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# DOES MONEY REALLY MATTER? THE EFFECTS OF ORGANIZATIONAL FINANCES ON QUALITY OF HEALTH CARE

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## ABSTRACT

This dissertation is divided into three separate but related studies pertaining to organizational finances and quality of health care. The first study identifies the pertinent empirical literature on the topic of interest and provides a unifying conceptual framework with reference to each study's focus and quality measures. The second study investigates the finance-quality relationship within Department of Defense hospitals. The third and final study follows a similar investigative approach with federally funded community health centers serving as the unit of analysis.

The purpose of the first study was to uncover the existing empirical literature as it pertains to the relationships between healthcare organizational finances and quality of care. Based on these findings I was able to develop the bases for predictions about how health care organization finances would affect quality within other organizational contexts. Eventually only 16 empirically rigorous studies on this topic were drawn from the available literature between 1980 and 2005. Collectively, these articles indicate that organizational expenses, net margins, and asset and liability management all affect healthcare outcome quality. There is less evidence about how organizational finance factors affect structural or process quality.

The purpose of the second study was to empirically test the association between financial resources and health care quality in Department of Defense hospitals. Financial and organizational data from the 2003 Health Care Survey of Defense Department Beneficiaries (HCSDB) and 1999-2003 data from the Department of Defense Medical Expense Performance Reporting System (MEPRS) are used. I employ a measure of

military treatment facility fiscal margin to predict seven Consumer Assessment of Health Plan Satisfaction (CAHPS) quality dimensions. Ordinary least squares regression analysis and multilevel modeling are the primary statistical methods. Results indicate a significant and positive association between organizational finances and quality outcomes. This indicates that organizations with more financial flexibility may be more adept at meeting or exceeding patient care expectations.

The purpose of the third study was to determine the nature of the finance-quality association within the ambulatory care context. The number of federally funded health centers has increased significantly due to a major Bush administration expansion initiative. As the number of health centers has increased, however, questions remain about financial capacity to provide quality care. In this study, I hypothesize that health centers with greater fiscal margins will provide preventive and primary care to a greater proportion of their patients.

Seven years (1998-2004) of data are used from the Health Resources and Services Administration's Uniform Data System, to test the association between organization finances and four process quality dependent variables, inclusive of two preventive care measures (e.g., percent of patients receiving PAP smears and percent under routine health supervision) and two well child/mother measures (e.g., % receiving first trimester care and % receiving post partum care). Multilevel modeling is the primary statistical method. Results indicate a significant and positive cross sectional association between organizational financial margins and percentages of patients receiving preventive health care. Findings are less supportive or negatively oriented when primary care is the dependent variable of interest. Based on our findings, health center net revenue may be

responsible for initial preventative care improvements, but appears less supportive of primary care service enhancement. Surprisingly, however, we also find the preventative care advantages gained from higher comparative net revenues to diminish while primary care (i.e., post partum care) services are enhanced over time.

In sum, this series of investigations addresses a significant gap in the health services literature pertaining to organizational financing and health care quality for three reasons. First, this research is the first known application of multi-level modeling in research applied to the finance-quality relationship, providing perspective on how organizational finances influence health care quality over time. Second, Department of Defense hospitals and federally funded community health centers are under studied organizations that comprise essential portions of the nation's health care safety net. Third, with the recognized shortcomings in health care quality on a national scale and U.S. health care costs exceeding $1.7 trillion each year – and growing – there has never been a more appropriate time to investigate the finance-quality relationship (CMS, 2006; AHA, 2006).

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## ACKNOWLEDGEMENTS

"Stay focused on and never forget what is important to you and act accordingly"

COL Brian Allgood
Commander, Mentor & Friend
1960-2007

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# CHAPTER 1

# INTRODUCTION

"In God we trust. All others must use data"

W. Edwards Deming

## ORGANIZATION OF THE THESIS

This dissertation follows the alternative journal format as defined by The Graduate School of Penn State University. Although presented in the traditional form, the work is divided into three distinct manuscripts, which have been written for publication in peer-review journals. These three manuscripts comprise Chapters 2, 3 and 4. A unifying conclusion is presented as Chapter 5.

## OVERVIEW OF THE THREE STUDIES

The purpose of the first study, *Does Money Really Matter? A Review of the Literature on the Relationships Between Healthcare Organization Finances and Quality* (hereafter referred to as study one) is to identify the pertinent empirical literature from 1980 to 2005 on relationships between healthcare organizations' finances and quality of health care in order to develop the bases for predictions about how health care organization finances would affect quality. Traditional electronic literature review search techniques are used

to identify the characteristics of organizational financing associated with the various aspects of health care quality.

The purpose of study two, *Does Money Really Matter? The Effects of Fiscal Margin on Quality of Care In Military Treatment Facilities* (hereafter referred to as study two) is to examine the relationship between organizational finances and health care quality in the context of Department of Defense military treatment facilities. Three years of data from the 2003 Health Care Survey of Defense Department Beneficiaries (HCSDB) and the Department of Defense Medical Expense Performance Reporting System (MEPRS) are used to investigate the relationship between treatment facility fiscal margin and seven Consumer Assessment of Health Plan Satisfaction (CAHPS) quality dimensions.

The purpose of study three, *Does Money Really Matter? The Effects of Net Revenue on Community Health Center Clinical Process Quality* (hereafter referred to as study three) is to investigate the connection between organizational finances and health care quality within the ambulatory care setting environment. Seven years (1998-2004) of data from the Health Resources and Services Administration's Uniform Data System are used to research the association between community health center net revenue and four process quality characteristics.

Considered as a whole, these studies examine the relationship between discretionary organizational finances and quality. Although similar in focus, the studies differ in approach in two ways. First, study two examines quality outcomes while study three examines processes quality measures. Second, I utilize two different financial variables of interest to examine my central question. In study two, I use the 'funding per enrollee' of the Defense hospitals as my predictive variable but employ organizational net revenue

in study three. Together, my approach makes the two empirical studies complementary, yet distinctly different in terms of the contexts of study as well as the measures used. Collectively, these three related studies seek to accomplish the following objectives pertaining to organizational quality:

1. To discover the extant relationships between organizational finances and quality as a potential significant contributing force behind sustained quality improvement in health care organizations across the United States.
2. To determine the impact of discretionary organizational financing on health care quality.
3. To uncover the relationship between organizational financing and quality across time.

As a preface to the three studies, I provide some background information on recent US health care expenditures, health care organization financing trends and quality shortcomings prevalent within the United States health care system.

## BACKGROUND ON HEALTH CARE FINANCES & QUALITY

### United States Health Care Expenditures

When considered in the context of the amount of resources dedicated to health care delivery in the United States, the quality shortcomings of the US health care system should not exist. The United State's spending per capita and percentage of Gross Domestic Product (GDP) dedicated to healthcare vastly exceed that of any other nation in the world. As of 2003, health care expenditures consumed 15.3% of US GDP, equating

to $1.7 trillion (NCHS, 2006; WHO, 2006). Considered together, hospital care (31%) and physician/clinical services (22%) combined to consume over half of total US health care expenditures.

## Health Care Organizations

Despite a high level of spending on hospital care, recent years have brought hard times to many of the hospitals and health organizations that comprise the backbone of the United States health care system. Many of these organizations have experienced a lengthy period of diminished or negative profitability – particularly for those that derive funding from government sources. Current estimates reflect a $14 billion shortfall between hospital costs and Medicare, Medicaid and other government reimbursement for services rendered by hospitals. This trend, in part, has diminished hospital total operating margins to levels nearly 22% below pre-1997 levels, placing many of America's hospitals on the edge of financial viability (AHA, 2006).

However, the phenomenon of marginal to negative profitability is not confined solely to the hospital sector. Although differing structurally from the financing of a typical hospital, community health center financing is no less volatile. Community health centers meet the primary care needs of many of the nation's poorest health care recipients in traditionally underserved areas and do so regardless of the patients' ability to pay. The financing of community health centers is derived from a patchwork quilt of Medicaid and Medicare reimbursement, private insurance reimbursement, federal and state grants, patient fees, and community donations (Federal Reserve, 2006). Acting as nonprofit entities often on the brink of financial solvency, community health centers comprise the

backbone of the United State's health care safety net, offering a tailored spectrum of care to over 3,500 communities in underserved urban and rural areas nationwide.

In times of economic uncertainty, hospitals and community health centers face a myriad of challenges in providing high-quality care to their patients. Uninsured, homeless and migrant populations increase with growth in unemployment, placing pressure on health care providers and facilities to provide care within legal and regulatory standards. Local, state and federal budget deficits force reductions in entitlement programs and financially strained organizations find it increasingly difficult to recruit and retain competent staff at below-market wage rates in aging facilities. Rising costs, shifting reimbursement streams, and growing demand make it difficult to obtain financing for working capital, building projects and equipment needs (Federal Reserve, 2006). These difficulties provide a basis for questioning the link between organizational fiscal margins and quality standards.

## Health Care Quality

Health care in the United States has been regarded as the most advanced among industrialized nations in the past. The fact is that the U.S. population does not have anywhere near the best health care in world (Starfield, 2000). Despite the amount of resources dedicated to health care in the United States, the nation ranks 21$^{st}$ in infant death rates and 18$^{th}$ in average life expectancy (WHO, 2006). Although one could argue such statistics are not resultant solely of available health care services, the Institute of Medicine's *To Err is Human* and *Quality Chasm* reports provide copious examples of shortcomings in the current United States infrastructure. For example, according to these reports, between 44,000 and 98,000 Americans die from medical errors annually and only

55% of adult patients receive recommended preventive or chronic care treatment when warranted (Institute of Medicine, 2000; Thomas et al., 2000; Thomas et al., 1999; McGlynn et al., 2003).

The recent landmark reports published by the Institute of Medicine's "Quality Chasm" reports provide a firm basis for investigating the intersection between organizational finances and quality. The IOM committee that developed the Quality Chasm reports highlighted at least two finance-related impediments to improvement of the health care system. Among several other factors, the group recognized 'toxic financing schemes' and 'low investment in system redesign' as problematic areas that must be corrected on a national scale before true quality improvement can be recognized (Berwick, 2002).

Thus, as the costs of providing care to the U.S. population continue to grow and quality concerns remain prevalent, it is imperative that administrators and health policy makers better understand the consequences of financing structures on quality of care.

# CHAPTER 2

## Does Money Really Matter? A Review of the Literature on the Relationships Between Healthcare Organization Finances and Quality


### ABSTRACT

The author reviews empirical literature from 1980 to 2005 on relationships between healthcare organizations' finances and quality of care. Ultimately, only 16 studies of this topic that employed statistical methods were discovered. This research indicates cumulatively that expenses, fiscal margin, and asset and liability management all affect healthcare outcome quality. There is less evidence about how organizational finance factors affect structural or process quality, and there is no information about how structural or process quality mediates between finances and outcomes. The author notes what patterns have emerged from previous studies and make specific suggestions about what future research is necessary and why.

A common but rarely tested assumption pervades the healthcare industry: More money leads to better quality. Does a connection exist? Recent government literature assumes that it does. The Institute of Medicine's *Crossing the Quality Chasm* emphasizes health organization resources as fundamental to quality improvement in the U.S. healthcare system (Berwick 2002; Institute of Medicine 2001). However, there has, in fact, been no comprehensive examination of empirical evidence about how financial resources affect quality.

The purposes of this review are to synthesize extant literature on how financial factors affect healthcare quality and to note what research is most urgently needed next. Toward those ends, I first draw on the most relevant literature from research in other industries. I then examine how specific facets of healthcare organization financing influence different dimensions of quality. Finally, I propose new possibilities for further research that may provide more actionable conclusions for healthcare providers, purchasers, and regulators.

The United State's spending per capita and percentage of gross national product (GNP) dedicated to healthcare vastly exceed those of any other nation in the world. From 1960 to 2000, the percentage of GNP devoted to healthcare expenditures increased from 5.2% to 14.3% (United States General Accounting Office 2005). Despite this disproportionate healthcare investment, the United States falls short of other developed nations on some key metrics. For instance, medically induced accidental death rates and infant mortality rates rival those of nations investing less than one-third of U.S. levels (Starfield 2000; Williams and Torrens 2002). In the aggregate, there appears to be an alarming gap between the level of financial resources dedicated to healthcare and the

quality of care delivered. This raises the questions of what types of investments improve outcomes, and how do they improve outcomes.

There is substantial literature about how nonfinancial factors affect quality and how healthcare quality affects organizations' financial performances (Harkey and Vraciu 1992; Hoff et al. 2004; McCue, Mark, and Harless 2003; Scott and Flood 1984). In contrast, there is a remarkably sparse amount of literature investigating the influence of organizational finances on healthcare quality. Scott and Flood (1984) and Fleming (1990) reviewed the relationship between expenses and quality of hospital care, with mixed results. Hoff et al. investigated how many organizational characteristics affect medical errors, but they did not include finances among the predictors. There has never been a comprehensive review of research on the relationship between healthcare organizations' finances and quality.

Therefore, the current study addresses a significant gap concerning how healthcare organizations' financial status affects the quality of care they provide. Seeking relevant literature on other service providers for which safety is salient, I also cite studies conducted in the railroad and airline industries. Understanding patterns from extant literature assists in predicting when and how money may affect healthcare quality. There is also compelling relevance to health policy makers and administrators responsible for managing within limited budgets, because awareness of known empirical relationships can assist them in directing those resources for maximum human benefit.

## CONCEPTUALIZING QUALITY AND ORGANIZATIONAL FINANCES

### Quality as a Sequence of Stages

Healthcare quality may be usefully conceptualized in stages, from structures to processes to outcomes (Donabedian 1980). Structural quality involves the resources used to deliver care and the environment in which healthcare is delivered. Common measures of structural quality include accreditation, staffing, equipment availability, health and safety code compliance, staff licensure, and board certification (Donabedian 1980; Dranove and White 1999).

Process quality refers to the appropriateness, efficiency, and effectiveness of both technical and interpersonal methods used to provide healthcare. Examples include length of stay, procedure duration, and clinical adherence to established practice guidelines (Donabedian 1980; Scott and Flood 1984; Yesalis 2005). Outcome quality is determined by changes to health status attributable to care received. Measures include rates of morbidity, mortality, infection or other complications, recovery, disability, and rehospitalization (Donabedian; Iezzoni et al. 2002; Scott and Flood 1984).

### Healthcare Organizations' Finances

Financial characteristics are observable indicators of health organization financial status, such as profit margin, fiscal margin, and investment ratios, which can be derived from standard financial documents, yearly operating reports, or similar organizational data sources. In the review below, I consider separately evidence about three types of financial characteristics that I anticipated might affect quality in different ways—expenses, fiscal

margin, and asset and liability management. The assessment of organizational financial health via targeted metrics is not uncommon. In-depth financial analysis involves review of aspects of organizational efficiency, leverage, expense coverage, and profitability. I review the impact of specific financial elements on quality. Although connected, particularly within the context of the individual organization, each of these categories relates to a distinct dimension of organizational financial activity. For example, a hospital might enhance quality by dedicating a high level of expense to the delivery of care, but at the same time it undermines quality through reduced financial flexibility or facility investment.

Expenses indicate the costs incurred in healthcare delivery. Evidence from a variety of industries indicates that fiscally solvent firms tend to produce goods that are both more expensive and higher quality. In contrast, fiscally distressed organizations are more likely to trim operating margins and lower quality standards in pursuit of short-term profitability (Allen 1984; Klein and Leffler 1981). In healthcare, the proportion of organizational expenses devoted to medical care may provide direct insight into commitment to healthcare quality (Interstudy 2004). For this review, I included the following variants of expense: medical, administrative, medical payroll, inpatient operating costs, and total expenditures per patient per day.

Fiscal margin reflects the degree of financial flexibility that an organization has. In an analysis of the airline industry, Rose (1990) investigated the influence of operating margin and profitability on quality, as defined by airline safety. Rose

concluded that circumstances exist under which firms would compromise quality, particularly in times of financial difficulty. Within the current review, I consider the following as types of fiscal margin: operating margin, fund balances, earnings growth, net worth, and profits.

Asset and liability management indicate the commitment of management to reinvest in organizational infrastructure or long-term financial strength. Examples include investment in property, plant, and equipment; asset availability; returns on assets; and debt management. Studies outside healthcare have found that product-focused organizational spending (Allen 1984; Klein and Leffler 1981) and positive operating margin levels (Rose 1990) contribute to higher levels of quality. Likewise, Noronha and Singal (2004) found effective airline debt management was associated with better safety outcomes.

## METHODS

### Databases Searched and Criteria for Study Inclusion

I identified articles referenced in the following sections in *ProQuest Direct*, *Web of Science Social Science Index*, and *Medline* databases and used the following key words: assets, expenses, finance, fiscal margin, fiscal pressure, healthcare, hospitals, profit margin, and quality. Those retained in the final review (*a*) are peer-reviewed, (*b*) are from 1980 or later, (*c*) pertain to health organizations, (*d*) use quantitative data, (*e*) measure financial status directly, and (*f*) focus on the influence of finances on quality. Figure 1 reflects the final 16 articles that meet all selection criteria.

### Resultant Sample of Studies

By far the most common type of healthcare organization represented in available literature was hospitals (12 studies). Three additional studies examine health plans, and one article investigates long-term care facilities. Thus, I have no direct evidence of how finances affect quality in a variety of other important types of healthcare providers, including ambulatory care, home healthcare, behavioral treatment facilities, and specialty care providers, such as freestanding imaging centers, surgical centers, and dialysis facilities.

