health System	**2**									**X**

Appendix 2 (continued). *Development of the Study Sample of Clusters*

Notes:
** = Cluster based (i.e., lead hospital located) outside of six-state group of FL, MD, NV, TX, VA, and WA;*
No. of Hosps. = Number of hospital members;
Facility Opened in 2012 = Number of hospitals opened in 2012;
2010 AHA Data = Number of hospitals with 2010 AHA Annual Survey data substituted for 2011 AHA data;
Missed AHA Data = Number of hospitals with missing service data from AHA Annual Survey;
Missed IM Data = Number of hospitals with missing Intellimed data;
Pooled AHA Data = Number of hospitals for which service data was combined with another hospital in the AHA Annual Survey dataset;
Pooled IM Data = Number of hospitals for which data was combined with another hospital in the Intellimed dataset;
Outlier = Calculated as an outlier observation based upon t-test of Mahalinobis distance measures ($p < 0.001$).

Appendix 3: Classification Variable Correlation Matrix

Appendix 3. *Classification Variable Correlation Matrix*

	HD1	HD2	VD1	VD2	VD3	Config1	Config2	Config3
HD1	1.000							
HD2	**0.534**	1.000						
VD1	**0.287**	0.159	1.000					
VD2	0.206	0.065	**0.660**	1.000				
VD3	0.049	0.094	0.228	0.082	1.000			
Config1	**0.655**	**0.769**	**0.272**	0.143	0.144	1.000		
Config2	0.159	0.092	-0.104	0.073	-0.143	0.048	1.000	
Config3	-0.083	-0.234	-0.171	0.114	-0.150	-0.235	**0.737**	1.000
HI1	**0.556**	**0.407**	0.179	0.084	0.080	**0.568**	0.188	-0.188
HI2	**0.524**	**0.844**	0.180	-0.007	0.188	**0.825**	0.035	**-0.288**
HI3	**0.524**	**0.474**	**0.283**	0.189	0.127	**0.773**	-0.035	-0.236
VI1	**0.711**	**0.457**	**0.279**	0.238	0.044	**0.502**	0.206	0.125
VI2	**0.969**	**0.540**	**0.220**	0.162	0.026	**0.638**	0.221	-0.038
VI3	**0.795**	**0.407**	**0.306**	**0.277**	0.042	**0.503**	0.141	0.022
Coord1	**0.335**	**0.254**	**0.425**	**0.347**	-0.138	**0.347**	0.081	-0.033
Coord2	**-0.541**	**-0.323**	-0.077	-0.177	0.017	**-0.381**	**-0.327**	-0.097

	HI1	HI2	HI3	VI1	VI2	VI3	Coord1	Coord2
HI1	1.000							
HI2	**0.425**	1.000						
HI3	**0.351**	**0.525**	1.000					
VI1	**0.307**	**0.409**	**0.400**	1.000				
VI2	**0.552**	**0.526**	**0.501**	**0.706**	1.000			
VI3	**0.456**	**0.343**	**0.392**	**0.738**	**0.707**	1.000		
Coord1	**0.264**	**0.256**	**0.312**	0.201	**0.272**	**0.324**	1.000	
Coord2	**-0.569**	-0.214	**-0.295**	**-0.411**	**-0.607**	**-0.424**	-0.169	1.000

Note: Bolded values indicate correlations significant at the 0.01 level.
Variable Key:
HD1 = Hospital Services (Horizontal Differentiation)
HD2 = Service Location Types (Horizontal Differentiation)
VD1 = Case Mix Difference (Vertical Differentiation)
VD2 = Extreme Case Share (Vertical Differentiation)
VD3 = Birth Case Distribution (Vertical Differentiation)
Config1 = Locations (Configuration)
Config2 = Geographic Reach (Configuration)
Config3 = Geographic Spread (Configuration)
HI1 = Hospitals (Horizontal Integration)
HI2 = Horizontally Integrated Stages (Horizontal Integration)
HI3 = Locations Per Horizontally Integrated Stage (Horizontal Integration)
VI1 = Vertically Integrated Stages (Vertical Integration)
VI2 = Upstream Vertical Integration Breadth (Vertical Integration)
VI3 = Downstream Vertical Integration Breadth (Vertical Integration)
Coord1 = Hospital Transfer Difference (Coordination)
Coord2 = Duplication of Services (Coordination)

Appendix 4: Principal Components Analysis Results (Comparative 16 Variable Analysis)

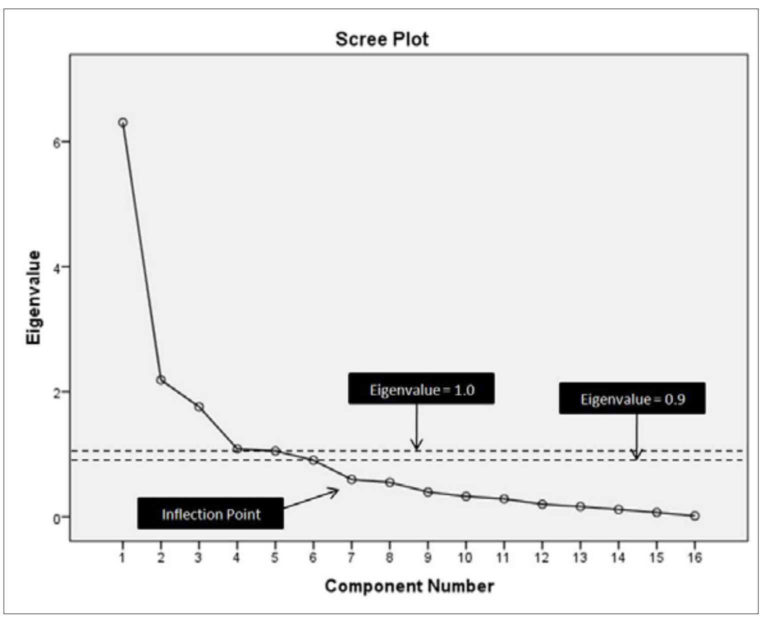
Appendix 4. *Principal Components Analysis Results (16 Variable Analysis)*

Total variance explained in the initial component matrix (16 variables)

Component	Initial Eigenvalues	% of Variance	Cumulative Variance
1	6.304	39.403	39.403
2	2.186	13.660	53.063
3	1.756	10.978	64.041
4	1.085	6.780	70.820
5	1.050	6.563	77.383
6	0.903	5.645	83.028
7	0.596	3.723	86.751
8	0.550	3.438	90.188
9	0.395	2.467	92.656
10	0.326	2.038	94.694
11	0.286	1.789	96.482
12	0.200	1.249	97.732
13	0.162	1.015	98.747
14	0.117	0.731	99.478
15	0.069	0.434	99.911
16	0.014	0.089	100.000

Note: Includes all 16 classification variables

Scree plot (16 variables)



Appendix 4 (continued). *Principal Components Analysis Results (16 Variable Analysis)*

