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Quality of Care & California Nursing Homes: The Effects of Staffing, Organizational, Resident and Market Characteristics

by

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DISSERTATION

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ABSTRACT

Quality of Care and California Nursing Homes:

The Effects of Staffing, Organizational, Resident & Market Characteristics.

Eric James Collier R.N., Ph.D.

BACKGROUND: Despite substantial expenditures and considerable legislative and regulatory oversight, the caliber of care in U.S. nursing facilities (NFs) is poor and has long engendered calls from various constituencies to improve quality. OBJECTIVE: The primary aim of this study was to evaluate relationships between staffing and organizational characteristics and five measures of quality including total deficiencies (state + federal), validated complaints, and three federal quality indicators (QIs): weight loss, restraint use and bedfast status. SAMPLE AND DESIGN: The study population included 1,080 free-standing California NFs. Cross-sectional federal and state data, from 2004-2005, were evaluated with regression models that included controls for resident and market factors. RESULTS: The weight loss model accounted for 16% of the variation in QI prevalence. Higher percentages of Hispanic individuals in the operating market and more African American and Asian residents in each facility were associated with less weight loss. In contrast, more Medicare resident days and higher case mix were positively related to weight loss. For restraints, the model accounted for 10% of the variation in QI prevalence. Facility size (number of beds), higher staffing levels and for-profit ownership predicted more restraint use. Chain membership and increased percentages of Asian, Hispanic and African American residents predicted less restraint use. The bedfast QI was negatively associated with the presence of both a family council

and more Asian and Hispanic residents, but positively associated with increased Medi-Cal (Medicaid) resident days and increased acuity. For complaints and deficiencies, more beds, increased staff turnover and more Medi-Cal days predicted more complaints and deficiencies. Elevated resident case mix also predicted more complaints, while increasing dependency and more Asian and Hispanic residents predicted fewer complaints. For-profit status predicted more deficiencies, while higher net income, increased percentages of African American and Hispanic residents (at the county level), and more Asian residents in ecah NFs predicted fewer deficiencies. IMPLICATIONS: As expected, the quality outcomes were related to various organizational and staffing characteristics. The favorable relationships between quality outcomes and increased racial/ethnic diversity at the market and facility levels were unexpected and contrary to findings in extant literature, which clearly warrant further investigation.

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CHAPTER ONE: INTRODUCTION, BACKGROUND AND RATIONALE

In 2000, approximately nine and one-half million people in the United States (U.S.) needed some type of long-term care (LTC) to assist with their medical, social, personal and/or supportive care needs (Kaiser Family Foundation, [KFF], 2007). Six million of these recipients were older than sixty-five and four out of five received care in the community (typically from un-paid family members), while the remaining one fifth were cared for in a nursing home or another type of LTC institution (KFF). Unfortunately, the quality of care in the nation's nursing homes, or nursing facilities (NFs) is, in general, deplorable and has been documented in a wealth of peer-reviewed publications that have been periodically reviewed on behalf the Institute of Medicine ([IOM], 1986, 1996, 2001, 2003). Projected increases in the sizes of the elderly population, including those may need some type of LTC, underscore the urgency of improving the caliber of care in the country's NFs (Federal Inter-Agency Forum on Aging Related Statistics [Forum], 2004; KFF, 2007; United States [U.S.] Census Bureau 2004). Given such growth and the history poor quality of care in NFs, it is imperative to further evaluate the factors (including staffing and ownership characteristics) that effect quality. The overall aim of this research is to better-evaluate the intersection between several quality of care measures and an array of resident, staffing, organizational and operating market characteristics.

Considerable research effort has been directed toward evaluating the role of staffing level (defined as hours of care per resident day [hprd]) and skill mix (i.e., the proportion of nurses and nursing assistants) and staff turnover on resident outcomes in nursing facilities, or, as they are more commonly known nursing homes. The literature related to the role of staffing characteristics, presented in Chapter III, draws heavily from literature reviewed in a

series of IOM reports that have evaluated the quality of care in the nation's health care facilities and, in particular, in the roughly 17,000 NFs in the U.S. (IOM, 1986, 1996, 2001, 2003). In addition to staffing-related literature, numerous investigators have evaluated differences in the quality of care between not-for-profit (NFP) nursing facilities (also known as tax-exempt or non-proprietary facilities) and their for-profit (FP) counterparts, which are also known as proprietary or investor-owned facilities. The literature related to ownership and resident outcomes is also discussed in Chapter III and draws from three comprehensive and systematic reviews: (Hillmer, Wodchis, Gill, Anderson & Rochon, 2005; O'Brien, Saxberg & Smith, 1983; Rosenau & Linder, 2003). This literature is complemented by a discussion of findings from several well-designed studies that have provided important insights on the effects of ownership type and quality including: (a) Aaronson, Zinn and Rosko, 1994; (b) Harrington, Woolhandler, Mullan, Carrillo and Himmelstein, 2001; (c) O'Neil, Harrington, Kitchener and Saliba, 2003; and, (d), Spector, Selden and Cohen, 1998.

The variables evaluated in the staffing and ownership literature related to NFs, and other health care organization's, have usually been analyzed using either an econometric model and/or from the perspective offered by Donnabedian's structure process and outcomes (SPO) framework (Donnabedian, 1966, 1988). Donnabedian's model is discussed in Chapter II along with organizational behavior perspectives, including strategic management (SM) theory (Shortell & Kaluzny, 2006). Together, these models were used to develop the conceptual framework that was used to evaluate three types of quality measures in a sample of California NFs: federal quality indicator (QI) prevalence rates, validated complaints and total deficiencies (which includes federal and state deficiencies and state citations). Chapter II also includes study aims and hypotheses, including a hypothesis table

for all predictors and outcomes. Chapter III contains a review of health services research literature, with an emphasis on publications that included analyses of relationships between staffing (i.e., staffing levels and turnover rates of nursing staff), organizational characteristics (e.g., ownership type) and quality of care in the nation's NFs. Chapter III also contains a detailed discussion of published literature related to the methodological development and clinical validation of key federal data sources that are used in NF research (i.e., the minimum data set [MDS] and related instruments). Sample information, predictor and outcome variables, aims and analytical models, data sources, data management procedures and the sequence of analytical steps are analysis are reported in Chapter IV. Findings, from a series of regression models, are reported in Chapter V and discussed (along with limitations of this study and implications for future research) in Chapter VI. The attached Appendix includes a brief discussion of data sources and complements the material related to the testing and development of NF data instruments presented in Chapter III.

Aims & Contributions of this Study

Aims

The two primary aims of this research include the following:

Aim 1: To examine relationships between various organizational characteristics (e.g., for-profit vs. not-for-profit facilities; chain vs. non-chain NFs) and staffing characteristics (e.g., hours of care per resident day [hprd], turnover rates), after controlling for various resident and market factors, on three outcomes: weight loss, restraint use and bedfast status, or being in bed for $\geq$ 22 hours per day (without clinical justification).

Aim 2: To examine relationships between organizational and staffing characteristics and the total number of validated complaints and deficiencies, after controlling for various resident and market factors.

Contribution of this Research to the Long Term Care Literature

Projected increase in the size of the nation's elderly population underscores the urgency of improving the caliber of care in the country's LTC facilities. Using both a structure-process-outcome (SPO) and strategic management framework (SM) to further evaluate relationships between organizational, staffing, resident and operating market, characteristics and quality of care merits additional research attention that extends both the health services research (HSR) and organizational behavior literatures. The use a large population of facilities that share characteristics with the nation's nearly 17,000 NF is also valuable, especially because this research will be evaluate quality in the context of California's improved staffing standards (California Health and Safety Code §1276.5a, 2000) , which may provide direction about the optimal level of NF staffing that is needed to assure adequate quality. Research that evaluates the most reliable federal quality indicators (e.g., weight loss, restraints and bedfast status) and reexamines total deficiencies, a critical indicator of quality, also adds to the HSR literature. In addition, this study extended the health quality literature by evaluating factors that are associated with the number of validated complaints, a quality measure that with few exceptions (i.e., Stevenson, 2005, 2006) has not been well-studied, but holds considerable promise by offering a consumer perspective on quality of care in California NFs. In addition to these benefits, HSR based on California data offers an excellent opportunity to explore NF quality of care because the state has comprehensive data sources (especially related to the staffing & financial

characteristics of NFs) when contrasted with federal sources. Lastly, California NFs include an ethnically diverse population that offers an unparalleled opportunity to evaluate the relationship between quality of care and the racial/ethnic characteristics of residents.

It is anticipated that the findings generated from this research can be used to better analyze the complex factors that influence quality of care in NFs and to add important information to national discussions of health care quality, which can then be translated into long-needed changes at both the health policy and clinical levels. For example, the federal government and more than 50 percent of the nation's health maintenance organizations have begun to explore and/or implement "pay-for-performance" programs (Epstein, 2007) and several states have adopted or are considering mandatory staffing standards that exceed those articulated in federal statutes. Studies that identify trends in quality of care measures can help to inform such efforts. More generally, the findings from this study can also provide information about the factors that influence quality of care to better-inform consumers and to assure that funding agencies receive the best value for their health care spending.

The remainder of this Chapter includes the following background information: (a) a brief discussion related to the state of quality in the nation's NFs; (b) data on changing population demographics and implications for growth in the size of the LTC population; (c) National Health Expenditures (NHE) allocated to free-standing NFs; (d), a review of federal and California statutes governing staffing levels and NFs; and, (e) current staffing levels in U.S. nursing facilities.

Quality of Care in the Nation's Nursing Facilities

Despite considerable spending, concerns related to the poor quality of care provided in the country's NFs are widespread and have been accompanied by impassioned and long-standing calls from various constituencies to both evaluate and, more importantly, improve the poor quality of care in the nation's NFs (Connolly, 2001; Committee on Government Reform, 2002; IOM, 1986, 1996, 2001 2003; Harrington et al., 2000a, 2000b; Kane, 1997, 2001; Kane & Kane, 2001; National Citizens' Coalition for Nursing Home Reform (NCCNHR), 1984; Pear 2001 2002; U.S. Centers for Medicare and Medicaid [USCMS or CMS], 2001; U.S. Health Care Financing Administration [USHCFA], 2001; U.S. Government Accountability Office [USGAO], 1997, 1999, 2002; U.S. Office of the Inspector General [USOIG], 1999a , 1999b, 2000, 2001).

Quality of Care: Staffing-Related Characteristics

The authors of the 2001 IOM report summarized and presented a considerable body of qualitative and quantitative literature related to the quality of care in the country's NFs. The report concluded that the quality can be thoroughly appraised by assessing seven outcomes that are thought to be related to staffing levels, employee behaviors and staff expertise including the: (a) use of physical and chemical restraints, (b) rates of acute care hospitalization for NF residents, (c) incidence rates of pressure ulcers (PUs), (d) management and prevention of incontinence, (e) management of pain, (f) measurement of resident's quality of life, and (g), management and prevention of malnutrition and dehydration. These types of domains are evaluated in the quality indicators (QI) measures reported by CMS (Zimmerman et al., 1995). Additional studies that assess the role of staffing levels and skill mix on the prevalence of these types of indicators is still needed,

especially because the QIs have been subject to periodic revisions and they are believed to convey valuable information about the state of quality in NFs (Zimmerman et al., 1995). Recent evidence suggests that at least three QIs may be particularly useful outcome measures in studies to evaluate the influence of staffing levels on quality: weight loss, restraint use and bed-fast status (Bates-Jensen et al., 2004a, 2004b; Schnelle et al., 2004a, 2004b; Simmons et al., 2003). These three QIs, along with total deficiencies and validated complaints were treated as quality outcomes in this study.

In 1999, nearly 25% of the nation's NFs were found to have severe deficiencies in the highest-severity category defined by USCMS (IOM, 2001), which refers to a facilities failure (or inability) to meet Medicare participation requirements. A facility is said to provide substandard care when a deficiency is detected (by federal regulatory agencies, or their state-level surrogates) in a critical area that affects (or could affect) residents. Deficiencies have been associated with both staffing and various organizational characteristics and they can be used to broadly evaluate an array of quality-related factors in NFs. For example, the following eleven deficiencies depict the most common quality/regulatory problems in the 15,401 NFs that were surveyed in 1998: (a) inappropriate use of restraints (12.7% of NFs); (b) failure to maintain resident's dignity (14.1%); (c) inadequate housekeeping practices (14.4%); (d) the presence of accident hazards (14.7%); (e) inadequate assessment of residents (15.1%); (f) failure to remove or correct accident hazards (18%); (g) poor care planning practices (15.2 %); (h) development of pressure sores among residents (17.1%); (i) inadequate care and disease prevention practices (17%); (j) inadequate accident prevention strategies (18%); and lastly, (k), poor food sanitation procedures (23.7%) (Harrington & Carillo, 2000). Even though the relationships between deficiency and staffing

variables have been commonly evaluated in the literature, it is worthwhile to further evaluate these types of measures, especially in light of California's minimum staffing standards that were implemented in 2002 (California Health and Safety Code §1276.5a, 2000). Assessing the effect of these standards on the number of deficiencies represents an important contribution of this research.

In addition to evaluating QI and deficiency data, this study will evaluate quality of care by treating validated complaints as a proxy measure of quality. With few exceptions (i.e., Stevenson 2005 & 2006), complaint data have not been used to assess quality. As Stevenson noted evaluating complaints may offer a more important measure of quality because this measure offers a consumer perspective on quality of care that is not captured by other measures.

Quality of Care: Organizational Characteristics

In addition to staffing variables, the authors of the IOM (2003) report, *Keeping Patients Safe*, noted that quality can differ based on NF characteristics including ownership type and chain membership. Evaluating differences in quality and management practices (using a framework based in organizational behavior) of health care organizations can help to better understand and create an organizational environment/culture that places a premium on resident safety and quality of care. To achieve this goal, the IOM authors suggested that organizations strive to balance the tensions between production efficiency and safety. In addition, and as the IOM reports note, it is also important to create a sense of trust within LTC organizations by involving workers in work flow design to create an environment where new knowledge/practices are incorporated into care. Even though this study did not evaluate employee-resident level interactions, the use an organizational behavior framework

can help to evaluate the role of organizational culture on outcome variables of interest. These models can be used to assess the influence of ownership type (i.e., profit status), profit margin, chain membership and other organizational characteristics on resident outcomes.

Population Demographics: An Aging Population

The current U.S. population numbers about 300 million individuals and by 2040-2050 the U.S. Census Bureau (2004) projects that the nation's population will increase to between 392 and 420 million. In 2003, roughly 35 million people age 65 and older lived in the U.S. (Forum, 2004). Beginning in 2010 and by 2050, the 65+ population is projected to account for 20% of the population (vs. the current 12%) (Hayutin, 2007). By 2050, the size of the 65+ population strata is expected to reach 78 million individuals compared to 36 million today; those over the age of 85 will account for about 5 percent of the population, or about 21 million persons by 2050. These demographic changes portend considerable consequences for the nation's LTC system and the need for LTC services is unlikely to diminish as the U.S. population ages. For, example, some sources have projected that as many as three million individuals (vs. approximately 1.7 million at present) will require care in NFs or other types of LTC facilities by 2030 (IOM, 2001; Sahyoun et al., 2001). The KFF (2007) estimated that forty-five percent, or 18 million, of the individuals who turn 65 in the year 2010 will need some type of NF/LTC care during their lifetimes. Given such projections, it is imperative to further analyze the factors that influence quality of care in NFs.

Growth in the overall/absolute size of the NF population is not surprising, even if the pace of growth has begun to slow or decline, given that the population of NF residents increased from 1.3 to 1.5 million between 1985 and 1999 (U.S Department of Health and

Human Services, National Center for Health Statistics [NCHS], 2002). During 2003, this was equivalent to a NF population that includes 43 persons per every 1000 individuals in the over-65 stratum of the U.S. population (Forum, 2004). The size of the (relatively more frail) 85 and over age group cared for in NFs has remained relatively constant, but is none-the-less considerable at 183 persons per 1000 individuals in this population stratum (Forum). In 2004, the nation's roughly 16,500 NFs provided long and short term care for approximately 1.7 million individuals (National Center for Health Statistics [NCHS], 2000 & 2007). Among current NF residents, 90 percent (or more than 15 million) are older than 65 and half of these individuals are older than 85; most residents are female (53%), widowed (60%) and 54 percent required some type of supervision or hands-on-assistance with activities of daily living (KFF, 2007, NCHS, 2007).

National Long Term Care Health Expenditures

Changes in the size of the elderly population and growth in the numbers of individuals who will need some type of LTC foreshadow substantial consequences for the country's national health care expenditures (NHEs). During 1999, for example, expenditures for free-standing LTC facilities reached $90 billion and accounted for 7.5% of the $1.2 trillion spent on NHEs (Heffler et al., 1999; Levit et al., 2003). By 2002, expenditures for free-standing NFs reached $115.4 billion, or roughly 6.8% the $1.7 trillion spent on NHEs in 2002 (Levitt, Smith, Cowan, Sensing & Catlin, 2004). In 2006, NHE spending on free-standing facilities accounted for $125 billion of the $2.1 billion spent on NHE (Catlin et al., 2008). In total and for 2006, NHE represented 16.0% of Gross Domestic Product (GDP) and LTC spending was equivalent to about 1.4% of GDP. By 2014, with anticipated growth in both the size of both over-65 and the NF populations, NF expenditures are projected to reach

$195 billion and account for 5.4% of the nation's national health spending (Levit et al., 2004). The slight decline in percentage of NHEs allocated to NFs during the next decade has been accounted for, in part, by the delivery of more community-based services, as states increase compliance with the provisions of the Olmstead decision (Levit, et al., 2004). The magnitude of these expenditures justifies ongoing study to elucidate the role of important staffing and organizational variables to assure that the nation is receiving the best possible return for investments in terms of quality of care.

Legislative and Regulatory Statutes

Nursing Home Reform Act

To address quality of care concerns, investigators from the Institute of Medicine recommended that the Health Care Financing Administration (HCFA), now known as United States Centers for Medicare and Medicaid Services (CMS or USCMS), adopt mandatory standards to govern the operation and inspection of the nation's NFs (IOM, 1986). This recommendation culminated in passage of the Nursing Home Reform Act (NHRA), a legislative initiative signed into law by President Reagan, which was embedded in the Omnibus Budget Reconciliation Act of 1987 (OBRA, 1987). This legislation is also referred to in the literature as Public Law-100-203, Subtitle C: Nursing Home Reform Act [PL-100-203], and it is reported in the Code of Federal Regulations (CFR) as section 483.30. The provisions of the OBRA-1987 legislation address some of the structural and process-related strategies that should be implemented to maximize resident function and independence (IOM, 1996).

The implementation of the NHRA led to increased federal oversight of Medicare, Medicaid, and/or so-called dually certified nursing homes (OBRA, 1987). The current

federal staffing regulations contained in the NHRA do not specify exact levels of staff, but stipulate that NFs of any size: (a) employ registered nurses (RNs) as directors of nursing (DON), and as assistant directors of nursing and education coordinators in larger NFs; (b) have an RN on duty for at least eight hours per day, seven days per week; (c) have either an RN, or a Licensed Practical or Vocational Nurse (LPN/LVN) on duty for the evening and night shifts (the DON may also serve as the one RN on duty in facilities with fewer than 60 residents [OBRA,1987]); and, (d), employ sufficient, although unspecified, levels of ancillary staff including activity directors, social workers and nursing assistants (NAs), or Certified Nursing Assistants (CNAs), to assure that residents maintain the "highest practicable level" of physical, mental and psychosocial well-being (OBRA, 1987). Even though most care in the nation's NFs is provided by CNAs, existing federal statutes fail to set any minimum numeric threshold for the level of these important caregivers. The guidelines of the NHRA, although vague, were designed to ensure that residents achieve and/or maintain, the highest possible level of physical, and psychosocial functioning (IOM, 1996; Kayser-Jones et al., 1999; OBRA, 1987).

The authors of the 2001 IOM report indicated that the quality of care provided in NFs had, in general, improved in the years following the full enactment of the NHRA (2001). The IOM's 2001 report, as well as more recent publications (e.g., Zhang & Grabowski, 2004), suggested that the enactment of the provisions in the NHRA was, in part, responsible for improvements in quality of care, including reduced use of physical and chemical restraints. However, as indicated above, serious care problems continue to occur in the nation's NFs including: poor management of pain, high incidence rates of pressure sore, persistent problems with malnutrition and urinary incontinence; problems that have been

exacerbated by inadequate levels of direct-care staffing and lax supervisory practices that endanger residents (CGR, 2002; IOM, 1986, 1996, 2001, 2003; USGAO, 1997, 1999, 2002; USOIG, 1999a, 1999b, 2000, 2001). For example, the recent report form the Committee on Government Reform (CGR, 2002) indicates that 95% of U.S. nursing facilities continue to provide poor care despite receiving citations for various types of deficiencies. These deficiencies have been significantly associated with lower staffing levels of both RNs and NAs, after controlling for other variables (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000a).

State-level Legislation

In contrast to relatively rudimentary federal standards, at least 25 states have established total staffing standards that require staffing levels beyond those specified in the language of the NHRA and, as Harrington (2001) has noted, 15 states had specific minimum standards for registered nurses (RNs) that were higher than the limited federal standards. Staffing levels are typically evaluated by hours of care per resident per day (hprd). In some states, including California, the definition of hprd is restricted to the level of direct care staffing direct care staffing provided by RN, LVN and CNAs/NAs.

The California minimum staffing requirements of 3.2 hprd for most NFs was codified in 2000 and fully enacted 2002 (California Health and Safety Code §1276.5a, 2000). If this staffing level is not sufficient to meet resident needs, then the statute requires that NFs must employ as many licensed nursing and certified nursing assistants as needed. Despite these requirements, only 57% of facilities in the state met the standard in 2002; by 2005 and encouragingly, 72% of NFs has met the state mandated staffing level (California HealthCare Foundation, 2007). The California staffing threshold is, however, subject to some variation

because residents in some types of LTC facilities are not as dependent on staff for care as the residents in most of the state's NFs; these facilities have lower staffing requirements: 1.1 hprd at intermediate care facilities and 2.3 hprd at institutions that care for residents who are mentally disabled or who have some type of "developmental delay" (California Health and Safety Code §1276.5a).

Current Staffing Levels

In 2007, The American Health Care Association (AHCA) reported that average direct care staffing levels in the nations' NF, using federal data sources, was 3.39 hprd; of this time, RN hours accounted for only 0.32 hprd, or about 9.5% of the total hours of care (roughly equivalent to 19 minutes of RN care per resident per 24 hour day). The total and RN staffing levels reported by the AHCA were lower (by about 17-18 minutes per day) than figures reported by Harrington and colleagues (2007). The later source, which was based on extensive national surveys of each state, indicated that average total staffing was 3.7 hprd and RN staffing was 0.6 hprd. The differences in the two reports is probably attributable to the inclusion of all types of RN staffing in the Harrington report (i.e., both direct and indirect car givers), while RN hours in the AHCA report was restricted to direct care RN staffing only.

In the AHCA (2007) report, LPN/LVNS provided, on average, 0.78 hours of care while Aids accounted for most of the hours of daily care at 2.30 Hprd. These figures are comparable to the data reported by Harrington and colleagues (2007). Aid hours include nursing assistant staffing, certified nursing aides/assistants (CNAs), nurse aids in training, and medication aides. The total staffing levels have increased slightly from fiscal year 2000; however, the overall increase was attributable to increases in both aide and LPN/LVN

staffing. Unfortunately, the overall increase in total staffing hours, reported by both the AHCA and Harrington and colleagues, was accompanied by a concomitant decease in RN staffing levels; an outcome that is likely to adversely influence quality of care.

Conclusion

Escalating national health expenditures (NHEs) when coupled with projected growth in the size of the elderly population makes it imperative to further analyze factors that influence health care quality. The long history of poor care in the nation's NFs and projected increases in the LTC population underscore the need for additional HSR in this area. Evaluating this issue (especially the role of staffing and ownership characteristics) from the joint perspectives of Donnabedian's (1966, 1988) framework and strategic management (and more specifically the areas of "managerial activity" described by Shortell & Kaluzny, 2006), represents a valuable contribution to the health services research literature. These models and the conceptual framework and hypotheses that guided study are discussed in the following chapter.

CHAPTER TWO: THEORETICAL FRAMEWORK

The overall aim of this proposal was to evaluate relationships between staffing, resident, organizational and market characteristics on facility-level quality measures including: quality indicator prevalence, deficiencies and complaints. Theoretical models provide frameworks to help elucidate patterns of relationships between variables and a phenomenon or outcomes of interest, such as quality of care. However, identifying relevant variables and relationships, and establishing causation, can be challenging. For example, in the initial 1986 IOM, report on the quality of care in NFs, the authors noted that quality of care is a multifaceted concept; a concept that is difficult to evaluate because of disagreement about what constitutes good quality and what needs to be to assessed or measured to accurately evaluate quality. The issue of defining and assessing quality has also been an issue that has been addressed in several more recent papers and editorials (e.g., Harrington, O'Meara, Kitchener, Simon, & Schnelle, 2003; Kane & Kane, 2001; Kane et al., 2003; Mor et al., 2003; Zimmerman et al., 1995).

In healthcare in general and more specifically in NFs, quality has usually been evaluated from either an econometric perspective or through the ubiquitously-used lens of Donnabedian's structure, process and outcome (SPO) framework (1966, 1988). The SPO approach to quality evaluation has gained acceptance because it is seen as a relatively objective, reliable and easily quantifiable approach (Zinn & Mor, 1998). Sainfort, Ramsey and Monato (1995), as well as numerous others (e.g., IOM, 2003), have used the SPO model to evaluate relationships between various structural and process variables and resident outcomes in NFs. The SPO framework is indeed useful and, in part, was used to develop the conceptual and analytical models for this study that are discussed Chapter Two.

Donnabedian's (1966, 1988) framework provides a familiar and, arguably, a relatively straightforward vehicle to evaluate resident outcomes. However, the SPO model is essentially and operational-level framework that does not adequately capture, at least in its original conception, the complexities of a organizations operating environment and, in particular, the factors in the external environment that alter the behavior of health care organizations. In addition to evaluating facility-level factors, it is equally important to examine the effects of, for example, the larger community of NFs, competitive forces, socio-demographics components of the population and regulatory influences on quality of care. The organizational behavior literature offers a wide array of macro-theoretical perspectives that have been used to analyze the behavior of health care and/or other types of organizations/agencies on consumers. Such theories offer models that can be used to better understand the social world and in particular the factors that influence the quality of care in NFs. Scott (2003) acknowledged the social significance of organizations; he described their ubiquity, their impact on power and status and their effects on the personalities and performance of their employees. He also suggested that organizations provide a mechanism of control of social processes by adopting specific communication, socialization and decision-making strategies. In a similar vein and during an earlier era, Parsons suggested that the "development of organizations is the mechanism by which, in a highly differentiated society, it is possible to 'get things done', to achieve goals beyond the reach of the individual" (as cited in Scott, 2003, p 41).

Developing knowledge and understanding the behavior of organizations and their effect on quality of care in LTC settings should be an imperative dimension of efforts to both analyze and enhance the quality of care in NFs. Therefore, and to evaluate quality of

care in this research, a conceptual model was developed that is jointly based on Donnabedian's (1966, 1988) perspective and the relatively more macro view of factors that can influence organizations and that are emphasized in Strategic Management (SM) theory (Ginter, Swayne and Duncan, 1998; Mintzberg 1990; Shortell & Kaluzny, 2006). The SM perspectives can, for example, include some of the political, economic, social and regulatory pressures that influence the operation of health care organizations and alter patient/resident care. Donnabedian's concept of quality and the SM conceptualization of the environment (particularly from the perspective of what Shortell & Kaluzny describe as the areas of managerial activity) are discussed below. This is preceded by background material, including a brief description of organizations as open systems and a description of the components that comprise the external and internal environments of organizations using Scott's (2003) typology. The chapter concludes with the conceptual model and the aims and hypothesis that were evaluated in this study. The health services literatures related to staffing, turnover and organizational characteristics are discussed in Chapter III.

Open Systems and the Elements of Organizations

Organizations as Open Systems

Organizations that have been described as open systems are those that engage in interchanges of throughputs (inputs and outputs) with the environment (Buckley, 1967, as discussed in Scott, 2003). Open systems, including social systems, have the ability (really the need) to span boundaries and transform inputs, obtained from the environment, into outputs to assure/prolong their survival (Scott, 2003). This open systems approach is described as pragmatic because the goal is to improve organizations, not simply describe them (Scott, 2003). Analytically, the components of systems are assumed to be more than

the sum of their components, thus one cannot (or ought not) to deconstruct a system to study individual parts because the effects of interactions or interrelationships are lost. Thus a holistic, or what Scott calls the "black box" (p 94) approach with all inputs/outputs and relationships is the preferred starting point for both theoretical frameworks and analysis that are based on an open systems perspective. This approach however, is not without problems because it is difficult to disentangle and/or account for the specific influence of any given factor on an organization's outputs.

The focus of open systems theories is on interactional relationships vs. an emphasis on self-action of the rational model (Scott, 2003). Open systems theorists acknowledge and stress the complexity and variability of individual parts of organizations and they recognize that while organizations may be semi-autonomous existence, they may also be characterized by transient couplings or temporary coalitions (Scott, 2003). An organization's environment receives primary attention in an open systems approach, which underscores relationships between organizations/systems and the broader environment that supplies material, energy and information that are crucial for survival of the/a system. In the case of NFs, the environment is not only the source of residents, for example, but it also the source of trained staff, revenue and regulatory structures. An open and rational systems approach recognizes that the environment shapes, supports and/or infiltrates an organization to create networks of formal (e.g., tightly coupled associations such as those prescribed by published lines authority in an organizational chart) and informal (i.e., loosely coupled) linkages among participants and between focal organizations (DiMaggio & Powell, 1983; Pfeffer & Salancik, 1978; Scott, 2003; Sofaer, 1994). This network of relationships can sustain and/or threaten the survival of a focal organization by altering its goals, influencing participants, changing

technology or altering structures. Open-system proponents acknowledge that organizations are neither complete nor self-sufficient, but rather their survival is dependent on exchanges or linkages with other social actors (in the environment), who serve as both a source of opportunity and resources and a force of constraint; this tension confers structure and encourages specific (strategic) responses from an organization (Pfeffer & Salancik, 1978; Scott, 2003; Sofaer, 1994).