## RESULTS

### Effects of Healthcare Organizations' Finances on Outcome Quality

I begin analysis of the literature with the outcome quality dimension for two reasons. First, outcomes arguably constitute the most important stage of quality; structures and processes are how providers get there. Second, and likely related to the first point, there has been much more research to date on the effects of healthcare organizations' finances on outcomes than structural or process quality. Quality outcome measures are employed by 12 of the 16 studies reviewed here. The most commonly examined types of fiscal factors were medical expenditures and fiscal margin; 11 of the 16 studies reviewed used some variation of one of these two categories in their analysis. As I explain below, in all but two cases, the link was found to be significant and positive.

### *Expenses*

Research in other service industries suggests that levels of expenditures do affect outcomes quality (Golbe 1983; 1986; Rose 1990). In each case, I found higher relative expenses to be associated with fewer adverse events. In my review, a total of six studies relate expense to outcome quality. My findings are largely consistent with those from other industries.

In an early study of 1,200 nonfederal hospitals, Flood, Scott, and Ewy (1984) found that facilities with higher total expenditures per patient day had lower mortality rates. Kuhn et al. (1991) found patients at greater risk of negligent injury if treated in a hospital with lower inpatient operating costs, as measured by clinical payroll expenses.

Cleverley and Harvey (1992) used staff hours per adjusted discharge in their study of eight high-mortality hospitals. The authors found seven of the eight hospitals to have lower median staff hours per adjusted discharge than did similar hospitals. In a study of 51 New York hospitals, Burstin et al. (1993) found the percentage of negligent adverse events to be significantly higher in hospitals with inpatient operating costs in the lowest quartile.

Financial management appears to affect quality in health plans as well as provider organizations. Himmelstein and Woolhandler (2002) examined associations between administrative loss ratio and quality of care in approximately 300 health plans. The authors defined administrative loss ratio as the ratio of total administrative expenses to total premium revenues. They derived quality measures from the National Committee for Quality Assurance (NCQA) Quality Compass, including the Health Plan Employer Data and Information Set (HEDIS) and HMO accreditation surveys (Himmelstein and

Woolhandler, 2002). Higher administrative costs were associated with lower quality across the entire study period of four years. This indicates that nondirect healthcare expenditures may result in suboptimal care.

Schultz et al. (1999) yielded the sole differing finding. This study found total operating expenses per patient per day to be significantly and positively related to mortality in cases of acute myocardial infarction. The authors noted that health organizations with higher total operating expenses per patient per day may have been allocating those resources inefficiently.

### *Fiscal Margin*

Having more financial latitude may provide some healthcare organizations with ways of supporting quality that others cannot afford. Evidence from other industries indicates that financial flexibility enhances service quality. For example, more profitable railroads experience fewer accidents per mile than do their less fiscally sound counterparts (Golbe 1983). We found five studies relating fiscal margin to outcome quality in the healthcare sector.

Burstin et al. (1993) found that New York hospitals in the bottom quartile of fund balance levels were 14.8% more likely to experience adverse events than were those in the top quartile. In Australia, there was a significant decline in satisfaction of postpartum mothers after government-financed public hospitals experienced a 15% budget cut (Brown and Lumley 1998). Similarly, Youn and Wan (2001) found fund availability to be inversely associated with preventable mortality in 832 hospitals. Most recently, Encinosa and Bernard's (2005) study of 176 Florida hospitals showed an inverse

relationship between current period profit margins and subsequent year adverse patient safety events.

The evidence from other types of healthcare providers and health plans about the effects of fiscal margin on quality is mixed. In a sample of 1,100 nursing homes, high profits were associated with lower quality, particularly among proprietary facilities (O'Neill et al. 2003). This study may indicate a threshold at which marginal returns of financial flexibility become harmful to the organization. These findings may also indicate something distinctive about nursing homes relative to other types of healthcare providers. In contrast, in a study of 200 health plans, Born and Simon (2001) found that above-average earnings growth was positively associated with subsequent levels of effectiveness of care HEDIS measures.

### *Asset and Liability Management*

Recent evidence from the airline industry suggests that successful asset and liability management can improve safety outcomes (Noronha and Singal 2004). A series of studies conducted in the early 1990s in hospital settings had parallel findings. Cleverly and Harvey (1992) found investment in fixed assets to predict lower mortality rates. Likewise, hospitals experiencing higher liabilities and lower available assets had higher rates of negligent adverse events in the hospital study conducted by Burstin et al. (1993). Finally, Levitt (1994) found negative associations between total asset availability and investment in hospital property, plant, and equipment, respectively, and hospital-specific confirmed failure rates determined by Peer Review Organization Generic Quality

Screens[†]. Thus, all three studies in acute-care settings found investment in organizational infrastructure to be positively related to quality. However, this phenomenon may not apply to all healthcare contexts. O'Neil et al. (2003) did not find a link between asset availability (liabilities:assets ratio) and long-term care system deficiencies.

### *Summary of the Impact of Finances on Outcome Quality*

With two notable exceptions (O'Neill et al. 2003; Schultz et al. 1999), the preceding studies indicate significant positive effects of increased medical spending, fiscal margins, and asset management on outcome measures of healthcare quality. Additionally, Himmelstein and Woolhandler (2002) observed the negative influence of administrative expenses on quality. Overall, there is robust support from a range of studies for the positive effects of higher expenses, greater fiscal margin, and more successful asset and liability management on outcome quality.

## Effects of Healthcare Organizations' Finances on Structural Quality

Only two studies in the last 25 years have examined the influence of healthcare organizations' financial characteristics on structural quality. The researchers examined two financial factors in the course of the research: fiscal margin and asset management.

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[†] For a complete review of on the PRO program and the GQS process, see Lohr (1990). These data result from practitioner reviews of medical care grouped into seven categories: adequacy of discharge planning, medical stability of patients at discharge, deaths, nosocomial infections, unscheduled returns to surgery, trauma suffered in the hospital, and delays or errors in treatment.

### *Fiscal Margin*

Duffy and Friedman (1993) examined 490 hospitals with persistent negative operating margins to see if this financial factor affected structural quality, measured as nurse-staffing ratios, the proportion of board certified physicians, and full-time equivalents (FTE) per admission. Findings did not support a relationship between prior period financial performance and quality thus measured. The authors concluded that the lack of short-term impact of financial losses on quality may have been due to hospitals' abilities to offset deficits with other sources of revenue. However, those persistent losses did tend to lead to lower investment in facility assets, such as computerized tomography, MRIs, or cardiac catheterization laboratory ownership.

In keeping with Duffy and Friedman's (1993) finding about quality-related facility investments, Langland-Orban, Gapenski, and Vogel (1996) found a higher percentage of Florida hospitals with high pretax fiscal margins compared with those with low margins, to have the highest Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) accreditation status. These two studies cumulatively indicate that, while healthcare organizations may in some instances compensate for short-term losses, positive fiscal margins are generally necessary to support the infrastructure and staffing investments conducive to sustained higher quality.

### *Asset and Liability Management*

In the study of hospital profitability and quality described above, Langland-Orban, Gapenski, and Vogel (1996) also found a statistically significant relationship between health organization pretax returns on assets and JCAHO score outcomes.

### *Summary of the Impact of Finances on Structural Quality*

The pattern of findings in this area is scant but consistent. Similar to what Rose (1990) and Noronha and Singal (2004) discovered in their studies of the airline industry, fiscal margins appear to provide healthcare organizations with the means to invest in structural quality and thus improve the infrastructure and environment by which care is delivered.

## Effects of Healthcare Organizations' Finances on Process Quality

Four of the studies reviewed examined the effects of healthcare organizations' finances on process quality, specifically examining medical expenses, administrative expenses, and fiscal margin.

### *Expenses*

Research in other industries indicates that firms with greater financial stability are able to produce higher quality products in a more timely manner (Allen, 1984; Klein and Leffler, 1981). In the sole study examining medical expense impact on process quality, Born and Geckler (1998) found a positive relationship between medical expense ratios and quality of preventive care initiatives in a nationally representative study of 76 large U.S. health plans. Health organizations in the quality top quartile dedicated 12.9% more

on average to medical expenses than did those in the lowest quartile in quality. Based on the reciprocal relationship between medical and administrative expenses, these authors also found an inverse relationship between health organizations' administrative expenses and quality performance. Health organizations ranked in the preventive quality top quartile spent 11.9% less on administrative expenses than did the lowest ranked plans. These findings suggest that a higher level of quality can be achieved by plans that dedicate a higher percentage of resources to providing medical care.

### *Fiscal Margin*

Prior research within the airline and railroad industries suggests a positive influence of fiscal margin on process quality, specifically the capacity to maintain current preventive maintenance schedules (Maksimovic and Titman 1991; Rose 1990). This fits with the generally positive associations noted between fiscal margin and structural quality in healthcare; organizations with more resources to invest in structural quality may yield better processes as well.

In a sample of 816 short-term hospitals, lower profitability associated with decreased Medicare length of stay, regardless of patients' acuities, as well as lower rates of outpatient visits. Hospitals under high fiscal pressure were also slower than were those facing less pressure to increase total spending (Hadley, Zuckerman, and Feder 1989). Subsequent work has yielded mixed results. Duffy and Friedman (1993) were unable to establish a short-term relationship between revenue margin and case-mix adjusted length of stay in their study of 490 hospitals. However, in the study by Langland-Orban,

Gapenski, and Vogel (1996) of 140 private Florida hospitals, hospitals with higher pretax fiscal margins had lower adjusted average length of stay with higher case-mix indexes.

### *Summary of the Impact of Finances on Process Quality*

Although there were only four empirical studies examining how healthcare organization finances affected process quality, the results were sufficiently consistent to allow some inferences. The studies suggest a positive effect of higher levels of medical spending, profitability, and fiscal margins on process quality for healthcare organizations. This indicates that financially robust healthcare organizations are better able to adequately resource the staffing, equipment, and infrastructure that support care delivery. Specifically, increased financial flexibility results in increased use of preventive and wellness measures and lower length of stay (Born and Geckler 1998; Hadley, Zuckerman, and Feder 1989; Langland-Orban, Gapenski, and Vogel 1996).

## DISCUSSION

There is now generally consistent—albeit sometimes sparse—evidence about how a few aspects of healthcare organizational finance affect quality. First, expenses related to the delivery of healthcare are positively associated with both process and outcome quality (Born and Geckler 1998; Burstin et al. 1993; Cleverley and Harvey 1992; Flood et al. 1984; Kuhn et al. 1991). Conversely, excessively high administrative expenses and profits are indicative of a managerial focus away from quality enhancing initiatives (Born and Geckler; Himmelstein and Woolhandler 2002; O'Neill et al. 2003).

Second, fiscal margin levels appear to influence structural, process, and outcome qualities. Health organizations with spare financial resources appear more able to make the requisite adjustments in staffing, infrastructure and equipment to facilitate quality (Born and Simon 2001; Burstin et al. 1993; Encinosa and Bernard 2005; Hadley, Zuckerman, and Feder 1989; Langland-Orban, Gapenski, and Vogel 1996; Youn and Wan 2001). Based on this evidence, it appears that financial leverage provides administrators with alternatives not available to their financially constrained counterparts. This could translate into quality upgrades ranging from updated waiting room periodicals to improved diagnostic technology to higher quality staff.

Finally, higher levels of investment in fixed assets appear to affect structural and outcome quality (Cleverley and Harvey 1992; Langland-Orban, Gapenski, and Vogel 1996; Levitt 1994). Conversely, healthcare organizations lacking the requisite financial flexibility might delay new projects or defer maintenance of human or physical capital. Thus, fiscal health appears to affect investments in quality improvement initiatives. As in the airline and railroad industries (Golbe 1983; 1986; Noronha and Singal 2004; Rose 1990), financial flexibility among health organizations appears to make a difference in the quality of care delivered.

There are, however, a number of important gaps in this literature. First, there has been very little examination of what additional factors may moderate associations between organizational finance and quality. There is now, for instance, substantial evidence that hospitals engaging in management practices supportive of nursing also achieve improved quality outcomes (Aiken, Clarke, and Sloane 2002; Aiken et al. 2002; Laschinger, Shamian, and Thomson 2001). Future studies might usefully examine how these

management practices may interact with financial status to affect patient care quality. It is possible, for instance, that managers may be able to reduce the negative effects of at least short-term financial shortages by employing practices such as evidence-based and participatory decision-making.

Second, there is very little empirical evidence about the effects of finances on quality for providers other than hospitals and none at all for some major types of healthcare providers. Given the increasing importance and distinctive attributes of subacute care, there is an urgent need for research that tests the generality of findings from hospitals to these other settings.

Finally, at this point there have been very few longitudinal studies on processes that we know unfold over time. Longitudinal research may extract when different types of financial factors affect types of quality. This type of information will help managers identify how to intervene most appropriately.

## CONCLUSION

At the onset of this article, I sought to synthesize the last quarter century of literature on how healthcare organizational financing influences quality. Given the rapidly rising healthcare costs over this period and the national attention this has generated, I expected to find substantial evidence of this phenomenon. Perhaps my most striking finding is how little empirical examination of this topic has occurred. In the past 25 years, a total of 16 empirical articles have been published on how healthcare organizations' finances affect quality—this equals less than one a year.

This article has contributed to the healthcare management literature in two important ways. First, I have noted what patterns have emerged from studies conducted to date. These findings alone have actionable implications. For instance, group health purchasers have empirical justification to look for providers with high medical expenses and greater fiscal margins. Second, I have shown what types of investigations need to take place in the future and provided a suggested order in which they might occur. My future research agenda involves unpacking the black box of finance–quality relationships and identifying what structural and process factors translate money into quality.

The work I suggest has critical implications for healthcare organization managers, consumers, and the healthcare purchasers who represent them, as well as legislative policy makers. Managers need to know which structural factors translate financial resources into high-quality processes and outcomes in order to maximize the impact of their investments. Managers of health facilities with tighter budgets could also benefit from findings about moderators that indicate what they can do to mitigate the negative effects of financial scarcity. Healthcare purchasers could also benefit from knowing which financial attributes best predict both process and outcome quality. Group purchasers may be interested in what factors may improve or diminish the quality return on their investments. Finally, legislators may benefit from a better understanding of which financial factors may serve as possible financial early-warning signals about the quality of care provided in healthcare facilities.

Healthcare costs will continue to undergo justified public scrutiny as their proportion of the U.S. economy increases. Participants at all levels of the healthcare system deserve a rigorous evidence basis for decisions about where to invest these resources.

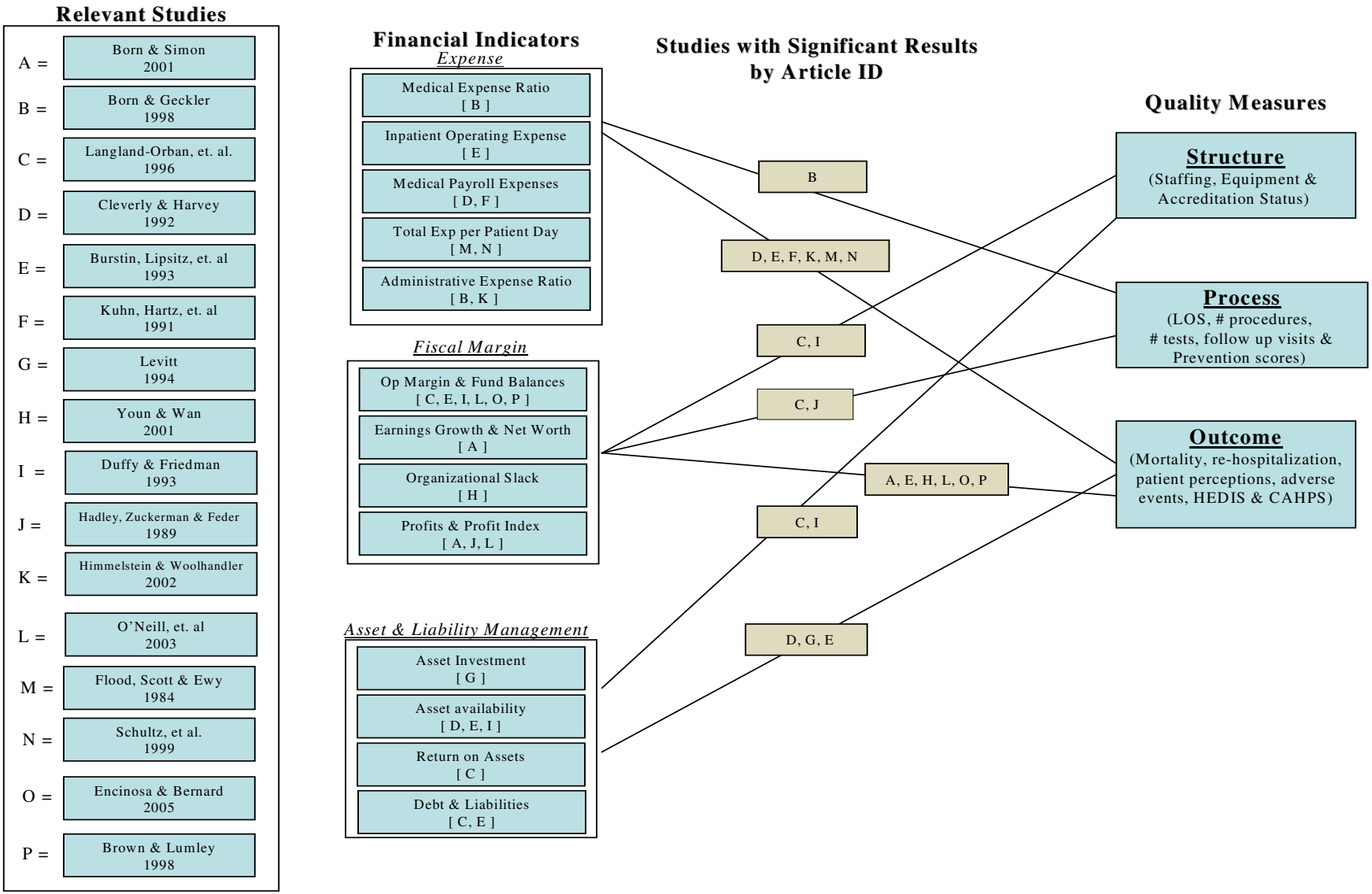


Figure **2-1**: 1980-2005 Empirical Research of the Influence of Organizational Level Financial Characteristics on Health Care Quality

# CHAPTER 3

## Does Money Really Matter?
## The Effects of Fiscal Margin on Quality of Care
## In Military Treatment Facilities

### ABSTRACT

This study was prompted by an escalating interest in the quality of health care provided within the United States. The author hypothesizes that one determinant of quality is the adequacy of financial resources available to the health care organization.