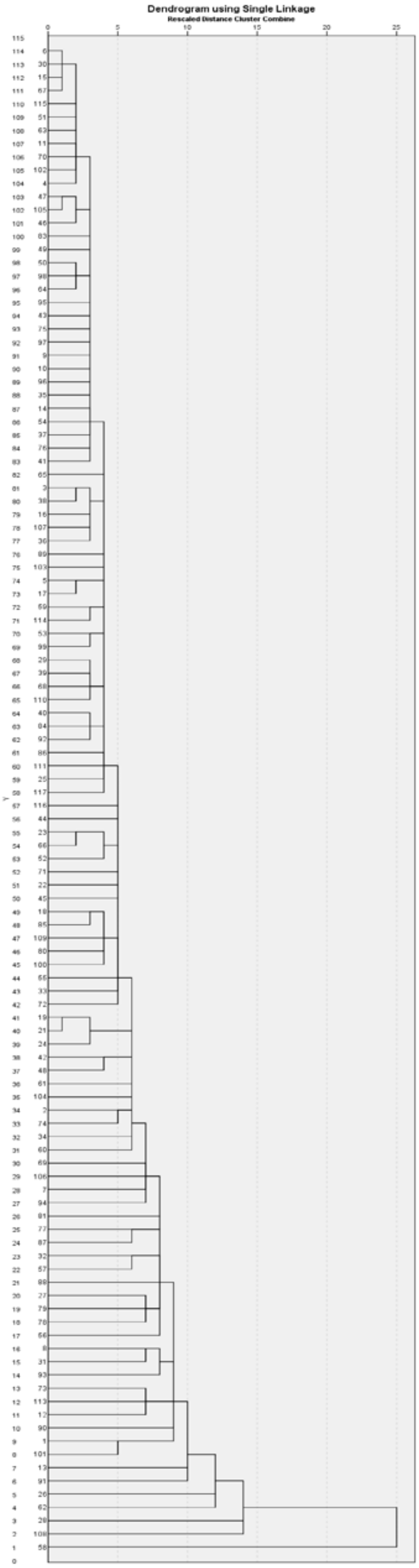
Communality values and rotated component matrix results (varimax rotation, 16 variables)

Variable	Communalities	Component 1	2	3	4	5	6
Hospital Services	0.911	0.371	**0.794**	0.125	-0.022	0.354	-0.045
Service Location Types	0.804	**0.852**	0.253	-0.006	0.008	0.117	0.011
Case Mix Difference	0.827	0.121	0.165	**0.859**	-0.153	0.017	0.151
Extreme Case Share	0.788	-0.051	0.156	**0.860**	0.123	0.034	0.069
Birth Case Distribution	0.886	0.144	-0.028	0.143	-0.095	0.033	**0.913**
Locations	0.901	**0.846**	0.313	0.134	-0.066	0.255	0.023
Geographic Reach	0.908	0.070	0.064	-0.021	**0.917**	0.227	-0.071
Geographic Spread	0.916	-0.246	0.077	0.010	**0.914**	-0.111	-0.043
Hospitals	0.825	0.329	0.191	0.075	-0.052	**0.820**	0.012
Horizontally Integrated Stages	0.892	**0.915**	0.191	-0.015	-0.056	0.089	0.083
Locations/Horizontally Integrated Stage	0.577	**0.638**	0.278	0.225	-0.142	0.149	0.004
Vertically Integrated Stages	0.840	0.274	**0.849**	0.130	0.161	0.011	0.040
Upstream Vertical Integration Breadth	0.885	0.372	**0.763**	0.048	0.043	0.398	-0.037
Downstream Vertical Integration Breadth	0.810	0.192	**0.829**	0.213	0.018	0.197	-0.039
Hospital Transfer Difference	0.735	0.322	0.043	**0.608**	0.012	0.153	-0.486
Duplication of Services	0.779	-0.094	-0.359	-0.039	-0.200	**-0.774**	0.008
Percent of Variance Explained		**21.238**	**19.539**	**12.650**	**11.402**	**11.206**	**6.993**

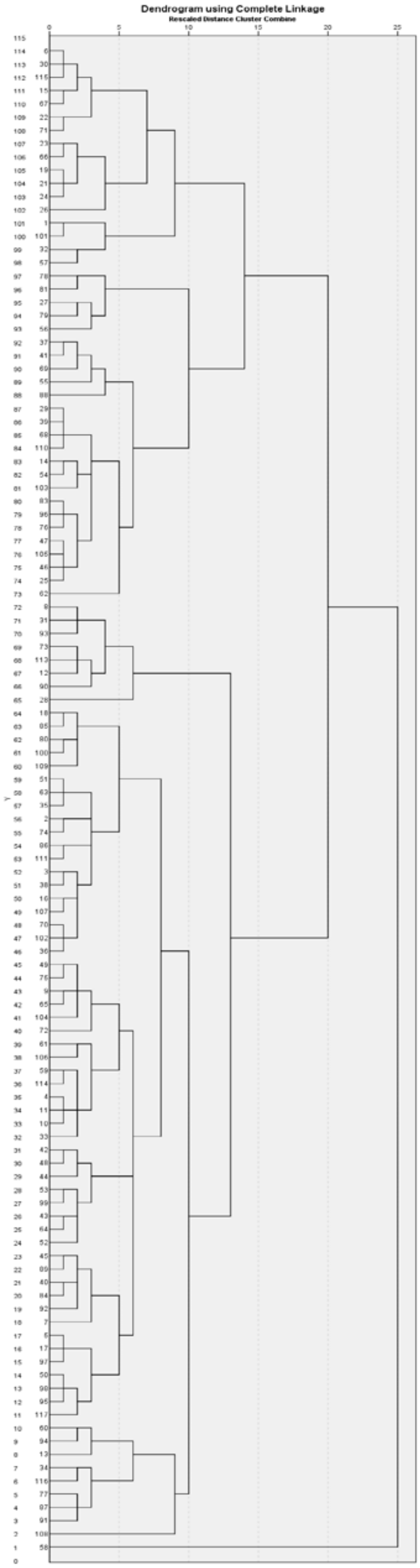
Note: Bolded values indicate statistically significant loadings (> 0.550, based upon 0.05 significance level and power level of 80% for sample size less than 120)