The Elements of Organizations

Scott (2003) noted that organizations are both complex and diverse. He expanded on the (1965) work of Leavitt, who had proposed that the study of organizations can be better understood by using (any of number of) theories to systematically address two key, albeit interdependent, features or divisions of organizations: (a) the external environment; and (b), the organizational elements, the institutional environment, or the domain that addresses the internal workings of organizations and consist of social structures (e.g., norms & values), participants, goals and technologies.

Organizations and the External Environment

In the broadest sense, the external environment of organizations refers to the milieu in which organizations operate. Sofaer (1994) noted that this dimension includes the external forces/sources that: (a) influence the work of an organization; (b) provide raw materials such as patients/residents, revenues and employees; and (c) influence operations, or, in the case of government agencies, regulate products and services. Open and rational organizations, from Scott's (2003) perspective, assure their survival by establishing linkages, creating interdependencies and adapting to external forces in the environment. Perrow (1970) offers a dual conceptualization of the environment as both a source of threats and a repository of

crucial resources or opportunities; he suggested that effective organizations reduce uncertainty and increase control by balancing these opposing forces.

Scott (2003) noted, for example, that organizations generally depend on the external environment for the: (a) socialization of participants (e.g., socialization of professional staff, through licensing bodies that establish norms and standards); (b) acquisition of technology, including mechanical equipment and training (e.g., NFs depend on schools of nursing for initial preparation of a trained workforce); and (c) information to establish the content/intent of organization goals that (ideally) reflect broader societal objectives (i.e., societal expectations of good quality healthcare may be translated into NF mission statements that emphasize quality and customer satisfaction). From the perspective of a systems framework, the environment is depicted as a set of pressures/forces that affect the behavior of the system. For example, the internal functioning of NFs is influenced to varying degrees by regulatory, financial, social, and political factors in the external environment. Scott (2003) designated three sublevels of organizational environments that are useful for describing the boundaries of organizations and for discussing the influence of organizations on each other and on society in general: (a) the organizational set, (b) the organizational population, and, (c) interorganizational communities. Analyzing data at the level of these sub-levels, in addition to analysis at the level of focal organizations (i.e., an individual NF), can yield insights into the factors that have an influence on resident outcomes in NFs.

Organizational Set. In Scott's typography, the organizational set depicts the environment from the perspective of a focal organization (i.e., an individual NF) and includes only those organizations (i.e., their neighbors, partners and/or their competitors) that directly effect the focal organization. This definition suggests that the type, size and

number of relationships that an organization participates in are important and that such relations can effect operations at the level of a/the focal organization and, in the case of NFs, alter resident outcomes. Scott (2003) suggested that it is important to evaluate the size of the set, as well the influence of the set on shared expectations and behaviors. For example, assessing organizations from the "set" perspective allows one to consider how a NF functions including assessing: how owners or operators make decisions (based, for example, on the number of suppliers) about securing access to resources; and, how staff collaborate with other organizations to produce products or services. Scott suggests that this level of analysis is useful for analyzing information about resource supply and individual organizations. However, such analyses are performed at the expense of diverting attention from organizational populations, which includes the larger system of similar types of focal organizations operating in a particular setting or sector.

Organizational Populations. This level of analysis includes aggregated groups of similar organizations (e.g., the populations of colleges, newspapers, or for-profit nursing homes in geographic locale). The emphasis at this level is on assessing the role of competition and the effects of environmental changes (e.g. regulatory and financial policies) on a population of interrelated organizations. Determining the degree of similarity between organizations to justify their inclusion within any given population (for purposes of analysis) is neither a simple nor an arbitrary decision. Hannan and Carroll (1977) suggest the best approach is to identify distinct organizational forms (analogous to species) based on the key characteristics of the technical cores that control the transformation of inputs into outputs. But, these change over time and therefore alter boundaries.

Interorganizational Community. Scott (2003) suggests that this third level of analysis, the interorganizational community, focuses on connections among/between organizations (both similar and dissimilar) that are in competitive, interdependent and/or collaborative relationships with one-an-other. Collaboration, adaptation and collective survival strategies of organizations are a focus of this level of analysis. In a successful, productive or effective community, organizations or "actors" operate with common rules or norms (e.g., a shared commitment to good quality care). In the healthcare sector these norms can include structures that are created or imposed by professional groups, government agencies, purchasers, providers and any intermediary groups that influence the behavior of organizations (Scott). In the case of NFs, this community of organizations can include health care systems and providers; individual as well as groups of consumers, acute care hospitals and the assortment of regulatory agencies that influence the operation of NFs and effect quality of care. Scott noted that this community conception of organizations allows one to isolate, for analysis, a system of organizations that are within what he described as the "same realm" and that are "defined by relational linkages and shared cultural rules and meaning systems". This definition can include both local and distant connections and also encapsulate vertical, as well as horizontal, ties between similar or dissimilar organizations. The definition also includes organizations that may not be formally linked, but may be operating under the same constraints and may therefore develop similar structures, a condition known a structural equivalence or isomorphism (Dimaggio, 1986). This approach allows for analysis of an organizations environment and permits one to address, what Scott calls, interdependence and coevolution of structures. Scott noted that, at the community or field level, structures refers to the patterns of relations among organizations and he also

suggested that analyses at this level provide a way to connect and study organizations within the broader context of social structures and process (i.e., the influence of federal and/or state regulations on the LTC sector as a whole vs. individual organizations).

Organizations and the Internal Environment

Social Structure & the Internal Environment. Both the early and contemporary perspectives to organizational behavior acknowledge that internal organizational structures reflect performance enhancement strategies and competitive necessity (DiMaggio & Powell, 1983; Pfeffer & Salancik, 1978; Zucker, 1987). In Scott's (2003) lexicon, social structures are one of the four elements that describe the internal environment of organizations. Structure refers to the expected or the actual organized patterns or routines that give order to an organization and describe relationships among participants within an organization (or more broadly within a sector) such as the stakeholders in the LTC arena. When an individual NF is used as the level of analysis, social structure could include the working relationships, formal and informal lines of authority and communication between managers and staff, managers and consumers (i.e., residents and/or their advocates) and between staff and residents. This network of relationships is forged to ensure access to resources for an organization and to decrease uncertainty, while also preserving as much power and autonomy as feasible (Pfeffer & Salancik; Scott).

Contemporary organizational theorists have argued that early functional perspectives are inadequate, because they detract attention from the role and influence of larger social relationships among the stakeholders in an organizational field, which are believed to be more important than facility-level characteristics (DiMaggio & Powell, 1983; Zucker, 1987). They have, instead, emphasized the importance of relationships and interactions between

focal organizations and various stakeholders that define the organizational field, the population or interorganizational community (Scott, 2003). Such influential and interdependent, almost omnipotent, assemblages or so-called "congeries", refers to the group of key resource suppliers, consumers, regulatory agencies and competing organizations that offer similar products and operate within a sector (DiMaggio & Powell; Scott). The relationships are reflective of broadly accepted (or imposed) values and norms that encourage standardization, generate inertia, and foster legitimacy (DiMaggio & Powell, 1983, 1991). For example, the enactment of the NHRA in 1987 forced NFs that participate in the Medicare/Medicaid systems to alter the types of participants and technology (e.g., by changing staffing skill mix and addressing knowledge deficits) to improve quality and meet the cumbersome assessment and data entry requirements engendered, by the introduction of the MDS reporting system. The system has grown to such an extent that NFs now seem to embrace the taken-for-granted need to train and dedicate staff members for the sole purpose of data entry; this is believed to have diverted employees away from direct care activities to meet sector/government expectations (Kane, 1997; Kane & Kane 2001).

Participants & the Internal Environment. Participants, social actors, or more broadly, stakeholders, refer to individuals who make varying contributions to an organization in exchange for some type of recognition, compensation or reward (Scott, 2003). Participants can be of key importance; through their agency, for example, they define and reinforce an organization's mission and identify and disseminate its values that were then reflected in the social structure (Scott, 1987).

Goals & the Internal Environment. Natural systems proponents recognize a disparity between stated goals and "real" or operative goals that organizations pursue (Scott, 2003).

They further note that the behavior of organizations is typically governed by goals that may not be readily apparent, explicitly espoused or related to output. In Scott's view, goals are both key and controversial elements in organizational analysis. He has discussed an array of views regarding the definition and importance of organizational goals. For example, Scott noted that some theorists have advanced the (cognitive or functionalist) view that goals provide motivation and understanding and therefore analysis of stated goals is indispensable to identifying sought after ends (i.e., why/how do NFs seek resources to improve quality or enhance customer satisfaction). Other theorists claim that goals are, for the most part, illusionary or symbolic and simply establish a veneer of legitimacy for core constituencies, such as taxpayers, governments, or in the case of NFs, acute care hospitals, potential consumers or regulators (e.g., DiMaggio & Powell, 1983; Scott, 1987, 2003; Zucker, 1983).

The purpose, meaning and perceived importance of goals clearly varies with the organizational perspective. For example, the managers of a LTC organization may claim via media campaigns that they are striving (in response to public concerns) to achieve more favorable staffing ratios as a means to improve patient care. This strategy may, perhaps, be interpreted as a highly rational response, and a legitimate goal to a competitive or highly regulated environment. Alternatively, these assertions may be reflective of a strategy that is intended to assure legitimacy by endorsing a policy that mimics expectations of the organizational sector or LTC consumers.

Technology & the Internal Environment. Scott (2003) defined technology in terms of the energies, expertise or materials that are used to transform an organization's inputs into outputs. His definition of technology speaks to the abilities and/or resources of an organization that are needed or available for processing resources. Scott also suggested that

it is almost always useful to view organizations as technical systems, because one can identify central or core sets of tasks that define an organization and contribute to how an organization has developed or how it is structured (e.g., patient care in hospitals, assembly work in automotive plants, or the development of legislation in congress). Technology in the health care sector, for example, could refer to the capacity of an organization to assure healthier patients or more satisfied residents in the LTC setting. Technological capacity may evoke images of hardware and machines, but Scott's conceptualization of the term, if applied in the LTC setting, also encapsulates the knowledge and skills of an organization's participants including administrators, managers, nurses, nursing assistants, physicians, and ancillary staff, such as social workers and pharmacists.

Donnabedian: Structure, Process & Outcomes

Structural determinants of quality, in the SPO model, are defined as the material, human or organizational resources that are available to support the delivery of resident care and which are assumed to alter resident outcomes (Donnabedian, 1966 & 1988). In the NF context, structural determinants of resident outcomes addressed in the literature have included organizational characteristics such as facility size, type of ownership (i.e., FP, NFP & government) and staffing characteristics. Staffing characteristics that have been addressed in the literature (including some that and will be evaluated in this study) include: (a) numbers and types of nursing staff, (b) staff to resident ratios, and, (c) staff training, tenure and expertise. Process measures of staffing and quality refer to the treatments, interventions or services that are provided to residents. Process measures include activities such as: (a) assistance with eating, toileting, and ambulation; and, (b) management of pain and behavioral symptoms.

Outcomes, the third element in Donnabedian's (1966) paradigm, refer to the consequence, products or outputs (e.g., a change in a resident's functional ability, physical health or cognitive function) that are attributed to the structures and processes of care provided to residents. Donnabedian (1988) distinguished between interpersonal and technical outcomes. Interpersonal outcomes can include measures of patient satisfaction, which until recently have largely been ignored in the NF literature to date mainly because standardized measure of satisfaction for NF residents were not well-developed (Castle, 2007; Kane, 1997; Steffen & Nystrom, 1997). In Contrast, technical outcomes including the following have been well-addressed in the literature: (a) reductions in morbidity, (b) improved functional status, (c) reduced use of physical restraints, (d) lowered incidence of pressure sores, (e) reduced rates of transfer to acute care hospitals, and, (g) improved hydration and nutritional status. These types of technical measures are the basis of the initial 24 quality indicators developed for CMS (Zimmerman et al., 1995) and they are often designated as dependent variables of interest in the LTC literature. For purposes of the research, 3 of the current 21 federal QI measures are treated as outcomes and were evaluated in this study: weight loss, restraint use and bedfast status.

Strategic Management

The Strategic management perspectives, in general, underscore what Shortell and Kaluzny (2006) described as the "importance of positioning the organization relative to its environment and competitors to achieve its objectives and assure its survival" (p. 27). They defined strategies as key concepts and ideas that an organization uses (or has used) to achieve and sustain competitive advantage over rivals. Shortell and Kaluzny distilled the various approaches to describe SM as a subset of organizational behavior theories that

emphasizes the alignment between an organization's strategy and the limitations and/or opportunities dictated by the attributes or characteristics of both the external and internal environment. The authors also noted that SM perspectives link external environmental factors, internal organizational processes and the strategic actions of organizations to achieve or enhance competitiveness, performance and efficiency to optimize their probability of survival or sustainability (Shortell & Kaluzny). For example, they suggest that if quality improvement programs are to be adopted as core components or capabilities of an organization, it is because such an emphasis imparts a strategic advantage over competitors in an operating market. This view is necessarily dependent on the assumption that managers have agency, or more specifically, the freedom or latitude to choose strategies that augment environmental factors in a manner that optimizes performance and, ultimately, survival.

Shortell and Kaluzny (2006) classified the various SM theories into two groups: a market structure and a resource-based perspective. The market structure approaches to SM focuses on behaviors of organizations that are designed to optimize competitive advantage; such behaviors are based on an assessment of external market factors that influence the decisions of health care organizations (Shortell & Kaluzny). They cite the 1987 work of Bain and Qualls to illustrate three important features of the competitive environment that are central to market-based approaches to SM and applicable to the study of LTC organizations: (a) degree of concentration (in the NF context this can be assessed by evaluating market measures including, for example, the Herfindahl-Hirshman Index (HHI), occupancy rates and/or the number of excess beds per capita); (b) entry barriers (e.g., certificate of need programs or low Medicaid reimbursement rates); and (c), level of product differentiation

when compared to competitors (in the NF context and among facilities in an operating market, this could include differences in average expenditures per resident day).

In contrast, the resource-based approaches to SM focus internally, not unlike Donnabedian's (1966) framework, on distinctive organizational capabilities, in particular its resources, structures and actions that help to achieve and sustain competitive advantages (Shortell & Kaluzny, 2006). Shortell and Kaluzny suggested that such emphasis is highly applicable to health care organizations because of their focus on technical and service quality, both dependent, they argued, on optimal management of resources and systems. They also noted that since health care organizations are increasingly complex, SM models provide an ideal framework to better understand the relationships between market level factors and the ways in which organizations integrate internally and inter-organizationally (e.g., degree of chain penetration in a particular operating market). Resources in the SM context can to refer personnel factors (e.g., staffing levels, skill mix, specialty training), equipment/technological resources, location, expertise and experience/tenure of staff.

Mintzberg (1990) offered a more nuanced view of SM by classifying the literature into ten subgroups: (a) three rational or prescriptive perspectives that are based on a logical, perhaps even rigid, step-wise approach to strategic management that provides a basic structure within which to examine organizations; (b) six descriptive (or so-called emergent) approaches that conceptualize strategic management as a process that emphasizes the role of continuous intuitive thinking, leadership and learning processes to analyze an organization and its operational setting; and (c), a configurational school, essentially an operations-level theory, that specifies the stages or phases of the strategic management process. No single approach to SM, as Mintzberg noted, is ideal or complete; rather, the dynamic environment

of the health care industry requires multiple approaches and he used the helpful analogy of maps and compasses to illustrate this view. Mintzberg argued, for example, that the rational/logical perspectives are much like a map and reflect the need for some type of logical plan to sustain and organization and guide decisions of leaders (e.g. a five-year strategic plan). In contrast, the author likened the emergent approaches to a compass that can help to guide an organization to a goal that may be somewhat ill-defined (e.g., high quality of care), or more likely subject to change in response to unanticipated factors (revealed during concurrent evaluations) or changes in the dynamic environment that typifies health care systems. The "compass" or emergent approaches are based on based on concurrent assessments of an organization, its operating environment or organizational setting. This setting can be conceived as the broader health care environment or industry that has the potential to alter an organization's operations.

Ginter and colleagues (1998) described how an organization responds strategically to its environment. They suggested that this process is typified four dynamic processes that are used to analyze the environment, an organizations context or its setting: (a) situational analysis, (b) strategy formulation, (c) strategic implementation, and, (d) strategic control (Ginter et al., 1998). This research includes measures that may be classified within the first two processes, while the latter two are not examined. Situational analysis, the first processes includes three components: external environment analysis, internal environment analysis and, third, the development of an organization's mission values and objectives (Ginter et al., 1998). In this research, specific information on the third element is not available for each NF, but variables from both the internal (e.g., percent of reimbursement from Medicare and Medicaid, staffing level) and external environments (e.g., regulatory and market

characteristics) have been used in this study to provide information related to an organizations context and these measures can suggest how leaders incorporate such data into their objectives, actions and strategies (e.g., the composition of payer sources among NFs may reflect a business decision or strategy in response to operating market characteristics). Strategy formulation, the second dynamic process described by Ginter and colleagues, involves progressive decision making processes based on information drawn from step one, the situational analyses. They described the articulation of a mission and vision statements and the development of goals and objectives as the first set of strategic decisions that an organization must confront when it comes into existence. These decisions are described as directional strategies that convey a macro view of an organization. In contrast, adaptive strategies are more specific and articulate how an organization will, among other things, expand (e.g. by selecting strategies to diversify, integrate operations or penetrate an operating market), contract, or stabilize in response to a situational analysis of the external environment (Ginter et al., 1998). Market entry strategies can refer to an organization's plans to incorporate adaptive strategies to become active in a market through, for example, acquisitions, mergers or internal changes that help to establish an organization or give it a competitive advantage over other organizations in an operating environment. The last strategy formulation processes are know as "positioning strategies" and refers to strategies that an organization adopts to position itself relative to other organizations in a particular operating market (e.g., defining cost/charge structures that specify the proportion of revenues allocated to resident care vs. other expenditures).

In the various approaches to SM, organizational choice and managerial actions are both underscored. Ginter and colleagues (1998), for example suggested that observed

changes in behavior (which can, perhaps, be evaluated by changes in resident outcomes) among LTC facilities might be attributed to factors/trends identified in both the internal and, most especially, the external environments. In a similar vein, Shortell and Kaluzny (2006) noted that the delivery of health care services to individual patients (or residents in a the case of NFs) can be influenced by an extensive and interdependent network of relationships or alliances composed of providers, suppliers, payers, regulatory agencies, and professional associations. While this study does not include measures for all of these groups, data from payers and survey agencies were examined during this analysis.

Shortell and Kaluzny's (2006) argued that interorganizational and organizational areas or domains of managerial activity are important components in organizational analysis. A macro (interorganizational) approach, for example, can include the influence on managerial activity of acute care hospitals, provider groups, professional organizations, training schools, federal and state agencies and regulatory groups, along with vendors, suppliers and payers. In contrast, Shortell and Kaluzny suggested that analyses based on group/department and/or individual areas of activity are reminiscent of resource-based organizational analysis, which has focused primarily on the role of individuals, or more precisely, individual actions of managers and the consequences for an organization and its customers (i.e., NF residents). This level of analyses is roughly equivalent to the type of factors that are emphasized in research based on Donnabedian's (1966) SPO framework. In the NF context, this micro approach underscores the importance of leadership styles, conflict management, communication and interpersonal relationships at the unit and faculty level and resources use. This level of analysis may, for example, include analyses of the

influences of work design (i.e., staffing levels and skill mix), coordination and communication on safety, efficiency, profitability and quality of care (Shortell & Kaluzny).

To catalogue the disparate factors that may influence the operation of an organization and alter outcomes, Shortell and Kaluzny (2006) (and their contributing authors: Flood, Zinn & Scott) described a multi-factor "Cause-and-Effect-Diagram" related to quality that was modified for this study (Figure 2.1). This figure depicts both the macro and the micro factors (i.e., internal and resident level characteristics, typically evaluated in studies that adopt an SPO perspective), that engender and/or are assumed to influence patient/resident outcomes. The variables in this cause and effect model, as well as those in a slightly altered version, of their more generic open-systems depiction of the environment (Figure 2.2) are understood to influence the behavior of health care organizations and their managers and collectively, in the case of NFs, alter quality of resident care.

Figure 2.2 depicts a modified version of what Shortell and Kaluzny (2006) described as areas of/for managerial activity (or agency) that can influence organizations and alter outcomes, including quality of care. The model is characterized by highly permeable relationships, depicted by the series of concentric dashed lines, between various stakeholders; these interrelationships, in turn, influence individuals/residents by altering the quality of care delivered to NF residents.

Figure 2.1: The Operating Environment and Nursing Facility Quality
(Modified from Shortell & Kaluzny, 2006)

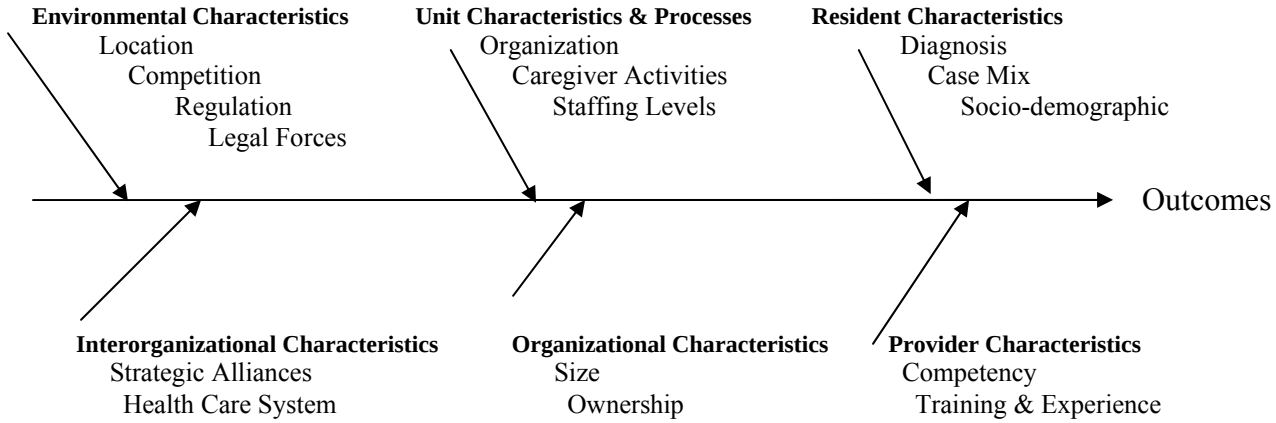
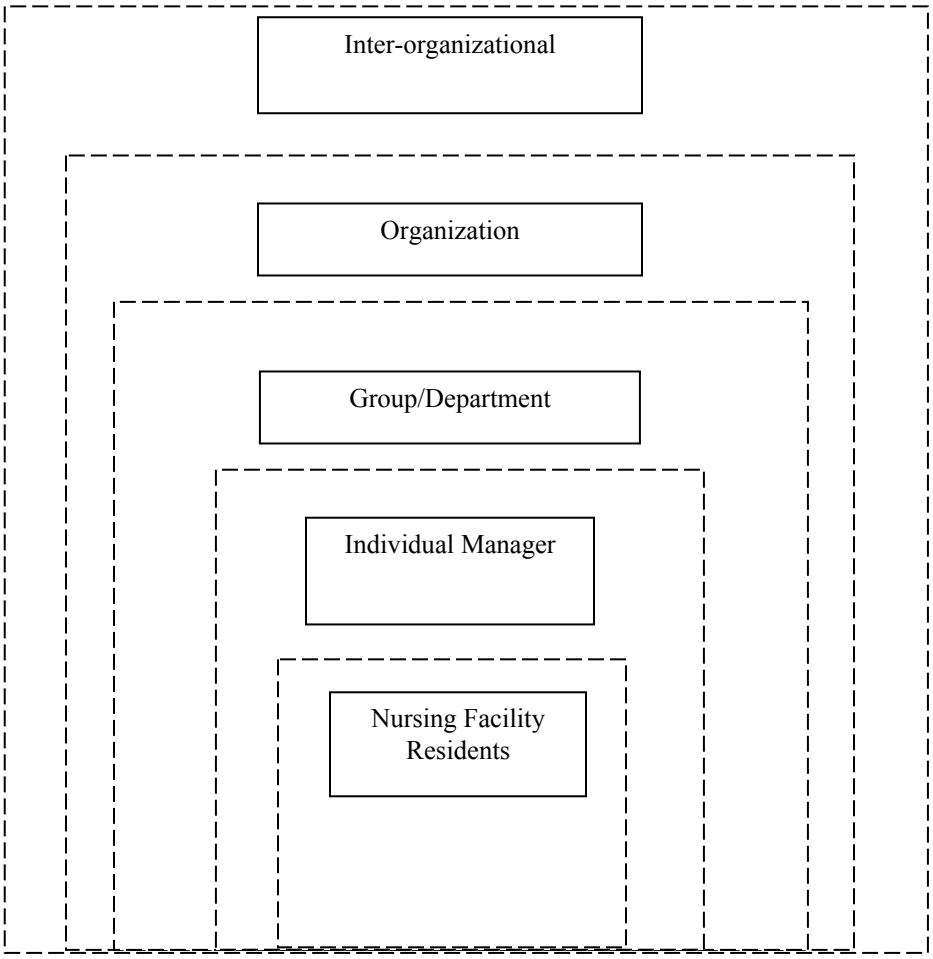


Figure 2.2: The Domains, or Major Areas of Managerial Activity
(Modified from Shortell & Kaluzny, 2006 p. 22)



Collectively, these models and Shortell and Kaluzny's (2006) summary of the SM perspectives illustrates the complex political, economic, social and regulatory pressures that influence the operation of health care organizations and alter patient or resident care.

Study Aims and Conceptual Framework

Study Aims

The two primary aims of this research include the following:

Aim 1: To examine relationships between organizational characteristics (e.g., for-profit- [FP] vs. not-for-profit [NFP] facilities; chain vs. non-chain NFs) and staffing characteristics (e.g., hours of care per resident day [hprd] and staff turnover) on selected outcomes, after controlling for various resident and market factors on three quality indicators (QIs): weight loss, restraint use and bedfast status, or being in bed for $\geq$ 22 hours per day (without clinical justification).

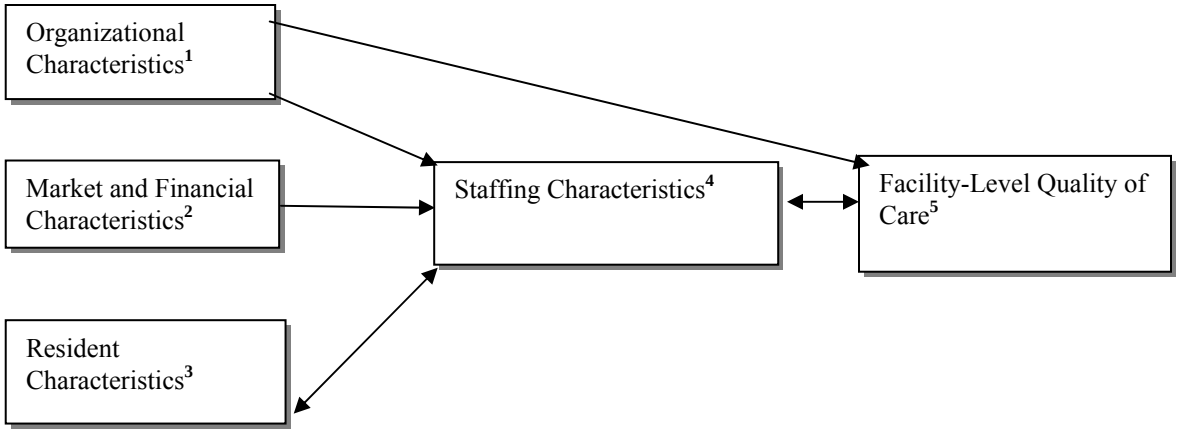
Aim 2: To examine relationships between organizational and staffing characteristics on quality outcomes on the number of complaints and total deficiencies after controlling for various resident and market factors on three quality indicators.

Conceptual Framework

To evaluate these aims, factors of an organization's operating environment that are emphasized in SM theory were combined with Donnabedian's (1966, 1988) SPO framework to produce the conceptual model developed for this study to evaluate quality of care in California NFs (Figure 2.3). The three types of outcome measures depicted in model include: (a) the prevalence rates for three facility-level quality indicators (QIs); (b) the combined number of state and federal deficiencies and state citations and, lastly, (c) the number of validated complaints. Four types of predictor variables, also illustrated in Figure 3, have been identified in the LTC literature as important factors that affect quality. In addition to literature findings, each of the classes of variables are based on the concepts and relationships suggested by both Donnabedian's (1966) SPO framework and the elements of an organization's operating environment that are emphasized in organizational behavior theories and in SM management perspectives in particular including: interorganizational, organizational, departmental and individual factors (Scott, 2003; Shortell & Kaluzny, 2006).

Table 2.1 follows the conceptual framework (Figure 2.3) and includes hypothesized relationships between the predictor and outcome variables that were analyzed in this study.

Figure 2.3: Factors that Influence the Quality of Care in Nursing Facilities



[1] **Organizational Characteristics**:
(a) Number of licensed beds; (b) ownership type [For-profit, Not for profit or government]; (c) Multi-facility chain membership [yes or no]; (d) Resident days of care [percent Medicare and Medi-Cal; (f) Net income; (e) family council [yes or no].

[2]**Market and Financial Characteristics:**
(a) Competition/market penetration [Herfindahl-Hirschman Index]; (b) Excess bed capacity; (c) Socio-Demographic measures at the county level.

[3]**Resident Characteristics:**
(a) Socio-demographic characteristics (age, gender, race/ethnicity); (b) Casemix Index [CMI]; (c) Average ADL dependency for three tasks [eating, mobility, toileting]).