The author addresses his question by using data from two Defense Department sources: the 2003 Health Care Survey of Defense Department Beneficiaries (HCSDB) and 1999-2003 data from the Department of Defense Medical Expense Performance Reporting System (MEPRS). The author uses a measure of military treatment facility fiscal margin to predict seven Consumer Assessment of Health Plan Satisfaction (CAHPS) quality dimensions. Regression analysis and multilevel modeling are the primary statistical methods. Results indicate a significant and positive association between organizational financial strength and quality outcomes. This finding indicates that organizations with more financial flexibility may be more adept at meeting or exceeding patient care expectations.

## INTRODUCTION

Quality improvement is arguably the single most important issue in modern health care. In an industry that consumes over 15% of the U.S. Gross Domestic Product – over 1.7 *trillion* dollars annually – there is mounting concern about both the financial health of the nation's health care providers and the quality of care they provide (NCHS, 2006). Roughly 60% percent of hospitals lose money providing patient care and 30% percent operate at an annual loss (American Hospital Assocation [AHA] 2006). Hospital payment shortfalls relative to government reimbursements exceeded $14 billion as recently as 2003 (AHA). Meanwhile, between 44,000 and 98,000 Americans die from medical errors annually and more than 50% of patients with chronic conditions (e.g., diabetes, asthma, hypertension) are managed inadequately (Clark, et al., 2000; Institute Of Medicine [IOM] 2001; Thomas, et. al., 2000).

Although the current health services literature speaks anecdotally to the importance of financial resources within health care organizations, few researchers have empirically explored the finance-quality relationship. In the current study, I pursue this agenda and test whether organizational finances may be a factor that contributes to and sustains quality (Deming, 1986; Green & Katz, 1997; IOM, 1999; Starfield, 2000; World Health Organization [WHO] 2000; Grazier, 2004). Specifically, I examine associations between hospital finances and quality in an overlooked segment of the health care environment: the hospitals of the Department of Defense medical system.

Military hospitals constitute a significant portion of the overall U.S. health care landscape, serving 9.2 million beneficiaries at an annual cost in excess of $37 billion (Congressional Budget Office [CBO] 2003; Winkenwerder, 2005). Defense hospitals are responsible – directly or indirectly – for the bulk of total military health system spending and face many of the same

environmental pressures common in private sector health care (Winkenwerder). In some ways, military treatment facilities are part of a distinct health care system, with a defined patient population and complete accountability to a single hierarchy of key stakeholders. In other ways, however, these facilities are arguably similar to non-military hospitals. Military treatment facilities continually struggle to meet diverse and dynamic environmental demands with limited resources and must modernize, retain appropriate staff, and improve patient outcomes. Further as government financed health care organizations, military treatment facilities are subject to similar regulatory oversight as non-military facilities (e.g., JCAHO, OSHA, etc.). The power of such regulation is common to all health care providers that accept federally sponsored insurance.

Like civilian institutions, Defense hospitals funding varies according to organizational mission, size, and history. There are also recognized differences in patient perceptions of quality (TRICARE, 2003). This raises a question that has, surprisingly, never been empirically addressed: *Are higher levels of funding associated with better quality in Defense health care facilities?* I investigated this question in three stages. First, I examined whether funding per enrollee was associated with quality of care cross sectionally within military hospitals. Second, I determined whether funding per enrollee was associated with changes in quality over time. Third and finally, I explored what factors affected the influence of funding on health care quality.

In my examination of these three areas, I intends to improve understanding of how hospital financial resources may affect quality. In the sections that follow, I provide a background on the relationship between military hospital finances and quality, and present the theoretical basis of my research. I then outline my methodology through which I tested my relationship of

interest. Given the intense pressures to restrain cost increases, health care managers and purchasers may benefit from the ability to foresee what the quality yields are for hospitals with greater financial resources.

## BACKGROUND

Because of the varying dimensions of the health care experience, defining precisely what quality entails is a challenging endeavor. For the purposes of this study, I used JCAHO's definition of quality as 'the degree to which patient care services increase the probability of desired outcomes given the current state of knowledge' (Green & Katz, 1997, pg. 8). Fundamentally, quality improvement is a form of organizational change. Change is challenging for all organizations, but increasingly necessary for health care organizations to meet consumer and governing body expectations (Green & Katz). Organizational change is particularly difficult for bureaucracies such as hospitals, because of the rules and hierarchies intended to ensure predictability (Gouldner, 1954; Merton, 1957; Selznick, 1966; Flood, et al., 2000). The current study builds on the premise that higher funding levels may assist hospitals in overcoming the barriers to quality improvement (Green & Katz, 1997). It takes money to procure more advanced diagnostic equipment, make process improvements, hire staff, or invest in physical infrastructure, all of which have been associated with improved patient outcomes (Alexander, et al., 2006; Donabedian, Wheeler, and Wyszewianski, 1982; Green & Katz, 1997). However, at this point, however, as intuitive as this claim is, existing literature does not provide evidence of the relationship within the context of military hospitals. The current study contributes to the evidence basis for health care management by testing the theory that military

hospitals with higher per enrollee funding, after controlling for factors such as size, have the latitude to improve health care quality.

The quality improvement literature assumes that hospital finances affect the quality of products or services delivered. For instance, Donabedian, Wheeler, and Wyszewianski (1982) proposed that improvements in health status, an outcome indicator of quality, were influenced by the resources available to the physician. Other researchers have recognized that financial resources affect strategic planning and managerial decisions to combine inputs to production and implement quality-enhanced services (Green & Katz; Marcus, 2005).

The effects of organizational resources on performance have emerged in several fields of study. Theories as disparate as neoinstitutionalism, resource dependence, population ecology, and contingency theory address how financial scarcity may constrain organizational change (Cyert & March, 1963; Hannan & Freeman, 1977; Kraatz & Zajac, 1996; Schoonhoven, 1981), serve as a catalyst to organizational effectiveness (Emerson, 1962), and enhance organizational survival (Pfeffer & Salancik, 1978; Casciaro & Piskorski, 2005). Although organizational financing was not the primary focus of these theories, all researchers shared the assumption that money affects managerial options.

Most previous empirical investigations of quality determinants have been in the industrial literature. Rose (1990) and Noronha and Singal (2004) investigated the influence of operating margin and profitability on quality, defined in terms of safety, in the airline industry. These researchers concluded that circumstances existed under which firms would compromise quality, particularly in times of financial difficulty. Other empirical findings suggest that levels of discretionary organizational finances affect quality (Allen, 1986; Burstin, et al., 1993; Golbe,

1983; 1986). In each case, the researchers found that organizations able to dedicate higher levels of resources to core business functions experienced fewer adverse events.

There is also evidence from a range of health care settings that financial resources support quality. Researchers have established a relationship between discretionary organizational finances and negligent adverse events (Encinosa & Bernard, 2005; Langa & Sussman, 1993), incident rates of cardiac revascularization (Cutler, 1995), mortality rates (Schupfer & Bapst, 2005; Youn & Wan, 2001), patient satisfaction (Brown & Lumley, 1998), level of services (Dranove & White, 1998), "effectiveness of care" quality measures (Born & Simon, 2001), and short term health outcomes (Shen, 2003).

Based on this pattern of results, my interest lies in testing for the existence of similar effects within the Defense health care system. Despite their potentially distinctive attributes as bureaucratic health care organizations with a unique financing structure, I predicted that previous literature would apply, and thus that:

> Hypothesis 1a: There will be a positive association between funding per enrollee in a given year and the change in quality level of military treatment facilities in the subsequent year.

My second research hypothesis focused on whether hospital funding was associated with change in quality over time. Previous health care related studies have been confined to multiple cross-sectional analyses (Cleverly & Harvey, 1994; Langland-Orban, 1996; Levitt, 1994; Youn & Wan, 2001). In general, these researchers found a persistent and significant impact of organizational finances on quality. Given the difference in financing structures between private (e.g., fee for service, capitation) and public (e.g., Congressional appropriation) health care facilities, it was unclear whether financial characteristics influence the rate of change in quality

over time. However, investments in quality improvement initiatives are often based on the premise of sustained or even increasing quality gains over time, especially in an organization where profitability and cost cutting are not the primary motivation of management (Crosby, 1979; Green & Katz, 1997). Therefore, I propose the following hypothesis:

Hypothesis 1b: Higher levels of military treatment facility funding per enrollee are associated with increases in health care quality over time.

My final hypothesis related to the factors affecting the influence of funding on health care quality. Although I found no prior empirical evidence that paralleled my research focus, organizational and environmental moderating factors are suggested by organizational theory and previous health care studies (Hannan & Freeman, 1984; Scott & Flood, 1984). On the basis of these literatures and the potential quality implications of administrative practices connected with size, location and branch of service, I examined each to identify how they might alter the influence of hospital funding on quality outcomes.

A military facility's branch of service affiliation may alter the effect of fiscal margin on quality by varying resource allocation methods, clinical and administrative standard operating procedures, and managerial practices. Job-related demands and other hardships imposed on military service members may result in transference of dissatisfaction to all military-related services rendered (Bliese and Halvorsen, 1996). Geographic region may also influence quality through altered beneficiary perceptions, because active duty service member perceptions of service quality may be influenced by the location-specific attributes of the current assignment (e.g., physical environment, available activities, remoteness). Thus, outcomes may be based partially on physical location rather than hospital aptitude. Finally, health care facility size may

moderate the influence of discretionary finances on quality through patient mix and resource intensity (Donabedian, 1980). Therefore, I propose the following hypothesis:

Hypothesis 2: Hospital branch of service, geographic location, and size will each significantly moderate the military hospital funding-quality relationship.

## METHODS

### *Population Data*

I collected data for this study from two Defense Department sources: the 2003 Health Care Survey of Defense Department Beneficiaries (HCSDB) and 1999-2003 data from the Department of Defense Medical Expense Performance Reporting System (MEPRS). The HCSDB provides Consumer Assessment of Health Plan Satisfaction (CAHPS) 2.0 quality data provided the dependent variables for this research. Data are available for 94 Defense hospitals in a single cross section (n = 94) and 282 observations across the three available years of HCSDB data. The 94 Defense hospitals comprise the entire population of interest within the continental United States. Thus, although p-values are reported, the results obtained are population parameters and not statistical estimates. In this study, I focused my investigation on active duty service men and women. This approach allowed me to reduce the influence of exogenous variables such as socio-economic status and co-morbidity factors and to more clearly discern the magnitude of the relationship of interest. MEPRS provided the source of the financial variables of interest. MEPRS is the standardized cost accounting system for the military health system, containing financial, personnel, and workload data from all military hospitals worldwide.

## *Measures*

The independent variable of interest was specified as a lagged measure of total funding per enrollee at the hospital level. Table 1 shows the distribution of the funding per enrollee measure across the study period. This measure is consistent with previous studies in their investigation of the finance-quality relationship (Born & Simon, 2001; Langa & Sussman, 1993). A one-year lag between independent and dependent variables allowed for administrative lead time (e.g., contracting, procurement, hiring) known to impact implementation of resources within the Defense Department. Alternative lag periods were tested, with the single year lag providing the most consistent results across outcome measures. The funding per enrollee measure was not adjusted by the annual inflation rate as federal budgets are presently adjusted for inflation. This eliminated the need for me to repeat the process in my analysis.

I used hospital CAHPS scores as the dependent quality variables. For the purposes of my study, I focused exclusively on outcome indicators of quality because these indicate the final results of the health care experience and are increasingly the focus of quality experts (Green & Katz, 1997; Drucker, 1985; Himmelstein, et al., 1999). A broad range of dependent variables was selected from the available data to provide a comprehensive picture of the finance-quality relationship. These variables are listed in Table 2. These measures were found to be moderately correlated (average = 0.54), but not to the degree where a Bonferroni correction was warranted (Perneger, 1998). The more liberal Dunn-Sidak adjustment was used which accounted for correlation in outcome measures but at a less restrictive threshold than the Bonferroni approach (Sokal and Rohlf, 1995). Results are presented both without adjustment to

the family-wise error rate ($\alpha = 0.05$) and after the Dunn-Sidak correction ($\alpha = 0.02$) (Sankoh, Huque & Dubey, 1997).

I also introduced branch of service affiliation (e.g., Army, Navy, Air Force), facility size (e.g., large medical tertiary medical center vs. clinic) and geographic region (e.g., north, south or west) into the model as both moderating and control factors. There were 29 Army, 21 Navy and 44 Air Force facilities in the data set. These facilities are dispersed across the continental United States with 26 in the north, 31 in the south and 37 in the west. Facilities also vary in size. The data set consisted of 14 medical centers, 26 large hospitals, 15 small hospitals, 28 large clinics and 11 small clinics. Each of the above control measures was dummy coded. For the purposes of this analysis, Army small clinics in the northern region served as the referent category.

## ***Models***

Investigation of Hypothesis #1a (direct effects) and Hypothesis #2 (moderating effects) was accomplished by using regression analysis. For Hypothesis #1b (effect of finance over time), I used a multilevel growth model to investigate the influence of organizational financial attributes on quality over time (Singer, 1998; Singer & Willet, 2003). The use of a growth modeling approach was warranted as medical treatment facilities varied significantly in change over time in quality as well as in their levels of quality at any point in time and thus required a model that allowed for testing variation in intercept and slope (Bliese and Ployhart, 2002). I established significant associations (e.g. $\beta_1 \neq 0$) were established at $\alpha < 0.05$ and adjusted to $\alpha < 0.02$ based

on the Dunn-Sidak adjustment (Sankoh, et al., 1997). The models testing these hypotheses are presented below.

**Hypotheses #1a** [Testing the cross sectional association between funding and quality]:

$$Q_{2003} = \beta_0 + \beta_1 \text{ Funding per enrollee}_{2002} + \beta_2 \text{ Branch} + \beta_3 \text{ Region} + \beta_4 \text{ Size} + \varepsilon$$

**Hypotheses #1b** [Testing the influence of funding per enrollee on quality over time]

Level 1: Time Varying Predictors

$$Qij = \Pi 0i + \Pi 1i(\text{Time})\ ij + rij \quad \text{where } rij \sim N(0, \sigma 2)$$

Level 2: Time Invariant Predictors

$$\Pi 0i = \beta 00 + \beta 01(\text{Funding per enrollee}\dagger)i + \beta 02(\text{Branch})\ i + \beta 03(\text{Region})\ i + \beta 04(\text{Size})\ i + u0j$$

$$\Pi 1i = \beta 10 + \beta 11(\text{Funding per enrollee}\dagger)\ i + \beta 12(\text{Branch})\ i + \beta 13(\text{Region})\ i + \beta 14(\text{Size})\ i + u1j$$

Where: † =hospital (grand mean centered) value at baseline,
i = individual hospital, j = time

The primary intent of my second model was to explain $\Pi_{1i,}$ the change over time in quality, due to funding per enrollee. In this model, the dependent variable (Q) represented the CAHPS score of hospital 'i' in the year 'j'. $\beta_{00}$ represented the average intercept across all hospitals. $\beta_{01}$ indicated the contribution that hospital funding per enrollee was expected to make on hospital quality intercept at baseline. $\beta_{02}$ characterized the influence on intercept due to branch of service affiliation. $\beta_{03}$ denoted the variation in intercept due to hospital region. $\beta_{04}$ showed the change in intercept for hospital 'i' due to size. $\beta_{10}$ measured the average slope for hospital 'i' across to time. $\beta_{11}$ was the change in slope over time for hospital 'i' due to the grand mean funding per enrollee measure. $\beta_{12,}$ $\beta_{13}$ and $\beta_{14}$ controlled for the effects of branch of service,

region and hospital size on the change in slope over time. The error terms (e.g., $u_{0j}$, $u_{1j}$ (Time), and $r_{ij}$) represented random effects for the intercept, the time slope, and the within-hospital residual respectively.

**Hypotheses #2** [Testing moderating influences on the finance-quality association]

$$Q_{2003} = \beta_0 + \beta_1 \text{ Funding per enrollee}_{2002} + \beta_2 \text{ Branch} + \beta_3 \text{ Funding per enrollee*Branch} + \beta_4 \text{ Size} + \beta_5 \text{ Region} + \varepsilon$$

$$Q_{2003} = \beta_0 + \beta_1 \text{ Funding per enrollee}_{2002} + \beta_2 \text{ Region} + \beta_3 \text{ Funding per enrollee*Region} + \beta_4 \text{ Branch} + \beta_5 \text{ Size} + \varepsilon$$

$$Q_{2003} = \beta_0 + \beta_1 \text{ Funding per enrollee}_{2002} + \beta_2 \text{ Size} + \beta_3 \text{ Funding per enrollee*Size} + \beta_4 \text{ Branch} + \beta_5 \text{ Region} + \varepsilon$$

## RESULTS

The present investigation extends the work from prior literature in its investigation of the finance-quality relationship within a different organizational context. In general, my results were consistent with the findings of prior private sector research that have indicated a significant and positive cross-sectional association between organizational financial resources and quality outcomes (Cutler, 1995; Shen, 2003).