Appendix 5: Hierarchical Cluster Analysis Dendrograms

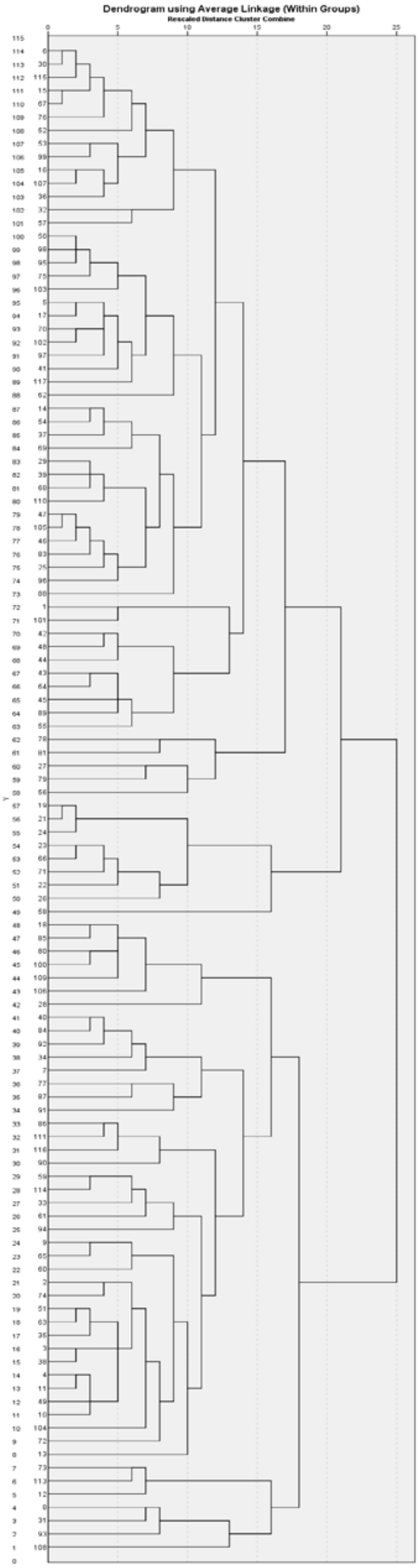
Single-Linkage



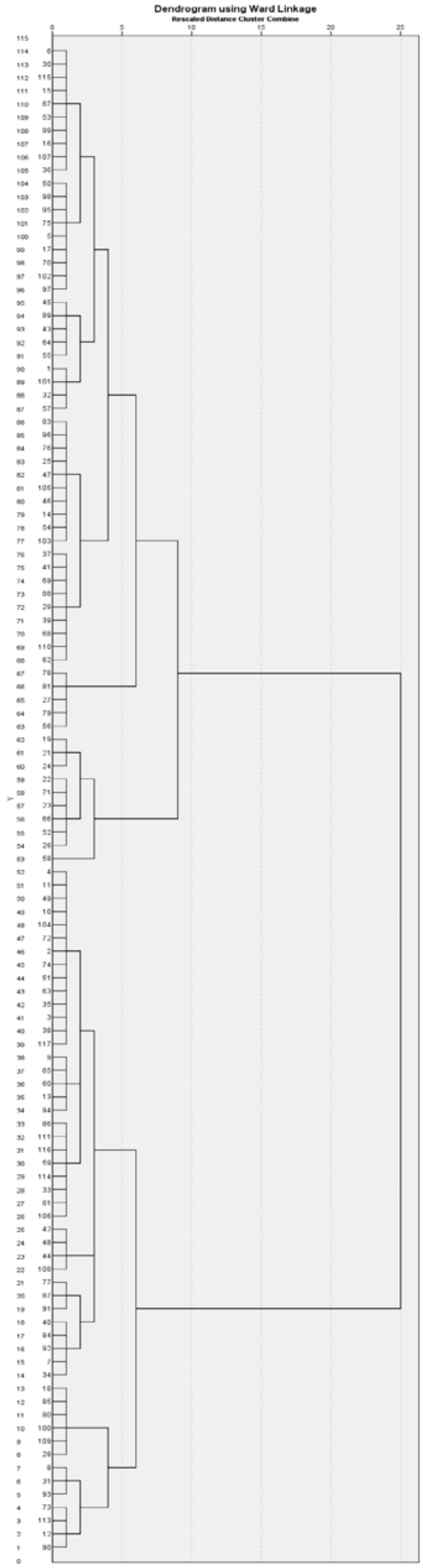
Complete-Linkage



Average Linkage



Ward's Method



Appendix 6: Final Cluster Analysis Solution Members

Appendix 6. *Final Cluster Analysis Solution Members*

CLUSTER 1 (*n* = 45)		
Adventist HealthCare – Mid Atlantic	Baptist Health System (Vanguard)	Baptist Hospitals of Southeast Texas (CHC)
Central Florida Health Alliance	CHRISTUS Health – Houston	CHRISTUS Santa Rosa
CHC Southeast Texas	DeTar Healthcare System (CHS)	Dimensions Health Corporation
Florida Hospital – Flagler/Volusia	Good Shepherd Health System	Halifax Health
HCA East Florida	HCA Jacksonville	HCA North Florida
HCA Orlando	HCA South Texas	HCA West Florida
HMA Central Florida	HMA North Port	HMA Shands
HMA West Florida	Hunt Regional Healthcare System	Las Palmas Del Sol Healthcare (HCA)
LewisGale Regional Health System (HCA)	LifePoint Hospitals – South Central Virginia	Manatee Health System
Martin Memorial Health Systems	Mary Washington Healthcare	Methodist Healthcare System (HCA)
Metroplex Health System (Adventist)	Prime Healthcare Services – South Texas	Rockwood Health System (CHS)
Sierra Providence Health Network (Tenet)	South Texas Health System (UHS)	Southwest Washington Health System
St. David's Health Care (HCA)	St. Joseph Health System	St. Rose Dominican Hospitals
St. Vincent's HealthCare	Sunrise Health (HCA)	Tenet Dallas
Tenet Houston	The Valley Health System (UHS)	Valley Baptist Health System
CLUSTER 2 (*n* = 39)		
Baptist Health	Baptist Health Care	Baptist Health South Florida
BayCare Health System	Bon Secours Hampton Roads Health System	Bon Secours Richmond Health System
Broward Health	Centra Health	CHRISTUS Health – SE Texas/SW Louisiana
Florida Hospital – Orlando	Florida Hospital – Tampa Bay & Heartland	Franciscan Health System (CHI)
Harris Health System	HCA Houston	HCA Miami
HCA North Texas	HCA Northeast Florida	HCA Tampa
HCA Virginia	Health First	Inova Health System
Jackson Health System	Lee Memorial Health System	LifeBridge Health
Memorial Healthcare System	Methodist Health System	MultiCare Health System
Providence – Western Washington	Renown Health	Riverside Health System
Sacred Heart Health System	Sentara Hampton Roads	Sentara Northern Virginia
Shands HealthCare	Swedish Health System	Tenet Florida
Texas Health Resources	UW Medicine	Wuesthoff Health System
CLUSTER 3 (*n* = 16)		
Baylor Health Care System	Carilion Clinic	CHRISTUS Spohn
Covenant Health System	ETMC	Johns Hopkins Health System
Memorial Hermann	Orlando Health	Providence Health Care
Scott & White Healthcare	Seton Healthcare Family	St. Luke's Episcopal Health System
The Methodist Hospital System	Trinity Mother Frances Hospitals & Clinics	University of Maryland Medical System
Valley Health - Virginia		
CLUSTER 4 (*n* = 9)		
CHS East Texas	CHS South Texas	CHS Southeast Texas
CHS Virginia	CHS West Central Texas	Confluence Health
IASIS Houston	LifePoint Hospitals – Northeast Texas	Memorial Health System of East Texas
CLUSTER 5 (*n* = 5)		
Corpus Christi Medical Center (HCA)	HMA Yakima	NCH Healthcare System
OakBend Medical Center	PeaceHealth – Northwest Washington	