[4]**Staffing Characteristics:**
(a) Hours of care per resident day [hprd] for each type ("skill mix") of direct care staffing [RN, LVN and CNA] and for all nursingg staff combined; (b) Turnover rate for among nursing staff.

[5] **Quality of Care:**
(a) Quality Indicator Prevalence Rates [QI]; (b) Total Deficiencies and citations (c) Validated complaints.

Table 2.1: Model Hypotheses

Independent Variables (Type[1])	Quality Indicator Prevalence(s)[2]	Total Deficiencies[2]	Validated Complaints[2]
Staffing Characteristics (C, D)			
RN hprd	+	+	+
CNA hprd	+	+	+
LVN hprd	+	+	+
Total hprd	+	+	+
Turnover	+	+	+
Organizational Characteristics			
Number of Beds (C, D)	+	+	+
Ownership type: (Profit vs. Non-profit)	+	+	+
FP Multi-Facility System (D) (Chain vs. Non-Chain))	+	+	+
Days of care (C):			
Percent Medicare	-	-	-
Percent Medi-Cal/Medicaid	+	+	+
Family Council (Presence vs. Absence)	NH	NH	NH
Resident Characteristics			
-Socio-Demographic Measures	NH	NH	NH
Age (C)			
Gender (D)			
Race/Ethnicity (D)			
- Resident Case mix			
Case mix Index [CMI] (C)	+	NH	NH
ADL dependency (D)	+	NH	NH
Market Characteristics			
NF Herfindahl Index (C)	+	+	+
Excess Bed Capacity (C)	-	-	-
Socio-Demographic (C)	NH	NH	NH

[1]Varibale type: Continuous (C), Categorical and/or Dichotomous (D).[2] Hypothesized relationships: (a) "+" indicates an hypothesized positive relationship between predictor and outcome variables; (b) "- "indicates a negative relationship; (c) "NH" indicates no *a priori* hypotheses.

The next chapter includes a review of published research related to quality of care, with an emphasis on the role of staffing and ownership characteristics. Both of these factors figure prominently in HSR studies that have adopted an SPO perspective to evaluate a wide array of quality outcomes. In addition and from the perspective of SM, managerial activity or agency, staffing and organizational characteristics (e.g., the percent of Medicaid vs. Medicare residents) are underscored in strategic management perspectives. While this research focuses primarily on internal features of NFs, the analytical models also include an array of measures to account for factors in the larger

operating market that may influence quality of care (e.g., the role of competition and whether or not a NF is part of a multi-facility chain system).

CHAPTER THREE: LITERATURE REVIEWS

The purposes of this chapter are twofold. First, to present a focused evaluation of the extant quality of care literature related to staffing levels, turnover rates and ownership type. This material is presented in Section I of this chapter and followed, in Section II, by a detailed appraisal of literature related to the development and testing of resident assessment instruments, including the Minimum Data Set (MDS). The MDS, and several related tools, comprise the key federal data sources that are used in this study and more broadly in NF HSR research including: (a) the long-term care (LTC) case-mix classification and prospective payment system known as RUGs, or the Resource Utilization Groups; and (b), the USCMS Quality Indicators (QIs) that have been developed to evaluate quality of care within, between and among NFs (Fries et al, 1994; Hawes et al., 1992; Morris et al., 1990; Zimmerman et al., 1995).

Section I: Staffing, Turnover and Ownership Literature

The literature related to staffing characteristics and quality (appraised in *Part I* of *Section I*) draws heavily from published literature reviews and from a series of IOM reports, beginning in 1986 and concluding in 2003. Literature related to staff turnover and quality of care is evaluated in *Part II*. In addition to the staffing and turnover literatures, numerous investigators have evaluated differences in the quality of care between not-for-profit (NFP) nursing facilities and their for-profit (FP) counterparts. The ownership literature is discussed in *Part III* of this section and also draws from comprehensive and systematic reviews (i.e., Hillmer et al., 2005; O'Brienet al., 1983; Rosenau & Linder, 2003). The literature evaluated in *Part III,* is augmented by a review of several well-designed studies that were not included in either of the three reviews, but

have provided important insights into the literature on the effects of ownership type including: (a) Aaronson et al., 1994; (b) Harrington, et al., 2001; (c) O'Neil et al., 2003; and, (d), Spector et al., 1998. Large studies that further evaluate the QIs, deficiency data and consumer complaints represent valuable additions to the quality of care literature. Analyzing data from the perspectives provided by organizational behavior theories may yield important insights into the role of other variables, including the relationships between ownership type, profit margins and resident outcomes.

Part I: Staffing Characteristics and Resident Outcomes

Considerable research effort has been directed toward evaluating the role of staffing level (typically defined as hours of care per resident day [hprd]) and/or skill mix (i.e., the proportion of nurses and nursing assistants) on resident outcomes in nursing facilities (NFs). The findings from published research as well the recommendations from the IOM and other panels (e.g., Harrington et al., 2000; National Citizens Coalition for Nursing Home reform [NCCNHR], 1995, 1999 [cited in Harrington et al]) all indicate that NF staffing levels must be increased and turnover rates reduced. The evidence to support this assertion is drawn from: (a) an extensive array of cross-sectional research, including CMS studies, that has been discussed in IOM reports and thoroughly appraised in series of literature reviews (e.g., Bostick et al., 2006; Castle, 2006; Davis, 1991; Dellefield, 2000; Konetzka et al, 2008; Wells, 2004); and, (b) to a lesser extent from the relatively few studies that have examined an array of staffing measures and various outcomes either prospectively (e.g., Bates-Jensen et al., Schnelle 2004b) or retrospectively (e.g., Horn et al., 2005) or from well designed simulation models (Schnelle et al., 2001).

As the authors of the 2003 IOM report in the "Quality Chasm" series noted, there are 2.8 million licensed nurses and 2.3 million nursing assistants in the nation (IOM, 2003); these caregivers account for 54% of all health care workers. Staffing characteristics in Donabedian's (1966) framework (see Chapter II) are usually treated as a structural variables (i.e., measured as average hours of care per resident per resident day [hprd], or a mixed structural/process variable (measured by evaluating observable care processes) that are presumed to cause or contribute to resident outcomes. These processes can include assistance with the activities of daily living, the administration of medications and the physical and/or psychosocial assessment of residents, including closer monitoring of a patients/residents health status, which may be more feasible in higher staffed facilities (IOM, 2003).

Current Staffing Levels and Nursing Facilities

The average hours of direct care staffing provided in U.S nursing facilities varies widely (Harrington, 2001; Harrington & Carillo, 2000; Harrington Carillo, Thollaug & Summers, 2000b) and these differences have been associated with an array of resident outcomes (IOM, 2001, 2003; USCMS, 2001). Harrington and colleagues (2000b) reported that U.S. nursing facility residents receive, on average, 5.7 hprd of care from *all* types of NF employees (i.e., nursing, non-nursing, direct and indirect care staff). The hours of care per resident provided by nursing personnel, including administrators, accounts for only 3.5-3.6 hours of the 5.7 hprd of care (Harrington et al., 2000b). Each licensed staff member (i.e., RN and/or LVN/LPN) usually oversees care for 32-34 residents at a time (i.e., providing on average 0.7-0.8 hprd [$\simeq$ 42-48 minutes] of care for each resident per 24 hour period). The level of professional care is known to vary across

shifts as well as the type of facility (IOM, 2003). For example, NFs that admitted only/primarily Medicare residents have twice the number of staff as facilities that care for long-stay residents, who are primarily Medicaid recipients and/or private pay residents (IOM, 2003). Paraprofessional staff members (i.e., CNAs or NAs) provide most of the direct care (2.1 hprd) to the residents of the nation's NFs and care for an average of 11 residents per shift (Harrington et al., 2000b), but these levels are still well below the important 2.8 hprd threshold for long-stay residents that was identified by CMS in 2001 (i.e., Kramer & Fish; Schnelle, Simmons & Cretin) and discussed by the IOM (2003). In addition, and of equal concern, is the finding that these paraprofessionals are often poorly supervised and inadequately trained (Bowers & Becker, 1992; IOM, 2001; Kayser-Jones & Schell, 1997). While this study is limited to an assessment of quantitative staffing–related variables, it is also important to consider, for example, the influences of qualitative factors, such as the level/content of specialty/leadership training, on quality of care.

Staffing Levels and the Institute of Medicine

The findings from a wealth of correlational studies suggests an inverse relationship between staffing levels and resident outcomes including: lower death rates, increased discharges to home, improved functional status, fewer urinary tract infections, lower catheter use and less antibiotic use (IOM, 2003). The IOM (2003) committee, based on finding from more than twenty years of literature called for CMS to update existing regulations (i.e., OBRA, 1987) and improve staffing levels NFs as follows: (a) require the presence of at least one RN in all facilities at all times; (b) increase total staffing levels; and (c), develop specific minimum staffing standards for CNAs, in

accordance with the recommendations of the CMS report. This latter recommendation reflects the fact that nursing assistants provide most of the "hands-on" care in the nation's NFs.

In the 2003 report, entitled *Keeping Patients Safe,* The IOM emphasized findings from the three important studies (Kramer & Fish, 2001; Schnelle et al., 2004; Schnelle, Simmons & Cretin, 2001) when they recommended that direct care staffing levels be increased in NFs and that CMS require NF to employ round-the-clock RN staffing. In addition to their staffing recommendation, the IOM committee recommended that organizations create defenses to reduce errors and increase safety including: improved leadership and management practices, workforce improvement, work process changes and organizational culture changes (IOM, 2003).

The authors of the 2003 report argued that the quality of direct care staffing personnel, as well as other providers, greatly affects the health of the population. This assertion is supported by a substantial body of evidence that reveals a generally positive (though not always linear) relationship between staffing level, skill mix and quality of care. For example, and in the acute care setting, the role of staffing levels on patient outcomes (e.g., mortality, infection, pneumonia gastrointestinal bleeding, failure to rescue and so forth) has been documented in two well-designed and well-regarded investigations (i.e., Aiken et al., 2002, Needleman et al., 2002). In addition, a much larger body of literature in the LTC arena indicates the strong relationships between staffing level and resident outcomes in the nation's NFs. The influence of higher staffing levels in the nation's LTC facilities has been repeatedly associated with better outcomes for residents and these findings have been summarized in several noteworthy IOM

publications (IOM, 1986, 1996, 2001, 2003). The authors of both the 2001 and 2003 IOM reports on the quality of long-term care noted that undesirable characteristics of the clinical workforce (i.e., inadequate staffing levels and poorly trained staff) in NFs can compromise the safety of resident care. The authors of the 2003 IOM report also noted that the existing federal standards governing staffing levels in the nation's NFs are more that a decade old and that these standards fail to reflect the minimum staffing levels suggested by findings in the contemporary peer-reviewed literature. Responding to literature findings and the opinions of expert panels, the authors of the most recent IOM report in the "Quality Chasm" series concluded that sufficient evidence exists to call for increases in the direct care staffing levels for LTC facilities that will be higher than the minimum levels stipulated in federal statutes (IOM, 2003); however the committee did not recommend specific staffing thresholds or, even minimum numeric levels.

Hartford Institute and Staffing Recommendations

Calls to improve the staffing level in the nation's NF are far from novel. For example, in 1990 the National Committee to Preserve Social Security and Medicare noted that 88% of U.S. nursing homes needed more nursing assistants; the committee's report called for the employment of an additional 151,000 CNAs in the nation's NFs (as cited in Kayser-Jones, 1997). In 1999, a panel of interdisciplinary healthcare experts convened at the John Hartford Institute in New York and offered recommendations to improve staffing in U.S. nursing facilities (Harrington et al., 2000c). The Hartford Panel included individuals who have also served on the IOM committees that produced the 1996, 2001 and 2003 reports. The group called for substantial increases in federal

spending and new staffing standards that would greatly exceed the levels specified in the language of the Nursing Home Reform Act (NHRA) (OBRA, 1987).

The first recommendation proposed by the Hartford Panel would have required the operators of all NFs to employ a full-time RN as director of nursing (Harrington et al., 2000c). Second, the experts recommended that NFs, with 100 or more beds, employ assistant directors of education and nursing to assist with leadership and staff development initiatives. Third, they suggested that all NFs be required to have a least one RN on duty for twenty-four hours per day. Fourth, the expert's recommended that minimum staffing levels of 4.55 hprd for nursing staff be adopted by CMS, and they further suggested that these minimums not be subject to waivers. The Panel also proposed that staffing levels ought to increase as necessary (beyond the minimum hprd) to reflect variations in accepted measures of residents case-mix (e.g., those derived from the Minimum Data Set [MDS] database). Fifth, the Panel strongly advocated for increased funding, higher salaries and improved benefit packages to: (a) enhance educational preparation, and (b) encourage recruitment and retention of competent staff. Finally, the Hartford Panel called for the expanded use of advanced practice nurses (APNs) in the nation's NFs (Harrington et al., 2000c). The Panel conservatively estimated that costs (in 1996 dollars), associated with improved staffing levels, would represent a two to seven percent increase in the $87.5 billion spent on NH expenditures in 1996 (Harrington et al., 2000a). To date these recommendations have not been implemented by CMS, despite an array of compelling empirical findings that substantiate the staffing thresholds recommended by the Hartford experts (Bates-Jensen et al., 2004a, 2004b; USCMS, 2001; Schnelle et al., 2004a, 2004b; Simmons et al., 2003).

Staffing and Resident Outcomes

Staffing-related outcomes that have been evaluated the LTC literature include prevalence rates of an array of clinical measures including some of the CMS quality indicators (QIs) for long and or short stay residents such as the incidence and/or the prevalence of: Pressure ulcers (PUs), weight loss, restraint use, degree of dependency for Activities of Daily Living (ADLs), incontinence, urinary catheterization, urinary track infections (UTIs) and other infections. Numerous studies have evaluated the effect of staffing characteristics on both the number and type of deficiencies, and less frequently, scope and severity of deficiencies. Other investigators have treated the rates of emergency room admission and/or acute care hospitalization rates as outcomes of interest. In addition, and to a lesser extent, investigators have evaluated the relationship between various staffing measures and the rates of validated complaints, resident abuse, employee injuries and satisfaction measures for both residents and NF staff. As might be expected, some outcomes were more sensitive to staffing measures than others; however, findings were generally in the hypothesized direction of better quality with higher levels of staffing and lower rates of staff turnover. The relationships between staffing characteristics and outcomes varied both across and within studies and when subgroup analysis were conducted to evaluate the effects of market, skill mix and staffing level, residents and organizational characteristics, including: the proportions of Medicaid, Medicare and private pay residents; profit status; number of beds; family involvement in care; chain membership and so forth.

Relatively early research by Munroe (1990), for example, concluded that higher quality of care (measured by fewer deficiencies) was related to more favorable nurse-to-

resident ratios. Higher staffing levels and lower turnover have also been associated with functional improvement (Cohen & Spector, 1996; Linn, Gurel & Linn, 1977; Spector & Takada, 1991), earlier discharges from NFs (Braun, 1991; Linn et al) and reduced mortality (Braun; Cohen & Spector). Higher staffing levels of total staffing have also been associated with fewer pressure ulcers (Aaronson, Zinn & Rosko, 1994). Cherry (1991) concluded that higher levels of RN staffing, in particular, were associated with fewer pressure ulcers, fewer catheterized residents and thus not surprisingly, fewer UTIs and less frequent use of antibiotics. Higher levels of licensed staffing have also been associated with fewer deficiencies (Harrington, Zimmerman, Karon, Robinson & Beutel, 2000a), improved functional outcomes, reduced mortality and fewer deficiencies in the first year after admission to a LTC facility staffing (Bliesmer, Smayling, Kane, & Shannon, 1998). In contrast, inadequate staffing levels, lack of training and a dearth of supervision has been associated with poor incontinence care, inadequate repositioning and not enough mouth care (Bowers & Becker, 1992). In addition, inadequate staffing and poor supervision have been identified as key factors in insufficient nutritional intake and increased prevalence rates of malnutrition and dehydration among NF residents (Kayser-Jones 1996, 1997; Kayser-Jones & Schell, 1997; Kayser-Jones et al., 1999). Lower levels of staffing have also been associated with higher rates of acute care hospitalization, electrolyte abnormalities, pressure ulcers and other types of skin trauma (USCMS, 2001).

Appropriateness of Minimum Staffing Levels in Nursing Facilities

The UCCMS (2001) report on minimum staffing was based on studies or well-designed simulation models (i.e., Kramer & Fish, 2001; Schnelle et al., 2004; Schnelle,

Simmons & Cretin, 2001) that assessed the role of staffing levels on resident outcomes. The CMS report identified the importance of specific staffing thresholds; they also noted the threshold beyond which increased staffing did not significantly reduce the predicted rates of occurrence for the outcomes of interest (IOM, 2003; USCMS, 2001). This finding not only suggests an upper and lower threshold for adequate staffing, it also suggests that adding more staffing above the upper threshold is not helpful and would of course be expensive without yielding appreciable benefits, such as lower incidence rates for the outcomes that were under consideration (IOM, 2003). This finding underscores the need to examine the role of other variables including ownership characteristics, facility size, chain membership, chain size profit margins, organizational structure and decision-making processes on important outcomes (IOM, 2003).

The authors of the report concluded that NFs should provide a minimum of 4.1 hours per resident day of care (hprd) to for long-staff residents to assure adequate care and quality Over the course of twenty four hours, this standard is equivalent to one RN for every 32 residents (0.75 hprd of care), one licensed nurse (RN or LVN) for every 18 residents (1.3 hprd) and one nursing assistant for every 8.5 residents (2.8 hprd). These standards are considerably higher than the average staffing levels reported by for all U.S. nursing facilities (Harrington, 2001; Harrington & Carillo, 2000; Harrington, Carillo, Thollaug & Summers, 2000b) and superior to the ratios reported in an anthropological study that directly evaluated the role of staffing levels on weight loss in California NFs (Burger, Kayser-Jones, & Bell, 2001). Burger and colleagues noted, for example, that CNAs were typically responsible for assisting seven to nine patients during the day shift and as many as fifteen residents during evening meals (Burger et al., 2001). Mealtimes

last about one hour in nursing homes, therefore, a CNA who is assigned to assist ten residents (not an atypical assignment) has only six minutes to spend with each resident; nursing assistants who are responsible for the nutritional needs of 15 residents have only 4 minutes to feed each resident (Kayser-Jones, 1997).

The USCMS study involved the analysis of data that were collected during 1999, from 9,000 NF residents in 10 states (USCMS, 2001). The resident-level data were separated into two groups for analysis: (a) short stay post-acute care residents, who are often Medicare recipients with acute conditions; and, (b), long stay residents who had been in the facility for at least 90 days. The primary outcome for the short-stay group was the rate of acute care re-hospitalization, from the NFs, within 30 days for treatment of five potentially avoidable conditions: congestive heart failure, electrolyte abnormalities, respiratory infection, urinary track infections, and sepsis. For the long-stay group, the incidence rates for three outcomes were chosen to evaluate the role of staffing levels: pressure ulcers (PUs), skin trauma, and weight loss. Hospital claims data were used to evaluate outcomes for the short stay sample, while MDS assessments that occurred 90 days apart was used to evaluate the incidence rates of outcomes for the long-stay residents (USCMS, 2001). Staffing data were retrieved from the Medicaid cost reports, which are thought to be more accurate that the widely used data in the On-line Survey Certification and Reporting System (OSCAR) (IOM, 2003).

Facilities in the worst 10th percentile were considered to have and unacceptable level of inappropriate or avoidable outcomes (in general, the residents in these NFs experienced adverse outcomes at rates that were three or more times greater than the mean number of each outcome for all NFs) (USCMS, 2001). The authors of the CMS

studies modeled the effect of various staffing levels (for each types of skill level) on the risk of resident-level outcomes, while controlling for differences in the rates of risk adjustors (Kramer & Fish, 2001; Schnelle, Simmons & Cretin, 2001). The authors concluded that staffing levels for between 75-90% of the NFs in the study were inadequate, depending on the on the skill level, as well as the outcome under consideration. The minimally-necessary thresholds for each skill level were again: (a) 2.4-2.8 hprd for CNAs/NAs; (b) 1.1-1.3 hprd for licensed staff; and, (c) between 0.55-0.75 hprd for RNs specifically (Kramer & Fish, 2001; Schnelle, Simmons & Cretin, 2001).

Staffing Levels and Nursing Assistants. In the 2001 CMS report, Schnelle and co-investigators reported findings from series of statistical simulation models to evaluate the level of CNA/NA staffing, after controlling for differences in case mix measures, that were needed to provide care in accordance with regulatory guidelines set forth in the NHRA (i.e., NFs should employ sufficient staff to assure that residents maintain the "highest practicable level" of physical, mental and psychosocial well-being) (OBRA, 1987). They specifically examined the level of CNA staffing that was needed to assure appropriate processes of care: for the management of incontinence care, for the provision of feeding assistance at mealtimes, and, to support ADL independence for residents. Their findings were also published in the *Appropriateness of Minimum staffing Levels* (USCMS, 2001, Chapter 3, page1-40). Schnelle and coauthors concluded that between 2.8 and 3.2 hprd of NA care is the minimum threshold depending on resident acuity and whether or not resident LOS was classified as short or long term. As Schnelle and colleagues also noted, this benchmark means that 92% of the nations NF provide staffing

levels that are below this threshold; in addition, they concluded, that more that 50% of NFs would need to double the staffing level of nursing assistants to meet minimum thresholds and to assure adequate care (Schnelle et al., 2001).

Other Staffing-Related Research and Nursing Facilities. In addition to the above research, several authors have described the relationship between higher RN staffing levels and/or RN + LPN/LVN staffing as well as more favorable RN/LPN skill mix ratios on an array of quality measures (Carter & Porell, 2003 & 2005; Castle, 2002; Castle & Meyers, 2006; Decker, 2006; Dellefield, 2006; Dorr et al., 2005; Hickey et al., 2005; Horn et al., 2005; Konetzka et al., 2008; Loeb et al., 2003; Mosley & Jones, 2003). These studies evaluated the effects of RN staffing levels that were lower than the 0.75 threshold identified by Kramer and Fish (2001); but ranged between 0.58 and 0.72 hours. These levels are higher than the average RN staffing levels of 0.33 Hprd in U.S. nursing facilities reported by the AHCA in 2007 for the period between 2000 and 2007, but comparable to the average NF staffing between 2000 and 2006 levels reported by Harrington and colleagues (2007). In these studies, the designated outcomes were diverse, ranging from: (a) an increased risk of deficiencies, including deficiencies related to restraint use (Castle, 2003), mental health care (Castle & Meyers, 2006), and inadequate resident assessment and treatment plans (Mosley & Jones, 2003); (b) increased resistance to commonly used antimicrobials for treatment of Methicillin-resistant *Staphylococcus aureus* (MRSA) (Loeb et al.); (c) elevated risk of avoidable hospitalizations (Carter & Porrell 2003 & 2005; Decker; Konetzka, 2007) and death (Decker, 2006); (d) increased risks for PUs (Horn et al., 2005; Hickey et al., 2005), weight loss and deteriorating ADL functioning (Horn et al.).

From a more positive perspective, NF residents in facilities with higher RN staffing were more likely to recover/stabilize (Decker, 2006), be discharged to the community (Jett et al., 2004), and less likely to be hospitalized that their counterparts in less well-staffed facilities (Decker, 2006; Horn et al., 2005). Investigators have also concluded that increased costs saving up to $3,191 per resident, related to decreased incidence rates for of PUs and UTIs among high risk residents, occur in higher staffed NFs. (Dorr et al., 2005). Other investigators have reported that residents of better staffed facilities, including those with higher ratios of RN to LVNs, experience fewer UTIs (Carter & Porell, 2005; Dorr et al.; Horn et al.), other Kidney infections (Carter & Porell) and fewer PUs (Dellefield, 2006). In addition and in a well-designed retrospective study by Horn and colleagues, residents in better-staffed NFs were shown to have experienced less weight loss, fewer PUs improved ADL functioning, less frequent urinary catheterizations, and higher use of nutritional supplements (Horn et al.); the latter outcome has not, necessarily, been necessarily regarded as a desirable outcome (Kayser-Jones et al., 1998). Hickey and colleagues (2005) prospectively evaluated the relationship between changes in staffing levels and PU development over the subsequent 12 month period. Higher total staffing levels, including average RN staffing of 0.72 Hprd, was associated with fewer PUs.

Several authors (Dellefield, 2006; Lapane & Huges, 2004; Miller et al. 2006) have evaluated the role of higher total licensed staffing levels (i.e., RN+LPN), and less frequently improved RN/LPN ratios (Mosley & Jones, 2003), on an array of outcomes including: increased survey deficiencies related to both inadequate resident assessment (Mosley & Jones) and PUs (Dellefield); increased, clinically-justifiable, use of

antidepressants (Lapane & Huges); elevated risk of restraint application and less anti-psychotic drug administration, especially among African American NH residents with symptoms of depression (Miller et al.). The combined hours of licensed staff in these studies ranged from 1.21-1.46 hprd, levels that met or exceeded the 1.3 Hprd thresholds identified by Kramer and Fish (USCMS, 2001).

Staffing Levels and Quality Indicators

Research by Schnelle and colleagues (2004b) evaluated staffing levels in 34 California NFs and reported differences in processes of care related to the quality indictors (QIs). Unlike much of the prior literature (excepting, for example: Bowers, Esmond, & Jacobson, 2000, 2003; Kayser-Jones, 1996, 1997, Kayser-Jones & Schell, 1997), the findings in the study by Schnelle and colleagues (2004b) analyzed data that were drawn from direct observations of residents and resident interviews, in addition to systematic chart reviews.

Schnelle and colleagues (2004b) examined four general types of care process (assessed by 16 activities) that were deemed to be directly relevant to CNA job performance and representative of desirable clinical care practices, including evidence that residents: (a) were out of bed and socially engaged; (b) had received feeding assistance, (c) had received incontinence care; and (d), had received exercise and were regularly repositioned. They specifically assessed the relationship between reported CNA staffing levels (as separately reported by facility administrators to state agencies and from on-site interviews with 118 NAs) and daily care process used to evaluate quality of care by CMS. Eleven care processes related to licensed staff activities were also assessed including pressure ulcer risk assessments, pressure ulcer management, the assessment and

management of incontinence and pain. The medical record documentation of these processes was the chief source of data; these data were augmented with resident interviews. They evaluated the relationship between care process and staffing levels in 21 NFs with a history of stable staffing levels for the two year period preceding on-site observation of 547 long-stay residents (i.e., those whose care was not reimbursed by Medicare).

Schnelle and colleagues (2004b) examined three types of NFs based on historical staffing level (using data from 1999 and 2000): (a) Group I facilities included nine NFs with average staffing levels of 2.7 hprd, which were drawn from the lowest quartile of NFs in the state (this sample included 228 residents); (b) Group II, six NFs with average staffing levels of 3.4 hprd (N= 204 residents); and (c), Group III, six facilities with a history of total average staffing levels above 3.8 hprd (N= 115 residents). Even though the residents in each group had comparable, MDS-based, acuity measures (i.e., recall ability, transfer ability, eating dependency, incontinence and pressure ulcer risk), some of the demographic characteristics of each group differed significantly. For example, the residents in Group I facilities tended to have higher cognitive functioning and were more independent in feeding and transferring. In addition, the groups differed on demographic attributes: residents in the upper decile (the best staffed, or Group III homes) were more likely to be female, older, private pay and Caucasian, while those in the lowest staffed homes tended to be member of ethnic minorities and were more likely to have been Medi-Cal recipients (Schnell et al., 2004b).

The authors determined that staff in the highest staffed nursing facilities (i.e., those with 4.9 hprd hours of care) provided different care processes than staff in all two

other NFs. They determined that CNAs in the best staffed homes cared for an average of 7.6 residents on the day and evening shifts, which was considerably lower than the average number of residents who were cared for by nursing assistant in all other NFs (Schnelle et al., 2004). Staff (specifically CNAs) in Group III homes, preformed better than their counterparts in all other facilities on 13 of 16 processes of care related to three CMS QIs: weight loss, bedfast, physical restraints. The residents in the best-staffed NFs, when compared to all other residents, were more likely to be out of bed and engaged in some sort of social activity; they were also more likely to have received assistance with eating and they consumed more of their meals in the dining room instead of in their bedrooms than residents in other facilities (Schnelle et al., 2004b; Bates- Jensen et al., 2004a). The staff members in Group III nursing facilities were also more likely to have accurately documented oral intake (especially for residents who had had a history of low intake). The residents in the best-staffed facilities also received more assistance with incontinence care and toilet training programs, and they were more likely to have participated in activities, including repositioning for residents who were unable to do so independently.

In contrast to the difference in care processes that CNAs were responsible for, the investigators found few differences when they compared licensed staff care processes in the best and worst staffed homes. This finding contrasted with documentation in the medical record revealed, which suggested that care processes did differ in the three groups of homes; this finding raises alarming questions about the not only the accuracy of the medical record, but also the accuracy and research value of data that are derived from the medical record (Schnelle, Bates-Jensen, Chu & Simmons, 2004c). The lack of

significant differences may, as the authors speculated, be due to the low levels of licensed staffing in all NFs in the study, which in the case of RNs, were below the 0.75 hprd threshold suggested in CMS 2001 report.

Section I Part II: Staff Turnover and Quality of Care

The American Health Care association (AHCA, 2003) conservatively reported the vacancy and turnover rates in 2002 for direct care licensed staff and DONs averaged about 50% and 10% respectively with some variation by state, region and type of position. The turnover rate for CNAs was, in contrast, considerably higher at about 71%, with relatively large state-state variation; the CNA vacancy rate, nationally, was approximately 9% (AHCA, 2003). Even though the AHCA concluded that turnover and vacancy rates were relatively stable from 2001 to 2002, they reported that there were approximately 95,000 open positions in that nation's NFs 2002; more than half of these (52, 500) were for CNAs. Nationally, and by skill level 15% of RN, 13% of LPN and 8.5 percent of CNA positions were vacant in 2002 (National Commission on Nursing Workforce for Long-Term Care [NCNF-LTC], 2005). In addition to the vacancy problem, the AHCA (Biles et al., 2005) estimates (based on data from the Bureau of Labor Statistics) that a 45% increase in the demand for new jobs in the LTC sector will occur between 2000 and 2010; that this is equivalent to 800,000 new jobs.