### ***Variable of Interest***

Table 1 displays the summary statistics for my variable of interest. For my measure of discretionary organizational financing, an increasing trend of funding per enrollee was observed starting at $3,176 per enrollee in 1999 and moving to $5,701 on average by 2003.

Table 3 presents the results of the analysis of model #1a, testing the influence of funding per enrollee (2002) on quality in a single year of analysis (2003). I observed here the positive and significant effect of funding per enrollee on quality in five of the seven measures of quality (e.g., getting needed care, getting care quickly, physician communication, health care satisfaction, and preventive medicine satisfaction) prior to alpha level adjustment. Following adjustment, significant results remain for only the health care satisfaction measure.

Based on my findings it appears that with each additional thousand dollars in funding per enrollee, patient health care satisfaction improved by over a full point after controlling for organizational size, branch affiliation, and geographic region. Although falling just above the adjusted significance level ($\alpha < 0.02$), this pattern appeared to be highly consistent in effect across quality measures, with improvements in quality scores attributable to financing also observed in (a) getting needed care (b) getting care quickly and (c) physician communication and (d) preventive medicine satisfaction. However, based on an adjusted alpha level, I can only tentatively support my first hypothesis.

### ***Effects Across Time***

Table 4 reflects the results of Model #1b, investigating the effects of finances on quality over time. Despite my expectations of the influence of funding per enrollee on measures of consumer satisfaction across time, I found only one instance of significant impact of funding across my seven measures of quality (satisfaction with office staff). These results are generally contradictory to my original hypothesis, as I had expected a significant effect of funding per enrollee on quality over time. Based on these findings I believe that the effects of finances on

patient perceptions of quality are primarily cross sectional and do not yield increasing quality gains over time.

## ***Moderating Influences***

Although my first hypothesis is loosely supported, the results of my remaining hypotheses are less consistent. Tables 5, 6 & 7 depict the results of model #2, testing the moderating effects on the finance-quality relationship by branch of service, region and facility size.

In Table 5, relating the moderating effect of branch of service on the finance-quality relationship, significant results were obtained in four of the seven regression models (e.g., getting care quickly, office staff satisfaction, health plan satisfaction and health care satisfaction). After adjusting the alpha level, however, the number of studies with significant results shrinks to a single outcome (health plan satisfaction). The negative coefficients observed for $\beta 3$ indicates facilities from my referent service (Army) garner greater quality effects from funding than similar facilities in the sister services. In the case of the health care satisfaction quality measure, this effect was as large as a full point.

Table 6 shows the moderating effects of health facility region on the finance-quality relationship. Across all seven regression models I observe no significant effects, indicating that the region of the country had no impact on the funding-quality relationship. Table 7 shows the results pertaining to the moderating effects of health facility size on the finance-quality relationship. Again, in all but one quality measure (getting needed care) I observed no significant effects across the quality dimensions.

### ***Control Variables***

Although not part of my original hypotheses, the implications of my control variables on quality in the federal health care context are worthy of mention here. First, in five of seven regression equations I observed a positive effect of Air Force affiliation on quality outcomes in relation to my referent Army, small clinic population. A similar effect was found for four of the seven quality measures pertaining to Navy facilities. Second, a potentially more interesting and dramatic effect was detected for health care facility size. Across all seven quality dimensions, I identified a large negative influence of facility size on CAHPS outcomes.

## DISCUSSION

The present research is the first exploration of the finance-quality relationship to the federal hospital context. The underlying supposition of this research was that organizational funding levels would affect health care quality. Although one could argue that quality improvement occurs primarily through continuous *process* improvement, I hypothesized that military hospitals with higher per enrollee funding would offer higher quality services. I also predicted that variations in organizational context would influence this relationship.

The results of my investigation of the temporal influence of finances on quality were puzzling. Intuitively, one would expect an effect across time given a significant and sizable effect within a single year. This is not what I observed. However, when considered in the context of the military hospital funding environment, these results became clearer. Military hospitals operate under an annual appropriation that expires at the end of each fiscal year

(September 30th). Thus, any discretionary financing secured during any given fiscal cycle may impact only on the current or immediately subsequent fiscal year. This is precisely what I observed in my first hypothesis, but may also explain why I did not observe a similar effect across my three years of analysis.

My observations of associations between of my control variables and perceptions of quality were also particularly interesting. At first my results appeared seemingly unrelated and counterintuitive. After all, it would seem quality should increase with the size and available ancillary support of the servicing hospital. However, when considered in the context of the availability or likelihood of receiving care outside of the military infrastructure the results appeared to make more sense. Air Force, and to a lesser extent Navy, facilities maintain less inpatient care capability when compared with their Army counterparts. Likewise, beneficiaries located more proximally to smaller military treatment facilities are more likely to receive care from health care providers outside of the walls of the nearest servicing military medical treatment facility.

These results may be important to policy makers within the Defense Department. Recent Defense policy discussions have focused on implementation of a capitated payment structure for military hospitals. Within this proposed financing structure, Defense health care facilities would be funded based primarily on the number of supported beneficiaries. This approach is intended to alleviate the inequities in financing across the Defense health system that have developed over time (Winkenwerder, 2005). Although this financing methodology may provide greater fiscal control and equity across military facilities, ignoring the impact of the moderating influences may adversely affect the quality of care provided.

My findings may also suggest that adequate non-federal hospital resourcing policies may be an important factor behind improving health care quality on a national scale. As recently as 2004, over 25% of community hospitals operate with negative total operating margins with Medicaid and Medicare accounting for over $20 billion of the recognized shortfall (AHA, 2006). Despite the structural differences between federal and non-federal hospitals, one can argue that the patients they serve are not dissimilar when it comes to their perceptions of quality. Thus, my findings suggest that higher levels of discretionary hospital reimbursement may indeed translate into better quality care.

It is important to note that after correcting for correlated dependent variables, the strength of the relationships of interest was greatly diminished. This provides a basis for caution in interpretation of these results, perhaps indicating financial status is not explaining a large portion of the variance in quality. However, based on the subjective selection process of dependent variables in this analysis, the strict application of the Type I error rate adjustments seems somewhat inappropriate as it greatly increases the Type II error rate and decreases the power of each test (Perneger, 1998). Despite these sentiments, results are presented with the Dunn-Sidak adjustment to provide evidence that correlated dependent variables were considered within the analysis.

## LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Perceptual quality outcome measures provide the most significant limitation to my research. Such perceptions have great value to managers across industries who base their quality improvement efforts on customer expectations (Green & Katz, 1997). However, while satisfaction measures have the advantage of including the patient's perspective, health care consumers typically are not able to evaluate either the technical quality of care or the aspects of

care they do not receive (Green & Katz). Ideally, I would have preferred to use additional, more objective measures of quality. Unfortunately, such measures were not available for the Defense Department at the time. Further research in this area should identify comprehensive outcome, process or structural quality measures to serve as alternative dependent variables in the model building process.

A second limitation to my study is based on the number of available years of CAHPS data on Defense Department hospitals. Although the HCSDB provides additional years of data both before and after my period of interest, the reliability and consistency of the data became a concern in my exploratory data analysis phase. This was attributable, in part, to the transition from CAHPS 2.0 to CAHPS 3.0-based responses in years subsequent to my study. Thus, while I would have desired to lengthen my study period, this was not possible with the data available.

A third, and no less important, limitation centers on causality. Although I have arguably satisfied Hill's criteria for causation (e.g., correlation, temporal relationship and competing causes), I hesitate to say that an organization's level of discretionary funding automatically induces higher quality (Hill, 1965). In short, patterns of association do not prove causality. Several mediating processes may intervene in this cause-effect relationship (e.g., application of information technology, quality of clinical staff, etc.). I believe the testing of these mediational relationships provides the greatest opportunity for future research in this area.

Fourth, this study was unable to control for the possibility of long-term financial benefits that may accrue to an organization with higher relative discretionary financing over time. This inertia effect (e.g., the effect of several past years' financial performance) was not considered in my analysis but provides an interesting basis for future study in the area.

Lastly, this research may be limited by at least two other factors. First, the data is based on a population of military hospitals within the continental United States. As such, my ability to generalize results to other hospitals is limited. Second, the data for the study were drawn during a time when the United States was involved in a long-term conflict in Iraq and Afghanistan. Because this data is based on active duty service member perceptions of quality, study results may be influenced by possible transference of general dissatisfaction from job-related difficulties (Bliese and Halvorsen, 1996).

## CONCLUSION

Health care managers face a constant struggle to secure sufficient funding for both ongoing operations and new quality enhancing initiatives. In times of financial distress, this managerial juggling act may result in lower quality services that are perceptible to patients. Discretionary finances allow management the organizational latitude to not have to make the choice between withholding resources from current services to finance quality improvement initiatives (Alexander et al., 2006).

The present investigation profiled the effect of organizational finances on health care quality in a manner different from those of prior studies in three important ways. First, this study investigated a very different organizational context than has been previously researched. Second, I tested for the effects of organizational financial attributes on change in quality over time. Third, the current study analyzed the contextual influences on the finance-quality relationship.

What remains uncertain from my findings are defining which factors alter the influence of funding on quality or how such resource advantages may accumulate within facilities over time.

The present research has shown there is little evidence of solving these questions, but stimulates my interest in developing further studies that can reliably predict how organizational factors may enhance or offset the positive influence financial margin gains in terms of quality for the organization. In addition, future research should entail longer periods of study (i.e., across more than three years of quality outcomes) as well as continue to use the most recent available data.

Ultimately, however, I provide support to prior empirical evidence that claims health facilities that sustain higher levels of hospital fiscal flexibility may be associated with higher levels of quality (Encinosa & Bernard, 2005; Langa & Sussman, 1993). I therefore can also support the claims of prior researchers that show organizations with more financial flexibility may be more adept at meeting or exceeding patient care expectations (Shen, 2003). In contrast, a financially constrained hospital may not have the means to meet consumer demands and may provide lower quality care. It appears money really does matter when quality is a concern.

**Table 3-1**: *Study 2 Average Funding per Enrollee '99 – '03*

| Year | Average Funding per Enrollee |
|---|---|
| 2003 | **$ 5,701.00**<br>$ (4,414.08) |
| 2002 | **$ 5,501.00**<br>$ (4,436.12) |
| 2001 | **$ 5,378.00**<br>$ (5,250.82) |
| 2000 | **$ 3,435.00**<br>$ (3,063.57) |
| 1999 | **$ 3,176.00**<br>$ (3,082.45) |

**Table 3-2**: *2003 CAHPS Score Descriptive Statistics for Active Duty Service Members*

| **2003 CAHPS Outcomes** | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|
| Health Plan Satisfaction | 46.21 | 7.40 | 26 | 62 |
| Getting Needed Care | 66.98 | 6.11 | 51 | 79 |
| Getting Care Quickly | 67.79 | 6.18 | 52 | 86 |
| Office Staff Assessment | 86.03 | 5.69 | 71 | 97 |
| Physician Communication | 85.19 | 4.62 | 69 | 93 |
| Health Care | 50.85 | 7.83 | 26 | 76 |
| Preventive Care Satisfaction | 86.43 | 5.56 | 69 | 97 |

***Note: CAHPS scores range between 0 - 100***

**Table 3-3**: ***Results - 2003 HCSDB Quality Outcomes***

| | Parameter | Getting Needed Care | | Getting Care Quickly | | Office Staff Satisfaction | | Physician Communication | | Health Plan Satisfaction | | Health Care Satisfaction | | Preventive Med Satisfaction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | beta0 | **58.7059** | *** | **62.8071** | *** | **83.4251** | *** | **81.5358** | *** | **42.7377** | *** | **47.0531** | *** | **85.0660** | *** |
| | | (2.5880) | | (2.6904) | | (2.3289) | | (1.8601) | | (3.2159) | | (3.2582) | | (2.2587) | |
| Funding per Enrollee (2002) | beta1 | 0.6832 | ** | 0.6136 | * | 0.3580 | | 0.4566 | ** | 0.5717 | | **1.0940** | *** | 0.4907 | * |
| | | (0.3011) | | (0.3130) | | (0.2709) | | (0.2164) | | (0.3741) | | (0.3790) | | (0.2628) | |
| Air Force | beta2 | **6.1079** | *** | 1.7609 | | **4.4224** | *** | **3.2253** | *** | 3.3116 | * | 2.8641 | | **5.2718** | *** |
| | | (1.4148) | | (1.4734) | | (1.2731) | | (1.0169) | | (1.7580) | | (1.7811) | | (1.2348) | |
| Navy | | **4.4758** | *** | **3.7619** | ** | 3.2782 | ** | **4.0079** | *** | -0.0141 | | 3.1838 | | -0.8282 | |
| | | (1.5583) | | (1.6431) | | (1.4022) | | (1.1200) | | (1.9363) | | (1.9618) | | (1.3600) | |
| West | beta3 | 3.1941 | ** | **4.9174** | *** | **3.5865** | *** | **3.0943** | *** | **5.7508** | ** | 3.4753 | * | -0.9783 | |
| | | (1.4306) | | (1.4890) | | (1.2874) | | (1.0283) | | (1.7777) | | (1.8011) | | (1.2486) | |
| South | | 1.8220 | | 1.6657 | | 0.9348 | | 0.2974 | | **4.5420** | ** | 1.3521 | | -0.8593 | |
| | | (1.4603) | | (1.5388) | | (1.3141) | | (1.0496) | | (1.8146) | | (1.8384) | | (1.2745) | |
| Medical Center | beta4 | -2.1964 | | **-6.6547** | ** | -6.4324 | ** | -4.1143 | * | -5.6373 | | -8.9801 | ** | -5.0522 | * |
| | | (3.0637) | | (3.1885) | | (2.7569) | | (2.2020) | | (3.8070) | | (3.8570) | | (2.6738) | |
| Large Hospital | | -1.1541 | | -3.2998 | | **-6.1665** | *** | **-4.7627** | *** | **-6.3421** | ** | **-8.4868** | *** | -4.1685 | ** |
| | | (2.1531) | | (2.2429) | | (1.9375) | | (1.5475) | | (2.6755) | | (2.7107) | | (1.8791) | |
| Small Hospital | | -1.3731 | | -1.6554 | | -2.7142 | | -1.5235 | | -5.5142 | * | **-8.8506** | *** | -4.6091 | ** |
| | | (2.2809) | | (2.3778) | | (2.0525) | | (1.6394) | | (2.8343) | | (2.8716) | | (1.9907) | |
| Large Clinic | | -0.4452 | | -1.0466 | | -2.7555 | | -1.4465 | | -4.1742 | | -0.4452 | | -0.8933 | |
| | | (2.0237) | | (2.1048) | | (1.8210) | | (1.4545) | | (2.5146) | | (2.5477) | | (1.7662) | |
| | | | | | | | | | | | | | | | |
| Rsquared statistics and goodness-of-fit | | | | | | | | | | | | | | | |
| Multiple R-Squared | | 0.2963 | | 0.2424 | | 0.3972 | | 0.4092 | | 0.2933 | | 0.2911 | | 0.4083 | |
| Adjusted R-Squared | | 0.2181 | | 0.1572 | | 0.3302 | | 0.3436 | | 0.2147 | | 0.2123 | | 0.3425 | |
| F Statistic p value | | 0.0005 | *** | 0.0059 | *** | 0.0000 | *** | 0.0000 | *** | 0.0006 | *** | 0.0006 | *** | 0.0000 | *** |
| | | | | | | | | | | | | | | | |
| * p<.10 ** p<.05 ***p<.01 | | Note: **Bolded** coefficients indicate those that meet the Dunn - Sidak adjustment threshold | | | | | | | | | | | | | |