Appendix 7: ANOVA and Games-Howell Test Results for Taxonomic Analysis

Appendix 7. *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Services	Between Groups	1.618	4	0.405	44.3	0
	Within Groups	0.996	109	0.009		
	Total	2.614	113			
Location Types	Between Groups	442.805	4	110.701	15.651	0
	Within Groups	770.985	109	7.073		
	Total	1213.789	113			
CMI Difference	Between Groups	3.483	4	0.871	34.159	0
	Within Groups	2.779	109	0.025		
	Total	6.262	113			
Extreme Difference	Between Groups	0.043	4	0.011	21.573	0
	Within Groups	0.054	109	0		
	Total	0.097	113			
Birth St.Dev.	Between Groups	0.031	4	0.008	12.397	0
	Within Groups	0.067	109	0.001		
	Total	0.098	113			
Locations	Between Groups	16063.19	4	4015.798	25.111	0
	Within Groups	17431.17	109	159.919		
	Total	33494.36	113			
Reach	Between Groups	17633.69	4	4408.422	27.421	0
	Within Groups	17523.46	109	160.766		
	Total	35157.15	113			
Spread	Between Groups	9481.079	4	2370.27	38.057	0
	Within Groups	6788.691	109	62.282		
	Total	16269.77	113			
Hospitals	Between Groups	278.626	4	69.656	14.689	0
	Within Groups	516.892	109	4.742		
	Total	795.518	113			
HI Stages	Between Groups	191.78	4	47.945	17.526	0
	Within Groups	298.185	109	2.736		
	Total	489.965	113			
Sites/HI Stage	Between Groups	336.554	4	84.138	17.915	0
	Within Groups	511.933	109	4.697		
	Total	848.487	113			
VI Stages	Between Groups	116.314	4	29.079	22.782	0
	Within Groups	139.124	109	1.276		
	Total	255.439	113			
Upstream Breadth	Between Groups	1.789	4	0.447	43.555	0
	Within Groups	1.119	109	0.01		
	Total	2.909	113			
Downstream Breadth	Between Groups	1.831	4	0.458	24.906	0
	Within Groups	2.004	109	0.018		
	Total	3.835	113			
Transfer Admit Difference	Between Groups	0.13	4	0.032	15.899	0
	Within Groups	0.223	109	0.002		
	Total	0.352	113			
Duplication	Between Groups	1.459	4	0.365	23.094	0
	Within Groups	1.722	109	0.016		
	Total	3.181	113			

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Robust Tests of Equality of Means[b]					
		Statistic[a]	df1	df2	Sig.
Services	Welch	40.702	4	20.997	0
	Brown-Forsythe	48.209	4	28.842	0
Location Types	Welch	15.455	4	20.292	0
	Brown-Forsythe	16.573	4	46.913	0
CMI Difference	Welch	25.732	4	19.404	0
	Brown-Forsythe	28.189	4	21.129	0
Extreme Difference	Welch	15.249	4	18.954	0
	Brown-Forsythe	16.554	4	33.035	0
Birth St.Dev.	Welch	13.736	4	20.547	0
	Brown-Forsythe	15.224	4	43.35	0
Locations	Welch	31.681	4	21.731	0
	Brown-Forsythe	23.916	4	28.789	0
Reach	Welch	17.063	4	21.168	0
	Brown-Forsythe	25.42	4	26.159	0
Spread	Welch	7.508	4	19.136	0.001
	Brown-Forsythe	18.038	4	12.868	0
Hospitals	Welch	15.48	4	26.303	0
	Brown-Forsythe	18.53	4	44.836	0
HI Stages	Welch	22.399	4	20.552	0
	Brown-Forsythe	16.632	4	27.798	0
Sites/HI Stage	Welch	17.961	4	20.853	0
	Brown-Forsythe	19.812	4	52.733	0
VI Stages	Welch	27.524	4	22.837	0
	Brown-Forsythe	31.406	4	67.839	0
Upstream Breadth	Welch	39.568	4	20.564	0
	Brown-Forsythe	41.213	4	17.172	0
Downstream Breadth	Welch	23.767	4	20.774	0
	Brown-Forsythe	29.112	4	60.109	0
Transfer Admit Difference	Welch	9.807	4	20.004	0
	Brown-Forsythe	14.914	4	25.497	0
Duplication	Welch	.	.	.	.
	Brown-Forsythe	.	.	.	.
[a] Asymptotically F distributed					
[b] Robust tests of equality of means cannot be performed for Duplication because at least one group has 0 variance					

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Services	1	2	-.20636*	0.02147	0	-0.2601	-0.1526
		3	-.27744*	0.02799	0	-0.3499	-0.2049
		4	-0.04018	0.02212	0.388	-0.098	0.0176
		5	0.09963	0.0511	0.403	-0.0714	0.2706
	2	1	.20636*	0.02147	0	0.1526	0.2601
		3	-0.07108	0.02834	0.117	-0.1444	0.0022
		4	.16619*	0.02256	0	0.1074	0.225
		5	.30599*	0.05129	0.011	0.1351	0.4768
	3	1	.27744*	0.02799	0	0.2049	0.3499
		2	0.07108	0.02834	0.117	-0.0022	0.1444
		4	.23726*	0.02883	0	0.1618	0.3127
		5	.37707*	0.05434	0.003	0.2068	0.5474
	4	1	0.04018	0.02212	0.388	-0.0176	0.098
		2	-.16619*	0.02256	0	-0.225	-0.1074
		3	-.23726*	0.02883	0	-0.3127	-0.1618
		5	0.13981	0.05156	0.185	-0.0311	0.3107
	5	1	-0.09963	0.0511	0.403	-0.2706	0.0714
		2	-.30599*	0.05129	0.011	-0.4768	-0.1351
		3	-.37707*	0.05434	0.003	-0.5474	-0.2068
		4	-0.13981	0.05156	0.185	-0.3107	0.0311
Location Types	1	2	-3.788*	0.574	0	-5.23	-2.34
		3	-3.232*	0.966	0.026	-5.81	-0.66
		4	1.289	0.6	0.257	-0.36	2.93
		5	0.556	0.97	0.974	-2.69	3.8
	2	1	3.788*	0.574	0	2.34	5.23
		3	0.556	1.049	0.983	-2.18	3.29
		4	5.077*	0.725	0	3.19	6.97
		5	4.344*	1.053	0.029	1.11	7.57
	3	1	3.232*	0.966	0.026	0.66	5.81
		2	-0.556	1.049	0.983	-3.29	2.18
		4	4.521*	1.063	0.003	1.73	7.31
		5	3.787*	1.308	0.079	0.18	7.4
	4	1	-1.289	0.6	0.257	-2.93	0.36
		2	-5.077*	0.725	0	-6.97	-3.19
		3	-4.521*	1.063	0.003	-7.31	-1.73
		5	-0.733	1.067	0.953	-4	2.53
	5	1	-0.556	0.97	0.974	-3.8	2.69
		2	-4.344*	1.053	0.029	-7.57	-1.11
		3	-3.787*	1.308	0.079	-7.4	-0.18
		4	0.733	1.067	0.953	-2.53	4