Turnover and Costs

As Decker and colleagues (2001) and the IOM noted (2001), turnover has considerable financial implications for both funding agencies for individual NFs that make it a worthwhile problem for intervention. In addition, turnover rates have been associated with poorer quality. For example, higher turnover rates has been associated

with substantially increased rates of infectious disease (30%) and acute care hospitalizations (80%), both of which can lead to higher expenditures for the Medicare and Medicaid programs. At the NF level, The National Commission on Nursing Workforce for Long-Term Care (2005) noted that costs associated with CNA turnover were about $4 billion dollars per year nationally, or approximately $250,000 per facility In an early study, Caudill and Patrick (1991) estimated the costs to NFs, to replace a CNA or RN staff was $2,200 and $7,000. In contrast, both the Hartford panel and a study by Straker and Atchley (1999), (cited in Castle (2006), noted that relatively minor increases in the value of benefits and salary can substantially stabilize the LTC workforce. These data indicate that reducing turnover, improving retention or fostering longer staff tenure can have substantial benefits for NFs. Thus, further evaluating factors that contribute to staff turnover is indicated.

Turnover Research and Quality

The 2001 and 2003 IOM reports, the AHCA (2003a, 2003b) reports on turnover, as well as the 2001 CMS report, and an array of peer-reviewed publications have addressed the importance of reducing turnover, enhancing retention rates and otherwise stabilizing the LTC workforce, including both direct care providers as well as DONs and administrators. The relationship between turnover/retention has been well explored in the peer reviewed literature and, in general, NFs with lower rates of turnover provide better quality care, including continuity and stability of care, when compared to facilities with high turnover rates. For example, reduced turnover rates and higher staffing levels have been associated with improvements in resident care and functioning including, less frequent antibiotic use and fewer pressure ulcers, less frequent urinary catheterization of

residents, fewer urinary track infections and other types of outcomes (e.g., Castle & Engberg, 2006, 2007; Cherry 1991; Harrington & Swan, 2003; Kramer & Fish, 2001; Munroe 1990; Nyman 1988; Spector & Takada, 1991).

While turnover and quality are related, the direction(s) and strength of that relationship is less than obvious (Castle, 2006). In his review, Castle evaluated 38 publications that appeared in the indexed/peer-reviewed literature between 1990 and 2003. Castle (2006) noted that it is difficult, however, to reach definitive conclusions about the precise effects or causes of turnover in part because investigators either do not define turnover, or because they have adopted disparate definitions. This problem is further complicated by the design of studies that have evaluated turnover which, like the staffing literature in general, is characterized by well-controlled cross-sectional models that prevent causal statements because they lack time-ordered measurements. Castle (2006) articulated the short comings of past research and offered detailed recommendations for future studies that may be of use to the NHC including: (a) adopting a uniform definition for turnover that is based on a specific/uniform reporting period; (b) differentiating, or at least accounting for, differences between involuntary and involuntary turnover; (c) reporting turnover by shift; and (d), reporting separate turnover rates for permanent employee and agency staff. As the authors of the 2001 IOM report noted, employing strategies to reduce turnover may be advantageous in terms of fostering improved quality. In addition to those important issues, recent research suggests that the turnover and quality are not linearly related and the relationships vary by type of provider (Castle & Engberg, 2006, 2007), by the hours of care (Castle & Engberg; Harrington & Swan, 2003), and by the acuity of residents (Harrington & Swan).

Turnover and Nursing Assistants. To asses the role of CNA retention/turnover rates on the rate of adverse outcomes, Kramer and Fish evaluated data from a sample of 631 California NFs (UCCMS, 2001). They concluded that NFs with retention rates less than 51% were about 3.5 times as likely as their counterparts, with higher retention rates, to be in the worst 10% of facilities for: (a) two of the five short-stay resident outcomes that they evaluated (i.e., electrolyte imbalances, and UTIs); and, (b) for three of the seven long-stay measures (i.e., functional improvement, PU incidence, and resistance to care processes). In their models and when retention rate dropped below 51%, the risk of hospitalizations, the incidence of urinary track infections, and the rates of pressure ulcer development increased. The Kramer and Fish study was important in that the authors identified the level of CNA staff stability that is needed to limit the risk of adverse outcomes. This study will build on that work by evaluating the relationship between staff turnover rates and five quality measures, including the three QIs that Schnell and colleagues (2004b) found to be related to staffing level.

Section I Part III: Ownership Type and Resident Outcomes

Published Literature Reviews

Various IOM reports (e.g., 2001, 2003) and the authors of at least three comprehensive have evaluated the literature related to ownership type and quality. This study will augment that research by evaluating the relationship between profit status and three valid and reliable QIs and validated complaints. In the first and widely quoted review of LTC literature, O'Brien and colleagues examined 20 years of peer-reviewed publications that had evaluated the differences in quality, including resident outcomes, between for-profit (FP) and not-for-profit (NFP) nursing facilities (O'Brien, Saxberg and

Smith, 1983). They noted that the projected growth in the size of the elderly population required an assessment of the role and benefit of nursing homes; however they suggested that unresolved questions about differences (if any) in the quality of care provided by proprietary and non-proprietary NFs. Their review spanned the two decades between 1964 and 1983. Interestingly, and perhaps not surprisingly, the findings in this literature yield a mixed picture. The author's of some studies in the O'Brien review, detected differences in quality between the two types of ownership; others concluded that there were few differences in quality between the two types of NFs and that care in each was inadequate and that the literature, in general, was characterized by design flaws that limited definitive conclusions. The early literature can be characterized, for example, by limited efforts to account for or control for an array of important variables (e.g., bed size, occupancy rates, staffing levels and so forth) that have become relatively standard practice in more contemporary research. Such deficits limited the ability of O'Brien and colleagues to draw firm conclusions about the influence of profit-making status on resident outcomes.

The interpretation, as well as the reliability and validity, of the findings from each of the studies evaluated in the review, by O'Brien and colleagues (1983), was complicated by multiple design and analytical flaws that have been addressed to varying degrees in the subsequent literature and that have been addressed (to some extent) in the present study including: (a) lack of data to control for variations in patient acuity or case mix; (b) poor or absent stratification of samples to account for differences in the size of NF chains (e.g., a FP facility that is part of a multi-state and large multi-facility chain is likely to be different from a FP facility that is part of a chain comprised of two NFs

operating in single jurisdiction); (c) aggregation of all NFP facilities into one category for analysis, even though government facilities are subject to differing funding and survey criteria than other types of NFP facilities (this is not an inconsequential concern given that roughly 10% of all U.S. facilities in 1993 (vs. about 8% today) were government owned [Spector et al., 1998]); (d) questionable data sources with information in early studies often obtained from non-random interviews with administrators in contrast to external sources, such as the On-line, Survey, Certification and Reporting System [OSCAR], the standardized reporting instrument maintained by CMS that is widely used in contemporary research; (e) the use of non-random surveys of state licensing and certification officials to identify so-called good and bad NFs that were then subjected to further scrutiny; (e) the use of non-random samples, or small randomized samples, of NFs that were restricted to a single state or a limited geographic region; (f) the lack of a uniform quality definitions/measures, a not-insignificant problem that has also been a criticism leveled toward more contemporary literature (Kane 1997, 2001; Kane & Kane 2001); (g) the use of proxies to assess quality and a dearth of studies with direct observations or interviews of NF residents, which limits one's ability to the draw causal conclusions; (h) the wide-spread use of cross-sectional study designs instead of longitudinal studies, which , again, prevents causal statements and limits the opportunity to asses changes in quality of care over time; (i), remarkably little in the way of replication studies to asses the stability of findings over time; and (j) the limited use of multivariate analysis (excepting a well-regarded study by Koetting from 1980), which, limits one's ability to evaluate or control for the role of an array of important covariates.

O'Brien and colleagues (1983) suggested that the key question, given similar circumstances among a sample NFs, is which ownership type offers better quality? They concluded that only one investigator had thoroughly attempted to assess that fundamental question up to the time of their review: Koetting (1980). O'Brien and colleagues repeatedly underscored the importance of Koetting's study, which they described as the (then) most-sophisticated inquiry of U.S. nursing facilities. Koetting had used a multivariate model to analyze cross-sectional data collected from a random sample of 136 NFs in a single midwestern state. Thus causation as well as generalization to the population of U.S. facilities is problematic, but Koetting included several enhancements that were not common in the LTC literature before 1980. For example, Koetting stratified the facilities for analysis into important groupings including county-owned NFs, other NFP, single operator proprietary NFs, multi-facility proprietary chains, and other proprietary NFs. The design was relatively sophisticated and included controls for important variables, including the number of beds in each NF and occupancy rates. Koetting did not include controls for market-level variables, but his study was one of the first to assess the role of residents' pre-existing health status on outcomes by using a rudimentary measure of case mix that was based on both physical and psychological conditions. Koetting (1980) used a composite quality of care measure (based on a review of resident medical records, as well as licensure and survey histories for each of the 136 NFs in the sample), which was judged by three-member teams comprised of physicians, nurses and social workers. These assessments were not, however, subjected to either psychometric testing or assessment of interrater reliability. Koetting (1980) concluded that FP facilities were more cost efficient, in that they could provide a specified standard

of quality at a lower costs that NFP; however, he also determined that FP facilities, as a group, provided lower quality of care when compared to their NFP counterparts.

In a more recent review, Rosenau and Linder (2003) systematically evaluated findings from 149 peer-reviewed manuscripts that were published between 1979 and 2002 to compare non-profit and for-profit health provider organizations (both NFs and other types of health care organizations). Their review included 23 papers from the LTC arena. Unfortunately, the results were not disaggregated by provider type (i.e., findings from NFs, acute care hospitals, hospice, dialysis centers, psychiatric hospitals and so forth were not presented separately). In addition, the studies included a broad array of samples (e.g., national vs. state-level data), which may, of course, limit generalizabilty. They cited economic theory (i.e., Rice, 1998) to predict that convergence between FP and NFP facilities, is likely to occur because both types of providers confront similar incentives, regulatory pressures, and competition for residents in an era of declining occupancy rates.

Rosenau and Linder's (2003) review was not a meta-analysis (a powerful, but in this case, an unfeasible approach) because of wide variations in study design and measures in the studies that they had reviewed. They choose instead to include all studies, despite flaws, under the assumption that design errors were randomly distributed among study types and among provider types (i.e., studies which favored outcomes in FP should not be any more prone to errors that literature favoring NFP providers). Moreover, they did not specifically evaluate study design, reliability or validity. Instead they (generously) assumed that the peer-review procedures in place at the various journals would assure the integrity of study design and the interpretation of findings discussed by the primary

authors. They used four performance indicators to compare FPs and NFP facilities including access, cost/efficiency, amount of charity care and quality.

The quality outcomes included rates of: adverse events, mortality, noncompliance, facility closures (attributable to violations of state and/or, more typically, federal regulations), and dis-enrollment or withdrawal from the Medicare/Medicaid programs. The use of mortality rate as an outcome measure of quality in NF research is less than an ideal measure because NFs have a history of transferring residents to hospital to avoid having resident (even expected) deaths occur in their facility (Bell, & Krivich, 1990 as cited in Rosenau & Linder), a practice that is thought to reduce the risks of increased/unwanted scrutiny from state or federal survey staff. Rosenau and Linder also assessed FPs and NFPs in the array of services they provided; lastly, they analyzed the studies to compare HEDIS (Health Plan Employer Data and Information Set) scores from the National Committee for Quality Assurance.

Findings were coded in three ways: (a) those that found superior outcomes among for-profit providers, (b) those that favored non-profit NFs, and, (c), studies that found no significant differences in the outcomes of interest between FP and NFP providers (Rosenau & Linder, 2003). Among the 69 studies with measures of quality, 41 (59%) reported that NFP providers were superior, 20 (29%) found no difference in quality between the two types of providers, and the authors of the remaining 8 (12%) studies concluded that FP facilities provided superior quality on one or more of the quality measures under consideration (Rosenau & Linder). Despite these differences, Rosenau and Linder initially concluded in their manuscript that no clear trends regarding differences in quality between FP and NFP providers exist. Later they revised this

position and concluded that for the outcomes of interest (excepting access to care), the predicted convergence in performance between FP and NFP had not occurred and thus quality of care provided by the two types of facilities is not equivalent and that NFP facilities provided superior care. The authors further asserted that if performance (assessed by cost/efficiency, amount of "charity care", and/or quality of care) is a primary consideration, then it is difficult to defend any increased role for profit in the nation's health care system (Rosenau & Linder).

Finally, the findings from the most recent systematic review of contemporary LTC literature and type of NF ownership (Hillmer, Wodchis, Gill, Anderson & Rochon, 2005) appear to contrast, at least at first glance, with the conclusions of Rosenau and Linder (2003). Hillmer and colleagues (unlike Rosenau & Linder) analyzed quality of care findings from publications restricted to LTC providers only. They stratified study findings from thirty-eight peer-reviewed publications with 81 measures of quality by ownership type (FP vs. NFP), risk-adjustment procedures (i.e., the use of one, two, three, four, or no adjustment measures) and study design: cross-sectional, retrospective longitudinal and prospective longitudinal.

Hillmer and colleagues (2005) noted that the authors of most cross-sectional studies (N= 46) had concluded that NFP facilities provided poorer quality of care, while the bulk of retrospective studies (N= 31) indicated that residents in FP facilities experienced more quality of care problems. The four prospective studies included in their review yielded mixed findings: one indicated lower quality in NFP facilities; the authors of another determined that quality was lower in FP nursing facilities and the remaining two did not reveal significant differences between quality of care in FP and NFP facilities

(Hillmer et al). However, when Hillmer and his co-investigators analyzed findings by authors who had incorporated risk-adjusting procedure into their analysis, they concluded that NFP facilities provided better quality of care than FP facilities (Hillmer et al). It is obviously imperative in to include adequate risk-adjusting procedure/variables to "level the playing field" as suggested by various authors (Arling, Nordquist, Brant & Capitman, 1987; Fries, 1990; Fries et al., 1994). These controls are necessary to allow for meaningful comparisons between facilities that care for populations of residents that can be quite dissimilar.

Recent Primary Source Literature: Ownership Type, Profit Levels and Quality

In addition to the literature summarized in the review papers discussed above, there have been a number of important papers that help to shed light on the role of profit status on resident outcomes in LTC facilities. The theoretical framework used in these studies was also based on Donabedian's (1966) structure, process and outcome framework. Some investigators have focused on process measures to assess quality, others have used outcome measures, but all have assessed the role of ownership type on quality with generally consistent findings that favor FP facilities.

Aaronson and colleagues (1994) noted, not unlike O'Brien and colleagues (1983), that poor analytical techniques could account for the history of equivocal findings related to the role of profit status and quality. Aaronson and colleagues built on the enhancements used by Koetting in 1980 (as cited in O'Brien et al., 1983), when they employed a 3SLS (three stage least squares) model to evaluate the behavior of FP and NFP nursing facilities in Pennsylvania (PA). They noted that this analytical technique helped to account for potentially-endogenous relationships between payer mix, case mix,

occupancy rates, nurse staffing levels, payment rates and organization type. The authors also suggested that the widely-used 2SLS (two-stage least squares) approach that is common in more contemporary LTC literature was inappropriate because of high correlations values between error terms in their study.

Aaronson and colleagues (1994) analyzed cross-sectional data to evaluate outcome variables including pressure sore development (which could have more accurately been described as a prevalence rate in their study) and the prevalence of restraint use in 449 free-standing NFs. The proportion of FP facilities in this study was less than the national average (59.9% vs. 75%). Aaronson and colleagues suggested this could limit generalizabilty because the larger proportion of NFPs in PA in 1987 may distort market behavior; this assertion was not substantiated in more recent research on market penetration, NF behavior and quality (Spector et al., 1998). Despite this limitation, the authors concluded that residents in NFP facilities, in general, experience superior outcomes (i.e., significantly lower rates of pressure sores & restraints; $R^2 = .43$, $p < .10$), even though the NFP facilities in this study tended to care for older and relatively sicker residents (Aaronson et al). The use of cross-sectional data does limit, of course, the validity of statements of causation, but Aaronson and colleagues were among the first to conclude that higher staffing levels in NFPs may account for observed differences in quality between NFP and FP facilities. However, the utility of their observations is probably limited by the use of data that were collected prior to the full implementation of the reforms of engendered by the 1987 NHRA, which did not occur until 1995 (Edelman, 1998).

Spector and colleagues (1998) analyzed 1987 data from the institutional component of the National Medical Expenditures Survey (NMES) to evaluate outcomes (assessed by: mortality, infections bedsores/pressure ulcers [PUs], hospitalization and functional disabilities) among 2,230 residents of FP and NFP nursing facilities. Spector and his co-investigators (1998) incorporated an extensive array of control variables to account for resident case mix, age, health conditions, family income, education, family structure and place of residence prior to entering a NF. Their design strengthened the caliber of the literature in this area because they also included an extensive array of market-level variables, extracted from the Bureau of Health Professions Area Resource File, including: urban/rural location, county per capita income, percent non-profit NF per county, empty beds per 10,000, percent aged 75+ individuals in the county population, and geographic Census area of the country. Spector and his co-investigators (1998), like Aaronson and colleagues (1994), also analyzed data that pre-dated the full enactment of the NHRA legislation (OBRA, 1987). They argued that these data might provide more accurate insights into organizational behavior (i.e., differences between FP vs. NFP), absent the increased regulatory constraints that were anticipated with full enactment of the legislation. They also speculated that future research, conducted on post-NHRA enactment data, might show evidence of convergence on quality measures between FP and NFP facilities; this has not been the case to date.

Spector and coauthors (1998) determined that NFP facilities admitted relatively more residents with health conditions and serious co-morbidities when compared to FP facilities. This finding, in light of their evidence that residents in FP facilities also experience more adverse outcomes, is of concern. They also noted that NFP facilities

have more private-pay residents and these individuals were 6.2-6.3 % less likely to experience an untimely death and infections compared to private pay residents in FP facilities. The later outcome, as they note, was in contrast to the findings from other investigators who have concluded that mortality rates are higher in NFP facilities. Like Aaronson and colleagues (1994), Spector and colleagues concluded that staffing level was an important variable and their analysis revealed that NFP facilities employed more RNs and fewer LPN/LVNs than FP facilities; a finding which as been implicated as a key quality-related factor in other literature (Harrington et al., 2001; O'Neil et al., 2003). The authors reported, somewhat tentatively, that NFP facilities "probably" provide better care, but they also discussed the possibility that differences in outcomes may reflect difference in resident health status. However, this contention seems unlikely, given their extensive use of control variables, a nationally-representative sample and their findings that FP facilities tend to care for healthier residents.

Harrington & colleagues (2001) used cross-sectional data to examine the effect of investor owned facilities on quality of care using the proportion of deficiencies as the outcome of interest. They analyzed a large national sample, with clear and well-reasoned inclusion/exclusion criteria. The authors analyzed OSCAR data drawn from nearly 13,500 NFs (of the roughly 17,000 facilities in the nation) located in all 50 states and the District of Columbia. The stability of findings was evaluated by examining data for both 1997 and 1998. In the U.S, nursing facilities receive a deficiency when they fail to comply with one or more of the roughly 185 quality-of -care and/or quality-of-life standards, which apply to all NFs that receive funding from the Medicare and/or Medicaid programs. The investigators used a series of multivariate, ordinary least squares

(OLS) models that included controls for the following: (a) dependency in performance of ADLs (activities of daily living), which was evaluated by assessing residents need for help with eating, transferring and toileting; (b) percentage of residents covered by Medicaid and Medicare; whether or not a facility was hospital based; (c) whether a NF was part of a chain or not (but not the size of the chain); and, (d) location by state. They also included proxy measures to account resident acuity, including: the prevalence of depression, dementia, behavioral symptoms, urinary incontinence and pressure sores. Lastly, they evaluated total nurse staffing level as well as staffing level for three skill levels (RN, LVN/LPN and NA/CNAs).

Harrington and coauthors (2001) concluded that investor-owned facilities received significantly more deficiencies of all types. On average each FP facility received 5.89 deficiencies, 46.5% more than NFP facilities, and 43% more than the number of deficiencies in government operated NFs. Of greater concern, were the rates of severe deficiencies, which were 40.5% higher at FP facilities than in non-profit NFs, and 35.8% higher than the rates for government operated NFs. Harrington and colleagues added further insights to the roles of staffing level and profit status on resident outcomes by determining that licensed staffing hours (RN and LPN/LVN) were lower at investor owned facilities: 31.7% lower than total hours at NFP facilities, and 22.8 percent lower that at government facilities. Total hours of care provide by CNAs were 11.9% and 16.0% lower that at NFP and government operated facilities respectively. These findings were stable when a confirmatory analysis of outcomes was conducted using 1997 data. The stability investigation was one of the few attempts to date, albeit rudimentary, to analyze outcome data over time. Unlike other sources (e.g., O'Neil et al., 2003; Spector

et al., 1998), they concluded that the residents of FP and NFP were comparable, based on the case mix measures, and that differences in the rate of deficiencies were primarily attributable to investor ownership of NFs.

It is unclear from their publication, however, if the authors evaluated their data for evidence of endogenous relationships between staffing level and ownership type. Harrington and coauthors (2001) also sounded a cautionary note, by suggesting that that care was unlikely to be adequate in any NF until enforcement of regulatory standards becomes more rigorous. Their analysis did not include any measure of enforcement intensity other than the number of deficiencies.

O'Neil and colleagues (2003) examined the relationships among profit, quality and ownership types for a sample of 1,098 free-standing California NFs. Even though they used cross-sectional data from one state and for only a single year, they have added an important dimension to the literature by analyzing the relationship between various profit-taking levels and quality. This is a novel approach and one that allows for more complete scrutiny of the problem beyond the profit vs. nonprofit ownership dichotomy. As O'Neil and his co-investigators noted, this issue is well-worth pursuing because FP facilities account for nearly 66% of the beds in the nation (the proportion was even higher in California, 86% in this sample). The authors were consistent with the approach endorsed by others, when they selected only free-standing NFs and excluded hospital-based facilities because the latter have differing reimbursement and staffing levels that are not typical of most facilities in either California or the nation. Like most contemporary investigators, they excluded government owned NFs as well and psychiatric facilities. The control variables, many of which are self-reported by NFs in

the OSCAR database, were typical and well-chosen, especially the case mix measures and proportion of Medicaid/Medi-Cal residents in each NF.

The FP facilities in this sample included fewer, so-called, "old-old" residents (>85) and they admitted more Latino and African American residents that NFP facilities (O'Neil et al., 2003). The health status of the residents in the sample was fairly homogenous and the two types of NFs did not differ on the primary case mix measure: the proportion or residents, who were dependent on NF staff for assistance with eating, transferring from bed to chair, and toileting. Staffing level was omitted from their analyses because the authors provided evidence that that staffing level might be highly collinear with other variables in their model (such as revenues, costs and profits). The primary outcome measures were the total number of deficiency citations, as well as the number of serious deficiencies; the same outcomes used by Harrington and colleagues (2001). As the authors noted, the number of deficiencies in U.S. facilities is relatively small (an average of 5.7 deficiencies per year for all of the nation's NFs in 1999) compared to an average of 11.3 per facility in for California. Deficiencies were non-normally distributed and the authors used a series of multivariate logistical regression models to predict the probability of total and severe deficiencies as a function of profit levels (O'Neil et al., 2003).

In general, proprietary NFs in California provided poorer quality of care, measured by both more total and more severe deficiencies, than their non-profit counterparts. O'Neil and colleagues (2003) reported that 377 of the NFs in their sample received more than 20 deficiencies each; of these, 349 NF were proprietary 28 were nonproprietary. Proprietary homes, in this study, received 7.4 more total deficiencies and 50% more

severe deficiencies than their non-profit counterparts. It should be noted that the authors did not assess the sample for evidence of differences in regulatory scrutiny, which is believed to differ depending on a facilities profit making status (Harrington, Zimmerman, Karon, Robinson & Beutel, 2000b). When O'Neil and colleagues (2003) restricted their analysis to FP facilities, they concluded that quality was significantly poorer (i.e., more total & severe deficiencies) in the 14% of NF highest profit levels above nine percent when compared to FP facilities with lower levels of profit or investor dividends. They concluded that profit making, *per se*, is not necessarily a problem in terms of quality (at least for these two outcomes), but that the level of profits is of more concern.

Section II: The Minimum Data Set and Related Instruments

The information directly collected from the assessment of individual NF residents, using the Minimum Data Set (MDS), are key sources of quality of care and resident data that are evaluated in this study. The purposes of this chapter are to review literature related to the development, reliability, validity and usability of the following sources of information about residents in the nation's nursing facilities (NFs): (a) the 300-plus item Minimum Data Set (MDS); (b) the long-term care (LTC) case-mix classification and prospective payment system known as RUGs, or the Resource Utilization Groups; and (c), the Centers for Medicare and Medicaid (USCMS) Quality Indicators (QIs) developed to evaluate quality of care within, between and among NFs (Fries et al, 1994; Hawes et al., 1992; Morris et al., 1990; Zimmerman et al., 1995).

Background

In 1986 Congress, in response to the 1986 IOM recommendations, directed the Health Care Financing Administration (HCFA), now known as CMS, or the Centers for

Medicare and Medicaid Services, to: (a) improve staff training, (b) develop minimal staffing standards, (c) enhance quality, (d) protect resident rights and (e), design and implement a uniform and comprehensive resident assessment process (Hawes et al., 1995; IOM, 1986; Morris et al., 1990*)*. These objectives were codified under the reforms imposed by the Omnibus Reconciliation Act of 1987 (OBRA, 1987), including Section C, the Nursing Home Reform Act (NHRA).

The enactment of the language in the NHRA required the operators of the nation's NFs to adopt the Resident Assessment Instrument (RAI). The RAI includes two components: (a) the MDS, which includes a set of physical, psychological and social assessment items, a index of existing medical conditions and a complete inventory of current medications; these parameters are evaluated at the time of admission and periodically thereafter; and (b), a more detailed series of 18 intervention protocols that are known as Resident Assessment Protocols, which are selectively activated for use as care-planning tools (IOM, 2001; Morris et al, 1990). The MDS has undergone repeated refinements and development and the data it provides is used to monitor quality.

The RUGs system is an MDS-based classification tool that is used to differentially and prospectively adjust reimbursement levels for each NF resident, based on the estimated amount of nursing and therapy time that each NF resident will require during the course of their admission (Fries et al, 1994). These estimates of resource utilization are believed to be an adequate surrogate or proxy for resident acuity or case mix (Fries et al; IOM, 2001). The system is similar to the diagnosis related groups (DRGs) that is the foundation of the prospective payment system for acute care hospitals. However, unlike the DRGs, which focus on length of stay (LOS) as the primary

dependent variable, the RUGs classification is based on estimates of resource consumption (Fries & Cooney, 1985). The RUGS system is designed to group similar types of residents (including those who require an extensive array of services) into case-mixed based categories that can be used to systematically and prospectively establish reimbursement levels for NF operators (Fries et al; Fries & Cooney).

The quality of care in the nation's NFs can be assessed by a variety of evolving measures including Quality Indicators (QIs). The initial version of these QIs, which are also based on resident-level MDS data, were developed and tested by researchers at CHSRA, the Center for Health Systems Research and Analysis, at the University of Wisconsin (Zimmerman et al., 1995, Zimmerman, 2002, 2003). Zimmerman and colleagues (1995) noted that the QIs were envisioned as tools to evaluate quality through internal and external quality assurance programs (e.g., nursing home surveys) through QI-based quality monitoring system (QMS). For the purposes of this study, three QIs will be used as one of the primary outcomes of interest based on validation work that preceded the development of California Nursing Home Search (Calnhs) (www.calnhs.org), a web-based consumer information system launched in 2002 by the California HealthCare Foundation (Bates-Jensen et al., 2004a, 2004b; Schnelle et al., 2004a, 2004b; Simmons et al., 2003).

Instrument Development

Minimum Data Set

The implementation of the national resident assessment process, and in particular the MDS component, was to designed to improve and standardize the quality of care in the nations NF's by generating uniform data, which can be used to implement

comprehensive plans of care that are based on the reproducible, accurate and standardized multidimensional assessment data generated from the MDS (IOM, 1986, 2001; Morris et al, 1990). The 300-plus items on the earliest version of the MDS were drawn from 60 pre-exiting tools and from a panel of questions recommended by an expert panel of clinicians, researchers, NF residents and their advocates (Hawes et al, 1992; Morris et al., 1990). The instrument developers identified content areas and potential domains of information through a series of Delphi-like procedures, which entailed consultations with clinical staff, researchers, residents and their advocate's providers, industry representatives, regulatory groups and measurement experts (Hawes et al; Morris et al). The MDS items were designed to address the 13 information domains specified by the OBRA (1987) legislation which required documentation and standardized assessments of residents, including evaluation of functional status, sensory and physical impairments, nutritional status, psychological status, special treatments and procedures, discharge potential, dental condition, potential for activities, cognitive status, and the appropriateness of selected drug therapies (IOM, 1986; Morris et al; OBRA, 1987).

The initial clinical trial of the MDS, referred to as the *Small Scale Reliability Trial* (SST), was the first of several validation studies, which were essentially tool development exercises (Morris et al., 1990). The initial reliability measures were established by determining interrater reliability coefficients between two trained, independent and blinded observers for a relatively small sample (N = 140) of short-stay, intermediate and long-stay NF residents. The investigators drew the sample from among residents with a wide array of physical and psychosocial characteristics who were cared

for in one of ten NFs (6 for-profits and 4 non-profit facilities) in two states (North Carolina & Massachusetts). Despite the sample size, the residents shared many common characteristics with the nation's NF population at the time. For example, (a) 90% of the participants were Caucasian and 7% were black; (b) 74%, were female; and, (c), the participants exhibited a wide array of physical and cognitive impairments that were characteristic of the long-term institutionalized residents in the late 1980s (Morris et al, 1990; National Center for Health Statistics, 1989).