## Table 3-4: *Results of Funding per Enrollee on Health Care Quality over Time*

| Fixed effects | | Parameter | Getting Needed Care | | Getting Care Quickly | | Office Staff Satisfaction | | Physician Communication | | Health Plan Satisfaction | | Health Care Satisfaction | | Preventive Med Satisfaction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Initial Status** | Intercept | beta00 | **63.247** | *** | **64.769** | *** | **86.568** | *** | **86.260** | *** | **32.198** | *** | **47.257** | *** | **87.373** | *** |
| | | | (2.281) | | (2.380) | | (1.679) | | (1.492) | | (2.435) | | (2.659) | | (1.871) | |
| Pi0i | Funding per Enrollee | beta01 | 0.390 | | 0.162 | | **0.538** | *** | 0.344 | | -0.197 | | 0.454 | | 0.198 | |
| | | | (0.344) | | (0.354) | | (0.268) | | (0.241) | | (0.387) | | (0.420) | | (0.266) | |
| | Air Force | beta02 | **3.627** | ** | 1.320 | | **3.197** | *** | 1.866 | ** | 2.950 | ** | **6.225** | *** | **3.933** | *** |
| | | | (1.412) | | (1.465) | | (1.022) | | (0.908) | | (1.474) | | (1.618) | | (1.133) | |
| | Navy | | 1.181 | | 1.067 | | 1.789 | | 0.883 | | 1.027 | | 0.507 | | -1.328 | |
| | | | (1.552) | | (1.632) | | (1.122) | | (0.997) | | (1.624) | | (1.776) | | (1.247) | |
| | West | beta03 | 2.581 | | **4.414** | *** | 0.079 | | -0.811 | | **7.225** | *** | -0.984 | | -1.467 | |
| | | | (1.395) | | (1.462) | | (1.025) | | (0.911) | | (1.490) | | (1.623) | | (1.144) | |
| | South | | 1.786 | | 0.151 | | -1.711 | | **-2.659** | *** | **6.547** | *** | -2.375 | | 1.041 | |
| | | | (1.456) | | (1.512) | | (1.055) | | (0.938) | | (1.521) | | (1.671) | | (1.170) | |
| | Medical Center | beta04 | -0.848 | | 0.821 | | **-4.447** | *** | -1.405 | | 6.143 | ** | 1.287 | | -3.584 | |
| | | | (2.777) | | (2.873) | | (2.046) | | (1.824) | | (2.966) | | (3.228) | | (2.206) | |
| | Large Hospital | | -2.759 | | -2.836 | | **-3.467** | *** | -2.966 | ** | 3.329 | | 0.130 | | **-4.828** | *** |
| | | | (2.053) | | (2.149) | | (1.520) | | (1.351) | | (2.209) | | (2.407) | | (1.694) | |
| | Small Hospital | | -0.740 | | 1.100 | | -1.729 | | -1.436 | | 2.370 | | 1.756 | | -2.349 | |
| | | | (2.236) | | (2.320) | | (1.625) | | (1.444) | | (2.359) | | (2.573) | | (1.810) | |
| | Large Clinic | | -0.515 | | 0.233 | | -0.428 | | -0.315 | | -0.649 | | -0.774 | | -0.609 | |
| | | | (1.956) | | (2.037) | | (1.453) | | (1.291) | | (2.109) | | (2.301) | | (1.621) | |
| **Rate of Change** | Intercept (time) | beta10 | -1.711 | | -0.392 | | -1.555 | | -1.831 | | **5.796** | *** | 1.003 | | -0.718 | |
| | | | (1.578) | | (1.461) | | (1.272) | | (1.187) | | (1.801) | | (1.895) | | (1.012) | |
| Pi1i | Funding per Enrollee * Time | beta11 | 0.218 | | 0.199 | | -0.111 | | 0.035 | | 0.369 | | 0.250 | | 0.126 | |
| | | | (0.228) | | (0.215) | | (0.187) | | (0.174) | | (0.265) | | (0.281) | | (0.150) | |
| | Air Force*Time | beta12 | 1.338 | | 0.286 | | 0.686 | | 0.627 | | 0.201 | | -1.597 | | 0.832 | |
| | | | (0.971) | | (0.897) | | (0.772) | | (0.721) | | (1.089) | | (1.150) | | (0.610) | |
| | Navy*Time | | 1.355 | | 1.231 | | 0.717 | | 1.395 | * | -0.563 | | 1.000 | | 0.555 | |
| | | | (1.067) | | (1.006) | | (0.849) | | (0.792) | | (1.200) | | (1.265) | | (0.672) | |
| | West*Time | beta13 | 0.531 | | 0.023 | | **1.671** | *** | **1.945** | *** | -1.140 | | 2.027 | * | 0.594 | |
| | | | (0.964) | | (0.896) | | (0.776) | | (0.725) | | (1.101) | | (1.156) | | (0.617) | |
| | South*Time | | 0.010 | | 0.505 | | 1.149 | | 1.532 | ** | -1.359 | | 1.800 | | -0.882 | |
| | | | (1.000) | | (0.932) | | (0.797) | | (0.744) | | (1.124) | | (1.188) | | (0.630) | |
| | Medical Center*Time | beta14 | -1.195 | | -3.300 | | -0.262 | | -1.246 | | -5.297 | ** | -4.194 | * | -0.691 | |
| | | | (1.981) | | (1.857) | | (1.603) | | (1.492) | | (2.269) | | (2.383) | | (1.280) | |
| | Large Hospital*Time | | 0.897 | | 0.564 | | -0.513 | | -0.269 | | **-4.176** | ** | -3.400 | * | 0.413 | |
| | | | (1.430) | | (1.329) | | (1.160) | | (1.082) | | (1.644) | | (1.727) | | (0.922) | |
| | Small Hospital*Time | | -0.002 | | -1.102 | | -0.132 | | -0.147 | | -3.174 | * | **-4.512** | ** | -1.283 | |
| | | | (1.545) | | (1.429) | | (1.234) | | (1.152) | | (1.749) | | (1.838) | | (0.980) | |
| | Large Clinic*Time | | 0.404 | | -0.069 | | -0.464 | | -0.335 | | -1.131 | | -0.197 | | -0.071 | |
| | | | (1.355) | | (1.247) | | (1.100) | | (1.027) | | (1.558) | | (1.639) | | (0.873) | |
| **Variance components** | | | | | | | | | | | | | | | | |
| Level 1 | Within-center Residual variance | sigma sq epsilon | 15.3459 | | 15.3459 | | 15.3656 | | 3.4943 | | 28.4204 | | 32.8401 | | 9.3345 | |
| Level 2 | Initial status Intercept variance | sigma sq 0 (tau00) | 7.5970 | | 10.1430 | | 1.1112 | | 0.0000 | | 3.5878 | | 4.9771 | | 8.3353 | |
| | Rate of change Slope variance | sigma sq 1 (tau11) | 1.8339 | | 0.0000 | | 0.3057 | | 0.3496 | | 0.6761 | | 0.0000 | | 0.0000 | |
| | Correlation between Intercept and Slope | | -0.7230 | | 0.0000 | | 0.4750 | | -0.3450 | | -0.0540 | | 0.0000 | | 0.0000 | |
| | Intraclass correlation coefficient | | 0.3893 | | 0.4367 | | 0.3579 | | 0.2489 | | 0.3218 | | 0.2636 | | 0.6891 | |

ICC = Variation attributable to differences among centers

* p<.10 ** p<.05 ***p<.01

Note: **Bolded** coefficients indicate those that meet the Dunn - Sidak adjustment threshold

**Table 3-5**: ***Moderating Factor Results - Branch of Service * Funding per Enrollee***

| | Parameter | Getting Needed Care | | Getting Care Quickly | | Office Staff Satisfaction | | Physician Communication | | Health Plan Satisfaction | | Health Care Satisfaction | | Preventive Med Satisfaction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | beta0 | **56.6052** | *** | **60.4530** | *** | **80.4984** | *** | **80.4168** | *** | **39.5242** | *** | **42.1559** | *** | **83.4568** | *** |
| | | (3.0732) | | (3.1887) | | (2.7231) | | (2.2192) | | (3.7780) | | (3.7717) | | (2.6830) | |
| Funding per Enrollee (2002) | beta1 | **0.9881** | ** | 0.9483 | ** | 0.8199 | ** | 0.6185 | ** | 0.9759 | ** | **1.8226** | *** | **0.6976** | ** |
| | | (0.3954) | | (0.4103) | | (0.3504) | | (0.2855) | | (0.4861) | | (0.4853) | | (0.3452) | |
| Air Force | beta2 | **9.5165** | ** | 5.6589 | * | **8.7716** | *** | 5.0468 | ** | **9.1962** | ** | **10.6146** | *** | **8.1702** | *** |
| | | (3.0413) | | (3.1608) | | (2.6948) | | (2.1961) | | (3.7387) | | (3.7325) | | (2.6552) | |
| Navy | | 7.1450 | ** | 6.5345 | * | **8.1159** | *** | 5.4135 | ** | 2.1929 | | **9.9546** | ** | 0.4126 | |
| | | (3.4419) | | (3.5998) | | (3.0497) | | (2.4853) | | (4.2311) | | (4.2241) | | (3.0049) | |
| Air Force*Funding | beta3 | -0.6172 | | -0.7084 | | -0.7705 | * | -0.3301 | | **-1.0940** | ** | -1.3951 | ** | -0.5370 | |
| | | (0.4929) | | (0.5118) | | (0.4367) | | (0.3559) | | (0.6059) | | (0.6049) | | (0.4303) | |
| Navy*Funding | | -0.4564 | | -0.4741 | | -0.8364 | * | -0.2402 | | -0.3620 | | -1.1623 | * | -0.2056 | |
| | | (0.5368) | | (0.5578) | | (0.4756) | | (0.3876) | | 0.6598 | | (0.6587) | | (0.4686) | |
| Medical Center | beta4 | -1.4341 | | -5.7339 | * | **-5.6959** | ** | -3.7035 | | -3.9249 | | **-7.3623** | ** | -4.2342 | |
| | | (3.1703) | | (3.2964) | | (2.8090) | | (2.2892) | | (3.8972) | | (3.8908) | | (2.7677) | |
| Large Hospital | | -0.4686 | | -2.4990 | | **-5.3586** | *** | **-4.3955** | *** | **-5.0470** | ** | **-6.9610** | ** | **-4.1685** | ** |
| | | (2.2324) | | (2.3228) | | (1.9781) | | (1.6120) | | (2.7443) | | (2.7398) | | (1.8791) | |
| Small Hospital | | -0.9048 | | -1.0929 | | -2.2287 | | -1.2716 | | -4.5177 | | **-7.8407** | *** | **-3.5377** | ** |
| | | (2.3294) | | (2.4261) | | (2.0640) | | 1.6821 | | (2.8636) | | (2.8588) | | (1.9490) | |
| Large Clinic | | -0.1924 | | -0.7468 | | -2.5048 | | -1.3103 | | -3.6173 | | -2.2669 | | -0.6267 | |
| | | (2.0440) | | (2.1213) | | (1.8111) | | (1.4759) | | (2.5127) | | (2.5085) | | (1.7845) | |
| West | beta5 | 2.8258 | * | **4.5114** | *** | **3.0228** | ** | **2.8988** | *** | **5.2721** | *** | 2.5920 | | -1.2241 | |
| | | (1.4675) | | (1.5240) | | (1.3003) | | (1.0597) | | (1.8040) | | (1.8010) | | (1.2812) | |
| South | | 1.5261 | | 1.3355 | | 0.4661 | | 0.1406 | | 4.1842 | ** | 0.6346 | | -1.0453 | |
| | | (1.4871) | | (1.5623) | | (1.3177) | | (1.0738) | | (1.8281) | | (1.8251) | | (1.2983) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Goodness of fit statistics | | | | | | | | | | | | | | | |
| Multiple R-Squared | | 0.3106 | | 0.2610 | | 0.4274 | | 0.4159 | | 0.3224 | | 0.3400 | | 0.4200 | |
| Adjusted R-Squared | | 0.2146 | | 0.1568 | | 0.3477 | | 0.3345 | | 0.2281 | | 0.2481 | | 0.3392 | |
| F Statistic p value | | 0.0011 | *** | 0.0094 | *** | 0.0000 | *** | 0.0000 | *** | 0.0007 | *** | 0.0003 | *** | 0.0000 | *** |
| | | | | | | | | | | | | | | | |
| * p<.10 ** p<.05 ***p<.01 | | Note: **Bolded** coefficients indicate those that meet the Dunn - Sidak adjustment threshold | | | | | | | | | | | | | |

**Table 3-6**: ***Moderating Factor Results – Geographical Region * Funding per Enrollee***

| | Parameter | Getting Needed Care | | Getting Care Quickly | | Office Staff Satisfaction | | Physician Communication | | Health Plan Satisfaction | | Health Care Satisfaction | | Preventive Med Satisfaction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | beta0 | **58.2400** | *** | **60.7476** | *** | **84.5664** | *** | **81.2900** | *** | **40.2180** | *** | **46.8400** | *** | **83.7903** | *** |
| | | (3.0820) | | (3.1738) | | (2.7566) | | (2.2180) | | (3.7696) | | (3.8860) | | (2.6811) | |
| Funding per Enrollee (2002) | beta1 | 0.8229 | * | 1.0656 | ** | 0.2243 | | 0.4843 | | 1.1993 | ** | 1.1030 | * | 0.7392 | * |
| | | (0.4464) | | (0.4597) | | (0.3993) | | (0.3213) | | (0.5460) | | (0.5629) | | (0.3883) | |
| West | beta2 | 3.3240 | | **7.6170** | ** | 0.5375 | | 3.7610 | | 8.0599 | * | 4.2340 | | 1.1120 | |
| | | (3.4980) | | (3.6017) | | (3.1282) | | (2.5170) | | (4.2778) | | (4.4100) | | (3.0425) | |
| South | | 3.0730 | | 5.3364 | * | 0.2281 | | 0.4379 | | **9.8756** | *** | 1.3120 | | 1.0549 | |
| | | (3.0330) | | (3.1369) | | (2.7126) | | (2.1830) | | (3.7095) | | (3.8240) | | (2.6383) | |
| West*Funding | beta3 | -0.0094 | | -0.5003 | | 0.6120 | | -0.1340 | | -0.3982 | | -0.1553 | | -0.4001 | |
| | | (0.6302) | | (0.6492) | | (0.5636) | | (0.4535) | | (0.7707) | | (0.7946) | | (0.5482) | |
| South*Funding | | -0.2281 | | -0.6712 | | 0.1325 | | -0.0264 | | 0.9743 | | 0.0063 | | -0.3512 | |
| | | (0.4848) | | (0.4992) | | (0.4336) | | (0.3489) | | (0.5929) | | (0.6112) | | (0.4217) | |
| Air Force | beta4 | **6.0540** | *** | 1.4194 | | **4.6863** | *** | **3.1680** | ** | 2.9436 | | 2.8060 | | **5.0408** | *** |
| | | (1.4630) | | (1.5090) | | (1.3087) | | (1.0530) | | (1.7897) | | (1.8450) | | (1.2729) | |
| Navy | | **4.3810** | *** | 3.3032 | * | **3.5696** | ** | **3.9450** | ** | -0.5584 | | 3.1260 | | -1.1244 | |
| | | (1.6210) | | (1.6924) | | (1.4497) | | (1.1660) | | (1.9824) | | (2.0440) | | (1.4100) | |
| Medical Center | beta5 | -2.5760 | | 6.7842 | ** | **-7.4810** | ** | -3.8800 | | -6.5078 | | -8.6440 | ** | -4.8293 | * |
| | | (3.3000) | | (3.4047) | | (2.9518) | | (2.3750) | | (4.0366) | | (4.1610) | | (2.8710) | |
| Large Hospital | | -1.4580 | | -3.6244 | | **-6.7254** | ** | **-4.6370** | ** | **-7.2078** | ** | **-8.2900** | *** | -4.1693 | ** |
| | | (2.2890) | | (2.3642) | | (2.0477) | | (1.6480) | | (2.8002) | | (2.8870) | | (1.9916) | |
| Small Hospital | | -1.6000 | | -1.7680 | | -3.2987 | | -1.3930 | | -6.0609 | ** | **-8.6610** | *** | -4.5032 | ** |
| | | (2.3950) | | (2.4751) | | (2.1421) | | (1.7240) | | (2.9293) | | (3.0200) | | (2.0834) | |
| Large Clinic | | -0.6622 | | -1.1706 | | -3.2887 | * | -1.3270 | | -4.7121 | * | -2.6320 | | -0.8083 | |
| | | (2.1320) | | (2.1956) | | (1.9067) | | (1.5340) | | (2.6074) | | (2.6880) | | (1.8545) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Goodness of fit statistics | | | | | | | | | | | | | | | |
| Multiple R-Squared | | 0.2989 | | 0.2597 | | 0.4067 | | 0.4099 | | 0.3179 | | 0.2916 | | 0.4143 | |
| Adjusted R-Squared | | 0.2012 | | 0.1553 | | 0.3241 | | 0.3278 | | 0.2229 | | 0.1929 | | 0.3328 | |
| F Statistic p value | | 0.0018 | ** | 0.0099 | *** | 0.0000 | *** | 0.0000 | *** | 0.0008 | *** | 0.0025 | *** | 0.0000 | *** |
| | | | | | | | | | | | | | | | |
| * p<.10 ** p<.05 ***p<.01 | | Note: **Bolded** coefficients indicate those that meet the Dunn - Sidak adjustment threshold | | | | | | | | | | | | | |