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
CMI Difference	1	2	-0.0842	0.03416	0.109	-0.1697	0.0013
		3	-.42226*	0.04671	0	-0.5437	-0.3008
		4	0.04871	0.05463	0.895	-0.103	0.2004
		5	-.58459*	0.10495	0.018	-0.9446	-0.2246
	2	1	0.0842	0.03416	0.109	-0.0013	0.1697
		3	-.33806*	0.04752	0	-0.4613	-0.2148
		4	0.13291	0.05532	0.178	-0.0198	0.2857
		5	-.50039*	0.10531	0.032	-0.86	-0.1408
	3	1	.42226*	0.04671	0	0.3008	0.5437
		2	.33806*	0.04752	0	0.2148	0.4613
		4	.47097*	0.06384	0	0.301	0.641
		5	-0.16233	0.11002	0.613	-0.5187	0.1941
	4	1	-0.04871	0.05463	0.895	-0.2004	0.103
		2	-0.13291	0.05532	0.178	-0.2857	0.0198
		3	-.47097*	0.06384	0	-0.641	-0.301
		5	-.63330*	0.11361	0.008	-0.9908	-0.2758
	5	1	.58459*	0.10495	0.018	0.2246	0.9446
		2	.50039*	0.10531	0.032	0.1408	0.86
		3	0.16233	0.11002	0.613	-0.1941	0.5187
		4	.63330*	0.11361	0.008	0.2758	0.9908
Extreme Difference	1	2	-0.00593	0.00424	0.63	-0.0165	0.0047
		3	-.05148*	0.00779	0	-0.072	-0.031
		4	-0.02006	0.0111	0.422	-0.0518	0.0117
		5	-.05572*	0.0106	0.018	-0.0909	-0.0205
	2	1	0.00593	0.00424	0.63	-0.0047	0.0165
		3	-.04556*	0.00758	0	-0.0656	-0.0255
		4	-0.01414	0.01095	0.703	-0.0457	0.0175
		5	-.04980*	0.01044	0.03	-0.0852	-0.0144
	3	1	.05148*	0.00779	0	0.031	0.072
		2	.04556*	0.00758	0	0.0255	0.0656
		4	0.03142	0.01276	0.152	-0.0031	0.0659
		5	-0.00424	0.01232	0.996	-0.0403	0.0318
	4	1	0.02006	0.0111	0.422	-0.0117	0.0518
		2	0.01414	0.01095	0.703	-0.0175	0.0457
		3	-0.03142	0.01276	0.152	-0.0659	0.0031
		5	-0.03566	0.01464	0.176	-0.0767	0.0054
	5	1	.05572*	0.0106	0.018	0.0205	0.0909
		2	.04980*	0.01044	0.03	0.0144	0.0852
		3	0.00424	0.01232	0.996	-0.0318	0.0403
		4	0.03566	0.01464	0.176	-0.0054	0.0767

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Birth St.Dev.	1	2	-.01726*	0.00574	0.028	-0.0316	-0.0029
		3	-0.00863	0.00554	0.531	-0.0227	0.0054
		4	-0.00074	0.00892	1	-0.0252	0.0237
		5	-.07816*	0.01049	0.002	-0.1115	-0.0448
	2	1	.01726*	0.00574	0.028	0.0029	0.0316
		3	0.00863	0.00532	0.49	-0.0049	0.0221
		4	0.01652	0.00878	0.375	-0.0077	0.0408
		5	-.06090*	0.01037	0.008	-0.0943	-0.0275
	3	1	0.00863	0.00554	0.531	-0.0054	0.0227
		2	-0.00863	0.00532	0.49	-0.0221	0.0049
		4	0.00789	0.00865	0.886	-0.0162	0.032
		5	-.06953*	0.01026	0.005	-0.103	-0.036
	4	1	0.00074	0.00892	1	-0.0237	0.0252
		2	-0.01652	0.00878	0.375	-0.0408	0.0077
		3	-0.00789	0.00865	0.886	-0.032	0.0162
		5	-.07742*	0.01241	0.001	-0.1132	-0.0417
	5	1	.07816*	0.01049	0.002	0.0448	0.1115
		2	.06090*	0.01037	0.008	0.0275	0.0943
		3	.06953*	0.01026	0.005	0.036	0.103
		4	.07742*	0.01241	0.001	0.0417	0.1132
Locations	1	2	-21.207*	2.396	0	-27.26	-15.15
		3	-25.593*	5.927	0.004	-41.56	-9.63
		4	5.400*	1.418	0.007	1.69	9.11
		5	1.444	3.14	0.988	-9.02	11.9
	2	1	21.207*	2.396	0	15.15	27.26
		3	-4.386	6.251	0.954	-20.94	12.17
		4	26.607*	2.441	0	20.41	32.8
		5	22.651*	3.715	0.001	11.96	33.34
	3	1	25.593*	5.927	0.004	9.63	41.56
		2	4.386	6.251	0.954	-12.17	20.94
		4	30.993*	5.945	0.001	15	46.99
		5	27.038*	6.572	0.005	9.61	44.47
	4	1	-5.400*	1.418	0.007	-9.11	-1.69
		2	-26.607*	2.441	0	-32.8	-20.41
		3	-30.993*	5.945	0.001	-46.99	-15
		5	-3.956	3.174	0.73	-14.41	6.5
	5	1	-1.444	3.14	0.988	-11.9	9.02
		2	-22.651*	3.715	0.001	-33.34	-11.96
		3	-27.038*	6.572	0.005	-44.47	-9.61
		4	3.956	3.174	0.73	-6.5	14.41