Morris and colleagues (1990) adopted a modest threshold for the acceptable values of the correlation coefficients; items with interrater reliabilities of .40 or greater were retained for further evaluation. This figure is considerably lower than the reliability threshold of .70 (for instrument development) suggested by Nunnally and Bernstein (1994). Roughly 55% for the items on the native instrument achieved reliabilities of .40 and above; 40% of the original items were retained without modification and a further 40% were modified and eventually retested, while 20% were dropped either because of unreliability in repeated measurements or because they were believed to offer redundant information (Morris et al).

Resource Utilization Groups

The RUGS classification system (now in its third iteration: RUGs-III) is based on an assessment of three dimensions that quantify the expected levels of nursing and/or therapy staff time (described as level of resource consumption) that is needed to care for residents who are classified into one of 44 homogenous and mutually exclusive categories (Clauser & Fries, 1992; Fries, 1990; Fries & Cooney, 1985; Fries et al., 1994). To uniquely classify each NF resident, individuals are first assigned to one of seven

hierarchal categories, based on the anticipated level of care, including: special rehabilitation, extensive care, special care, clinically complex care, impaired cognition, behavioral problems and reduced physical functioning (Fries & Cooney). Second, each resident's activities of daily living (ADL) needs are evaluated by analysis of the MDS-ADL subscales, which conceptualize ADL ability by level independence for the following tasks: eating, toileting, bed-chair transfers, and bed mobility for residents who were classified as bed-bound (Fries & Cooney). Third, the type and duration of necessary specialty services is projected for each resident (e.g., the level of therapy, rehabilitation care and specialty services such as social workers, dentist, and speech pathologist) (Fries & Cooney).

Quality Indicators

The initial quality indicators (QIs) constructed by Zimmerman and colleagues (1995) were developed in consultation with a broad array of LTC clinical disciplines and interest groups (including nursing, medicine, medical records social work, dietetics, physical occupational and speech therapy, facility administrators and resident advocates). The original QIs were selected to assess the clinical, functional, and psychosocial dimensions that were thought to be important in any effort to monitor NF quality; these QIs evaluated 12 domains: (a) accidents, (b) behavioral and emotional patterns, (c) clinical management, (d) cognitive functioning, (e) elimination and continence, (f) infection control, (g) nutrition and eating, (e) physical functioning, (f) psychotropic drug use, (g) quality of life, (i) sensory functioning and communication, and (j), skin care (Zimmerman, 2003; Zimmerman et al., 1995). These domains were initially associated with 175 potential quality indicators that were developed after evaluating the extant

literature as well as the recommendations from an expert panel that had been convened to advise the researchers at CHSRA (i.e., the Center for Health Systems Research and Analysis). Zimmerman and colleagues (1995) noted that these 175 indicators were subjected to further scrutiny including clinical validly and usability, feasibility, and statistical robustness (Zimmerman, 2003). Following those analyses, the 175 available indicators were reduced to approximately 100 and then further to 31 measures, which were then subjected to pilot testing to evaluate their utility during the survey process in U.S. nursing facilities (Karon & Zimmerman, 1996). The 31 potential QIs were further evaluated to assess their compatibility with the data collection requirements and existing content of the MDS (Version II) assessments, which vary from resident to resident once the initial admission and annual assessments are completed (Zimmerman, 2003; Zimmerman et al., 1995).

Zimmerman (2003) suggested, that in optimal circumstances, QIs can provide data on the presence or absence of care process and the occurrence of two types of outcomes: (a) those that measure changes or outcomes that develop over time, defined as incidence measures; and (b), those that simply capture outcomes at one point in time without regard to antecedents; these are known as prevalence measures. The final group of 24 indicators developed by CHSRA, are predominantly prevalence QI as surveyors reported difficulties using incidence QIs (i.e., during pilot testing) because of problems identifying the denominator (Zimmerman et al., 1995). This is an unfortunate decision, but not an uncommon problem (Berg et al., 2002), because it hampers efforts to track changes in care over time at NFs; an objective that is theoretically possible since the MDS provides resident-level data from multiple assessments administered over time.

The final group of CHSRA-QIs evaluates 11 of the original 12 domains, the 12th domain sensory function and communication, was omitted without explanation (Zimmerman et al., 1995) Each of the domains are assessed by one or more of the 24 indicators, some of which have been risk adjusted, and have been further classified as process, outcome or mixed indicators of quality. Zimmerman (2003) went to some length to express his view that QIs are only indicators, and not measures, of quality problems; he suggested that the presence of these indicators requires further assessment to reach a conclusion about the existence of a quality of care problem. The investigators at CHSRA also noted that the non-random convenience sample of NFs surveyed during the pilot studies could not provide sufficient or definitive evidence to assess QI accuracy (Zimmerman et al., 1995). Zimmerman (2003) recently suggested that additional validation studies were necessary and that QIs only provide a starting point, as it were a "signal flag", or a mechanism that should prompt clinical staff, surveyors or other stakeholders to more closely scrutinize specific aspects of care in any given NF to determine if there are potential quality of care problems in any of the domains assessed by either of the 24 QIs.

For the purposes of this research three domains, which can be assessed with up to nine QIs were used as the dependent variables of interest and are discussed below and again in Chapter V: (a) nutrition and eating, assessed by the prevalence of weight-loss, an outcome measure in CHSRA classification (Zimmerman et al., 1995); (b) physical functioning assessed by prevalence of bedfast residents, another outcome measure; and (c), quality of life, assessed by the prevalence of daily physical restraint application, a process measure in Zimmerman's typology (Zimmerman, 2003).

Instrument Reliability and Validity

Minimum Data Set (MDS)

MDS Reliability. Morris and colleagues (1990) evaluated item reliability for the 16 domains evaluated in the initial version of the MDS tool by assessing interrater reliability with three commonly used strategies: (a) percentage agreement; (b) magnitude and direction of correlations between independent observations; and (c) measure of congruence between observer assessments, which were regarded as the most conservative measure of reliability, because the authors adjusted for chance errors in agreement between observers (Morris et al., 1990). The authors presented a representative illustration of their findings by discussing three of the sixteen MDS domains: ADL dependency, cognitive patterns (constructs related to: memory and decision making ability) and measures of psychosocial well-being (construct related to: happiness, sense of control and degree of social involvement (Morris et al).

Morris and colleagues (1990) evaluated two measures of ADL dependency by assessing if: (a) an ADL performed or provided (i.e., was the/a resident-participant groomed, dressed or fed); and (b), the self-performance level of residents (e.g., was a resident able to transfer from bed to chair). Reliability coefficients for the measures of performance ranged in magnitude from .15 to .32; thus, most of these items were eliminated from the MDS. In contrast, six measures of resident's ADL ability (locomotion, transfer, grooming, bathing, dressing, and eating) had acceptable reliabilities that met or exceeded .75. The items that purported to measure resident's cognitive functioning, memory ability and decision-making capacity achieved reliabilities of .48 t o .75 (Morris et al). Items that were designed to assess psychosocial well-being

achieved reliability coefficients of .38 and above; all of these items were retained and incorporated into a single scale with a reported Spearman-Brown internal consistency coefficient of .64 and fair-to-good KR-20 values between .61 and .70 (Morris et al). The decision to retain items was based on the value of various reliability coefficients and on a consensus of opinion, among the individuals on the advisory panel, about the importance of each domain and individual MDS items, (Hawes et al., 1992; Morris et al).

Publication of these reliabilities has generated considerable criticisms related to the use of both the MDS and the RUGs data for research purposes. In addition, some authors have repeatedly questioned whether these tools are sufficiently well-developed or if they represent an appropriate or legitimate mechanism to assess the construct of "good quality" in the LTC setting (IOM, 2001; Kane, 2001; Kane & Kane 2001; Kovner, Mezey & Harrington, 2000; Ouslander, 1997; Teresi & Holmes, 1992).

Hawes and colleagues (1992) undertook further efforts to evaluate and enhance reliability by administering two versions of the MDS to 123 residents in 13 nursing facilities in five U.S. states. The participants in these studies were cognitively and physically more impaired (70% for the study vs. 62% nationally) than the participants in both the original reliability trial and those surveyed in 1985 national assessment of NF residents (Morris et al, 1990; National Center for Health Statistics, 1989). Hawes and colleagues suggested that this strategy was designed to evaluate the sensitivity and reliability of the MDS for NF residents with complex care needs (i.e., those with incontinence, cognitive impairment, pressure ulcers, delirium and the presence of adjunct devices, such as feeding tubes). Roughly 89% of the items in the final version of the MDS achieved intraclass kappa correlations of .40 or higher (Hawes et al). The intraclass

correlation coefficients for key MDS items that assessed resident's functional ability (including measures of cognition, hearing ability, ADL dependence, and continence) generated reliabilities of .70 and higher. For the full MDS, reliability coefficients for 63% of the items achieved values of .60 and higher; 89% of MDS items generated intraclass coefficients of .4 or higher. Hawes and colleagues eliminated 22 items from the native MDS, either in the interest of parsimony, or because the item lacked adequate reliability.

Morris, Fries and Morris (1997) recently examined the validity of the MDS-ADL scales by comparing the percent agreement between observers using the weighted kappa. Reliability values for these assessments exceeded .75 for the pairs of independent observations. They also subjected the MDS to a confirmatory factor analysis, which tested three factors (with loadings of .40 and above) that were used to produce a hierarchal classification system, which reliably captured changes in ADL dependency from early, to middle, to late-loss ADLs over a series of assessments (KR-20's ranged from .90 to .94 for the three subscales) (Morris et al). This hierarchy can be used not only to discriminate differences in ADL-ability at the resident level, but can also be used to design and more effectively target interventions.

MDS Validity. The authors of the MDS did not initially address validity of MDS items, other than opting to select, reject or design possible item based on the content recommended by the advisory panel (Morris, 1990). More recently, investigators have addressed the validity and reliability of various subsections of the MDS (Blaum et al., 1995; Gruber-Baldini et al., 2000). For example, Blaum and colleagues evaluated the validity and clinical value and utility of the MDS tool for assessment of nutritional status

by comparing the congruence, or convergent validity (assessed by correlation coefficients), between MDS measures of nutritional status (i.e., weight), with relatively more cumbersome measures of nutritional well-being not available in the MDS dataset. The values of the significant correlation coefficients between the MDS and the external standards, for both female and male participants, respectively were: .60 and .78; .49 and.83; and lastly, .60 and .75 (Blaum et al). The author's suggested that these values revealed both the convergent validity and clinical value of the MDS for detection of widespread clinical problems, such as impaired nutritional status among NF residents.

Morris, Fries and Morris (1999) recently assessed criterion-related validity of the three MDS ADL scales with two external measures. In this study the three MDS scales explained the same amount of variance as the external tools; moreover, the ADL measures were comparable to the variance explained by RUGs-ADL items, thereby supporting the validity of both the MDS and the RUGs classification system for measurement of ADLs (Morris et al., 1999). These findings counter criticisms that the MDS and related instruments are unsuitable measures to evaluate resident case mix for research purposes.

Gruber-Baldini and colleagues (2000) assessed construct (convergent and divergent) and criterion-related validity and internal consistency of two highly correlated ($r = .92$) MDS cognitive scales with two other commonly used tools: (a) the MMSE (Mini Mental Status Exam) and (b) the PGDRS (Psychogeriatric Dependency Rating Scale) cognitive scales (Gruber-Baldini et al., 2000). This validation study was extensive and involved over 1900 NF residents and 59 facilities. Pearson Product Moment correlations between the MDS scales and the external criterions (MMSE and PGDRS)

were respectable with absolute vales ranging from .63 to .68 (p =. 003). However, the correlations had lower magnitudes among resident with more severe level of impairment, suggesting that either the MDS scales or the external standards were less reliable in more cognitively impaired residents; this has been a frequent criticism of the ubiquitously used MMSE (Gruber-Baldini et al; IOM, 2001). The authors noted that other studies have generated stronger measures of association; however, they defended their use of "untrained" staff (NF staff vs. research staff) by suggesting that their approach illustrated the "natural validity" of the MDS, which revealed how the MDS performs in clinical practice. This concept may also be important for secondary data analysis of the MDS, which are entirely reliant on the validity of staff assessments.

Resource Utilization Groups (RUGs)

RUGS Reliability and Validity. Fries and Cooney (1985) used MDS data collected from 1,469 Connecticut NF residents to classify residents, with similar care needs, into nine mutually exclusive clusters or categories based on resource consumption, in particular the level of expected nursing and therapy time that would be needed by each resident. This was, perhaps, a reasonable and appropriate measure, since resource expenditures in this area (i.e., nursing and therapy time) accounted for 37% of all NF costs in Connecticut during 1985 (Fries & Cooney). Resource use during the initial reliability study was measured by subjective, self-reported level of staff time (in minutes/hours per 24 hour period) dedicated to direct and indirect resident care activities. Fries and Cooney audited the behavior of staff in 1/3 of the Connecticut facilities to validate self-reports of NF staff. The reliability coefficients for these comparisons were poor and raged from .11 to .20; however, when these estimates were combined with data

related to unit staffing patterns, the reliability of the RUGs resource dimension improved and ranged from .40 to .57 (Fries & Cooney). During the initial reliability study, The ADL dimension, evaluated by the MDS-ADL subscales, accounted for a respectable 20% of the variance explained by the RUGs model (Fries & Cooney). Unfortunately, the authors validated the predictive validity of the ADL scales with the widely used Katz ADL index, an instrument that lacks adequate reliability data despite 40 years of use (Bennett, 1999). The latest version of the RUGs classification system, RUGS-III, was evaluated with data from a large sample of residents (N = 7,658) from 176 NFs in six states (Fries et al., 1994). The authors' over-sampled residents with complex care needs to evaluate the sensitivity and specificity of RUGS-III. Spearman-Brown coefficients for inter-observer agreement for the ADL assessments ranged from.60 to .76 (Fries et al).

The native version of the RUGs revealed that four easily discernible characteristics, identified by cluster analysis, were sufficient to reliably divide NF residents into distinct groups that reflected clinically meaningful differences in acuity and that also accurately captured differences in projected costs (Fries & Cooney, 1985). The acuity (casemix) and cost projections were well explained (R = 37%) by a resident's level of dependence in the following activities: dressing, ambulation, feeding and incontinence (Fries & Cooney). Encouragingly, the latest version of the tool (RUGs-III) has been shown to account for 55% percent of the variance observed in 24-hr NF resource use and can also be reliably used to asses and control for case mix differences among NF residents (Fries et al., 1994). Moreover, with the addition of other covariates, such as facility and unit type, the R-square for RUGS-III increased to 71% (Fries et al).

Quality Indicators (QIS)

As Zimmerman indicated in 2003, only a very limited validation study with a convenience sample of NFs in three states (Maine, Mississippi and South Dakota) was conducted prior to selecting the final 24 QIs. During the initial pilot studies, the authors reported accuracy for each QI (defined as the presence of QI as reported/detected by an investigator and facility staff; i.e., congruence of surveyor findings with NF reports). For example, for weight-loss, the initial accuracy of the pilot studies (assessed by percent agreement) was 93%, 88% for bedfast status and 98% for restraint use (Zimmerman et al., 1995).

Despite the non-random study design, Karon and Zimmerman (1998) concluded that the QIs had a high degree of accuracy with rates of 72 to 95%. The investigators also concluded that the QIs have high predictive power; for example, they note that a facility that reported a high prevalence (>90th percentile) of a QI was likely to have that QI problem present, on follow up some 70% of the time. The probability of finding the QI on follow-up visits to a study facility by the research team rose to 88% for facilities that report QI prevalence at the 95th percentile.

The inter-facility prevalence rate for each QI is calculated from quarterly, annual or significant change assessments; the initial and/or readmission visits are omitted from calculations. This approach seems judicious, and as Zimmerman (2003) suggested, this approach minimizes the likelihood that a new condition that may have began outside a NF will be included in the facility level data. This strategy is congruent with the goal, for QIs to capture aspects of poor quality care that occurred within the facility and not outside of it (i.e., surgery at an outside facility and a new surgical wound would be

excluded from consideration as a new QI problem in a NF). The effect of this is, in general, to lower the overall prevalence rate for the QIs in any one facility. Zimmerman (2003) suggested that this may mean that a QI does not asses/detect instances or poor care that result in hospitalization; this seems unlikely, however, because the NF would presumably have completed a change in assessment prior to any hospital transfers.

Mor and colleagues (2003) built on the preliminary validation work of Zimmerman and the CHRSA researchers by publishing results form a large inter-rater reliability study, conducted in U.S. nursing facilities, of MDS assessments and its derivatives (i.e., the QIs). They note that QIs are supposed to reflect the performance of a facility on some aspect of quality. They focused on the newly revised short and long stay QIs that CMS had adopted, some claim without adequate study. Mor and his co-investigators analyzed data from 219 of the 462 (47.4%) NFs that were invited to participate in the study; these included 65 hospital-based and 154 free-standing randomly selected NFs in six sates: California, Illinois, Missouri, Ohio, Pennsylvania and Tennessee. The NFs were stratified by their volumes of post-hospital discharge residents, the variety of sub-acute services provided and their published QI scores in the year prior to the study. This allowed the investigators to compare historically poor and well-performing facilities, each of which were randomly selected and invited to participate in the study (Mor et al). The average number of beds in participating facilities was 110; unfortunately, however, the facilities that agreed to participate were less likely to be part of a chain (52.5.4 vs. 58.4%) and they were more likely to be non-proprietary than investor owned NFs (61.7% vs. 50.2%). In addition, the NFs did not participate were more likely to be located in rural areas, smaller in size and, again, they were

predominantly, propriety operations. Resident-participants were described as being typical of most NF residents, although limited data were cited to support this assertion: 43.9% were continent of urine, 1.7% had end stage renal disease, and about 25% were rated as likely to be discharged in 30 days from the NF, mainly from hospital based facilities (Mor et al., 2003).

Mor and colleagues (2003) used the assessments of trained research nurses as "gold standards" to compare with assessments conducted by facility staff for 5,758 resident-participants. They typically collected between 25 and 30 matched pairs of observations per facility (i.e., each resident was assessed by both facility staff and research nurses) and concluded that interrater reliability, assessed by kappa statistics, for 100 assessment items on the MDS was respectable. Kappa statistics express percentage agreement measure that is used to compare two sets of raters who have observed the same group of residents independently. Mor and colleagues adjusted the kappa values to reflect chance agreement. The kappa values for this study were generally greater that 0.75 (by convention [see Nunnally & Bernstein, 1994], a kappa statistic $\geq$ .70 is defined as excellent and a value $\leq$ .40 is considered unacceptable) and; they concluded that all but two QIs were reliable based on kappa values. The average number of days between observations (i.e., between facility raters and the "gold standard" rater) was 24 days (SD = 27); about 2% of the matched pairs of observation were more than 90 days apart for some of the long-stay residents.

For the cross-sectional QIs, Mor and his co-investigators (2003) concluded that that all have adequate kappa values, even though the kappa vales for two of the QI was at or below .50 Conversely, four QIs had Kappa values above 0.8. They concluded that the

performance of facility staff raters was “reasonably high” when compared to the gold standard assessments completed by the trained research nurses. This bodes well for the reliability of the MDS; an especially important finding given the wealth of studies that are based on data drawn from the MDS assessments. However, and not surprisingly, percentage agreement was highest only for outcome or process QIs that are generally more easily observable and cross-sectional in nature. For example, determination of low body mass index (kappa = .87); the presence of a feeding tube (kappa = .83), antipsychotic drug use or incontinence (kappa = .78 for both.). In contrast, the Kappa values for less observable QIs were alarmingly low: pain management (kappa = .50; detection of urinary track infection (kappa =. 45); or other infections (.39). Interestingly, the application of restraints had a kappa value of only .53 and presence of a urinary catheter revealed a kappa of only .67, which is surprising, given that the presence of a restraints or indwelling catheters should be easily observable. It may be the case that the QI definition is unclear (e.g., the relatively restrictive MDS definition of restraints), or that the matched pairs of observations may have been separated from each other by so many days or months the device may not have been in place at the time of both the facility and expert assessments.

Mor and colleagues (2003) reported considerable variation across facilities in QI reliability, when the facility assessments were compared with those conducted by research staff, and they further noted that a minority of NFs experienced unacceptably poor levels of reliability for many of the QIs. The low performing NFs had similar number of beds, comparable populations of Medicaid and Medicare residents, and average acuity measures that were comparable; moreover, the low performing facilities

did not differ from the higher performing counterparts on survey findings such as the number of health related deficiencies (Mor et al).

California Nursing Facility Information System & Quality Indicator Validation

California Nursing Home Search

Although data on nursing facility quality already exists in the public domain, the information is not particularly easy to access or analyze. In response, a number of state and federal data sources were combined to create California Nursing Home Search (*Calnhs),* a comprehensive database containing data on each California NF. The website was launched in October 2002 by the California HealthCare Foundation. The data and measures reported on this website are primarily drawn from a variety of federal and state sources that have customarily been used in the research literature (e.g., OCSAR, MDS, RUGS, and QIs) and that were evaluated before development of the website.

Quality Indicator Validation Study and Calnhs

The authors of a recent series of studies, conducted as part of the *Calnhs* validation project, evaluated selected quality indicators (QIs) and an array of related measures to evaluate both the validity and reliability the QIs and care processes in a sample of 34 California NFs (Bates-Jensen et al., 2004a, 2004b; Schnelle et al., 2004a, 2004b; Simmons et al., 2003). Unlike much of the prior LTC literature (excepting, for example, the following: Bowers, Esmond, & Jacobson, 2000, 2003; Kayser-Jones, 1996, 1997, Kayser-Jones Schell, 1997), the data in this series of investigations were drawn from direct observations of residents and resident interviews, in addition to the more ubiquitously used sources of information: systematic chart reviews and data in the OSCAR system. The validation study analyzed eight quality indicators (QIs); three of

these were found to be relatively useful measures or indicators of quality: bedfast prevalence, weight-loss and restraint use and were also used in the dissertation research as outcome measures (Bates-Jensen et al., 2004a, 2004b; Schnelle et al., 2004a, 2004b; Simmons et al., 2003). The validation study compared the structures, processes and outcomes of care between NFs with a prior history of either high or low QI measures.

In general, the findings suggest that many common problems of NF residents were not being appropriately identified or treated by NF staff. For example, the following problems highlight quality of care issues that were encountered in most NFs: (a) the absence of strategies to prevent or reduce avoidable weight-loss; (b) the unnecessary confinement of residents to bed for all or most of each day; (c) the high frequency of physical restraint application, (d) high prevalence rates and inconsistent treatment practices for pressure ulcers, (e) widespread urinary and fecal incontinence among residents complicated by plans of care that were devoid of toileting plans or procedures; (d) the loss of physical functioning; and finally (e), problems with the detection and management of depression and pain (Bates-Jensen et al., 2004a, 2004b; Schnelle et al., 2004a, 2004b; Simmons et al., 2003). However, the authors also suggested that the QIs indicators are not necessarily the most optimal tools to detect these types of care process problems in NFs. They instead suggested that staffing level was a more important predictor of quality at least for care process for which nursing assistants were chiefly responsible (Schnelle et al., 2004b). Also, the QIs are the measures that CMS uses at present to screen NFs for quality problems and thus it is important to further evaluate the role of various organizational, staffing and resident characteristics on the prevalence of

these QIs. For the purpose of this paper, the findings related to only three of the QI studies are discussed below.

*Quality Indicator: Bedfast Prevalence***.** Excessive time in bed has negative effects on the physical condition and the functioning of NF residents (Bates-Jensen et al., 2004b). The bedfast prevalence QI is derived from MDS assessments and measures addresses the percentage of residents in a NFs, who are in bed (or in a reclining chair that limits mobility) for all or most of the time day (i.e., $\geq$ 22 hours per day) during the four or more of the seven days preceding an MDS assessment. This rate, the numerator, is divided by the total number of residents in each NF to generate a facility-wide prevalence rate for the bedfast QI (Bates-Jensen et al., 2004b). Bates-Jensen and colleagues suggested that it was unclear at the time of their study if reported differences in the prevalence rates (between or among different NFs) of bedfast QI detected differences between NFs or if the QI reflected differences in quality of care processes. The investigators compared on-site resident observations, medical record data, and MDS bedfast QI scores, that were reported to the state of California, for two small groups of NFs that were recruited from a sampling frame of 222 facilities: (a) the lower quartile (LQ) group, representing the 25% of NFs with those low reported prevalence rates for the bedfast QI (N = 8 NFs, and 208 consented resident-participants); and, (b), the upper quartile (UQ) group representing facilities with the highest reported prevalence rates for the bedfast QI (N= 7 NFs, with 243 participants). The residents in the LQ group, when compared with the resident of the UQ facilities, were younger, less dependent, more likely to be non-Caucasian and more likely to have lived in the NF for a longer period of time (Bates-Jensen et al., 2004b).

The investigators concluded that the bedfast QI accurately discriminates between UQ and LQ facilities; however, they also reported that the prevalence rate of the bedfast QI was underreported and that between two and three times more residents in the LQ homes were in fact bedfast when the direct observations were compared to the MDS reports (Bates-Jensen et al., 2004b). Among the UQ homes (i.e., those with a history of higher bedfast QI prevalence rates), the investigators also noted that the QI was also sometimes underreported: 10-25% reported prevalence rate vs. an 18% observed rate. The investigator concluded that the bedfast QI, even though the prevalence rate may be underreported, can be used to compare homes and more importantly, as Zimmeman and colleagues (1985) suggested, the QI can be used to target quality improvement activities. However, contrary to their hypothesis, they also concluded that processes of care did not differ between the two types of NFs until staffing level was included in their analysis. Bates and colleagues (2004b) also assessed the prevalence rate of the bedfast QI as a function of staffing level. They noted that residents in lower staffed homes were more likely to have been in bed during the day (i.e., 7 a.m to 7 p.m) when compared to their counterparts in high-staffed homes (43% vs. 26% respectively) (Bates-Jensen et al., 2004a).

Quality Indicator: Weight-loss Prevalence. Simmons and colleagues (2003) analyzed data drawn from a sampling frame of 46 California NFs with a history of weight-loss among residents. The study sample consisted of two groups: (a) 262 residents from 11 NFs in the lower quartile for the prevalence of weight-loss (i.e., low reported history of weight -loss prevalence); and (b), 138 residents from 5 NFs from the group of upper quartile homes with a history of weight-loss. The study excluded transitional (or

Medicare reimbursed) residents. Participants in the upper quartile facilities were significantly older, required more assistance to transfer, but both groups required the same amount of assistance with eating according to the MDS assessments conducted by facility staff.

Weight loss and its eventual sequelae, malnutrition, if undiagnosed or left untreated, contributes to relatively higher rates of infection, increased incidence of pressure ulcers, unintentional (and sometimes severe) weight-loss and, in the most serious of circumstances, death (Kayser-Jones, 1996, Kayser-Jones & Schell, 1997). In contrast, even modest increases in body weight (of five or more percent) in undernourished individuals have been significantly associated with a reduced incidence of morbidity and mortality (Keller, 1993). Weight-loss is thought to be more common when there are not enough staff to help residents at mealtimes, and the phenomenon has also been related to unattractive food, unpleasant mealtimes, food without enough nutrients and calories, restricted diets that can be unappealing and lacking in flavor, and lack of variety or choice among food items (Kayser-Jones, 1996, 1997; Kayser-Jones & Pengilly, 1999; Kayser-Jones & Schell, 1997; Kayser-Jones et al., 1998; Porter et al., 1999). The language of the Nursing Home Reform Act (NHRA) (OBRA, 1997) specified that the causes of unintentional weight-loss must be promptly assessed and, where appropriate, interventions implemented to reverse the symptoms (OBRA, 1987). The provisions of the NHRA also addressed the following structural and process-related strategies that should be implemented to prevent and/or detect malnutrition and dehydration: (a) timely and ongoing physical assessments, (b) individualized care planning, (c) vigilant physician oversight of resident care and (d), implementation of

standards to ensure sufficient levels of direct care staffing (Burger et al., 2001). The study by Simmons and colleagues (2003) assed some of these factors, as well as the validity of the weight-loss QI measure itself.

The QI definition of weight-loss used by Simmons and colleagues (2003) is based in the language of the Nursing Home Reform Act (NHRA) (OBRA, 1997). The legislation defines weight-loss, among NF residents who weigh more than 100 pounds (at the time of admission), was defined as either a $\geq$ 5% reduction in body weight over a 30-day period or a $\geq$ 10% reduction over 180 days. In addition to this QI definition, the provisions of the NHRA applied a more stringent definition of reportable weight-loss for NH residents who weighed less than 100 pounds: weight-losses of two or more pounds per month must be promptly evaluated by the resident's primary provider (OBRA, 1987).

Simmons and colleagues (2003) reported that NFs with a low reported prevalence of weight-loss have fewer residents who lose weight and fewer residents at risk for malnutrition, primarily because they take in more food and fluids. They concluded that the MDS weight-loss QI was reliable and captured differences in the prevalence of weight loss between NFs. The analysis of care processes in low weight-loss homes revealed that facility staff provided more verbal encouragement to residents than the staff in high weigh-loss facilities; they also encouraged social interactions (53% versus 16%; $p < .01$) and provided more feeding assistance to all residents during meals, but particularly to residents who had been assessed to be at greater risk for weight-loss.

Quality Indicator: Prevalence of Physical Restraints. Physical restraints include any device, material, equipment, or manual method that restricts or prevents freedom of movement and normal access to the body (e.g. soft ties, vests, chairs with lap trays, bed

side rails and/or belts) (Castle, 2001). Restraints do not necessarily provide security or safety for NF residents and they been associated with negative consequences including: the development of pressure ulcers, loss of mobility, agitation, falls, loss of dignity, social isolation and, in the most serious of circumstances, death (Castle, 2001). Restraints should only be used on a short-term basis, and they must be removed to preserve range of motion and functional ability. Language in the *Nursing Home Reform Act* specifically mandated that NF reduce their use of restraints (Castle, 2001 OBRA, 1987).