**Table 3-7**: ***Moderating Factor Results – Facility Size * Funding per Enrollee***

| | Parameter | Getting Needed Care | | Getting Care Quickly | | Office Staff Satisfaction | | Physician Communication | | Health Plan Satisfaction | | Health Care Satisfaction | | Preventive Med Satisfaction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | beta0 | **79.6486** | *** | **56.3383** | *** | **78.7758** | *** | **76.2807** | *** | **40.7417** | *** | **57.6857** | *** | **89.2400** | *** |
| | | (11.3688) | | (11.9092) | | (10.4219) | | (8.3426) | | (14.4958) | | (14.6052) | | (10.0500) | |
| Funding per Enrollee (2002) | beta1 | -5.7800 | * | 2.4321 | | -1.4699 | | 2.0560 | | 1.1347 | | -2.1840 | | -0.6549 | |
| | | (3.3920) | | (3.5529) | | (3.1291) | | (2.4890) | | (4.3244) | | (4.3570) | | (2.9980) | |
| Medical Center | beta2 | -21.8946 | * | 1.5744 | | -0.8772 | | 0.4646 | | -3.1439 | | -20.0030 | | -10.8900 | |
| | | (11.8293) | | (12.3925) | | (10.8441) | | (8.6806) | | (15.0830) | | (15.1968) | | (10.4600) | |
| Large Hospital | | -22.6266 | * | 3.8296 | | -2.5089 | | 2.0221 | | -3.8694 | | -16.5814 | | -8.7820 | |
| | | (11.6068) | | (12.1602) | | (10.6401) | | (8.5173) | | (14.7993) | | (14.9110) | | (10.2600) | |
| Small Hospital | | -24.8727 | ** | -3.8387 | | -2.2358 | | 2.5679 | | -5.4376 | | -19.3964 | | -3.1310 | |
| | | (12.0617) | | (12.6354) | | (11.0571) | | (8.8511) | | (15.3793) | | (15.4954) | | (10.6600) | |
| Large Clinic | | -21.9620 | * | 4.7356 | | -2.9756 | | 4.2619 | | -3.0507 | | -15.2592 | | -3.1900 | |
| | | (11.4843) | | (12.0373) | | (10.5278) | | 8.4274 | | (14.6431) | | (14.7536) | | (10.1500) | |
| Medical Center*Funding | beta3 | 6.3610 | * | -2.0207 | | -1.2035 | | -1.5380 | | -0.6212 | | 3.3290 | | 1.3340 | |
| | | (3.4130) | | (3.5756) | | (3.1460) | | (2.5050) | | (4.3522) | | (4.3850) | | (3.0170) | |
| Large Hospital*Funding | | 6.6080 | * | -1.9992 | | -1.2035 | | -1.9030 | | 0.6716 | | 2.8200 | | 1.2760 | |
| | | (3.4320) | | (3.5950) | | (3.1460) | | (2.5180) | | (4.3758) | | (4.4090) | | (3.0340) | |
| Small Hospital*Funding | | 7.0260 | ** | -0.1666 | | -0.5714 | | -1.3830 | | -0.2028 | | 3.2950 | | 0.0783 | |
| | | (3.5170) | | (3.6845) | | (3.2245) | | (2.5810) | | (4.8490) | | (4.5190) | | (3.1090) | |
| Large Clinic*Funding | | 6.6710 | * | -1.7410 | | -1.7139 | | -1.7420 | | -0.3568 | | 3.8130 | | 0.7196 | |
| | | (3.4830) | | (3.6510) | | (3.1928) | | (2.5560) | | (4.4408) | | (4.4740) | | (3.0790) | |
| Air Force | beta4 | **6.2066** | *** | 2.2950 | | **4.5745** | *** | **3.3341** | *** | 3.4732 | * | 3.0055 | | **4.8640** | *** |
| | | (1.4540) | | (1.5251) | | (1.3329) | | (1.0669) | | (1.8539) | | (1.8679) | | (1.2850) | |
| Navy | | **4.5949** | *** | **3.9732** | ** | 3.2958 | ** | **4.1293** | *** | 0.0485 | | 3.4017 | * | -0.9573 | |
| | | (1.5874) | | (1.6852) | | (1.4552) | | (1.1649) | | (2.0240) | | (2.0393) | | (1.4030) | |
| West | beta5 | 2.6317 | * | **5.1286** | *** | **3.7779** | *** | **3.1565** | *** | **5.8122** | *** | 3.0553 | | -1.1480 | |
| | | (1.4865) | | (1.5589) | | (1.3627) | | (1.0908) | | (1.8954) | | (1.9097) | | (1.3140) | |
| South | | 1.5651 | | 1.6186 | | 0.9894 | | 0.1975 | | **4.5461** | ** | 1.0562 | | -0.9008 | |
| | | (1.5158) | | (1.6105) | | (1.3895) | | (1.1123) | | (1.9327) | | (1.9473) | | (1.3400) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Goodness of fit statistics | | | | | | | | | | | | | | | |
| Multiple R-Squared | | 0.3329 | | 0.2714 | | 0.4070 | | 0.4163 | | 0.2947 | | 0.3003 | | 0.4245 | |
| Adjusted R-Squared | | 0.2203 | | 0.1468 | | 0.3069 | | 0.3177 | | 0.1756 | | 0.1821 | | 0.3274 | |
| F Statistic p value | | 0.0015 | *** | 0.0185 | ** | 0.0000 | *** | 0.0000 | *** | 0.0072 | *** | 0.0058 | *** | 0.0000 | *** |
| | | | | | | | | | | | | | | | |
| * p<.10 ** p<.05 ***p<.01 | | Note: **Bolded** coefficients indicate those that meet the Dunn - Sidak adjustment threshold | | | | | | | | | | | | | |

# CHAPTER 4

## Does Money Really Matter? The Effects of Net Revenue on Community Health Center Clinical Process Quality


### ABSTRACT

Community health centers are the backbone of the nation's health care safety net. The number of federally funded health centers has increased significantly due to a major expansion initiative. As the number of health centers has increased, however, questions remain about financial capacity to provide this care. In this study, the author hypothesizes that health centers with greater fiscal margins, as measured by net revenue, will provide preventive and primary care to a greater proportion of their patients.

The author addresses his question using 1998-2004 data from the Health Resources and Services Administration's Uniform Data System, which contains information on a variety of financial and other operational factors from federally funded community health centers' annual grant applications and progress reports. A measure indicating local rurality was merged in from Area Resource Files. Four dependent variables were used: percent of women/girls 15-44 receiving cervical cancer screening (PAP smears), percent of children 0-12 under routine health supervision, percent of deliveries receiving first trimester care and percent of deliveries receiving post partum care. The total data set was comprised of 5,510 observations across

seven years representing a maximum of 914 health centers in any one year. Multilevel modeling is the primary statistical method.

Results of the analysis indicate mixed effects of net revenue on health care quality. The study results indicate a significant and positive association between organizational net revenue and percentages of patients receiving preventive health care at baseline. Baseline net revenue was also positively associated with improvements over time in the percent of patients receiving post-partum care. There was no association between net revenue and first trimester care either at baseline or over time. Finally, there were also unexpected negative associations between organizational net revenue and changes in preventive care over time as well as in baseline postpartum health care delivery.

## INTRODUCTION

Quality is arguably the single most important issue in modern health care. In an industry that consumes over 15% of the U.S. Gross Domestic Product – over 1.7 *trillion* dollars annually – there is substantial evidence of quality problems (CMS, 2005; Tufts, 1998; Chassin, 1997). Estimates indicate that between 44,000 and 98,000 Americans die from medical errors annually and more than 50% of patients with chronic conditions (e.g., diabetes, asthma, hypertension) are managed inadequately (IOM, 2001; Thomas, et al., 2000; Clark, et al., 2000; Green and Katz, 1997). At greatest risk are the rural and urban indigent and poor who may not have access to routine healthcare services and thus may lack even the most basic of preventive care. Thus the availability and quality of services provided to this segment of the population are vitally important.

The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) defines quality as 'the degree to which patient care services increase the probability of desired outcomes given the current state of knowledge'(Green and Katz, 1997). There is a strong body of evidence indicating that preventive and primary care are essential to population health, especially for disadvantaged populations (Chistman, et al., 2004; Felt-Lisk, et al., 2002). For this reason, the current study focuses on the percentages of health center patients receiving preventive and primary care.

Anecdotal evidence suggests that organizations' financial resources may contribute to positive health care outcomes (Green and Katz, 1997; Deming, 1986; Starfield, 2000; Grazier, 2004). This article builds on this intuitive premise, defining fiscal margin as annual net operating revenue (i.e., total revenues less expenses). Here, I examine the relationship between

organizational net revenue and quality in a critical segment of the health care sector: federally funded community health centers.

Federal community health centers were established to increase the availability of primary and preventive health care services for low-income people living in medically underserved areas. These centers have become an important source of health care for Medicaid beneficiaries and the uninsured in the United States (Felt-Lisk et al. 2002; Institute of Medicine, 2002; Tufts, 1998).

Recent Bush administration efforts have sought to increase the availability of medical services to 1,200 communities through the support of new access points or expanded medical capacity. Through FY 2005, the Presidential strategy has resulted in the creation of 428 new access points, the provision of grants to significantly expand the medical capacity of existing service delivery sites, and new access for an estimated 3.65 million patients (BPHC, 2006). Even before the recent expansion initiative, federally funded community health centers provided care to 10% of the United States' rural population, 11% of the uninsured, 13% of the low income, 11% of Medicaid/SHCIP beneficiaries, and 25% of the low income and uninsured children and contributed to the support of 20% of low income births (Markus et al., 2002).

Thus, recent policy initiatives have sought to improve access through increased funding. There is, however, currently no empirical information about how health centers' existing financial strength may affect the quality of care provided. Especially during a period of rapid expansion, access to care within centers also merits attention. This prompts me to ask the question: *are higher levels of net revenue associated with better quality in federally funded community health centers*? My approach to addressing this question was to determine whether community health center finances were associated with changes in quality cross- sectionally as

well as over time. A particular strength of the current investigation is the use of multilevel modeling to allow more direct tests of how finances affect change than previous models have allowed (Youn & Wan, 2001; Cleverly & Harvey, 1994; Levitt, 1994; Langland-Orban, et al., 1996).

Understanding how discretionary levels of net revenue affects quality is relevant to both health care managers and policy makers, particularly in the nonprofit sector where maintaining the balance between means and ends is a constant struggle (Bigelow & Stone, 1995). In the sections that follow, I first provide a background on the relationship between health clinic finances and quality, present the conceptual basis of my research and present the methodology through which I tested my hypotheses.

## BACKGROUND

The current study builds on the premise that financial flexibility may assist health clinics in maintaining and improving quality (Green and Katz, 1997). Financial resources are necessary to procure new diagnostic equipment, hire additional staff, or invest in physical infrastructure, all of which have been associated with improved patient outcomes (Green and Katz, 1997; Donabedian, et al., 1982). At this point, however, as intuitive as this claim is, existing literature does not provide evidence of the finance-quality relationship within the context of community health centers. The current study contributes to the evidence basis for clinic managers by testing the proposition that clinics with greater fiscal margin have the latitude to maintain and improve health care quality.

The quality improvement literature has assumed that health organization finances affect the quality of products or services delivered. For instance, Donabedian proposed that

improvements in health status, an outcome indicator of quality, were influenced by the resources available to the physician (Donabedian, et al., 1982). Others have recognized that financial resources affect managerial efforts to promote service quality (Green and Katz, 1997; Marcus, 2005).

Research on organizational factors affecting service quality began outside health care. Rose (1990) and Noronha and Singal (2004) investigated the influence of operating margin and profitability on quality, defined in terms of safety, in the airline industry. These authors concluded that circumstances exist under which firms will compromise quality, particularly in times of financial difficulty. Other empirical findings suggest that discretionary organizational finances affect quality (Golbe, 1983; Allen, 1984; Golbe, 1986; Burstin, et al., 1993). In each case the authors found that organizations able to dedicate higher levels of resources to core business functions were rewarded with fewer adverse events.

There is also evidence from a range of health care settings that financial slack supports quality. Researchers have found a negative relationship between discretionary organizational finances and negligent adverse events (Encinosa & Bernard, 2005; Langa & Sussman, 1993), incident rates of specialty hospital cardiac revascularization (Cutler, 1995) and hospital mortality rates (Youn and Wan, 2001; Schupfer and Babst, 2005; Brown and Lumley, 1998). Likewise, researchers have established a positive association between organizational finances and improved hospital patient satisfaction (Dranove & White, 1998), HMO levels of services (Born and Simon, 2001), hospital "effectiveness of care" quality measures (Shen, 2003), and hospital short term health outcomes (Cleverly & Harvey, 1994).

The consistency of evidence across sectors to date suggests that discretionary resources have similar effects on service quality across a broad range of organizational contexts. Community health centers, in particular, are very different providers than the hospitals and health plans in which previous studies in health care have been conducted. Health centers employ simpler core technologies than hospitals, offering predominantly primary and preventive care services. The typical community health center has traditionally maintained operations with little to no sustained fund balances, thin operating margins, small management teams, and, recently, have encountered an array of distinctive challenges, including increases in undocumented patients and the uninsured (Cook, et al., 2006; Jacobson, et al., 2005). Logic dictates, however, that in circumstances where discretionary financing is available, centers may be more adept at meeting environmental demands. Thus, I propose the following hypothesis:

**Hypothesis 1a**: There will be a positive association between the degree of community health center net revenue and the level of quality.

My next hypothesis related to whether community health center revenues were associated with change in quality over time. Existing health care related studies have been confined to multiple cross-sectional analyses (Youn & Wan, 2001; Cleverly & Harvey, 1994; Levitt, 1994; Langland-Orban, et al., 1996; Crosby, 1979). These studies sought to determine the influence of finances on quality across time in the private, public and not-for-profit sectors. In general, these authors found persistent associations between organizational finances and quality. However, they have been unable to reveal how organizational resource levels affect changes in quality over time.

The current study moves beyond the work of these prior authors, by extending the perspective gained from analysis of multiple cross-sections to examination of the effects of baseline revenues on intra-organizational change across time. This is an important distinction and the first study of its kind pertaining to the finance-quality relationship in the ambulatory care organizational context.

Long-term investment in quality improvement initiatives within the community health center context is often difficult to accomplish due to the lack of adequate financial resources (Cook, et al., 2006; Jacobson, et al., 2005). However, given the opportunity, community health centers may manage at-risk populations more proactively, especially while operating in an environment where profitability and cost cutting are not the primary motivation of management (Green and Katz, 1997; Hannan & Freeman, 1984). Based on this logic, I offer the following hypothesis:

**Hypothesis 1b**: Baseline community health center levels of net revenue are associated with linear rates of change in health care quality over time.

## METHODS

### Sample Data

Data for this study were collected from 1998-2004 data from the Health Resources and Services Administration's Uniform Data System, which contains information on a variety of financial and other operational factors from federally funded community health centers' annual grant applications and progress reports. A measure indicating county level rurality was merged in from Area Resource Files and was coded 0 if urban and 1 if rural.

There were 5,511 center-years in the original sample, representing a total of 978 health centers that had submitted grant applications and/or progress reports inclusive of and between 1998 and 2004. Each dependent variable had observations missing at random, thus the final analytic sample varied in size, dependent upon the dependent variable of interest (Little & Schlenker, 1995). In the case of my preventative care dependent variables (i.e., PAP smears and health support), the final sample used for analysis was fairly robust: 5,445 and 5,404 observations respectively. However, fewer observations were available for my primary care variables. The first trimester care variable was modeled on 3,886 observations and the post partum variable analysis was based upon a sample of 3,727 observations. Tables 1 and 2 provide summary explanations of all variables as well as descriptive statistics.

## Measures

In my analysis, the dependent variables reflected two aspects of preventive care and two aspects of primary care. The preventive care measures were (1) percent women and girls 15 to 44 receiving routine cervical cancer screening (PAP smears) on site and (2) percent of children 0-12 receiving routine 'well child' screening or observation. The primary care measures were (1) percent of deliveries preceded by first trimester care and (2) percent of deliveries followed by postpartum care. Each of preceeding variables was constructed from the UDS data based on the number of individuals receiving the care in question (e.g., well child visits) divided by the total number eligible for that particular type of care.

Ultimately my explanatory variable of interest was a categorical measure of net revenue derived from each center's annual net revenue figure (calculated as total revenue minus total costs) from the UDS data. In general, my use of net revenue, an indicator of financial health, is

consistent with prior studies of finances and their impact on organizational dynamics (Encinosa and Bernard, 2005; Shi, et al., 2000; Hadley, Mullner & Feder, 1982; Kilstein, Sanders & Schieber, 1980). Table 3 summarizes the raw net revenue data.

A great deal of consideration was given to the choice of my variable of interest. Other, more common, choices were evaluated and rejected on both conceptual and empirical grounds. Conceptually, my decision to set aside a ratio-based variable such as 'net revenue as a percent of total costs' is based on my logic that such a variable may be measuring efficiency of cost control – which was not the focus of my study.

Additionally, I evaluated net revenue as a measure of organizational discretionary finances. After controlling for center for centers' volume of services, there is likely an association between the amount of net revenue available to the organization and the ability to augment access to care. Empirically, however, the heavy skew and kurtosis of the raw net revenue variable raised concerns about my ability to capture linear associations. Scatterplots of net revenue and the dependent variables did not offer any visual clues suggesting a curvilinear relationship. Transformations (e.g., rescaling to log transform) were also considered but disregarded based on their inability to improve the distribution of the net revenue data.

Thus, I opted to categorize centers into one of five groups to mitigate the effects of the non-normal nature of the net revenue variable yet still capture the intended associations between net revenue and quality. These categories consisted of: (1) Bust: -$15 M to -$500.1K (2) Loss: -$500K to -$0.1K (3) Even: $0 to +$250K (4) Gain: +$250.1K to +$5M and (5) Flush: +$5.1M to +$45M. My explanatory variable of interest represented the magnitude of organizational discretionary financing after controlling for the aspect of scale (# FTE's) in addition to other

individual CHC characteristics. Summary statistics reflecting the total number of observations within each group are presented in Table 2.

It should be noted that two fundamental implications arise via this approach. First, in categorizing the independent variable I have coarsened the relationship between my chosen independent and dependent variables of interest. Second, by introducing additional variables into the analysis, I have consumed additional degrees of freedom. However, while interpretation of a direct linear relationship is preferred, this did not appear possible given the distribution of the independent variable. Additionally, given the sample size the consumption of degrees of freedom did not appear to be a significant problem.

The identified break points for the groups were placed to (1) capture the full range of net revenue (i.e., minimum to maximum), (2) clearly identify a narrow 'break even' category (i.e., $0 - $250K), and (3) establish logical separation between the remaining community health centers based on their annually available net revenue. Dunnett's one way ANOVA means testing revealed significant difference in means among the five groups at a 99% confidence level and a 1% family error rate (p=0.0000). Similar results were obtained for the Hsu's, Tukey's and Fischer's Least Significant Difference tests. In performing these tests, I validated my choice of categories through statistically testing their mean values to ensure two groups were not testing the same effect in the analysis process. Finally, with my variable of interest in categorical format and finding it largely invariant in inter-facility comparison across the sample period, it was included in my model as a time invariant predictor. As such, the net revenue variable is included in the model as a within-center measure of organizational financial latitude.