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Reach	1	2	-8.31414*	2.81319	0.034	-15.3931	-1.2352
		3	-12.31790*	2.82601	0.002	-19.6618	-4.974
		4	-46.85311*	6.81371	0.001	-66.6237	-27.0825
		5	5.15822	3.1446	0.524	-4.5868	14.9032
	2	1	8.31414*	2.81319	0.034	1.2352	15.3931
		3	-4.00377	3.43985	0.771	-12.7509	4.7434
		4	-38.53897*	7.09034	0.002	-58.6198	-18.4581
		5	13.47236*	3.70604	0.024	3.1474	23.7974
	3	1	12.31790*	2.82601	0.002	4.974	19.6618
		2	4.00377	3.43985	0.771	-4.7434	12.7509
		4	-34.53521*	7.09544	0.004	-54.6391	-14.4313
		5	17.47613*	3.71579	0.005	7.022	27.9302
	4	1	46.85311*	6.81371	0.001	27.0825	66.6237
		2	38.53897*	7.09034	0.002	18.4581	58.6198
		3	34.53521*	7.09544	0.004	14.4313	54.6391
		5	52.01133*	7.22824	0	31.5979	72.4248
	5	1	-5.15822	3.1446	0.524	-14.9032	4.5868
		2	-13.47236*	3.70604	0.024	-23.7974	-3.1474
		3	-17.47613*	3.71579	0.005	-27.9302	-7.022
		4	-52.01133*	7.22824	0	-72.4248	-31.5979
Spread	1	2	0.91819	1.27571	0.951	-2.2754	4.1118
		3	-3.24447	1.28662	0.105	-6.5199	0.0309
		4	-33.59378*	7.02706	0.008	-54.1898	-12.9978
		5	0.41578	3.85524	1	-12.7917	13.6233
	2	1	-0.91819	1.27571	0.951	-4.1118	2.2754
		3	-4.16266*	1.32416	0.024	-7.5308	-0.7945
		4	-34.51197*	7.03403	0.007	-55.1139	-13.91
		5	-0.50241	3.86793	1	-13.6945	12.6897
	3	1	3.24447	1.28662	0.105	-0.0309	6.5199
		2	4.16266*	1.32416	0.024	0.7945	7.5308
		4	-30.34931*	7.03602	0.015	-50.9533	-9.7453
		5	3.66025	3.87154	0.867	-9.5305	16.851
	4	1	33.59378*	7.02706	0.008	12.9978	54.1898
		2	34.51197*	7.03403	0.007	13.91	55.1139
		3	30.34931*	7.03602	0.015	9.7453	50.9533
		5	34.00956*	7.91915	0.008	11.9093	56.1098
	5	1	-0.41578	3.85524	1	-13.6233	12.7917
		2	0.50241	3.86793	1	-12.6897	13.6945
		3	-3.66025	3.87154	0.867	-16.851	9.5305
		4	-34.00956*	7.91915	0.008	-56.1098	-11.9093

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Hospitals	1	2	-2.393*	0.492	0	-3.64	-1.15
		3	-3.986*	0.775	0.001	-6.07	-1.91
		4	0.222	0.331	0.96	-0.68	1.13
		5	0.689	0.258	0.125	-0.04	1.42
	2	1	2.393*	0.492	0	1.15	3.64
		3	-1.593	0.889	0.398	-3.9	0.71
		4	2.615*	0.547	0	1.22	4.01
		5	3.082*	0.506	0	1.79	4.37
	3	1	3.986*	0.775	0.001	1.91	6.07
		2	1.593	0.889	0.398	-0.71	3.9
		4	4.208*	0.811	0	2.06	6.36
		5	4.675*	0.784	0	2.58	6.77
	4	1	-0.222	0.331	0.96	-1.13	0.68
		2	-2.615*	0.547	0	-4.01	-1.22
		3	-4.208*	0.811	0	-6.36	-2.06
		5	0.467	0.351	0.68	-0.51	1.44
	5	1	-0.689	0.258	0.125	-1.42	0.04
		2	-3.082*	0.506	0	-4.37	-1.79
		3	-4.675*	0.784	0	-6.77	-2.58
		4	-0.467	0.351	0.68	-1.44	0.51
HI Stages	1	2	-2.462*	0.357	0	-3.36	-1.57
		3	-1.938*	0.562	0.019	-3.42	-0.45
		4	1.222*	0.35	0.018	0.29	2.15
		5	0	0.919	1	-3.14	3.14
	2	1	2.462*	0.357	0	1.57	3.36
		3	0.524	0.594	0.901	-1.02	2.07
		4	3.684*	0.399	0	2.65	4.72
		5	2.462	0.939	0.204	-0.66	5.59
	3	1	1.938*	0.562	0.019	0.45	3.42
		2	-0.524	0.594	0.901	-2.07	1.02
		4	3.160*	0.59	0	1.61	4.71
		5	1.938	1.035	0.408	-1.2	5.07
	4	1	-1.222*	0.35	0.018	-2.15	-0.29
		2	-3.684*	0.399	0	-4.72	-2.65
		3	-3.160*	0.59	0	-4.71	-1.61
		5	-1.222	0.937	0.702	-4.35	1.91
	5	1	0	0.919	1	-3.14	3.14
		2	-2.462	0.939	0.204	-5.59	0.66
		3	-1.938	1.035	0.408	-5.07	1.2
		4	1.222	0.937	0.702	-1.91	4.35

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Sites/HI Stage	1	2	-2.76396*	0.46279	0	-3.9228	-1.6051
		3	-3.71038*	0.76648	0.001	-5.7279	-1.6929
		4	1.51578	0.59924	0.138	-0.1118	3.1433
		5	0.29578	0.77045	0.994	-2.1576	2.7492
	2	1	2.76396*	0.46279	0	1.6051	3.9228
		3	-0.94642	0.78184	0.745	-2.995	1.1021
		4	4.27974*	0.61876	0	2.6165	5.9429
		5	3.05974*	0.78574	0.042	0.6057	5.5137
	3	1	3.71038*	0.76648	0.001	1.6929	5.7279
		2	0.94642	0.78184	0.745	-1.1021	2.995
		4	5.22616*	0.86959	0	2.9502	7.5022
		5	4.00616*	0.99534	0.011	1.2607	6.7516
	4	1	-1.51578	0.59924	0.138	-3.1433	0.1118
		2	-4.27974*	0.61876	0	-5.9429	-2.6165
		3	-5.22616*	0.86959	0	-7.5022	-2.9502
		5	-1.22	0.87309	0.645	-3.7816	1.3416
	5	1	-0.29578	0.77045	0.994	-2.7492	2.1576
		2	-3.05974*	0.78574	0.042	-5.5137	-0.6057
		3	-4.00616*	0.99534	0.011	-6.7516	-1.2607
		4	1.22	0.87309	0.645	-1.3416	3.7816
VI Stages	1	2	-1.997*	0.261	0	-2.65	-1.34
		3	-2.147*	0.289	0	-2.89	-1.41
		4	-1.578*	0.386	0.009	-2.63	-0.52
		5	0.378	0.308	0.738	-0.5	1.26
	2	1	1.997*	0.261	0	1.34	2.65
		3	-0.151	0.286	0.984	-0.88	0.58
		4	0.419	0.384	0.808	-0.63	1.47
		5	2.374*	0.305	0	1.5	3.25
	3	1	2.147*	0.289	0	1.41	2.89
		2	0.151	0.286	0.984	-0.58	0.88
		4	0.569	0.404	0.631	-0.52	1.66
		5	2.525*	0.33	0	1.6	3.45
	4	1	1.578*	0.386	0.009	0.52	2.63
		2	-0.419	0.384	0.808	-1.47	0.63
		3	-0.569	0.404	0.631	-1.66	0.52
		5	1.956*	0.417	0.004	0.8	3.11
	5	1	-0.378	0.308	0.738	-1.26	0.5
		2	-2.374*	0.305	0	-3.25	-1.5
		3	-2.525*	0.33	0	-3.45	-1.6
		4	-1.956*	0.417	0.004	-3.11	-0.8