The facility-wide restraint QI is derived from MDS assessment data and the denominator is identified enumerating all residents who had daily restraint use, while out of bed during the daytime, for the 7-day inclusive period preceding an MDS assessment (Schnelle et al., 2004a; Zimmerman et al., 1995). The denominator equals the total number residents in each NF. Bed rails are excluded from the QI definition (but not the MDS definition of restraints), as are restraints applied while resident are in bed and if the device was applied less frequently than every day for 7 days prior to an MDS assessment the resident is not classified as being restrained (i.e., a resident who had had restraint applied for only 6 of the 7 days preceding an MDS assessment would be excluded from the QI prevalence calculation).

Schnell and co-investigators completed medical records reviews, conducted resident interviews and observed residents in small sample of 14 California NFs to determine if there were differences in care processes (e.g., gait management and balance training) or the frequency of restraint use between two groups of homes: (a) six NFs, with 144 consented resident-participants, that had a history of high scores on the restraint prevalence QI (the sample frame was defined as the upper quartile of NFs on the restraint

QI); and, (b), eight NFs, with 269 consented residents, that had a low history of restraint use ($\leq$ the 25th percentile). The NFs were comparably staffed during the observation periods of 7 a.m to 3 p.m. and 3-11 p.m. (e.g., 7-9 & 10-13 residents per nursing assistant respectively). The facilities also had a similar history of total staffing: 3.4 hprd for the low QI prevalence rate NFs compared to 3.2 hprd for NFs with a history of high QI prevalence. Research staff members were blinded to the restraint QI records of the participating facilities. The average age of residents was the only demographic variable that differed between the two types of homes (80 in high prevalence facilities vs. 83 in the low prevalence NFs). The residents in the two types of NFs did not differ on any of the acuity measures. To further address generalizabilty concerns, the investigators again compared NFs on a wide array of organizational and resident characteristics; the only significant difference between participating and nonparticipating homes was the average expenditures per resident day ($72 vs. $58, respectively).

During their on-site observations, Schnelle and his co-investigators (2004a) considered all types of restraints, including bedrails and chairs with elevated foot pedals. They found that facilities were frequently using restraints and that staff members failed to assure that residents received frequent exercise or repositioning; in addition, the investigators reported that, in general, staff failed to adequately assist residents with movement, walking or similar activities. They concluded that 73% of residents in the low prevalence NFs and 81% or residents in high prevalence facilities had been restrained at least once during the observation period. This finding stands in stark contrast to reported QI prevalence history, of 6% and 22% respectively, for low and high prevalence facilities. However, the QI prevalence measure includes a far more restrictive definition of

restraints than Schnell and colleagues (2004a) used in their investigation. They also noted that high prevalence facilities raised side rails more frequently that low prevalence NFs (74% vs. 64%). The authors also noted that the homes did not provide different care; related to management of restraints, exercise, gait or mobility. This finding is of particular concern but it may, in part, be explained by staffing levels that did not vary between the two types of homes. The facilities in this study did not differ on the level of staffing and it may be helpful to compare facilities based on staffing level. In addition, the investigators did not, in point of fact, evaluate the accuracy of the prevalence QI because they used a less restrictive definition of restraints, which limits one's ability to assess the accuracy of utility of the restraint prevalence quality indicator. Schnelle and colleagues (2004b) also concluded that the homes did not differ on the number of times that residents were restrained while out of bed, even though this is what the QI was intended to measure. Schnell and colleagues (2004a) concluded that the CMS restraint QI, a prevalence measure, lacks compelling data to support to its use as a marker of quality of care for NF residents who are restrained, but again they were not able to measure bedfast status in the way that is envisioned by the QI definition of bedfast.

Diversity of the Resident Sample and Reliability: MDS and RUGS

The primary objective of the initial reliability studies was to refine the instrument's development in terms of necessary training material, selection of ADL items, assessment amount of staff time needed to complete the assessment and identify usability problems. The studies did not initially address difference in the usability or sensitivity of the MDS in differing cultural or ethnic groups. However, the participants (i.e., NF residents) in the initial reliability studies were reportedly of the nation's NF residents

(Hawes et al., 1992; Morris et al, 1990; National Center for Health Statistics, 1989). The MDS has been modified and reliably translated (as well as back translated) with reliability coefficients of .60 and higher into at least six languages and is used in more than 15 countries (Sgadari et al., 1997). Translated versions of the RUGs system have been validated into at least two other languages with comparable values (i.e., 40-60%) of explained variance (Clauser & Fries, 1992).

Clinical Usability and Reliability

Morris and colleagues (1990) relied on trained registered nurse observers during the initial evaluation studies, although more recent studies have relied on nurses, nursing assistants, providers, residents and family members for information that may then be recorded by specifically trained staff (the "MDS nurse") or by any licensed staff member in a NF (IOM, 2001). Currently, the MDS is administered 21 times to each newly admitted NF resident for all shifts over a 7 day period. The ease of use of the native MDS tool was evaluated by both debriefing observers and by measuring the amount of the time required to complete assessments as reported by 20 nurse assessors (Morris et al). MDS assessments are comprehensive and entail the abstraction of medical chart data and sometimes interviews and assessment with each NF resident, direct care providers and family members. Each assessor completed an average of 27 assessments and required 90 to 129 minutes to complete an individual MDS assessment for a single resident (Graney & Engle, 2000; Morris et al). This finding emphasizes the considerable amount of time and resources that must be allocated to completion of MDS assessments, since current standards require each resident to be fully and repeatedly assessed (with the MDS) within 14 days of admission and at least annually thereafter (Morris et al). The assessors, in the

Morris study, estimated that completion of the MDS added 30 additional minutes to the typical amount of time dedicated to resident assessments. Time data for completion of the RUGs tool are not available; however, the focus on just four physical factors suggests that the tool is relatively simple to administer and it provides a reliable source of case mix data. A more pressing concern is the recent finding by Schnell and colleagues (2004) that questions the accuracy of the content of the medical record.

The Value of the MDS, RUGs and QIs for Research

The MDS and the RUGs system have been widely used in numerous countries and translated into several languages for clinical assessment and research purposes including the assessment and control of case mix status for studies of NF residents. However, the coefficients in the initial reliability studies suggest that these tools are considerably less reliable than the thresholds identified in widely accepted standards (Nunnally & Bernstein, 1994). The less than optimal reliability underscores recent recommendations for further reliability and validity studies of both the MDS and its derivatives (i.e., RAPs, RUGs, QIs) (IOM, 2001; Kovner et al., 2000).

In addition to these problems, there is also disturbing evidence that staff in some NFs may be underreporting clinical quality performance data on the MDS resident assessment reports, including underestimating QI measures that address: weight-loss, physical restraint use, depression and pain (Schnelle et al., 2004c).

CHAPTER FOUR: RESEARCH DESIGN AND METHODS

The primary purpose of this research was to evaluate relationships between an array of staffing, organizational, resident and operating market characteristics and three proxy measures of quality: (a) the prevalence rates of three Quality Indicators (i.e., weight loss, restraint use and bedfast, or being in bed or a chair for $\geq$ 22 hours per day); (b) validated complaints; and, (c) the total number of deficiencies (i.e., federal + state deficiencies + state citations). This cross-sectional study entailed secondary analyses of federal and state data drawn from mandatory reporting systems of certified California nursing facilities (NFs). Limitations inherent in a cross-sectional include the measurement of variables at a single point in time, thus preventing causal inferences (i.e., temporal distinctions or temporal ordering) between selected predictors and outcomes (Hulley et al., 2001). However, the strengths of a cross-sectional design are the ability to: (a) generate descriptive information about the prevalence of selected outcomes, (b) study several quality-related outcomes at once, and (c) examine networks of causal links among variables of interest (Hulley et al.).

Research aims and hypotheses are specified below (see also Table 2.1, Chapter II). This information is followed by a description of the study population, data sources (Table 5.1), variable definitions and both the data management and data analyses plans including: analytical equations associated with each hypothesis and the sequence of analytical steps undertaken during the course of this research.

Aims & Hypotheses

The specific aims of this research include:

Aim 1: To examine relationships between organizational characteristics (e.g., for-profit [FP] vs. not-for-profit [NFP] facilities; chain vs. non-chain NFs) and staffing factors (e.g., hours of care per resident day [hprd] and turnover rate) on selected outcomes, after controlling for various resident and market factors on three quality indicators: weight loss, restraint use and bedfast status, or being in bed or a chair for $\geq$ 22 hours per day.

Aim 2: To examine relationships among organizational and staffing characteristics and the number of validated complaints and total deficiencies, after controlling for various resident and market factors.

Hypothesized relationships between selected organizational, staffing, resident and market characteristics and the five outcomes appear in Table 2.1. The following hypotheses were evaluated in this study:

Ho_1: NFP nursing facilities, when compared to for-profit (FP) organizations, will be a predictor of better quality as measured by lower prevalence rates for weight loss, restraint use and bedfast.

Ho_2: NFP status will be associated with fewer facility complaints and total deficiencies when compared to FP status.

Ho_3: Higher levels (Hprd) of total staffing (i.e., Registered Nurses [RNs], Licensed Vocational Nurses [LVNs] and Certified Nursing Assistants [CNAs]), and lower rates of staff turnover, will be associated with a lower prevalence rates for the three quality indicators (i.e., weight loss, restraint use and bedfast).

Ho_4: Higher levels of total staffing and lower rates of turnover will be associated with fewer validated complaints and total deficiencies.

Study Population and Data Sources

Population

The primary unit of analyses for this study was free-standing California NFs. These NFs provide care for more than 110,000 residents annually (California HealthCare Foundation [CHCF], 2007). While there are about 1,300 NFs in the state, this study was restricted to the population of 1,080 free-standing Medicare and/or Medicaid certified facilities in California with data from 2004 and 2005 for the outcome variables of interest. Hospital-based NFs, as well as Intermediate Care Facilities for the Mentally Retarded or disabeled (ICF-MR), pediatric sub-acute care facilities, and congregated living facilities were excluded because these types of facilities are subject to different reporting requirements and they have variations in reimbursement and staffing levels that distinguish them from the 1,079 free-standing NFs in this study. In addition, facilities that lacked data from federal (N=56) and state (N= 33) primary data sources were also omitted.

Data Sources

Analyses are based on variables available from the state and federal sources depicted in Table 4.1 and discussed in further detail in the Appendix. These data were assembled by Dr. Charlene Harrington, at the University of California San Francisco (UCSF), and are from the database that is used to maintain the California Nursing Home Search Information System (available at: www.calnhs.org). This information system was developed from five public sources (two from the state of California and three from the Centers for Medicare and Medicaid (USCMS or CMS): (a) The Automated Certification and Licensing Administrative Information and Management System (ACLAIMS), which

is maintained by the California Licensing and Certification Program (L&C), the Agency that surveys California NFs on behalf of CMS; (b) the Long-Term Care Financial Database, maintained by the California Office of Statewide Health Planning and Development (CA-OSHPD); (c) the On-line Certification and Reporting System, known as OSCAR, an administrative database maintained by CMS; (d) the Resource Utilization Groups (RUGs) database, obtained from CMS; and, finally, (e) the quality indicator (QI) database also maintained by CMS. In addition to these data sources, 2002 Federal census data, from the Area Resource File (ARF), were used to develop market-level variables including county-level socio-demographic measures such as median family income, education level, race/ethnicity characteristics and disability levels for each California county. These data sources are described the Appendix and literature related to the development of the MDS, RUGs and QI was evaluated in chapter II.

Table 4.1: Variables and Data Sources[1]

Dependent Variables	Definition	Data Source
Quality Indicator (QI) Prevalence Bedfast Status Physical Restraints Weight-loss	-Percentage of residents in each nursing facility (NF) with each QI	CMS_QI
Deficiencies (for each NF) Total Federal and State State Citations	-Total number for each NF -Total number for each NF	ACLAIMS
Complaints Total Complaints	-Total number for each NF	ACLAIMS
Independent Variables	**Definition**	**Data Source(s)**
Staffing Characteristics -Total Nurse Staffing (hprd)	-Productive hours of full-time, part-time and contract nursing staff (RN, LVN, CNA) hours divided by the total annual resident days of care (excludes mealtimes vacation hours, sick time, disability, & other paid time off)	-CA-OSHPD
-Nursing Staff Turnover Rate	-The number of staff unemployed at years end divided by the number of employees (Fulltime-Equivalents [FTEs]) employed during the year	-CA-OSHPD

Organizational Characteristics -Number of Licensed Beds -Ownership type -Chain membership -Days of care -Family Council -Net Income	 -Number of Reported Licensed Beds -Not for profit (Yes =1) (No=2) - ≥2 facilities controlled by same owner -% Medicare & Medicaid resident days -Present or absent -Earnings from health care operations plus non-operating revenue, minus expenditures	 ACLAIMS -ACLAIMS -OSCAR -CA-OSHPD -OSCAR -CA-OSHPD
Resident Characteristics -Socio-Demographic Age, Gender, Race/Ethnicity -Resident Case mix -Case mix Index [CMI] -ADL Dependency	 -Percent of residents who fall into each of five needs-based groups (based on the projected therapy & nursing time). -Average resident dependency for three tasks: eating, toileting & mobility	 -CA-OSHPD -CMS_RUGs -OSCAR
Market Characteristics -Herfindahl-Hirschman Index (HHI) -Excess Bed Capacity -Socio-Demographic	 -Number of beds (in each NF) divided by the number of occupied beds in the county (proportion is squared and summed to create a 0-1 index for each NF) -The number of NF residents is subtracted in each county from the total number of beds to yield the number of vacant beds in each county annually; this figure is divided by the total number of beds to yield the percent of vacant (or excess) beds -Age, Gender, Race/Ethnicity, Income Educational Level	 ACLAIMS ACLAIMS/OSCAR -Census Bureau; Bureau of Labor Statistics; Area Resource File (ARF); California Dept. of Finance

[1]Data Sources: (1) CMS_QI (Centers for Medicare and Medicaid [CMS] Quality Measures); (2) ACLAIMS (California's Automated Certification and Licensing Administrative Information and Management System); (3) OSCAR (CMS's On-line Survey, Certification and Reporting System); (4) CA_OSHPD (California Office of Statewide Health Planning and Development); (5) CMS_RUGs (Resource Utilization Groups (RUGs). (Appendix for Additional Information).

Variables

Dependent Variables

The primary outcome measures that were used to assess quality of care in this study were: (a) the prevalence rates and/or counts for the three facility-level QIs; (c), the

number of validated complaints; and, (c), the combined number of state and federal deficiencies and state citations.

Quality Indicator Prevalence Rates

For the purposes of this research, the facility-level prevalence rates for three stable and reliable QIs (CHCF, 2002), using 2005 data, were used to evaluate quality: (a) nutrition and eating, assessed by the prevalence of weight-loss, an outcome measure in the original QI classification system (Zimmerman et al., 1995); (b) physical functioning assessed by prevalence of bedfast residents, another outcome measure; and (c), quality of life, assessed by the prevalence of daily physical restraint application, a process measure in Zimmerman's typology that is used as an outcome for this research (Zimmerman, 2003).

Weigh Loss Quality Indicator Prevalence

The definition of weight-loss used by Simmons and colleagues (2003), as well as the definition used this study, are based on language of the Nursing Home Reform Act (NHRA) (OBRA, 1997) (Allen, 2006). The legislation defines "significant" weight loss among NF residents who weighed more than 100 pounds (at the time of admission) as either a 5% reduction in body weight over the 30-day period preceding an MDS assessment or a 10% reduction over the 180 days (or six months) preceding an assessment. However, evidence suggests that the 5% (or 30-day weight loss) prevalence rates are underreported by as much 3-10 times their actual level (CHCF, 2002). For the above categories, weight losses of more than 5 or 10% are considered "severe" in the federal QI definitions (Allen, 2006). In addition to these definitions, the provisions of the NHRA applied a more stringent definition of reportable/treatable weight-loss for NF

residents who weighed less than 100 pounds at the time of admissions: weight-losses of two or more pounds per month must be promptly evaluated by the resident's primary provider (OBRA, 1987).

Resident body weight is recorded on the MDS assessments and the number of residents in each facility, who have experienced an OBRA-defined weight loss, is divided by the total number of residents in each NF to generate a facility-wide prevalence rate for the QI (USCMS, 2006). This measure is not risk adjusted by CMS to account for resident health conditions that could increase/decrease the likelihood of them being included in this measure, but is subject to exclusions including: new residents (i.e., those with medical records that include only the initial/admit MDS assessment), residents on a prescribed weight loss program, those who have an end-stage or terminal disease (i.e., with death expected in 6 or fewer months), and/or those who are receiving hospice care (USCMS, 2004; Allen, 2006; USCMS, 2006).

Physical Restraints Quality Indicator Prevalence

Physical restraints include any device, material, equipment, or manual method that restricts or prevents freedom of movement and normal access to the body (e.g. soft ties, vests, chairs with lap trays, bed side rails and/or belts) (Allen, 2006; Castle, 200, 2002). The facility-level restraint QI is regarded as a quality of life measure that is also generated from resident MDS assessment data. The numerator for this QI is identified by facility staff includes all residents who had had a daily restraint applied, while out of bed during the daytime only, for the 7-day inclusive period preceding an MDS assessment (Schnelle et al., 2004a; Zimmerman et al., 1995). The denominator equals the total number residents in each NF who had a full annual MDS or a quarterly assessment

available, but excludes those who only have an initial MDS assessment (Allen, 2006). This measure is not risk adjusted by CMS, but is subject to exclusions (USCMS, 2004; 2006), which probably lead to underreporting of prevalence rates. For example, the prevalence rate for restraints excludes bed rails, as well as restraints that were applied to residents who are in bed (Allen, 2006). In addition, the restraint QI excludes devices that have been applied less frequently than every day for the seven consecutive days prior to an MDS assessment (i.e., a resident who had had a restraint applied for only six of the seven days preceding an MDS assessment would be excluded from the QI prevalence calculation).

Bedfast Quality Indicator Prevalence

Excessive time in a bed (or a chair) can have deleterious effects on the physical condition and the functioning of NF residents (Bates-Jensen et al., 2004b). The bedfast prevalence QI is also derived from resident MDS assessments and the measure enumerates the number of residents in each NF, who are in bed (or in a "reclining" chair that limits mobility) for all or most of the time (i.e., defined as $\geq$ 22 hours per day) during four (or more) of the seven days immediately preceding an MDS resident assessment (UCLA, 2002). This figure, the numerator, is divided by the total number of residents in each NF to generate a facility-wide prevalence rate for the bedfast QI (Bates-Jensen et al., 2004b). The measure is not subject to statistical risk adjustment, but excludes both new residents (i.e., those who have only an initial admission MDS assessment) and residents who are comatose (USCMS, 2006; Allen, 2006).

Complaints

Validated Complaints

In addition to the QI outcomes, the number of validated complaints was used as a measure of quality; this variable refers to the number of formal grievances filed against a facility that have been investigated and substantiated by the state survey agency (i.e., the L&C agency in the case of California) and/or by representatives of the ombudsmen program. Ombudsmen who investigate a complaint and find a serious problem, inform L&C staff and ask the agency to investigate. After L&C investigates a complaint, it is deemed substantiated or validated if the inspector found the claim to be true, or unsubstantiated if there was no proof to support it. If a complaint is substantiated, the facility is given a deficiency or citation. A complaint is usually filed when someone (e.g., a resident, family member, employee or a provider) has objections or concerns about resident treatment or safety. Complaint investigations protocols were established by the CMS in the wake of the 1987 OBRA legislation (Stevenson, 2005). Stevenson recently examined five years of complaint data (both validated and total) from Massachusetts and concluded that these measures could be used as a tool to assess quality of care. In a more recent paper, Stevenson (2006) assessed the use of complaints as a measure of quality in all states and concluded that this measure offers a "real-time" signal of quality that is related to with other quality measures and more importantly, perhaps, complaints provide a consumer perspective on the quality of nursing facility care that has largely been omitted form discussions of quality. In this study, total validated or substantiated complaints for 2004 and 2005 were summed to create a single measure of complaints for each NF in California.

Deficiencies

The fifth and final proxy measure of quality that was evaluated in this study to analyze relationship between staffing levels and ownership type, was the total number of deficiencies (federal + state deficiencies + state citations) received by each certified NFs in California.

Federal Deficiencies

Deficiencies are indicative of the poor quality of care provided by a NF and higher rates of deficiencies have been associated with less staffing, unfavorable resident outcomes and a wide variety of quality of care problems in U.S. nursing facilities (CGR, 2002; Harrington et al., 2000b; IOM, 2001; OIG, 1999a, 1999b, 2000). The federal government has 185 quality standards and a number of life safety standards that NF operators must comply with in order to be licensed and certified as approved provider facilities for Medicare and/or Medicaid recipients (Allen, 2006; IOM, 2001). Facilities receive deficiencies when they fail to comply with these standards. Deficiencies are rated by scope and severity and are grouped into eight categories by survey agencies: quality of care, abuse, resident assessment, resident rights, environment, administration, pharmacy, and nutrition. In this study these categories were collapsed (along with state deficiencies and citations) into a single measure, the total number of deficiencies for each NF.

State Deficiencies and Citations

Nursing facilities is California are penalized with a state deficiencies and/or citation when they violate state minimum standards that are discovered by investigators during annual survey visits to the facility, or applied after a complaint is investigated (during a complaint survey) by state officials and found to be credible. In California,

when a warning is given instead of a fine for a state violation, it is called a deficiency. When a facility is given a fine (also called a Civil Monetary Penalty, CMP) for a state deficiency, it is called a citation. For analyses, the total number deficiencies (state + federal) plus state citations for 2004 and 2005 were summed to create a single outcome measure of deficiencies for California NFs.

Independent Variables

A broad array of organizational, staffing, resident and market variables have been associated with various measures of quality in the health services research literature (e.g., IOM 1986, 1996, 2001 & 2003). These types of variables are encompassed within both the micro and macro approaches to SM and organizational analyses described by Shortell and Kaluzny (2006) and have also been evaluated in analyses based on the Donnabedian's framework (1966). For this study, and following a series of preliminary analyses, the following types of variables were selected for inclusion from a larger group of available measures.

Facility Characteristics

Facility characteristics, which can influence structure and processes of care, that were evaluated during this study include: (a) profit status (FP vs. NFP); (b) chain membership; (c) resident days by payer sources (i.e., percent Medicare and Medicaid resident days); (d), the number of beds in each NF; and, (e) whether or not a NF has a family council. These variables, with the exception of the family council measure, have been associated with variations in staffing levels and quality of care measures (Aronson et al., 1994; Grabowski & Angelelli, 2004; Grabowski & Castle, 2004; Harrington et al.,

1998; Harrington & Swan 2003, 2005; Hillmer et al., 2005; IOM, 2003; Kanda & Mezey, 1991; O'Brien et al., 1983; Rosenau & Linder, 2003).

Staffing Characteristics

In this study, staffing characteristics were treated as a primary group of independent variables (vs. an element of facility characteristics). The quality of care in NFs has been linked both to staffing level, skill mix and rates of turnover in NFs (Harrington & Swan, 2003; Harrington et al., 2000a, b; IOM, 2001 &; USCMS 2001; Zinn, 1993). Staffing levels vary widely in NFs across the U.S and in California (USCMS, 2001; UCHCFA 200; Harrington & Swan, 2003). The influence of higher staffing levels and skill mix has been associated with better outcomes for residents of the nation's NFs (IOM, 1986, 1996, 2001). This relationship between total staffing level, three categories of staffing levels, and the influence of staffing levels for each skill level (RN, LVN, NA/CNA) on the three quality indicators, total deficiencies and complaints. In addition to staffing level and skill mix, the turnover rates for nursing staff were evaluated in this study because high turnover rates can negatively affect quality and continuity of care (e.g., Castle, 2006; Harrington & Swan; Harrington et al., 2000a).

Resident Characteristics

Staffing hours should be based on the type of residents within a facility (OBRA, 1987). Several studies have shown strong positive relationships between resident case mix and nurse staffing (Arling, Nordquist, Brant & Capitman, 1987; Cohen & Dubay, 1990; Fries et al., 1994; Harrington et al., 1998; Harrington, Carillo, Thollaug & Summers 2000b). The three QIs that were evaluated in this study have not been risk adjusted (with regression models), to account for preexisting conditions, by USCMS.

Unless scores are adjusted to reflect resident acuity, quality measures may not represent an accurate assessment of the clinical care being provided in NFs because the influence of acuity, preexisting or co-morbid conditions on quality may be discounted (Mukamel, 1997). The QI definitions are, however, subject to inclusion and exclusion criteria described earlier, which USCMS describes as one method of risk adjustment (USCMS, 2006). Therefore, for this study, and to permit comparisons across facilities, resident case mix will be controlled during analyses by two measures: (a) the Case Mix Index (CMI) developed from the resource utilization group (RUGs) classification for each NF resident (Fries et al., 1994); and by (b), the average dependency level in Activities of Daily Living (ADL) for residents of each NF (Harrington, et al., 2000a). In addition to these two measures, resident sociodemographic characteristics including age, gender and race/ethnicity measures were also evaluated for inclusion in the final regression models.

Case Mix Index (CMI). Nursing facility residents have various physical, psychological and psychosocial requirements that necessitate differing levels of care that were accounted for in this study. To prospectively estimate such complex care needs, CMS adopted RUGs-III system to quantify the projected level of care required by each NF resident at the time of admission (Fries et al., 1994). This system is based a prospective estimate of the level of nursing and therapy time that will be required to care for each resident care based on assessment of the following: the level of rehabilitation services needed; the level of extensive, special care or complex care required by each resident; the/a residents cognitive functioning; any behavioral problems; and the level of physical functioning. The score ranges from 0.5-2.4 and NFs with residents that have higher than average care needs require more staff time than facilities with lower scores.

*Average ADL dep*endency. For this study, the percent of residents in each NF who were dependent on NF staff for assistance with three ADLs was also be used to control for resident case mix: (a) eating, the percent of residents who were completely dependent on staff for assistance at mealtimes; (b) mobility, the percent of residents who were completely dependent on staff to help them move from bed to a chair or wheelchair; and, (c) toileting, the percent of residents who were completely dependent on staff to help them use the lavatory.

Market Characteristics

In this study, several county-level variables will be used as controls in the planned regression analyses to account for important characteristics of the operating market for each NF as suggested by several sources (e.g., Grabowski, 2001a, 2001b; Grabowski & Agelleli, 2004). In the SM literature, market characteristics are assumed to alter market-level strategy or the interplay between market structures and organization-level behaviors. In the NF context and for this study, these structures include the level of competition (or market saturation/concentration) in an operating market, excess (or open) bed capacity or supply, and (any) patterns of cooperation between/among organizations (e.g., chain membership). For the purposes of this study, chain membership was classified as a facility characteristic. In addition and at the county level, the role of various socio-demographic measures were explored including education level, race/ethnicity and income data; this information was derived from U.S. Census Bureau data, the Bureau of Health Professions Area Resource File, and/or the California Department of Finance datasets.

Herfindahl-Hirschman Index (HHI). The HHI quantifies market share, or concentration, of providers (i.e., NF) in an operating market (Harrington & Swam, 2003: Grabowski, 2001a, 2001b). For this study, the HHI was developed for each NF using the number of beds in each facility and each county; the measure has a scale of zero to one with zero representing (theoretically) unlimited competition and one representing a monopolistic environment in which all NF beds in a county are controlled by one facility or by one organization. The index increases in counties with less competition (or more concentration) and the research literature and economic theory suggest that quality suffers as competition lessens and vice versa (Grabowski & Agelleli, 2004; Grabowski & Castle 2004; Nyman 1988). This use of the county, as a proxy for the nursing home market, is common practice in econometric studies (e.g. Cohen & Spector, 1996). As Banaszak-Holl and colleagues noted (1996), the county may be a reasonable approximation of the operating market environment for NFs care because federal block grant funds for LTC services are distributed at the county level.

Excess Bed Capacity. Excess demand (or, in this case, excess bed capacity) was described, by Grabowski and Castle (2004), as a measure of "market tightness" that may be expected to alter the behavior of NF operators and managers and thereby affect quality. As more beds (in 2 or more independent facilities) become available, competition should increase and NF would, therefore, be expected to compete on the basis of quality to attract/retain residents. Data drawn from OCSAR were used to calculate excess bed supply/capacity for each county by first subtracting the number of NF residents in each county from the total number of beds in the county to determine the number of vacant beds in each facility annually; this figure is then divided by the total number of beds to

yield the percent of vacant (or excess) beds (Note: in California 50, of the 51, counties in the state have one or more certified NFs).

Days of Care. The average proportion of Medicare and Medicaid resident days for each facility was evaluated in this study to asses the effects on the quality measures. It was important to include these measures in the analyses because the reimbursement rates can affect the behavior of organizations by influencing, for example, the proportion of resources or expenditures allocated to direct resident care or other cost centers. For this study, the Medicaid rates in California were not dependent on case mix and were, instead, based on the size of the NF (< 60 beds or ≥60 beds) and the location of each facility based on one of three regions: Los Angeles County, the San Francisco Bay Area and all other counties (Harrington & Swan, 2003; Swan & Harrington, 2007). The system of reimbursement was changed after 2004 to a cost-based, facility-specific structure following enactment of The Medi-Cal Long Term Care Reimbursement Act of 2004 (Assembly Bill, 1629).

Data Management Plan

Data Cleaning

The databases had been previously cleared of duplicate records by matching all nursing facilities based on their unique OSCAR provider number and facility address. Databases were examined for missing information from each NF. In addition, and in accordance with prior studies (e.g.,Harrington & Swan, 2003; Harrington, et al., 2000a) and to mitigate the risk of including erroneous data, NFs with 15 beds or less and those that reported: either ≥ 24 hours of care per resident day or zero hours of care were also removed from the dataset.