Potential confounders were tested in the model building sequence as controls following bivariate tests to eliminate colinearity. As a whole, these measures helped to accurately define

the operational environment in which each center operates. Depending on the variation of each measure across the sample period, each control entered the model as either a time varying (Level 1) or time invariant (Level 2) measure. Level 1 covariates included the number of full time equivalent employees (log-transformed) as a proxy for facility size, the percentage of patients uninsured and the percentage of patients considered migrant. Level 2 (time invariant) covariates included a measure of patients considered homeless as well as two dichotomous variables, one indicating the facility age (proxied by the center's existence in the UDS data set prior to 1996 or not) and the other indicating center location (i.e., urban versus rural). Table 1 provides the results of where we tested time as a predictor of the variable of interest (e.g., percent uninsured) to ascertain correct placement within my model structure. With the exception of the age and location variables, each covariate was grand mean centered to facilitate model interpretability (Singer and Willet, 2003).

## Statistical Method

The longitudinal data available on community health centers presents a powerful resource for analysis of change over time. However, this data structure also presents methodological challenges. For example, multiple responses from a single health center will tend to be correlated over time. This undermines the statistical assumption of independence on which ordinary least squares regression is based (Bliese and Ployhart, 2002).

To overcome the challenges associated with longitudinal data, I applied a growth modeling technique (Meredity and Tisak, 1990; Bliese and Ployhart, 2002). Originally applied within a developmental psychology context, growth modeling has since been expanded to numerous other domains (Bliese and Ployhart, 2002). For my purposes, I pursued growth modeling to

look specifically at how organizational financial characteristics influence changes in quality over time and whether there are differences in quality outcomes as a result of these internal dynamics. This approach allowed me to capture the effects of baseline organizational attributes on change over time while also addressing autocorrelation. By using a growth modeling approach, I was able to iteratively build upon a basic regression framework and allow the model intercept and slope to vary randomly and subsequently test for improvement in model fit through the inclusion of my financial and control variables (Bryk and Raudenbush, 1992; Bliese and Ployhart, 2002; Singer, 1998).

The statistical package R was used to test my models. The R statistical software, based upon the S and S+ statistical packages, has an extremely powerful and flexible set of "packages" that operate within one program. Most important to my research, the R website (http://cran.r-project.org/) offers the inferential statistical tools necessary to properly execute my proposed analysis (R core team, 2006).

## Models

To test my hypotheses, I used a multilevel modeling building approach to investigate the influence of organizational net revenue on quality over time (Bliese & Ployhart, 2002). Significant associations (e.g. $\beta_{01} \neq 0$) were established at $\alpha = 0.05$, indicating the tested dimension of interest to be associated with quality processes within the community health center context. The model testing this hypothesis is presented below.

**Level 1: Time Varying Predictors (between centers)**

$$Qij = \Pi 0i + \Pi 1i(Time)_i + \Pi 2i \text{ to } \Pi 4i \text{ (Time varying controls*)}_{ij} + r_{ij}$$

**Level 2: Time Invariant Predictors (within center)**

$$\Pi 0i = \beta 00 + \beta 01(\text{Net Revenue})_i + \beta 02(\text{Old})i + \beta 03(\text{Homeless*})_i + \beta 04(\text{Rurality})_i + u0i$$

$$\Pi 1i = \beta 10 + \beta 11(\text{Net Revenue})_i + \beta 12(\text{Old})_i + \beta 13(\text{Homeless*})_i + \beta 14(\text{Rurality})_i + u1i$$

where: rij ~ N (0, $\sigma^2$); i=individual, j=time and all observations are structured on time

The equations above combine to form the following analytical model:

$$Qij = [\beta 00 + \beta 01(\text{Net Revenue})_i + \beta 02(\text{Old})i + \beta 03(\text{Homeless})_i + \beta 04(\text{Rurality})_i] + [\beta 10(\text{Time}) + + \beta 11(\text{Net Revenue*Time})_i + \beta 12(\text{Age*Time})_i + \beta 13(\text{Homeless*Time})_i + \beta 14(\text{Rurality*Time})_i] + [\ \beta 20 \text{ to } \beta 40 \text{ (Time varying controls) }] + [u0i + u1i + rij]$$

* = Grand Mean Centered.
Note: Time varying controls include Size(FTE), Percent Migrant & Percent Uninsured.

In this analysis, the dependent variable (Q) represented the percent score of center 'i' in year 'j'. Hypothesis 1a proposed a positive association between the degree of organizational net revenue and the level of quality. The model above tests this hypothesis through explanation of $\beta_{01,}$ the effect of organizational level attributes on quality at baseline. In this model, $\beta_{00}$ represented the average intercept (e.g., PAP smears) across all centers. $\beta_{01}$ represents the influence of my variable of interest had on patient service delivery at baseline. $\beta_{02,}$ $\beta_{03}$ and $\beta_{04}$ indicated the contribution that community health center age, percent of patients characterized as homeless and rurality had on baseline health care delivery respectively.

Hypothesis 1b predicts a positive influence of organizational net revenue on change in quality over time. I tested this theory by modeling $\beta_{11,}$ the conditional change over time in quality, due to facility level net revenue. Thus, in testing this hypothesis, the variables in the model were interacted with time to ascertain their impact on slope variability (Bliese, 2005, Singer and Willet, 2003). In this portion of the model, $\beta_{10}$ measured the average slope for center 'i' across to time. $\beta_{11}$ accounts for the impact of net revenue on service quality over time. $\beta_{12,}$ $\beta_{13}$ , and $\beta_{14}$ entered the model to control for the contribution that community health center

age, percent of homeless patients and center rurality had on health care delivery over time. The error terms (e.g., $u_{0j}$, $u_{1j}$ (Time), $u_{2j}$, $u_{3j,}$ $u_{4j}$ and $r_{ij}$) represented measures of the random effects for the intercept, the time slope, the level 1 covariate slopes and the within-center residual.

## RESULTS

### *Financial Effects at Baseline*

In general, my findings were mixed when compared to Hypothesis 1a. Table 4 presents the results of the model testing the influence of net revenue on quality across the seven years of analysis (1998-2004). I observed here the positive and significant relationship between revenue and quality in two of the four measures of quality (e.g., PAP smear screening rates and child health supervision), while a null and negative association emerged for the first trimester care and post partum care dependent variables respectively. Based on this analysis it appears that more prosperous health centers were associated with PAP smear screening rates between up to 6% higher in comparison to my the lowest referent group. Likewise, more profitable health centers reflected superior child health supervision rates, improving on the referent category by over and 17% (Gain). These findings supported Hypothesis 1a.

Results of the tests using the remaining two measures of quality (e.g., first trimester and post partum care) were contradictive. In the case of these variables, the presence of a significant ($p < .05$) finance-quality relationship was detected only for the post partum care variable and ran in the opposite direction to that hypothesized. More profitable centers were up to 9.8% (Loss) lower in post partum care compared to the referent category (Bust). These results were generally consistent - in terms of coefficient direction - with the results obtained for

the first trimester care variable, although the latter results were insignificant across all finance categories. These findings ran contrary to Hypothesis 1a.

### ***Financial Effects Across Time***

Table 4 also reflects the temporal results of the influence of net revenue on quality. In Hypothesis 1b, I expected discretionary funding to positively influence measures of quality across time but found conflicting evidence in my analysis. Negative associations between baseline net revenue and change over time were detected for both the PAP smear and health support dependent variable with more significant declines recognized in the latter measure. In contrast, a positive influence emerged in the analysis of post partum care. In all cases this effect was minor, ranging between –0.7% (Even / PAP smear) and -4.3% (Even / Health Support), but significant across the study period.

These results reflect a diminishing influence of baseline funding in preventative health care services (PAP smears and child health support), but supportive effect in post partum care. In general these results are mixed when considered against my original hypothesis where I expected a significant effect of fiscal margin on quality over time.

### ***Covariates at Baseline***

My observations of the influence of my Level 2 control variables on my measures of quality were also particularly interesting. Rural locations were found to have a lower percentage of beneficiaries receiving preventive care services (e.g., PAP smears and health support)

decreasing the percentages of each dimension at baseline by 5.5% and over 33% respectively relative to their urban counterparts. In contrast, rural locations were found to be nearly 9.7% higher in their impact on first trimester care versus urban locations.

The age of the facility was found to be relevant in only one set of analyses as was the percent of homeless patients. Older locations were found to administer higher levels of first trimester care (8.6%) while centers with an average homeless rate provide 14.4% lower cervical cancer screenings. As would be expected, centers with an average level of homeless patients were less able to provide preventive care services, marked by a 14.5% and 21.9% reduction in cervical cancer screening and child health support, respectively.

### ***Covariates Across Time***

Level 1 confounders provided the most interest in my review of covariates across time. The size of the facility was relevant in each of the four analyses conducted but of minor effect. In all but one case (first trimester care) the size of the facility reflected higher quality of services by between 0.2% (post partum care) to over 0.8% (child health). Counter-intuitively, the size of the facility registered a negative influence on first trimester care on average, but of only 0.1%. In contrast, the percentage of uninsured patients in the population had greater effect, accounting for a marked decline in health quality in two of the four quality dimensions (well child visits and first trimester care), reducing each by 18.4% and 7.6% respectively while also accounting for a 3.8% increase in PAP rates. The percent of migrant patients in the population was significant in only one model, negatively impacting PAP smear rates by 5.5% across the study period.

In general, my findings pertaining to the influence of my Level 2 control variables across time were insignificant. Inclusion of these interactive effects did change the parameter estimates for my variable of interest and thus were left in the model to assist in eliminating omitted variable bias and for reporting consistency.

## DISCUSSION

This research is the first extension of the finance-quality relationship to the community health center context. Findings indicate that large differences in net revenue in some instances could support enhanced primary care cross sectionally even after controlling for the scale of operations.

The underlying supposition of this research was that the financial strength of an organization was a factor associated with health care quality. Originally, I questioned whether variations in organizational context influence this relationship in health centers. I proposed that community health centers, which typically operate on the brink of financial insolvency, may be forced to allocate discretionary financial resources toward satisfying routine operating expenses in lieu of improving health care services (McAlearney, 2002). Early exploratory analyses did not reveal any linear associations between net revenue and quality. However, after adjusting for the non-Gaussian distribution of my explanatory variable, observations indicated that large differences in absolute net revenue were associated with differences in preventive care cross sectionally, despite the fact net revenue as a percent of costs was not associated directly with any quality indicators. This indicates a potential relationship between organizational slack and health care quality after controlling for its scale of operations.

However, the mixed results of my investigation were puzzling. Why would such large and significant results be obtained for two of my measures while the remaining two barely register an effect or were negative in influence? One explanation may be that regardless of financial status, community health centers aggressively address pre and post-partum health care for pregnant girls and women in need of such services in an effort to meet the basic health care needs of the typically disadvantaged populations which these centers support. This conjecture is supported by the high values for $\beta_{00}$ for first trimester and post-partum care, indicating the average baseline level of care in new urban facilities operating at a severe loss (over $500K per year) (Singer and Willet, 2003). In the case of preventive care variables (e.g., PAP smears and health support for children), which could be viewed as largely non-urgent preventive measures, additional financial leverage may have more of an effect as discretionary financial resources can be dedicated toward such services.

Another puzzle centered on the negative association between post-partum care and net revenue at baseline. One possible explanation may be that health centers improve net revenue by maintaining lower levels of post-partum care. This assumption may not necessarily indicate a deliberate strategy to improve finances through decreased services but may, in fact, occur naturally when other sources of care (e.g., hospitals or other agencies) provide post partum care, thereby relieving health centers from an under-reimbursed service.

An additional question surfaced pertaining to the reason behind the slight decline in cervical cancer screening rates and child health supervision for centers with higher initial revenue and positive impact at baseline. One possible answer is that there was a regression to the mean, such that centers with initially above-average levels of access struggled to maintain those high levels of care, given many competing demands on limited organizational resources.

Results generally suggest that there are immediate effects of financial slack on preventive services and perhaps delayed effects on some types of other services. It is possible that cervical cancer screening and child supervision entail fewer fixed costs than obstetrical services, and thus can be more quickly expanded when additional money is available. Thus, available discretionary finances (net revenue) may have an initial effect on preventive care service delivery, but without yielding improvements in access that cumulate over time.

For instance, health centers may allocate more staffing to preventive care when current budgets allow and then cut back when money is restricted. In contrast, post partum care may require significant initial investments (e.g., to hire additional staff or purchase diagnostic equipment). The acquisition of such staff and equipment requires time as well as the implementation of additional services tied to these pieces of equipment may be delayed. However, once placed into practice, the benefits may build over time. For instance, women who have had post partum care may tell others about the benefits of this care, thus increasing access rates over time.

## LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

This study is limited by several factors. First, this study is based on secondary data (i.e., the UDS data set) collected annually by the administrators that oversee operations in each of the 900+ community health centers. As such, the consistency of the data may be brought into question given the various perspectives and reporting methodologies utilized by center administrators. Despite the structure of the UDS data set and guidance provided by the Bureau

of Primary Health Care, the UDS data set remains a secondary data source. As such, reliability of the reported data may be an issue.

Second, the availability of diverse quality outcomes is an additional limitation to this study. The dependent variables utilized in my study followed a distinct 'woman and child' theme. Should the availability of data allow, further research on the finance-quality relationship in the community health center context should utilize more diverse quality measures (e.g, structure, process or outcome) that depart from my current research paradigm. These may include additional cancer or diabetes screening measures, routine eye examination results, dental wellness screening results, or substance abuse mitigation measures, just to name a few.

Third, this study was limited by the net revenue variable. The UDS data set reports net revenue in a manner inconsistent with Generally Accepted Accounting Principles (GAAP) methods. The revenue reported in the UDS is on a cash basis and the expenses are on an accrual basis (Pope, 2006). This leads to a question of whether an accurate net revenue calculation can be obtained, although similar measures of financial status have been used in prior research (Shi, et al., 2000). Because of this potential problem and the non-Gaussian distribution of the variable of interest, this is an additional reason I chose to employ a categorical variable in my analysis.

Fourth, this study also was unable to control for the effect of past years' financial benefits accrued to an organization. Although this study employed a relatively long-term focus, I was unable to control for the possibility that some organizations may have developed positive (or negative) inertia in the accumulation of prior years quality-enhancing equipment and staff. Moreover, I cannot account for the fact that organizations may have, in fact, skimped on services to save money to apply in other areas of clinical or administrative practice. These

effects were not considered in this analysis but may be an interesting departure point for future study in the area.

Lastly, the predictive ability of this study is diminished by the non-availability of organizational level variables that may further clarify the confounding factors contributing to the creation of sufficient financial reserves in community health centers across time. This is an additional detriment to using a secondary data set but provides a significant and potentially beneficial course of further research.

## CONCLUSION

"An ounce of prevention is worth a pound of cure". Philip Crosby's landmark book, *Quality Is Free*, captured the essence of this age-old adage by extending the relationship between quality and operating efficiency (Crosby, 1979). Essentially, Crosby argued that the costs resulting from poor quality *greatly exceed* the costs required to produce a high-quality product or service in the first place. Based on this logic, it follows that a rational organization should willingly invest in quality management to avoid the higher cost of service defects. In the case of community health centers, however, the issue of rationality is complicated by their financial hardships.

Since their inception in the 1960's community health centers have served as a primary care safety net for the nation's poor and underserved in both inner city and rural areas. These organizations incorporate comprehensive health services within a single institutional setting through the provision of primary and preventive care. Through the provision of essential medical services, CHC's reduce hospitalizations, days of stay and emergency room use among their supported populations (Samuels, Shi and Campbell, 1998). I assert that when financial

circumstances allow, community health centers may be more adept at providing certain preventive and primary care services, while the effects of discretionary financing may wax or wane across time.

Continued state and federal government interest is necessary if community health centers are to succeed and fulfill their mission of providing quality health care services. Further research in support of my preliminary findings should focus more closely on quality outcome measures. While my quality measures focused on the intermediary steps of the health care delivery process, outcome measures are increasingly the focus of quality experts as they provide concrete results of the total healthcare experience (Green and Katz, 1997; Drucker, 1985).

The current study provides admittedly mixed empirical evidence that organizational financing supports managerial efforts to maintain financial reserves that can meet contingent demands or which may be applied to improving the quality of the health care experience. Obviously, without the means to procure supplies, personnel and diagnostic equipment, a health care organization fails to remain a health care organization. Yet, what my research indicates is that the degree to which a health care organization can focus remaining resources to elevate performance (e.g., through enhanced clinical services, patient comfort, infrastructure, ease of access or atmosphere), the potential exists to augment the quality of services rendered.