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Upstream Breadth	1	2	-.21620*	0.02234	0	-0.2721	-0.1603
		3	-.27594*	0.02846	0	-0.349	-0.2029
		4	-0.04716	0.02507	0.353	-0.1124	0.0181
		5	0.14642	0.06744	0.329	-0.0824	0.3752
	2	1	.21620*	0.02234	0	0.1603	0.2721
		3	-0.05974	0.02676	0.198	-0.1291	0.0096
		4	.16904*	0.02312	0	0.1078	0.2303
		5	.36262*	0.06674	0.02	0.133	0.5923
	3	1	.27594*	0.02846	0	0.2029	0.349
		2	0.05974	0.02676	0.198	-0.0096	0.1291
		4	.22878*	0.02908	0	0.1526	0.3049
		5	.42236*	0.06903	0.009	0.1948	0.6499
	4	1	0.04716	0.02507	0.353	-0.0181	0.1124
		2	-.16904*	0.02312	0	-0.2303	-0.1078
		3	-.22878*	0.02908	0	-0.3049	-0.1526
		5	0.19358	0.0677	0.165	-0.0351	0.4223
	5	1	-0.14642	0.06744	0.329	-0.3752	0.0824
		2	-.36262*	0.06674	0.02	-0.5923	-0.133
		3	-.42236*	0.06903	0.009	-0.6499	-0.1948
		4	-0.19358	0.0677	0.165	-0.4223	0.0351
Downstream Breadth	1	2	-.21880*	0.03073	0	-0.2959	-0.1417
		3	-.33251*	0.03945	0	-0.4357	-0.2294
		4	-0.09798	0.04316	0.221	-0.2181	0.0221
		5	0.0101	0.04586	0.999	-0.1364	0.1566
	2	1	.21880*	0.03073	0	0.1417	0.2959
		3	-.11371*	0.043	0.087	-0.2245	-0.0029
		4	0.12082	0.04642	0.119	-0.0047	0.2463
		5	.22890*	0.04894	0.013	0.0816	0.3763
	3	1	.33251*	0.03945	0	0.2294	0.4357
		2	.11371*	0.043	0.087	0.0029	0.2245
		4	.23453*	0.05261	0.002	0.0952	0.3739
		5	.34261*	0.05484	0.001	0.1872	0.4981
	4	1	0.09798	0.04316	0.221	-0.0221	0.2181
		2	-0.12082	0.04642	0.119	-0.2463	0.0047
		3	-.23453*	0.05261	0.002	-0.3739	-0.0952
		5	0.10808	0.05756	0.386	-0.0552	0.2713
	5	1	-0.0101	0.04586	0.999	-0.1566	0.1364
		2	-.22890*	0.04894	0.013	-0.3763	-0.0816
		3	-.34261*	0.05484	0.001	-0.4981	-0.1872
		4	-0.10808	0.05756	0.386	-0.2713	0.0552

Appendix 7 (continued). *ANOVA and Games-Howell Test Results for Taxonomic Analysis*

Post Hoc Test: Games-Howell							
Multiple Comparisons							
Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
						Lower Bound	Upper Bound
Transfer Admit Difference	1	2	-0.02112	0.0092	0.158	-0.0442	0.0019
		3	-.10239*	0.01639	0	-0.1452	-0.0596
		4	-0.00454	0.01111	0.994	-0.0334	0.0243
		5	-0.00247	0.0264	1	-0.0907	0.0858
	2	1	0.02112	0.0092	0.158	-0.0019	0.0442
		3	-.08127*	0.01527	0	-0.1218	-0.0407
		4	0.01658	0.00939	0.427	-0.0088	0.042
		5	0.01865	0.02572	0.94	-0.0704	0.1077
	3	1	.10239*	0.01639	0	0.0596	0.1452
		2	.08127*	0.01527	0	0.0407	0.1218
		4	.09785*	0.0165	0	0.0545	0.1412
		5	.09991*	0.02908	0.061	0.0115	0.1883
	4	1	0.00454	0.01111	0.994	-0.0243	0.0334
		2	-0.01658	0.00939	0.427	-0.042	0.0088
		3	-.09785*	0.0165	0	-0.1412	-0.0545
		5	0.00206	0.02647	1	-0.0863	0.0904
	5	1	0.00247	0.0264	1	-0.0858	0.0907
		2	-0.01865	0.02572	0.94	-0.1077	0.0704
		3	-.09991*	0.02908	0.061	-0.1883	-0.0115
		4	-0.00206	0.02647	1	-0.0904	0.0863
Duplication	1	2	.15310*	0.02908	0	0.0803	0.2259
		3	.26498*	0.03287	0	0.1813	0.3487
		4	.10911*	0.04015	0.095	0.0012	0.217
		5	-.20883*	0.02236	0	-0.2656	-0.152
	2	1	-.15310*	0.02908	0	-0.2259	-0.0803
		3	.11188*	0.03043	0.007	0.0338	0.19
		4	-0.04399	0.03819	0.777	-0.1485	0.0605
		5	-.36193*	0.0186	0	-0.4094	-0.3144
	3	1	-.26498*	0.03287	0	-0.3487	-0.1813
		2	-.11188*	0.03043	0.007	-0.19	-0.0338
		4	-.15587*	0.04114	0.012	-0.2664	-0.0453
		5	-.47381*	0.02409	0	-0.539	-0.4086
	4	1	-.10911*	0.04015	0.095	-0.217	-0.0012
		2	0.04399	0.03819	0.777	-0.0605	0.1485
		3	.15587*	0.04114	0.012	0.0453	0.2664
		5	-.31794*	0.03335	0	-0.4162	-0.2196
	5	1	.20883*	0.02236	0	0.152	0.2656
		2	.36193*	0.0186	0	0.3144	0.4094
		3	.47381*	0.02409	0	0.4086	0.539
		4	.31794*	0.03335	0	0.2196	0.4162

*The mean difference is significant at the 0.10 level.