Missing Data

Facilities that that lacked data for the primary outcomes of interest were omitted from analyses. Outcome data were from 2004 and/or 2005 and, where missing data and when available, 2003 or 2002 measures were substituted for NFs that lacked measures on the primary predictor variables. In addition, the mean substitution function in statistical software was used to estimate measures for financial variables for NF that lacked these measures. The final dataset had 1,079 facilities; however, for each analyses sample sizes vary because some NFs lacked complete data for all outcomes, especially the three quality measures.

Outlier Analyses

Facilities that reported extreme values for independent variables (e.g. staffing levels in the upper and lower five percent (Harrington et al., 2000a), or less conservative one percent suggested by Grabowski, of the distributions (equivalent to two or three standard deviations above the mean respectively) were examined (i.e., included in the analyses and then omitted or trimmed from the dataset) to asses their affect on mean and standard deviation values of predictors and the outcomes variables of interest (Grabowski; Harrington et al., 2000a).

Specification Error and Analytical Models

Specification error, as described by Berry & Feldman (1985), refers to the estimation of an erroneous model. They noted that this serious problem is best dealt with by adopting a well-developed framework with concepts that are assessed by precise and reliably measured variables that have been identified in the literature. While the types of variables selected for analyses in this study are based on well-established practices in the

LTC literature, the data sets are likely to have measurement error, especially because underreporting of quality indicators is a recognized problem (Schnell et al., 2004c). In addition, the reliability of the primary data sources (e.g., MDS accuracy) and inconsistent survey procedures all raise concerns about the stability of data (Hawes et al., 1992; Mor et al., 2003). A recent GAO (2007) report, for example, raised concerns about the accuracy of survey procedures and reported that surveyors have been "down-grading" quality problems so that the scope and severity ratings appear to be less widespread and less severe. In addition to the preceding concerns and to assess model stability and fit, a series of ordinary least square (OLS) regression models for each outcome were assessed for stability of coefficients and violations of normality assumptions, by standard practices including the evaluation of tolerance statistics as well as variance inflation factors (VIF) and inspection of residuals to assess normality and to optimize model fit (Berry & Feldman, 1985; Cohen et al., 2003; Demaris, 1992; Harrington et al., 2000a).

Hypotheses and Analytical Models

Hypotheses

Hypothesized relationships between selected organizational, staffing, resident and market characteristics and the five outcomes appear in Table 4.1. The following hypotheses were evaluated in this study:

Ho_1: NFP nursing facilities, when compared to for-profit (FP) organizations, will be a predictor of better quality as measured by lower prevalence rates of weight loss, restraint use and bedfast.

Ho_2: NFP status will be associated with fewer facility complaints and total deficiencies when compared to FP nursing facilities.

Ho_3: Higher levels (Hprd) of total staffing (i.e., Registered Nurses [RNs], Licensed Vocational Nurses [LVNs] and Certified Nursing Assistants [CNAs]) and lower rates of turnover will be associated with a lower prevalence rates for each of the three quality indicators (i.e., weight loss, restraint use and bedfast status).

Ho_4: Higher levels of total staffing and lower rates of turnover will be associated with fewer validated complaints and total deficiencies.

Analytical Models

Each of the five outcomes (i.e., the three QIs, validated complaints and total deficiencies) was first evaluated with a series of ordinary least regression (OLS) models:

For Aim 1, and for Hypotheses Ho_1 and Ho_3:

The following general model form was used to evaluate relationships between each of the three QIs and staffing and organizational characteristics, while holding stable various resident and operating market (i.e., county) characteristics:

$$QI_i = a + FAC\ Characteristics_i + STAFF\ Characteristics_i + RES\ Characteristics_i + CMI_i + ADL\ Dependency_i + Market_i + E_I$$

Where:

QI= Quality Indicator; a = alpha of .05; $_i$ = facility; FAC Characteristics $_i$ = facility characteristics (e.g., ownership type, number of beds); STAFFCharc$_i$ = staffing characteristics (i.e., hours of care per resident day & turnover rates); CMI $_i$ = average resident case mix index; ADL Dependency $_i$ = average resident dependency score for assistance with three activities of daily living (i.e., eating, transferring & toileting); Market $_i$ = county-level market characteristics (e.g., Herfindahl-Hirschman Index [HHI],

excess bed capacity & county-level socio-demographic characteristics); and, E_i, a error term that is assumed to represent unpredicted, unmeasured or unexplained variation in the dependent, outcome, criterion or response variable.

For Aim 2: Ho $_2$ and Ho$_4$:

The relationships between total deficiencies, staffing characteristics and organization type were evaluated by the following model, while also holding stable resident and operating market characteristics:

$$Total\ Deficiencies_{\ i} = a + FAC\ Characteristics_i + STAFF\ Characteristics_{\ i} + RES\ Characteristics_i + CMI_i + ADL\ Dependency_{\ i} + Market_{\ i} + E_I$$

The third variant of the OLS model was used to evaluate relationships between validated complaints, staffing characteristics and organization type:

$$Complaints_{\ i} = a + FAC\ Characteristics_i + STAFF\ Characteristics_{\ i} + RES\ Characteristics_{\ i} + CMI_{\ i} + ADL\ Dependency_{\ i} + Market_{\ i} + E_{\ i}$$

Analyses

Initial analyses were conducted using Version 11.5 of the Statistical Package for the Social Sciences (SPSS Inc, 2002 Chicago Illinois) with alpha set to < .05 for null hypothesis testing. Additional variables (e.g., those derived from recoding, square root and/or log transformations, and so forth) were generated using the SPSS software. Descriptive statistics, correlation matrices (with predictor and outcome variables) and ordinary least squares (OLS) regression models (using both transformed and untransformed outcome measures for selected outcomes) were generated using SPSS. Analyses with alternate regression models were undertaken for outcomes that were counts (i.e., total deficiencies and validated complaints) or transformed to counts because

of extremely non-normal OLS residual distributions (i.e., the proportion of bedfast residents). For these analyses, SPSS data files were first converted to STATA-9 (2005, College Station, TX) using the Stat/Transfer software available from Circle Systems (2005, Seattle, Washington). Second and for each of the count outcomes, negative binomial regressions models (NBREG) were generated using both the base version of STATA and additional software for post post-estimation analyses (e.g., percent and standard deviation changes in outcomes), using the procedures described by Acock (2006). To compare NBREG coefficients with logistic regression (LR) models for the bedfast measure, the data were also analyzed using a logistic model with Stata-9.

Analytical Steps

First. Frequency distributions were assessed for independent (also described as attribute or predictor variables) and the five dependent variables along with descriptive uinvariate statistics, including measures of central tendency (means and medians), and measures of dispersion or variability (variance and standard deviation). Summary statistics for predictor and outcome variables for the population of free-standing NFs in California are reported in Table 5.1 of Chapter V.

Second. In cases where the frequency of any given predictor was less than five percent, individual variables were collapsed to yield larger groups. For example, since the sample included only six government-operated NFs, these organizations were combined with other non-profit NFs to create a single category of not-for-profit (NFP) organizations. Similarly, a single variable was constructed to represent all for-profit organizations by combining FP organizations that were classified in the database as corporations, group partnerships, limited liability corporations and sole partnerships.

In addition, selected variables were excluded from further analyses because they were used to generate new variables. For example, occupancy rate, a measure that is commonly reported in the literature, was omitted from all regression analyses because this variable was used to generate a measure of excess bed capacity, a potentially-more informative county (i.e., market-level) measure of bed availability that may be expected to influence the operation and behavior NFs and therefore alter the outcomes of interests. However, the value of the Pearson product moment correlation coefficient (r) between occupancy rate and excess bed capacity was still relatively weak ($r = -.311$, $p<.001$).

Third. The assumption, in multiple regression analyses, as Cohen and colleagues (2003) noted, is that each independent variable (IV) (at least those that are selected on the basis of past literature and/or theory) may add predictive ability to account for variations in the value of dependent variables (DVs). As they also noted, the predictive value from any one IV is, however, less unique when two (or more) predictors are correlated, especially when any pair of measures is highly correlated. Therefore each pair of potential/available predictors was evaluated for this problem.

Glantz and Slinker (2001) noted that a common source of high correlations (referred to as multicollinearity) is attributable to an inability to manipulate IV, which is certainly the case in: (a) observational and/or epidemiological studies (including secondary cross-sectional studies like the present one); and, (b) in studies in which variables are related or, as they described it, “coupled”, such as income and education. Multicollinearity in cross-sectional studies, most commonly occurs when multiple measures of similar (or the same) construct are included in a model. They describe multicollinearity, as the situation in which IVs are correlated, or statistically dependent,

to the point that one or more IVs can be predicted from one or more of the remaining IVs. In practice, this means that knowing the value of one variable gives information about the value of any other variables that it is correlated with; a circumstance that makes it difficult to distinguish the unique effects of any one IV on changes in the DV(s) of interest.

The potential for this problem in the current study may be anticipated with the ADL and RUGS-derived case mix measures, the percent of Medicare residents in each NF and the average CMI index and the various age and gender measures that were available for analyses. To assess measures for evidence of multicollinearity, each of the available staffing, organizational resident and market variable were evaluated using an extensive series of bivariate Pearson correlation matrices prior to including any given (potential) pair of predictors in the same analytical models (Berry & Feldman, 1985).. Generally and in situations when any pair of variables was correlated at the $r \geq .70$ level, then one or the other of the pair was eliminated from use in multivariate models. However, if two or more variables were strongly correlated and each was though to be of theoretical importance, then these variables were further evaluated in multivariate models to more closely evaluate the measures for additional evidence of multicollinearity as described in step five.

Fourth. In addition to evaluating relationship between each pair of available predictor, the relationships between the five outcome measures was also evaluated with Pearson correlations; these data reported in Table 5.2 in the next Chapter.

Fifth Multicollinearity among variables can be evaluated both quantitatively and qualitatively in regression models by examining coefficients of each IV as additional

predictors are added to a model (Cohen et al., 2003; Glantz & Slinker, 2001). As these sources have noted, multicollinearity can produce unexpected signs/sign changes for beta [β], the unstandardized regression coefficient, that are contrary to hypothesized relationships, theoretical suppositions or findings from prior literature. As correlated, or interdependent, variables are added to regression models and β become larger, this phenomenon is accompanied by larger standard error (*SE*) values that represent less precise estimates of the relationship between predictor and outcome variables. The converse situation (i.e., uncorrelated, or statistically independent IVs) creates relatively more precise estimates of the true regression equation coefficients that are accompanied by smaller *SE* values. To evaluate the extent of this potential problem in the present study, variance inflation factor (VIF) values were evaluated as each IV was added to an exploratory series of regression models. In multivariate models, VIF values quantify how much β, the regression parameter/coefficient of interest, is "inflated" by the degree of redundancy among IVs. By way of explanation, the square root of VIF for a predictor equals the amount that its respective regression coefficient increases (because of multicollinearity) when compared to situations in which multicollinearity is absent (i.e., all predictors are uncorrelated).

By convention, values of VIF of ten or more convey clear signs of a problem with multicollinearity, while values beyond four also warrant investigation because even these values limit one's ability to draw conclusions about regression coefficients. As Cohen and colleagues (2003) illustrated, a VIF value of ten means that the value of a corresponding predictor's β'*s*, or regression coefficient, will increase by 3.16, or the square root of 10. Tolerance is also a measure of multicollinearity reported with some

statistical software; this value is the reciprocal of VIF (i.e., 1/VIF). In this case, values of .10 (or less) are indicative of serious multicollinearity problems. Neither of these thresholds was surpassed in the present research and, therefore it is unlikely that multicollinearity was a problem during these analyses. However and despite these guidelines, or "rules of thumb", Cohen and colleagues argued that there is no adequate statistical rationale for categorizing an acceptable level of IV collinearity from an unacceptable level. For example, to illustrate the consequence of multicollinearity, they described an hypothetical case in which additional (correlated) IVs were added to a model that generated inflated VIF values of 5, (i.e., 1/2 of the customary VIF threshold of 10). This manipulation resulted in both an increase in the magnitude of coefficient and changes in signs. This situation is refereed to as statistical suppression, which, in turn, creates considerable difficulty for the interpretations of coefficients.

Cohen and colleagues (2003) suggested that multicollinearity is neither always unexpected, nor uniformly problematic. For example, variables created from dummy coding schema are, of course, related and may have high VIF values, as are regression coefficients for interaction terms, which are derived from two or more variables and are therefore likely to have higher VIF values that the VIFs of either of the individual IVs. In this study, such variables include excess bed capacity and the Herfindahl-Hirschman Index (HHI). In addition and as Glantz and Slinker (2001) noted, if prediction of new outcomes or descriptions of phenomenon are the areas of interest, then multicollinearity need not be seen as a problem (p186). Similarly, Cohen and Cohen (2003) argue that multicollinearity does not justify much concern if one's interest is limited to prediction of outcomes or the value of R-squared (R^2).

Both sources suggest that the real concern occurs when testing or developing a theory in which one is interested in an array of IV and their respective β values (Cohen et al., 2003; Glantz & Slinker, 2001). Thus, if estimation of coefficients or delineation/validation of model structure is an overarching goal, to better understand the nature of "the system under study" (p.193), then it is essential to reduce or eliminate the effects of multicollinearity on the estimation of the regression equation (Glantz & Slinker). They also recommended that investigators attempt to discriminate between two types multicollinearity that may be present in data: structural vs. sample-based multicollinearity. The first, they note, is a mathematical problem that arises when new IVs are created from other IVs that are included in the model. The latter is often seen in observational studies and in those in which IV cannot be manipulated (independent of others) to examine/identify their unique effect on outcomes (Cohen et al., 2003). If theoretical understanding of a health care system is the objective of analyses, then both sources (i.e., Cohen et al.; Glantz & Slinker) describe potential remedies to multicollinearity. First and, perhaps, most obviously, respecification of the model to reduce multicollinearity is appropriate. This approach, they argued, may be appropriate when examining a construct such as socio-economic status (SES) when one has several variables that measure this construct, such as income of individual family members, occupation, employment status, education level and so forth. This type of problem may be addressed by: either, (a) creating and index of SES, a single measure derived from all available variables; or, (b) eliminating measures/variables in accordance with prior empirical work, one's understanding, theoretical interest, suppositions, or reasoning about the system under study. The latter strategy was adopted in this study; although the

approach is somewhat arbitrary and risky because new or unrecognized variables that could be theoretically important may be omitted from analyses. For example, the percentage of MediCal days and the number of beds in each NF**,** two theoretically important variables that have been evaluated in the HSR literature, were significantly and strongly correlated with each other (r = .786, p<.000). To consider the consequences of including both measures in the final models for this study, exploratory regression models were generated to compare VIF, beta and SE's values. In this case, both variables were retained for further analyses.

In addition to respecification, the authors described other approaches to address multicollinearity that were either unfeasible or unnecessary in the present study including: (a) collection of additional data to increase precision of beta estimates; and, (b), the use of ridge regression techniques for cases of an extremely high degree of multicollinearity (Cohen et al.; Glantz & Slinker).

Sixth. To evaluate how multiple predictors are related to the outcomes of interest, ordinary least squares (OLS) regression models were generated using SPSS software (SPSS Inc, 2002 Chicago Illinois) for each of the five outcomes (i.e., weight loss, restraints, bedfast, validated complaints & total deficiencies) with all predictors entered as a single block in the final models, but only after constructing a series of exploratory model to first evaluate VIF values. Once these models were generated, each was evaluated to assess congruency with the assumptions of linear regression, especially the assumption of normality of residuals, by examining standardized residual histograms and P-P plots as recommended (Cohen et al., 2003; Glantz & Slinker, 2001). Next, model summaries and coefficient tables were assessed for significance (i.e., at the $p < .05$ level)

along with the values of: beta, standard errors terms, R^2, adjusted *R*-square, VIF and tolerance statistics in accordance with the practices described by Cohen and colleagues.

Each of the three QI outcomes (i.e., weight loss, restraints and bedfast) were also transformed using log+1 and/or square root distributions and included in OLS models to assess the effects of these transformations on model residuals. Transformations are changes in the scale or units of a variable designed to accomplish three objectives: (a) to simplify relationships between predictors and outcomes, (b) to eliminate heteroscedasticity, or unequal variance of residuals; or, (c), to normalize residuals by changing the distribution of original variables (Cohen et al., 2003). Transformations of the weight loss and restraint measures did not improve model fit and the untransformed models for these two QI were retained, while transformations did not resolve the severe violations of normality for the bedfast measure.

During this phase of the analysis various permeations of the staffing measures were evaluated in separate models before selecting the total hours of care per resident day (hprd) as the measure that was retained for use the final specification of the regression models. Staffing levels were evaluated in three separate OLS models: (a) in the first model, staffing level was defined as total hprd, which included combined hours of care for registered nurses (RNs), licensed vocational nurses (LVN) and certified nursing assistants (CNAs); (b) in model two, staffing levels were disaggregated into skill mix, by including separate measure for the hours (and minutes) of care provided by each of the three types of caregivers (i.e., RN, LVN and CNA); and, (c), the third iteration, staffing levels were categorized into three mutually-exclusive groups using a "dummy" coding system (i.e., <3.2 hours; 3.2 to less than 4.1 hours, and $\geq$ 4.1 hours). This coding system

model was based on the staffing standards mandated by California's minimum staffing legislation (i.e., 3.2 hprd) (California Health and Safety Code §1276.5a, 2000) and the optimal direct care staffing level (i.e., 4.1 hprd) reported in the 2001 CMS staffing study.

The findings from the analyses in these six steps were used to specify final OLS models that are discussed in the next chapter. Finally and because the OLS model residuals for the bedfast QI (transformed & untransformed) and for both the total deficiencies and validated complaints measures were non-normally distributed, these outcomes were all analyzed with the alternate models described in step seven. For comparison purposes, the bedfast variable was analyzed with both logistic regression (LR) and negative binomial regressions (NBREG) models, while the last two outcomes were separately evaluated with NBREG models only when it became clear that OLS models were not appropriate.

Seventh. For bedfast prevalence, as well as the number of validated complaints and total deficiencies, the OLS models were significant; however, residual plots indicated that these models violated normality assumptions. Therefore, the bedfast measure was converted to a count variable and, along with the counts of validated complaints and total deficiencies. Data for each of these three outcomes was analyzed with an NBREG model, using STATA 9.2 software (2005, College Station, TX) to avoid the "suboptimal strategies", described by Gardner, Mulvey and Shaw (1995). These strategies include: (a) reducing/diluting power by rescaling continuous variable into (potentially-arbitrary and/or un-informative) categories, or, (b), using miss-specified OLS models that violate assumptions of normality and risk creating biased estimates of the effects of predictors on outcomes of interest (Gardner, Mulvey & Shaw, l995.; Slymen, Ayala, Arrendondo &

Elder, 2006). Instead, and as these authors recommend, generalized linear (GLL) models for dealing with non-negative, non-linear counts, and over-dispersed data to retain the "natural" features of the data, were developed.

Such GLL models are appropriate for evaluating outcomes variables that are not suited to linear regression analyses and are characterized by, so-called, J-distributions, which are frequency distributions that are described as right or positively-skewed or characterized by a large proportion of variable cases with values of true zeros (Gardner et al.; Slymen et al., 2006). These characteristics lead to violations of normality assumptions and are not well-served by techniques, including transformations, to induce normality (Chnag & Pocock 2000; Slymen, et al.). In addition and to avoid losing information (or power) that may occur by rescaling or categorizing data for analyses (e.g., for use in logistic or probit models), Slymen and colleague and others (e.g., Lachenbruch, 2002; Pedan, n.d) recommended alternative analytical techniques that are based on a Poisson distribution to retain the power of a continuous outcome or response variable. The underlying analytical model, based on this distribution, is known as a Poisson regression model; variants of the Poisson model include, among others, negative binomial regression (NBREG) models used in this study and zero-inflated negative binomial (ZIP) models (Slymen et al.).

As Slymen and colleagues (2006) noted, the use of the Poisson models is predicated on the assumption of equal variance and means (i.e., absence of over-dispersion); if this assumption is not met and to retain power of variable measured continuously and avoid other concerns (e.g., underestimation of standard error values and over-statement of significance during hypothesis testing, generation of narrow confidence

intervals and/or small p values), Slymen and colleagues suggested including either correction/inflation factors for Poisson analyses or using one of the related models that better-accommodate over-dispersed data. Gardener and colleagues (1995) noted the relatively restrictive assumptions of Poisson models and argued instead, and as a general approach, for the use of either an over-dispersed Poisson or a negative binomial model for analyzing counts or rates. Both Slymen and Gardner and their colleagues suggested that inflation techniques for over-dispersed Poisson models are appropriate if one is primarily interested in hypotheses testing related to regression coefficient values, but that alternate and "more flexible" models are better suited to estimate probabilities of particular outcomes as well as to test hypothesis about coefficient values in over-dispersed models. Thus, and for this study, NBREG models were developed to evaluate relationships between the remaining three outcomes (i.e., bedfast, validated complaints and total deficiencies) and the four types of predictors (i.e., facility, staffing, resident and market characteristics). Results form this series of analyses are reported in the next chapter and discussed in Chapter VI.

Protection of Human Subjects: Committee on Human Research

This research was approved by the Committee on Human Research (CHR), the Institutional Review Board of the University of California, San Francisco (UCSF) under the expedited review process because the study does not involve subject contact or the review of data at the individual level. All individual data are, instead, aggregated (by staff on each NF) and reported at the facility level to various State and Federal agencies; these facility-level data, and the county-level measures evaluated in this study, are available in publicly-accessible databases at either the state or federal levels.

CHAPTER FIVE: RESULTS

Population Descriptive Statistics

This study included the population of all free-standing NFs in California (N=1,080) and analyses are, therefore, not based on a sample of facilities and all data are reported at either the facility or county level. Descriptive statistics, including frequency distributions and measures of central tendency and variability are reported for predictor and outcome variables included in the final specification of each analytical model. An abbreviated version of these population parameters, including population means and standard deviations for all outcomes and predictors for the full population appears in Table 5.1.

Table 5.1: Descriptive Data California Free-Standing Nursing Facilities (N= 1,080)

Outcome Measures	**M (*SD*)** [1]
Average Weight Loss Prevalence (% Residents)	7.5 (3.98)
Average Bedfast Prevalence (% Residents)	4.8 (4.97)
Average Restraint Prevalence (% Residents)	15.7 (10.76)
Avg. Number of Deficiencies	29.8 (18.16)
Avg. Number of Validated Complaints	2.3 (3.93)
Predictor Measures	
Staffing Characteristics	
Average Total Hprd[2]	3.4 (.61)
Average Staff Turnover Rate	59.40 (36.68)
Facility Characteristics	
Number of beds	100 (50)
For profit facility (%)	88
Chain membership (%)	57
Net income (1000$)	294.37 (31.32)
% Medi-Cal Days	64.08 (25.58)
% Medicare Days	10.60 (8.78)
Family council (%)	45
Resident Characteristics	
ADL score[3]	30.78 (13.63)
CMI[4]	1.11 (.33)

Avg. Staffing Turnover Rate	59.40 (36.68)
% Asian Nursing Facility Residents	7.15 (13.43)
% Hispanic Nursing Facility Residents	12.91 (13.76)
Market Characteristics	
Herfindahl Index	.05 (.11)
Excess Bed Capacity (%)	.12 (.03)
% African American Residents	7.03 (3.91)
% Hispanic Residents	32.85 (12.09)
Median Family Income ($1000)	53.4 (11.95)

Key: [1] *M(SD):* Mean and standard deviation; [2] hprd: Hours of nursing care per resident day; [3]ADL (Activities of daily living) score: Average score for three ADLs (Eating, Transferring, Toileting); [4]CMI: Case mix Index derived from the Federal Resource Utilization Groups (RUGs).

In this population, 88% of NFs of free-standing facilities were members of for-profit (FP) organizations compared to 86% for of all California NFs (California HealthCare Foundation [CHCF], 2007) and 67% of facilities nationally (IOM, 2001). Approximately 57% of facilities in this study were part of a multi-facility chain, which is comparable to the national figure of 56%. The average number of beds in each NF in was 103, while average facility occupancy rate was 88%; these figures are comparable to both the average number of beds (107) and typical occupancy rates (89%) in all U.S. nursing facilities in 2007 (NCHS, 2000; AHCA, 2007). The average profit margin in the NFs evaluated the study was 3% and average net income was about $294,000.

In this study and during 2005, the average hours or nursing care provided by direct staff was about 3.4 hprd (equivalent to 204 minutes per day or 68 minutes per 8 hour shift, assuming maximum productivity) and the average turnover rate for these caregivers was 59%. In the study population and when staffing levels were disaggregated by skill mix, RN direct care staffing accounted for 0.33 hours of care per resident day, while LPN and CNA staffing accounted for 0.68 minutes and 2.41 hours (or 144 minutes) of care respectively. When NFs staffing levels were categorized into three groups, based on hprd levels, only about 7% of facilities in the state reported total staffing level above

the 4.1 hprd threshold reported by CMS (2001) for long stay residents. About 65% of NFs had staffing levels between 3.2 hprd and 4.1 hprd. Lastly and of great concern, from both a regulatory and quality of care perspective, approximately 28% of free-standing facilities had staffing levels lower than the minimum 3.2 level that was mandated by California's staffing standards (California Health and Safety Code §1276.5a). By way of comparison, the American Health Care Association (AHCA, 2007) reported that NF residents received an average of 3.4 hours of direct care per day in 2005; while turnover rates vary from about 50% for licensed staff up to 71.1% for CNAs. Harrington and colleagues (2007) reported average higher staffing levels of 3.7 hprd, but the difference is attributable to how RN staffing was measured. In the study by Harrington and colleagues, administrative nursing staff were included the staffing measure, while the AHCA study was limited to direct care staff only.

Among NF residents in this study, Medi-Cal and Medicare recipients accounted for 64% and 11% of resident days. Approximately 67% of the NF population were female; 45% of residents were between the ages of 65 and 85 (3% were younger than 45, 13% were between the ages 45-65, and 40% were older than 85); 70% were self-classified as Caucasian, while Hispanic, African American and Asian residents represented 13, 10 and 7%, of the resident population, respectively. Roughly 31% of residents were completely dependent on staff for assistance with three ADLs (i.e., eating, transferring & toileting); this measure was one of two that was used to account for resident case mix in the regression models**.** Average case mix index (CMI) in each NF, the second measure, was 1.1. This measure is derived obtained from the RUGs system and is based on prospective estimates, generated at the time of admission, of the hours of

nursing and therapy care that each resident will require (Fries et al., 1994); the range of values for CMI in this population was 0.52 up to 2.41, with higher values associated with higher acuity residents.

In terms socio-demographic measures at the operating market level (i.e., the county in which a NF was located), the median annual family income was $52,866; on average, African Americans individuals accounted for about 7% of county populations in this study, while individuals of Hispanic/Latino and Caucasian race/ethnicity, on average, accounted for 33% and 70% of county populations respectively. Also at the county level, the average Herfindahl-Hirshman Index (HHI), a measure of market concentration was .053 (a value of one is equivalent to a monopolistic environment, while a value of zero is [theoretically] equivalent to unlimited competition) and average, county-level, excess bed capacity was 12%.

Multicollinearity, Pearson Correlations and Independent variables

Pearson correlations provide a means to evaluate the magnitude and direction of bivariate relationships (if any) among all potential predictor variables that were available for this study. When pairs of attribute variables were correlated at or above customarily-accepted thresholds (i.e., $r = \pm .70$), then generally one or the other of that pair was excluded from further analyses. The correlation matrices for each type of predictor variable are discussed below (i.e., staffing, organization, resident & market measures).

However and as discussed in Chapter IV, if a particular pair of correlated variables had theoretical importance, regression models that contained both variables were developed. The stability of these model specifications was then evaluated with VIF and tolerance statistics and both the sign and magnitude of unstandardized regression

coefficients were evaluated for changes as correlated measures were added to regression models. For example, the percentage of Medi-Cal resident days and the number of beds in each NF were strongly and significantly correlated ($r = .786$, $p < .001$); however, the regression models were stable when both of these measures were included. Therefore and since the HSR and strategic management theory indicates that both of these measures are important, both were retained for use in the analytical equations. The number of beds was also associated with the percentage of Medicare resident days in each NF, although the correlation was moderate ($r = .449$, $p < .001$); the regression models were also stable when both measures were retained. Similarly and as expected, the CMI variable (one of the case mix measures evaluated in this study) was significantly correlated with the percentage of Medicare days ($r = .518$), but including both measures in the model did not reduce stability of coefficients and so, again, both variables were retained in the final analytical models.

Correlation Matrices and Staffing Characteristics

The various staffing level measures were, of course, moderately-strongly correlated with each other (r's = $\pm$ .50-.85); therefore, only one type of measure was included in any given model (i.e., total staffing level, staffing by hprd and skill mix, or staffing level by hprd category). Since each type of staffing measure lead to similar findings in an exploratory series of OLS regression models, only the total hprd staffing measures (i.e., RN+ LVN+CNA hours) was retained in the final specification of each model for the five outcomes.

Correlation Matrices and Organizational Characteristics

For the measures of organizational characteristics and as expected, the total number of beds was correlated with other facility size measures including four mutually-exclusive categories (i.e., NFs with: < 60 beds, 60-99 beds, 100-150 beds and >150 beds); in this case, and not surprisingly, the strongest significant correlation ($r = .761$, $p < .001$) was between the total number of beds in each facility and NFs classified as having more than 150 beds. While exploring data for differences in quality between large and small facilities is a worthwhile enterprise (particularly in an era where smaller facilities may becoming more favored), for purposes of this research the variable was not disaggregated into categories and the power of a continuous measure (i.e., total number of beds) was retained for regression analyses.