**Table 4-1**: *Study 3 Variable Descriptions*

| Measure | Description | Stable or time varying? |
|---|---|---|
| ***Outcome Measures*** | | |
| % PAP Smear | Percent of women/girls over the age of 15 receiving cervical cancer screening | Time varying (p= 0.0471) |
| % Health Support | Percent of children 0-12 under routine health supervision | Time varying (p= 0.0004) |
| % First Trimester Care | Percent of deliveries receiving first trimester care | Time varying (p= 0.0000) |
| % Post Partum | Percent of deliveries receiving post partum care | Time varying (p= 0.0005) |
| | | |
| ***Variable of Interest*** | | |
| Finance (Net Revenue) | Center net revenue calculated as total revenue less total costs.<br>Factored into five dummy categories.<br>Categories are defined as follows:<br>Bust: $-15 M: -500.1 K;<br>Loss: -500 K: 0.1;<br>Even: 0 : 250K;<br>Gain: 250.1 K: 5 M;<br>Flush: 5.1 M: 45 M | Treated as Stable |
| | | |
| ***Controls*** | | |
| % Uninsured | Percent of patients without health insurance | Time varying (p= 0.0001) |
| % Migrant | Percent of patient considered migrant | Time varying (p= 0.0000) |
| % Homeless | Percent of patients without sustained housing | Stable (p = 0.1770) |
| % Old | Present in the Bureau of Primary Health Care's Uniform Data System in 1996 (first year of electronic data) ( 0 or 1 dummy variable) | Stable |
| Rural | Dummy variable indicating rurality (0 if urban; 1 if rural) | Stable |
| FTE (Log) | Proxy measure for size of the servicing facilitiy | Time varying (p= 0.0000) |

**Table 4-2**: *Descriptive Statistics*

| | Mean | Median | Variance | Std Dev | # Obs | ICC * |
|---|---|---|---|---|---|---|
| ***Outcome Measures*** | | | | | | |
| % PAP Smear | 0.222 | 0.196 | 0.022 | 0.150 | 5445 | 0.5960 |
| % Health Support | 0.717 | 0.662 | 0.259 | 0.509 | 5404 | 0.5404 |
| % First Trimester Care | 0.656 | 0.663 | 0.031 | 0.176 | 3886 | 0.5724 |
| % Post Partum Care | 0.710 | 0.745 | 0.053 | 0.231 | 3727 | 0.3433 |
| | | | | | | |
| ***Variable of Interest*** | | | | | | |
| Net Revenue (Non-factored) | $462,200 | $61,070 | 5.198E+12 | $2,280,000 | 5148 | |
| | Min = -$10.9M | | Max = +$43.9M | | | |
| | | | | | | |
| | **Bust** | **Loss** | **Even** | **Gain** | **Flush** | |
| Net Revenue Categories | 557 | 1476 | 1410 | 1559 | 146 | |
| | Mode = Gain | | | n = 5148 | | |
| | | | | | | |
| ***Control Measures*** | | | | | | |
| % Uninsured | 0.421 | 0.388 | 0.046 | 0.214 | 5483 | |
| % Migrant | 0.060 | 0 | 0.032 | 0.180 | 4258 | |
| % Homeless | 0.108 | 0.001 | 0.076 | 0.276 | 4812 | |
| % Facilities older than | 0.797 | 1 | 0.162 | 0.402 | 5513 | |
| Size: # FTE | 81.52 | 54.55 | 7809 | 88.37 | 5500 | |
| Size: # FTE (LOG) | 3.927 | 3.999 | 1.070 | 1.035 | 5500 | |
| Rural | 0.351 | 0.000 | 0.228 | 0.477 | 5383 | |
| | | | | | | |
| * ICC = Intraclass correlation coefficient or the amount of variation attributable to differences among centers | | | | | | |

**Table 4-3**: *Community Health Center Net Revenue Analysis by Year*

| Year | Mean | Median | s.d. | # Obs | Min | Max |
|---|---|---|---|---|---|---|
| 1998 | $ 2,388,000.00 | $ 563,600.00 | $ 4,732,000.00 | 694 | $ (7,125,167.00) | $ 43,932,440.00 |
| 1999 | $ 1,197,000.00 | $ 268,622.00 | $ 2,882,000.00 | 401 | $ (6,400,944.00) | $ 25,253,271.00 |
| 2000 | $ 45,800.00 | $ 16,040.00 | $ 938,000.00 | 718 | $ (8,169,623.00) | $ 11,388,801.00 |
| 2001 | $ 76,000.00 | $ 28,336.00 | $ 998,000.00 | 733 | $ (10,922,742.00) | $ 12,875,520.00 |
| 2002 | $ 76,340.00 | $ 31,172.00 | $ 1,191,000.00 | 823 | $ (8,510,666.00) | $ 23,318,058.00 |
| 2003 | $ 28,250.00 | $ 10,585.00 | $ 1,016,000.00 | 873 | $ (8,783,215.00) | $ 13,081,401.00 |
| 2004 | $ 68,490.00 | $ 36,268.00 | $ 1,063,000.00 | 905 | $ (8,401,823.00) | $ 13,233,895.00 |

## Table 4-4: *Results of Association between Net Revenue & Quality*

| | | Parameter | PAP Smear Care | | Child Health Support | | First Trimester Care | | Post Partum Care | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Baseline** | | | Value | | Value | | Value | | Value | |
| **Pi0i** | **B00** | **(Intercept)** | **0.1849** | *** | **0.5331** | *** | **0.5394** | *** | **0.8397** | *** |
| | | s.d. | 0.0229 | | 0.0650 | | 0.0269 | | 0.0495 | |
| | **B01** | **Net Revnue - Loss** | **0.0349** | * | **0.1465** | *** | **-0.0136** | | **-0.0982** | * |
| | | versus "Bust" | 0.0151 | | 0.0521 | | 0.0207 | | 0.0340 | |
| | | **Net Revenue - Even** | **0.0310** | * | **0.1648** | ** | **0.0182** | | **-0.0939** | * |
| | | versus "Bust" | 0.0155 | | 0.0534 | | 0.0215 | | 0.0352 | |
| | | **Net Revenue - Gain** | **0.0207** | | **0.1778** | *** | **-0.0073** | | **-0.0931** | * |
| | | versus "Bust" | 0.0144 | | 0.0500 | | 0.0194 | | 0.0319 | |
| | | **Net Revenue - Flush** | **0.0606** | *** | **0.1600** | * | **-0.0349** | | **-0.0896** | * |
| | | versus "Bust" | 0.0177 | | 0.0648 | | 0.0231 | | 0.0385 | |
| | **B02** | **Old** | **0.0112** | | **0.0984** | | **0.0860** | *** | **0.0155** | |
| | | | 0.0152 | | 0.0507 | | 0.0219 | | 0.0324 | |
| | **B03** | **Homeless** | **-0.1445** | *** | **-0.2193** | ** | **-0.0275** | | **-0.1132** | |
| | | | 0.0207 | | 0.0741 | | 0.0534 | | 0.0874 | |
| | **B04** | **Rurality** | **-0.0554** | *** | **-0.3301** | *** | **0.0972** | *** | **0.0118** | |
| | | | 0.0114 | | 0.0399 | | 0.0156 | | 0.0228 | |
| **Conditional Rate of Change** | | | | | | | | | | |
| **Pi1i** | | | | | | | | | | |
| | **B10** | **Time** | **0.0146** | ** | **0.0643** | *** | **0.0067** | | **-0.0410** | |
| | | | 0.0045 | | 0.0145 | | 0.0063 | | 0.0099 | |
| | **B11** | **Time*Loss** | **-0.0082** | * | **-0.0382** | *** | **0.0052** | | **0.0250** | ** |
| | | | 0.0035 | | 0.0115 | | 0.0049 | | 0.0079 | |
| | | **Time*Even** | **-0.0076** | * | **-0.0430** | *** | **-0.0002** | | **0.0289** | *** |
| | | | 0.0036 | | 0.0117 | | 0.0050 | | 0.0081 | |
| | | **Time*Gain** | **-0.0051** | | **-0.0430** | *** | **0.0026** | | **0.0211** | ** |
| | | | 0.0034 | | 0.0111 | | 0.0046 | | 0.0074 | |
| | | **Time*Flush** | **-0.0108** | | **-0.0032** | | **0.0112** | | **0.0156** | |
| | | | 0.0078 | | 0.0230 | | 0.0097 | | 0.0150 | |
| | **B12** | **Time*Old** | **-0.0040** | | **-0.0116** | | **-0.0086** | | **0.0078** | |
| | | | 0.0030 | | 0.0095 | | 0.0044 | | 0.0067 | |
| | **B13** | **Time*Homeless** | **-0.0017** | | **-0.0030** | | **0.0042** | | **0.0339** | |
| | | | 0.0044 | | 0.0144 | | 0.0122 | | 0.0206 | |
| | **B14** | **Time*Rural** | **0.0019** | | **-0.0027** | | **0.0051** | | **0.0075** | |
| | | | 0.0024 | | 0.0076 | | 0.0033 | | 0.0050 | |
| **Rate of Change Due to Size** | | | | | | | | | | |
| **Pi2i** | | **Size (FTE LOG)** | **0.0074** | *** | **0.0079** | *** | **-0.0019** | *** | **-0.0020** | * |
| | | | 0.0014 | | 0.0042 | | 0.0021 | | 0.0032 | |
| **Rate of Change Due to Migrant Population** | | | | | | | | | | |
| **Pi3i** | | **Migrant** | **-0.0552** | ** | **0.0646** | | **0.0120** | | **0.0674** | |
| | | | 0.0209 | | 0.0677 | | 0.0281 | | 0.0373 | |
| **Rate of Change Due to Uninsured Status** | | | | | | | | | | |
| **Pi4i** | | **Unisured** | **0.0383** | * | **-0.1843** | *** | **-0.0767** | *** | **-0.0545** | |
| | | | 0.0162 | | 0.0511 | | 0.0241 | | 0.0332 | |

| **Variance components** | | | | | | |
|---|---|---|---|---|---|---|
| **Level 1** | Within-center residual sigma sq epsilon | 0.0133 | 0.2107 | 0.0197 | 0.0509 | |
| **Level 2** | Intercept variance sigma sq 0 (tau00) | 0.0109 | 0.1353 | 0.0137 | 0.0250 | |
| | Slope variance sigma sq 1 (tau11) | 0.0003 | 0.0028 | 0.0003 | 0.0008 | |
| | Correlation between Intercept and Slope | -0.4380 | -0.5430 | -0.3440 | -0.5320 | |

| **Goodness-of-fit Measures** | | | | | |
|---|---|---|---|---|---|
| R-sq epsilon | -8.62% | -54.17% | -15.61% | -29.12% | |
| R-sq 0 | 26.66% | 41.00% | 39.12% | 21.20% | |
| R-sq 1 | -16.82% | 31.94% | -16.67% | 12.42% | |
| Deviance (2*Log Liklihood) | 6145.4640 | -2958.5520 | 3175.5060 | 782.2556 | |
| AIC | -6095.4630 | 3008.5520 | -3125.5050 | -734.2556 | |
| BIC | -5938.5980 | 3165.2840 | -2977.2770 | -592.7920 | |

*** p < .05** **** p < .01** ***** p < .001**

# CHAPTER 5

# CONCLUSION

Health care executives are challenged with positioning their organizations strategically to capture available resources and then deploy those resources wisely (Grazier, 2004). However, the current health care landscape poses an increasingly difficult terrain to manage when means are constrained. The ability of health care organizations to overcome the increasing costs of information technology, pharmaceuticals, skilled labor, mass casualty preparedness and managing chronic disease is compromised by the financial circumstances they face. Often health care leaders are faced with the choice of determining which services to offer and which to curtail or close (Encinosa and Bernard, 2005). Even if these organizations manage to make ends meet, they may incorporate organizational changes that compromise quality of care (Duffy and Friedman, 1993).

Congressional efforts to constrain the inflation of national health care costs in the public and private sectors have given rise to cost cutting measures that have placed health care organizations in awkward financial circumstances. As of 2003, over sixty percent of hospitals lose money providing patient care and over one third lose money overall (AHA, 2006). Hospitals and health care organizations with a high dependence on federal reimbursement for services rendered have been placed under intense pressure to maintain services despite these financial difficulties (Encinosa and Bernard, 2005). When contrasted with the noted quality deficiencies highlighted at the outset of this dissertation, a logical connection between the two becomes apparent and served as the catalyst to this body of work.

In this dissertation, I conducted three related analyses pertaining to the review and study of organizational discretionary financial effects on health care quality. The first study focused on the extant empirical research available in the literature pertaining to the intersection of financial resources and quality at the organizational level. The second study tested the association between finances and outcome quality in the context of Department of Defense military treatment facilities. The third and final study tested the same relationship on quality process measures in the context of federally funded community health centers.

As highlighted in chapter 2, anecdotal evidence is abundant in contrast to the sparse literature testing the finance-quality relationship. No studies were available testing the relationship of interest for either of the organizational contexts I pursued. However, sufficient evidence was obtained from other health care and industrial areas of research to provide evidence of a likely association between discretionary finances and quality in my contexts of interest. Eventually, only sixteen studies of this topic that employed statistical methods were extracted from the health care literature. These articles collectively indicated that expenses, fiscal margin, and asset and liability management all affect healthcare outcome quality. There were fewer studies testing the association between organizational finances and structural or process quality. This provided further support to use of process quality measures for my research performed in chapter 4 (CHC study).

Previous empirical work has focused nearly exclusively on hospitals and health plans. The current research, however, focused on military hospitals and community health centers. To my knowledge, this if the first research of its kind to investigate this issue in two vastly different organizational settings using two diverse data sources. As mentioned within the introduction, the choice of these two organizational contexts also controlled for the threat of reverse

causality, which may have been an issue in previous studies (Harkey & Vraciu, 1992; Cleverley & Harvey, 1992; Burstin, et al., 1993; Encinosa & Bernard, 2005). Using both data sets further enabled me to compare the results of the studies and contrast their findings.

The findings of the current studies have important implications for policy and practice not only in the settings considered, but in other organizational environments as well. First, my results suggest discretionary organizational finances influence both outcome and process quality measures in the short term. However, this association is not pervasive across all quality measures and is tempered by the magnitude of discretionary finances that must be employed to elicit a quality response. In Chapter 3, I observed the positive and significant effect of lagged measures of fiscal margin on quality in five of the seven measures of quality (e.g., getting needed care, getting care quickly, physician communication, health care satisfaction, preventive medicine satisfaction), while two measures (office staff and health plan satisfaction) remained uninfluenced by organizational finances. Likewise, the analysis conducted in Chapter 4 revealed an impact of finances on process quality in only three of the four measures studied (e.g., PAP smears, child health support & post partum care) in cross sectional analysis. In both studies, however, the scope of improvement is small compared to the level of discretionary finances required.

Second, results of these studies indicate that the effects of organizational finances on quality are transient. Neither study indicated a particularly strong nor persistent positive influence of finances on quality across time, with the exception of post partum care in study three. In general, these results indicate the recurring need by health care organizations to generate marginal resources to cover up front costs that may enhance patient services.

The overarching results of the study imply better support for predictions cross sectionally than over time. In hindsight, this is not entirely illogical. The effects of any new piece of equipment depreciate with time. Further, neither empirical study provided results that were particularly straightforward or intuitively obvious when first observed. In both studies, a deeper level of understanding was required in order to gain perspective on the results of the analysis in question. Collectively, these results suggest a need to continue research into the moderating or mediational effects that may influence the finance-quality relationship. Of particular personal interest are those factors within the military hospital (e.g., staffing levels, specialty care, administrative staffing, etc.) that contribute to heightened quality levels.

An additional focus of future work is defining more precise alternative measures of organizational finances and quality measures. The current research approach utilized existing measures from available data within each secondary data set. The use of more specific measures, such as service line profitability, for example, may provide managers greater insight on how best to balance scarce organizational resources for optimal quality gains.

In conclusion, this investigation as a whole represents an important *first* step in obtaining a better understanding of the association between finances and quality in two rarely studied organizational contexts. The results presented here are suggestive of a relationship between discretionary finances and health care quality. However the mixed findings of these studies suggest that additional studies should be undertaken to further refine the finance-quality association. It is my hope that the chapters of this research may serve as a catalyst toward further research and discussion on the appropriate financing of health care organizations.

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# VITA

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**EDUCATION**

**Colorado State University**, Fort Collins, CO
**Bachelor of Science,** Ag Business, 1995

**University of Oklahoma**, Norman, OK
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**EXPERIENCE** **Major, Medical Service Corps, U. S. Army, 12 Years Active Service**

**2004-2007** **Doctoral Candidate** The Pennsylvania State University, State College, PA
Doctoral candidate in the Department of Health Policy and Administration. Course curriculum concentrated on health care finance, health policy, statistics and research methodology.

**2001-2004** **Chief Financial Officer** United States Military Academy, West Point, NY
Responsible for the financial management of Keller Army Community Hospital, consisting of 41 departments, a staff of 500 employees and an annual operating budget of $30 million. Managed the hospital's prioritization of resources for internal procurement as well as effective cost management of outsourced care not available within the facility.

**1998-2000** **Chief Operating Officer** Wuerzburg, Germany
Provided fiscal and managerial oversight for 14 geographically isolated dental clinics responsible for the treatment of 60 thousand eligible beneficiaries within southern Bavaria. Responsible for the leadership and development of 12 FTE's that were responsible for the administrative support of 220 military and civilian dental care providers and support staff. Maintained an annual operating budget of $5.7 million.

**1997-1998** **Financial Management Intern** Wuerzburg, Germany

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Does Money Really Matter? A Review of the Literature on the Relationships between Healthcare Organization Finances and Quality, Brad Beauvais, Rebecca Wells. Hospital Topics. Sarasota: Spring 2006. Vol. 84, Iss. 2; p. 20 (9 pages)

Does Money Really Matter? The Effects of Fiscal Margin on Quality of Care In Military Treatment Facilities, Brad Beauvais, Rebecca Wells. Joseph Vasey, Jami DelliFraine, Hospital Topics. Forthcoming (2007)