Appendix 8: Univariable Logistic Regression Analysis Results

Appendix 8. *Univariable Logistic Regression Analysis Results*

Variable	Odds Ratios (*p*-values)		
	Group 1 vs. Group 3	*Group 2 vs. Group 3*	*Group 2 vs. Group 1*
FORM1	0.600 (0.084) *	0.462 (0.013) **	0.771 (0.241)
	-2 Log Likelihood = 29.908, Chi-square = 6.771, *p* = 0.034, Correct classification = 53.0%		
FORM2	0.695 (0.102)	1.401 (0.095) *	2.017 (0.000) ****
	-2 Log Likelihood = 46.755, Chi-square = 19.148, *p* = 0.000, Correct classification = 57.0%		
FORM3	0.708 (0.192)	0.681 (0.162)	0.961 (0.863)
	-2 Log Likelihood = 37.749, Chi-square = 2.135, *p* = 0.344, Correct classification = 45.0%		
Market Population	0.967 (0.010) ***	0.995 (0.697)	1.030 (0.006) ***
	-2 Log Likelihood = 164.208, Chi-square = 10.923, *p* = 0.004, Correct classification = 57.0%		
CBSA	0.383 (0.002) ***	0.417 (0.004) ***	1.088 (0.769)
	-2 Log Likelihood = 27.213, Chi-square = 12.331, *p* = 0.002, Correct classification = 48.5%		
Per Capita Income	0.899 (0.050) **	1.018 (0.704)	1.133 (0.005) ***
	-2 Log Likelihood = 164.911, Chi-square = 10.220, *p* = 0.006, Correct classification = 52.0%		
Age Diversity‡	2.8E+10 (0.051) *	3.3E+7 (0.166)	0.001 (0.267)
	-2 Log Likelihood = 169.551, Chi-square = 5.581, *p* = 0.061, Correct classification = 48.0%		
% Population Nonwhite‡	0.004 (0.088) *	0.890 (0.971)	222.253 (0.028) **
	-2 Log Likelihood = 169.015, Chi-square = 6.116, *p* = 0.047, Correct classification = 46.0%		
Specialist to Generalist Ratio	0.825 (0.402)	1.133 (0.570)	1.374 (0.071) *
	-2 Log Likelihood = 171.627, Chi-square = 3.504, *p* = 0.173, Correct classification = 48.0%		
Beds	0.997 (0.000) ****	1.000 (0.962)	1.003 (0.000) ****
	-2 Log Likelihood = 160.167, Chi-square = 42.400, *p* = 0.000, Correct classification = 60.0%		
Market Leader's Cluster Form			
Different form	2.889 (0.135)	0.361 (0.246)	0.125 (0.002) ***
Same/Lead form	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 14.509, Chi-square = 13.050, *p* = 0.001, Correct classification = 54.0%		
Ownership			
Nonprofit	3.2E-9 (0.000) ****	1.6E-8 (--)	4.844 (0.002) ***
For profit	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 12.357, Chi-square = 25.430, *p* = 0.000, Correct classification = 56.0%		
Teaching Hospital Members			
No teaching hospitals	2.8E8 (--)	5.878 (0.007) ***	2.9E-9 (0.000) ****
1+ teaching hospitals	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 11.734, Chi-square = 29.296, *p* = 0.000, Correct classification = 54.0%		

Appendix 8 (continued). *Univariable Logistic Regression Analysis Results*

Variable	Odds Ratios (*p*-values)		
	Group 1 vs. Group 3	*Group 2 vs. Group 3*	*Group 2 vs. Group 1*
State CON Restrictions			
Least restrictive	1.429 (0.611)	0.214 (0.036) **	0.150 (0.004) ***
Moderately restrictive	12.857 (0.031) **	6.786 (0.096) *	0.528 (0.260)
Most restrictive	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 19.954, Chi-square = 20.618, *p* = 0.000, Correct classification = 53.0%		
State SOP Restrictions			
Least restrictive	0.089 (0.060) *	0.111 (0.078) *	1.250 (0.761)
Moderately restrictive	0.144 (0.076) *	0.069 (0.015) **	0.481 (0.125)
Most restrictive	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 19.610, Chi-square = 11.400, *p* = 0.022, Correct classification = 50.0%		
HHI	9.402 (0.187)	0.437 (0.662)	0.046 (0.024) **
	-2 Log Likelihood = 168.328, Chi-square = 6.804, *p* = 0.033, Correct classification = 54.0%		
ASCs	0.985 (0.005) ***	0.997 (0.479)	1.013 (0.010) ***
	-2 Log Likelihood = 143.663, Chi-square = 11.168, *p* = 0.004, Correct classification = 60.0%		
HHAs	0.998 (0.104)	1.000 (0.979)	1.002 (0.050) **
	-2 Log Likelihood = 159.424, Chi-square = 4.884, *p* = 0.087, Correct classification = 52.0%		
SNFs	0.985 (0.005) ***	0.998 (0.669)	1.013 (0.003) ***
	-2 Log Likelihood = 151.776, Chi-square = 13.334, *p* = 0.001, Correct classification = 59.0%		
Admissions‡	0.096 (0.299)	0.005 (0.033) **	0.056 (0.130)
	-2 Log Likelihood = 198.804, Chi-square = 5.150, *p* = 0.076, Correct classification = 47.0%		
Discharges‡	14.142 (0.536)	0.437 (0.850)	0.031 (0.284)
	-2 Log Likelihood = 202.711, Chi-square = 1.243, *p* = 0.537, Correct classification = 40.0%		
% of "Extreme" Cases‡	1.2E-34 (0.000) ****	3.2E-31 (0.001) ****	2742.483 (0.572)
	-2 Log Likelihood = 183.410, Chi-square = 20.544, *p* = 0.000, Correct classification = 49.0%		
% Urban Population‡	2.739 (0.565)	144.050 (0.045) **	52.583 (0.074) *
	-2 Log Likelihood = 169.519, Chi-square = 5.612, *p* = 0.060, Correct classification = 45.0%		
Unemployment Rate‡	2.0E+25 (0.005) ***	1.7E23 (0.011) **	0.009 (0.652)
	-2 Log Likelihood = 163.792, Chi-square = 11.339, *p* = 0.003, Correct classification = 43.0%		
CAH			
No CAH members	5.056 (0.015) **	6.806 (0.009) ***	1.346 (0.665)
One or more CAH members	*Reference*	*Reference*	*Reference*
	-2 Log Likelihood = 14.748, Chi-square = 8.113, *p* = 0.017, Correct classification = 46.0%		
Unemployment Rate Change‡	475.46 (0.668)	2.2E10 (0.141)	4.7E7 (0.173)
	-2 Log Likelihood = 172.243, Chi-square = 2.888, *p* = 0.236, Correct classification = 42.0%		
Population Change‡	26.371 (0.307)	0.013 (0.200)	2.5E-6 (0.004) ***
	-2 Log Likelihood = 165.765, Chi-square = 9.366, *p* = 0.009, Correct classification = 62.0%		

Note: ‡ = standard error scores > 2.0 in the univariable logistic regression model results
**=p ≤ 0.10; **=p ≤ 0.05; ***=p ≤ 0.01; ****=p ≤ 0.001*

Vita

Patrick Davis Shay was born on June 30, 1981 in Sellersville, Pennsylvania. He graduated with a Bachelor of Science in Business Administration and a minor in Communications Management from Trinity University in 2003, and he subsequently completed his Masters of Science Degree in Health Care Administration from Trinity University in 2005. Prior to beginning his doctoral studies in Health Services Organization and Research at Virginia Commonwealth University (VCU) in the fall of 2009, Patrick worked as a health care administrator for a post-acute care system in Texas, including nearly three years of service as Director of Operations at an inpatient rehabilitation facility in San Antonio, Texas.

As a doctoral student, he enjoyed the opportunity to work as a graduate assistant with Dr. Stephen S. Mick and Dr. Roice Luke, examining hospital-based clusters in regards to their boundary definitions as well as their levels of differentiation and integration. He was also privileged to serve as a co-editor and contributing co-author with Dr. Mick on the upcoming text, *Advances in Health Care Organization Theory, Second Edition*. While at VCU, Patrick enjoyed teaching an introductory course on the U.S. health care system for undergraduate students, for which he served as a co-instructor for three semesters.

Patrick is married to the former Laura Aubree Lewis of San Angelo, Texas, and they are the proud parents of Elliot (2) and an eagerly anticipated child to be born in the late summer of 2014. In January 2014, they returned to San Antonio, Texas, where Patrick serves as an Assistant Professor in the Department of Health Care Administration at Trinity University.