Similarly, and as expected, the number of beds in a facility was highly correlated with total resident days ($r = .915$, $p < .001$), but weekly correlated (i.e., $r \leq .20$) with more informative measures, such as percentages of Medi-Cal and Medicare resident days, therefore both of these utilization measures are included in models and total days was omitted. The occupancy rate was also omitted from regression models because this variable was used to construct a potentially more informative measure of market capacity: excess bed capacity; however the correlation between both of these variables was not strong ($r = -.311$, $p < .001$)

The percent of Medi-Cal resident days in each NF was significantly and negatively correlated ($r = -.733$, $p < .001$) with the percent of self-pay resident days, therefore, of the two measures, only the percent of Med-Cal days was retained for use in the analytical models because the Medi-Cal (or Medicaid) measure is a particularly

important factor that has been associated with quality of care in the literature and because the Medicaid system accounts for a substantial portion of spending in NFs. In addition and again, as expected, the percentage of Medicare resident days in each NF was highly correlated with the length of stay (LOS) measures; therefore only the percent of Medicare days was included in final models instead of either or all of the three LOS measures that were available (i.e., LOS: less than three months; greater three months, but less than two years; and greater than two years).

Correlations Matrices and Resident Characteristics

Resident characteristics, including resident age group (i.e., < 65 and >85 years of age), gender and racial/ethic group were significantly correlated with each other (Pearson coefficients at or above the .70 level), therefore final iterations of the regression models did not include all of these measures, particularly because coefficients became unstable when two or more of these measures were included in any one model. Therefore and to explore relationships (if any) between racial/ethnic characteristics of NF residents, the age and gender measures were omitted from final models. Residents whose race/ethnicity was classified as "other" and those with Hispanic ethnicity were not mutually exclusive categories, so only the percentage of Hispanic residents was included in the analytical models. The correlation between Caucasians and others exceeded .70, and so, again, the "others" category was excluded and the percentage of Caucasian residents was excluded and used as the comparison group.

Correlation Matrices and Market Characteristics

The predictor variables available in the data sources were also evaluated to examine the magnitude of bivariate correlations between various operating market (i.e.,

county-level) measures to identify potential multicollinearity problems. For example, and not-unexpectedly various socio-demographic measures that were drawn from 2000 Census data were correlated with other variables including: (a) the percent of individuals in each county, who were older than 65 years of age; (b), race/ethnicity; (d) median family income; (e) disability; and, (f) education level (i.e. the percent of individuals in each county with a high school education). Again and because model coefficients became unstable when two (or more) of these measure were included in the regression equations, only the race and ethnic/measures and the median family income variables were retained to account for demographic attributes of the population in the operating market of each NF. For example, median family income, was only weakly related to the race/ethnicity measures (r's $\leq .165$, $p < 001$)), but strongly correlated (and in the expected direction) with both the percent of high school graduates ($r = .761$, $p < 001$) and the percent of disabled individuals ($r = -.807$, $p < .001$) in each county. The percentage of individuals within a county with a high school education was also negatively associated with the percent of Hispanic individuals in the population at the county level ($r = -.917$, $p < .001$). Therefore, the age, gender, disability and education measures were omitted from further analyses because each of these types of measures was correlated with either income or the race/ethnicity variables.

Pearson Correlation Coefficients and Dependent Variables

In addition to evaluating the relationships between predictor, or attribute variables, bivariate relationships between the five outcome or dependent measures (i.e., weight loss, restraints, bedfast validated complaints and total deficiencies) was also evaluated with a Pearson correlation matrix. These data are reported in Table 5.2.

Table 5.2: Bivariate Correlation Matrix: Dependent Variables

	Weight Loss Prevalence	Restraint Prevalence	Bedfast Prevalence	Validated Complaints	Total Deficiencies
Weight Loss Prevalence	1				
Restraint Prevalence	.027	1			
Bedfast Prevalence	.195**	.010	1		
Validated Complaints	.095**	.053	.059	1	
Total Deficiencies	.130**	.104**	.060	.593**	1

** Correlation is significant at the p < 0.01 level (2-tailed).

The largest Pearson correlation coefficient, *r*, for each of these pairs of variables was .593 (p <.001): for total deficiencies and total complaints. The existence/direction of the relationship between these two measures is not surprising because validated complaints can give rise deficiencies. For all other pairs of outcome variables, the *r* values were either not significant or significant, but with a value less than or equal to .195 (p < .001). Therefore, each of five outcomes (i.e., weight loss, restraints, bedfast, validated complaints and total deficiencies) that had been selected as proxy measures of quality were retained for evaluation in the regression models that are reported below.

Analytical Models

Following preparation of dataset, evaluation of correlation matrices and the execution of the analytical steps described in the previous chapter, each of the five quality outcomes was evaluated in a series ordinary least squares (OLS) regression models that included four types of predictor variables (i.e., staffing, organizational, resident and market characteristics). Because of Missing data, the population size for each analysis was slightly different; Table 5.3 includes descriptive data for each of the variables included in the regression model(s) for each outcome.

Table 5.3: Descriptive Statistics by Outcome

	Weight Loss Prevalence	Restraint Prevalence	Bedfast Prevalence	Total Deficiencies	Validated Complaints
	(N=932)	(N=966)	(N=965)	(N=1031)	(N=1017)
	M (SD)[1]	M (SD)	M (SD)	M (SD)	M (SD)
	7.456 (3.977)	15.759 (10.743)	4.810 (4.934)	30.024 (18.240)	2.352 (3.975)
Predictor Variable	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Staffing Characteristics					
Total Hprd[2]	3.363 (.483)	3.379 (.532)	3.372 (.485)	3.416 (.594)	3.411 (.589)
Staffing Turnover	59.095 (36.490)	58.860 (36.029)	58.854 (36.047)	58.905 (36.323)	59.163 (36.359)
Facility Characteristics					
Number of Beds	105.800 (48.647)	104.275 (48.736)	104.344 (48.715)	100.991 (49.411)	101.750 (49.303)
For Profit Facility	.893 (.310)	.888 (.315)	.888 (.315)	.876 (.330)	.884(.320)
Chain Membership	.584 (.493)	.577 (.494)	.577 (.494)	.571 (.495)	.573 (.495)
Net Income ($100,000)	3.060 (21.280)	3.232 (21.682)	3.229 (21.693)	3.245 (29.767)	3.226 (29.933)
% Medi-Cal Days	67.228 (21.520)	66.443 (22.415)	66.415 (22.409)	64.575 (29.942)	64.990 (24.669)
% Medicare Days	10.430 (7.681)	10.516 (7.920)	10.527 (7.918)	10.676 (8.666)	10.720 (8.697)
Family Council	.460 (.499)	.451 (.498)	.451 (.498)	.445 (.497)	.447 (.497)
Resident Characteristics					
ADL score[3]	31.513 (12.986)	31.576 (13.079)	31.516 (12.954)	30.895 (13.508)	30.876 (13.535)
CMI[4]	1.104 (.305)	1.109 (.311)	1.108 (.311)	1.112 (.330)	1.114 (.332)
% African American	10.309 (14.928)	10.260 (14.821)	10.260 (14.829)	10.096 (14.678)	10.179 (14.736)
% Asian	7.450 (14.085)	7.391 (13.916)	7.392 (13.924)	7.195 (13.645)	7.225 (13.689)
% Hispanic	13.272 (13.642)	13.184 (13.624)	13.146 (13.579)	12.971 (13.869)	12.981 (13.631)
Market Characteristics					
Herfindahl Index	.0531 (.114)	.053 (.112)	.053 (.113)	.0523 (.111)	.053 (.112)
Excess Bed Capacity	.122 (.032)	.122 (.032)	.122 (.032)	.123 (.034)	.123 (.034)
% African American	7.006 (3.905)	7.022 (3.914)	7.026 (3.914)	7.007 (3.927)	6.976 (3.928)
% Hispanic	33.042 (12.123)	32.972 (12.090)	32.981 (12.093)	32.712 (12.155)	32.640 (12.149)
Median family income ($1,000)	52.88 (11.54)	52.98 (11.54)	529.52 (11.51)	53.45 (11.91)	53.49 (11.94)

Key: [1] *M(SD):* Mean and standard deviation; [2] hprd: Hours of nursing care per resident day; [3]ADL (Activities of daily living) score for three ADLs: Eating, transferring, toileting; [4]CMI: Case mix Index derived from the Federal Resource Utilization Groups (RUGs).

First and for the three quality indicators ([QIs]; i.e., weight loss, restraint and bedfast prevalence), separate OLS models were generated and the residual plots were qualitatively evaluated for evidence of violations (if any) of the assumptions normality. For the both weight loss and restraint models, the normal P-P standardized residual plots were linearly distributed along a diagonal line, which indicates that the assumption of normality of residuals was not violated. In contrast, the residual analysis for the bedfast OLS model indicates that this model violated normality assumptions. Therefore and in an effort to optimize (i.e., induce) normality of residuals, a series of log and square root transformation were conducted for each of the three QI measures. These transformed outcomes were included in regression models with the same group of predictors that were evaluated in models with non-transformed outcomes. For both weight loss and restraint prevalence, the transformed outcome variables did not appreciably improve the distribution of residuals in the P-P plots. Therefore, only the regression coefficients and squared semi-partials are reported for the untransformed weight loss and restraint outcomes are reported (Table 5.4). Transformations of the bedfast measure did not improve OLS model fit and this outcome was then evaluated with both logistic (LR) and negative binomial regression (NBREG) models that are described below. Next and for both validated complaints and total deficiencies, the P-P residual plots (from the OLS regression models) were clearly non-normal and both of these outcomes were also evaluated with NBREG models.

Weigh Loss Quality Indicator Prevalence

The final OLS model specification for the weight loss and restraint QIs are reported in Table 5.4. The untransformed OLS model for weight loss (N = 932 NFs) was

significant (F =10.259, df 19, 912, p <. 001) (df = degrees of freedom: model [19] and residual [912]). The adjusted R^2, which accounts for the number of optimally-weighted predictors in the model, accounted for 15.9% of the variation in the weight loss outcome; a moderate level of observed variation in the facility-wide prevalence rate for weight loss among residents in each NF. The unadjusted R^2value for this model was 17.6%.

Table 5.4: Weight Loss and Restraint Quality Indicator (QI) Prevalence

	OLS[1] Weight Loss Prevalence (N=932)		**OLS Restraint Prevalence (N=966)**	
Variable	***β (SE β)*** [2]	***Semipartial-R^2***	***β (SE β***	***Semipartial-R^2***
Staffing Characteristics				
Total hprd[6]	-.272 (.284)	.001	1.867 (.709)**	.007
Staffing Turnover	.005 (.003)	.002	.017 (.010)*	.003
Facility Characteristics				
Number of beds	.004 (.003)	.002	.016 (.007)**	.004
For-profit facility	-.873 (.464)* [3]	.003	3.409 (1.25)**	.007
Chain membership	.292 (.256)	.001	-2.228 (.703)**	.009
Net income	-.002 (.006)	.000	-.022 (.015)	.002
% Medi-Cal Days	.056 (.008)	.000	.040 (.021)*	.004
% Medicare Days	.056 (.020)**	.007	-.095 (.053)*	.003
Family council	-.437 (.243)*	.003	1.713 (.670)**	.006
Resident Characteristics				
ADL score[4]	.007 (.010)	.001	.141 (.028)***	.002
CMI[5]	2.105 (.538)***	.014	1.695 (1.42)	.001
% African American	-.019 (.010)**	.004	-.078 (.027)**	.008
% Asian residents	-.037 (.009)***	.015	-.031 (.026)**	.001
% Hispanic	-.020 (.010)*	.003	-.091 (.029)**	.010
Market Characteristics				
Herfindahl Index	2.010 (1.29)	.002	-6.398 (3.58)*	.003
Excess Bed Capacity	-6.314 (4.26)	.002	18.246 (11.720)	.002
% African American	-.064 (.038)*	.003	-.026 (.105)	.000
% Hispanic	-.077 (.015)***	.024	-.034 (.041)	.001
Median family income	$-5.84E^{005}$ (1.48E)***	.014	$-2.92E^{005}$(4.08E)	.001
Model				
Constant	12.465 (1.763) ***		-.488 (4.693)	
R^2	.176		.117	
Adjusted R^2	.159 (3.65) ***		.100 (10.194)	
F for change in R^2	$10.259_{19, 912}$ ***		$6.620_{19, 946}$ ***	

Key: [1]OLS: Ordinary least squares regression; [2]*β (SE β)*: Raw coefficient, *β*, and its associated standard error; [3]Significant at *p-value* =: <.1*, <.05 ** , < .001*** ; [4]Comparison groups: Not for profit facilities, non-chain facilities, no family council; [5]ADL (Activities of daily living) Summary score for three ADL: Eating, transferring, toileting; [6] CMI: Case mix Index derived from the Resource Utilization Groups (RUGs) system; [1] hprd: Hours of nursing care per resident day.

In the model (and contrary to both hypothesis Ho_1 and Ho_3), neither profit status (FP vs. NFP), total direct care staffing levels nor staff turnover rate were significant predictors of the facility-wide prevalence rate of weight loss among NF residents at the 0.5 alpha level. Moreover, and of theoretical and clinical interest, the staffing level measures also did not contribute significantly to R^2 values in exploratory OLS models when the total staffing level variable was disaggregated and analyzed by either: (a) skill type (i.e., the hours of care provided by RNs, LVNs, CNAs); or, (b) hprd category (i.e., hprd = 3.2-4.1, or hprd > 4.1 vs. hprd <3.2).

Among the other types of facility characteristics (see Figure 5.1 or Hypotheses: Table 2.1), only the unstandardized regression coefficient for the percent of Medicare-funded resident days in each NF was significantly and positively associated with the prevalence of the weight loss outcome (i.e., $\beta = .056$; standard error [SE] = .02; $p = .006$). The interpretation of the slope for this variable in the statistically significant model (i.e., $p < .05$), is that for each one percent increase in the proportion of Medicare resident days the regression equation predicts, on average, about a six percent increase in the prevalence rate of the weight loss outcome in each NF (i.e. , $\beta = .056$ rounded to $\simeq 6\%$). The standard error (*SE*) associated with this estimate is 0.02. Standard errors are estimates of the standard deviation of regression coefficients; Cohen and colleagues (2003) described *SE* as a measure of the precision with which a regression coefficient (β) is measured (the coefficient value is generated by multiplying a test statistic by the *SE* of the estimate). In well-specified models, if a regression coefficient is large compared to its standard error, then it is likely that the coefficient is significantly different than zero (in the population being considered) and an implied statistical null hypothesis of "no

relationship" between a predictor and an outcome may, therefore, be rejected in favor of the alternate hypothesis (Glantz & Slinker, 2001).

The SR^2, or the squared semi-partial correlation coefficient, for the percent of Medicare funded resident days in the model was approximately .007 (SR^2 is equivalent to incremental increases [if any] in R^2, also called R^2 change, that occur as each IV is added to a model) (Table not shown). The beta weight, or standardized regression coefficient value for the Medicare variable was approximately 0.11 (Table not shown), which is equivalent to standardized odds ratio for a continuous variable, and indicates that a one standard deviation change in the predictor (i.e., $\pm$ 8.78% from Table 5.1) was associated with a $\pm$ 0.11 standard deviation change in the weight loss outcome (the mean and SD for the weight loss QI, from Table 5.1, was: *SD* 7.5 $\pm$ 3.98). By way of explanation, Beta weight values, like Pearson correlation coefficient values, range from -1 to + 1; with zero indicative of no relationship between a predictor and an outcome and a value > 0.50 classified as a strong effect (Cohen et al., 2003).

Among the five measures that were used to control for resident characteristics (see Table 5.4), higher percentages of both African American and Asian residents were significantly, and unexpectedly, associated with less weight loss among residents at the $p < .05$ and $p < 0.001$ levels respectively. The standardized beta and SR^2 values for these measures were: (a) -.07 and .0035 for the percent of African American residents in each NF; and, (b), -.13 and .0149 for the percent of Asian residents. Neither of the two case mix measures (i.e., ADL and CMI), nor the percent of Hispanic/Latino residents in each facility were significant contributors to the model at the $p < .05$ level.

Amongst the five variables used to evaluate the operating market characteristics on weight loss (Tables 5.4), an increase in the percentage of Hispanic Americans individuals as well as higher median family incomes in the county were both negatively, and [again] unexpectedly, associated with weight loss among residents (p <.001). This indicates that the prevalence of the weight loss QI was significantly lower in NFs that were located in more affluent counties as well as counties with more Hispanic/Latino citizens (note: the Pearson correlation coefficient for these two measures in the population was -.592, p < .001, but the VIF and tolerance statistics were within acceptable parameters when both measures were included in the same regression model). The standardized beta values for these two predictors were moderate to low: -.037 and -.020 for the percentage of Hispanic residents and median income respectively; while the corresponding SR^2 values were .024 and .014.

For the weight loss outcome, and at a less conservative alpha (i.e., p < .10), several other measures in the analytical model were predictive of lower prevalence rates of the weight loss QI: (a) for-profit ownership (vs. non-profit status); (b) the presence of a family council (vs. the absence); (c) increased percentages of African Americans individuals (in each county); and, (d) higher percentages of Hispanic residents in each NF. Unstandardized beta coefficients (β), standard error and SR^2 values for these four predictors are also reported in Table 5.4.

Restraint Quality Indicator Prevalence

For the restraint QI, the final version of OLS model was also significant (F = 6.620, df $_{19, 946}$, p <. 001), and the optimally-weighted predictors (evaluated by the Adjusted R^2 value) accounted for 10% of the observed variation in the prevalence rate for

this outcome in the population of NF (956 NFs) with complete data that were analyzed (Table 5.4). The unadjusted coefficient of determination was approximately 12%.

For the staffing characteristics and partially congruent with hypothesis Ho_3, the number of hours of care per resident day was a significant predictor of restraint prevalence; however, and unexpectedly, the sign of the regression coefficient was opposite to the direction hypothesized (i.e., in this study more restraints use was detected in NFs with higher staffing levels). This surprising finding may be attributable to endogenous relationships between staffing, acuity and/or quality measures that has been reported in the literature and is further discussed in Chapter VI. The turnover rate of nursing staff was not a significant variable at the .05 alpha level contrary to hypothesis.

For the measures classified as facility characteristics (see Table 5.1), and as expected, FP facilities and those with more beds was predictive of significantly more restraint use ($p < .05$) (Table 5.4). In addition and, surprisingly, the presence of a family council in a NF was also positively and significantly associated with the application of restraints. The squared semi-partial correlation values, SR^2, for these three predictors (i.e., FP status, number of beds & family council) was 0044, 0069 and 0061 respectively, while the beta weights, or standardized regression coefficient values, for these predictors was .07, .10 and .08. Beta weight values indicate that for a one standard deviation change (or a category change in a non-continuous variable) in the value of the predictors, the concomitant change in the restraint outcome was .07, .10 and .08. In contrast and among NFs that were part of a chain, the prevalence rate of restraints was significantly reduced ($\beta = -2.2$, $SE = .703$, $p < .05$). The SR^2 value for this variable was .009. The remaining

measures classified as organizational characteristics did not significantly contribute to the restraint QI model.

For resident characteristics and as with the weight loss QI, restraint prevalence was negatively associated with the race and ethnicity of residents. Higher percentages of African American, Asian and Hispanic residents all predicted significantly less restraint use for residents in the population of free-standing NFs. The respective beta weights values were: -0.019, -0.37 and -0.20. One of the two case mix measures (i.e. ADL dependency) was, as hypothesized, positively and significantly associated with more restraint use; this again may speak to potentially endogenous relationships between case mix and processes of care measures like restraint prevalence.

None of the variables that were evaluated to account for operating market characteristics were significant at the $p < .05$ or less threshold. However as reported in Table 5.4, and at a less conservative alpha (i.e., $p < .10$), several other measures from each of the groups of variables were also predictive of prevalence rates for the restraint QI including the: (a) percentages of both Medicare (β = 0-.095*)* and Medi-Cal days (β = 0.40); (b) the Herfindahl-Hirschman Index (β = -6.39), which indicates that NFs in more competitive markets tend to use fewer physical restraints; and (c) turnover rates of direct care staff (β = 0.017). For the later measure, the sign of β for the unstandardized regression coefficient is congruent with the hypothesis that increased turnover may be associated with more restraint use.

Bedfast Quality Indicator Prevalence

In contrast to both the weight loss and restraint prevalence OLS models, the models for both the transformed and untransformed bedfast QI outcome violated the

assumptions of normality based on an examination of residual plots. Therefore and using the same group of predictors that were included in the OLS models, the bedfast data were first fitted to a logistic regression model to predict the likelihood of a NF having bedfast residents. The variable was coded as 1 for a bedfast rate of zero percent and 0 for a bedfast rate greater than one percent. Second, the bedfast prevalence measure was converted to a count variable and the data were also analyzed with a negative binomial regression model (NBREG) to retain the power of a continuous variable.

For the logistic model, the bedfast variable was dichotomized into a categorical variable. In this case, approximately 12% of NFs had zero cases of residents who were bedfast, while 88% of California free-standing facilities had some level of this QI outcome. The logistic model was significant with a *Pseudo-R^2* value of 14.7%. The regression coefficients and odds ratios for the model are reported in Table 5.5.

Table 5.5: Bedfast Quality Indicator (QI) Prevalence (Logistic Regression Model)

	Bedfast Prevalence (N=957)
Predictor Variables	***Odds Ratio (SE)*** [1]
Staffing Characteristics	
Total Hprd[2]	.693 (.205)
Staffing Turnover	.995 (.009)
Facility Characteristics	
Number of beds	.988 (.003)*** [3]
For Profit Facility[4]	2.394 (1.061)**
Chan Membership[4]	.875 (.202)
Family Council[4]	1.172 (.261)
Net Income	1.000 (.006)
% Medi-Cal Days	.985 (.006)**
% Medicare Days	.981 (.019)
Resident Characteristics	
ADL Score[5]	.958 (.009)***
CMI[6]	.305 (.165)**
% African American	1.013 (.003)
% Asian American	1.012 (.021)**
% Hispanic	1.009 (.009)

Market Characteristics		
	Herfindahl Index	.021 (.057)**
	Excess Bed Capacity	11.091 (47.42)
	% African American	.942 (.037)
	% Hispanic	1.004 (.015)
	Median Family Income	1.000 (.000)
Model		
	Constant	-.926 (.500) *
	LR χ^2	101.46***
	Pseudo R^2	14.69

Key: [1]Odds Ratio (bedfast: no vs. yes) and associated standard error; [2]Hprd: Hours of nursing care per resident day.[3]Significant at p-value: <.10*, <.05 ** , < .001***; [4]Comparison groups: Not for profit facilities, non-chain facilities, no family council; [5]ADL (Activities of daily living) summary score for three ADLs: Eating, transferring, toileting; [6]CMI: Case Mix Index derived from the Resource Utilization Groups (RUGs) system.

At the $p < .05$ level, neither of the two the staffing characteristics were significant contributors to the model. In contrast, the following organizational characteristics predicted the occurrence of the bedfast QI outcome: (a) increased percentages of Medi-Cal residents (OR = .985, which is equivalent to a 1.5% lower likelihood of a facility having no bedfast residents as the percentage of Med-Cal resident days increases by one percent); (b) more beds (OR = .98). In contrast, and somewhat unexpectedly, for-profit (FP) nursing facilities were significantly less likely than their non-profit counterparts to have bedfast residents (OR = 2.39, $p = .049$).

For measures of resident characteristics, NFs with higher case mix populations (and/or more dependent residents) were more likely than facilities with lower acuity residents to have some level of bedfast residents (i.e., greater than zero percent). Specifically, NFs with more dependent residents (measured by the ADL dependency variable) were 4% less likely (OR = 0.958), than NFs with comparatively fewer dependent residents, to have residents who were bedfast (i.e., bedfast prevalence > zero percent). Similarly and for the CMI acuity measure, NFs with higher case mix resident scores were about 70% less likely (OR = 0.305), than NFs with lower acuity residents, to

have no cases of the bedfast QI. In addition and among NFs with more Asian residents, the likelihood of having any bedfast residents was lower (by 1.7%) when compared to NFs with more Caucasian residents. The remaining variables, including other racial/ethnic characteristics at both the facility and county levels, did not significantly contribute to the model.

In addition to the logistic model and to retain the advantages (i.e., power) of a continuous outcome variable, the bedfast prevalence variable was converted to a count variable and analyzed with an NBREG model (Table 5.6).

Table 5.6: Bedfast Quality Indicator (QI) Prevalence (Negative Binomial Regression)

	NBREG[1] Bedfast Prevalence (N=965)				
Predictor Variables	***β (SE β)*** [2]	e^{b} [3]	$e^{b}SDX$ [4]	**% Δ** [5]	**%Δ *SDX*** [6]
Staffing Characteristics					
Total Hprd[11]	.185 (.080)**[7]	1.203	1.094	20.3	9.4
Staffing Turnover	.002 (.001)*	1.002	1.069	0.2	6.9
Facility Characteristics					
Number of Beds	-.001 (.001)	.999	0.961	-0.1	-3.9
For Profit Facility[8]	-.157 (.123)	0.854	0.952	-14.6	-4.8
Chan Membership[8]	.031 (.068)	1.032	1.016	3.2	1.6
Family Council[8]	-.138 (.068)**	0.871	0.934	-12.9	-6.6
Net Income	-.001 (.002)	0.999	0.990	-0.0	-1.0
% Medi-Cal Days	.008 (.002)***	1.008	1.193	0.8	0.8
% Medicare Days	.006 (.005)	1.006	1.049	0.6	0.6
Resident Characteristics					
ADL[9] Score	.015 (.003)***	1.016	1.229	1.5	22.0
CMI[10]	.734 (.136)***	2.083	1.256	108.3	25.6
% African American	.001 (.003)	1.001	1.008	0.1	0.8
% Asian American	-.007 (.003)**	.993	.905	-0.7	-9.5
% Hispanic	-.009 (.003)**	.991	.886	-0.9	-11.4
Market Characteristics					
Herfindahl Index	.944 (.365)**	2.572	1.112	157.2	11.2
Excess Bed Capacity	-1.030 (1.162)	.357	.968	-64.3	-3.2
% African American	. 009 (.010)	1.009	1.035	0.9	3.5
% Hispanic	-.002 (.004)	.998	.976	-0.2	-2.4
Median Family Income	$6.17e^{-06}$ (4.04e)	1.000	1.074	0.0	7.4

Model	
Constant	-.926 (.500) *
LR χ^2	132.73***
Pseudo R^2	.026
ℓn-alpha	.045***

Key: [1]NBREG: Negative binomial regression; [2]*β (SE β)*: Raw coefficient, *β*, and its associated standard error; [3] e^{β}: exp(β) = factor change in expected count outcome for unit increase in predictor variable;[4] e^{β} *StdX: exp(b*SD of X)* = change in expected count for a SD increase in X predictor variable;[5]*%Δ*: Percent change in expected count for unit increase in predictor variable; [6]*%Δ SDX*= percent change in expected count for SD increase in predictor variable; [7]Significant at *p-value* =: <.10*, <.05 ** , < .001***; [8] Comparison groups: Not for profit facilities, non-chain facilities, no family council; [9]ADL (Activities of daily living) summary score for three ADLs: Eating, transferring, toileting; [10]CMI: Case Mix Index derived from the Resource Utilization Groups (RUGs) system; [11]Hprd: Hours of nursing care per resident day.

In this approach, and contrary to the logistic model, the total staffing variable was significant factors in the model at the 0.05 level, but the coefficient carried an unexpected positive sign (similar to the restraint OLS model). In addition, and as hypothesized and reported in the logistic regression, a larger number of beds ($\beta = 0.001$, $p < .001$) and higher percentages of Medi-Cal residents ($\beta = 0.008$) in a NF were both predictive of higher bedfast counts. The coefficients both resident case mix measures were also significant in this model and each carried the expected sign, which predicted higher bedfast counts with higher resident acuity: ADL dependency ($\beta = 0.016$) and CMI ($\beta = .734$). Lastly, NFs with a higher percentage of Hispanic residents predicted lower bedfast counts ($\beta = -0.009$); this resident characteristic was not significant in the logistic model; in the latter model the percent of Asian residents was the only racial/ethnic measure with a statistically significant coefficient. In addition and in contrast to the findings of the logistic model, profit status (i.e., FP vs. NFP) was not a significant variable in the model (i.e., $\beta = -0.157$, $p = .407$).

Validated Complaints

For the validated complaints quality outcome, the OLS models were significant; however, qualitative inspection of model residuals using P-P standardized residual plots,

indicated severe violations of normality assumptions and these count data were also analyzed with an NBREG model (Table 5.7). For the validated complaints measure, data from two years of observations (i.e., 2004 and 2005) were combined to increase power; the analysis was restricted to 1, 017 freestanding NFs in California with complete data for this outcome.

For the measures of staffing characteristics, total staffing level in this model was significant ($p < .05$), but with a sign that was contrary to the hypothesized direction (which was also the case for restraint OLS and bedfast NBREG models). In contrast and consistent with hypothesis, staff turnover was significantly and positively associated with more validated complaints. At the facility level, both a larger number of beds ($\beta = 0.007$) and an increased percentage of Medi-Cal (or Medicaid) resident days ($\beta = 0.011$) were predictive of more complaints ($p < .001$). For a one percent change in each predictor, the model predicted 0.7 and. 1.1 percent more complaints respectively.

At the resident level both the ADL dependency and CMI measure were significant predictors in the NBREG model for complaints; however and unexpectedly, the coefficients had opposite signs: negative for the ADL measure (β =-.010) and positive for the CMI measure ($\beta = 0.413$); the later variable is based on the RUGs data for each NF resident and the sign of its coefficient was contrary to hypothesis.

Consistent with findings from the QI measures, the racial/ ethnic composition of the NF population was also negatively associated with fewer complaints: higher percentages of Asian and Hispanic residents predicted 18.5 and 6.8 percent fewer validated complaints respectively (Table not displayed).

Table 5.7: Total Deficiencies and Validated Complaints (Negative Binomial Regression Models)

	NBREG[1] Deficiencies Prevalence (N=1031)					NBREG Complaints (N=1017)				
Predictor Variables	***β (SE β)*** [2]	e^{b} [3]	e^{b}***SDX*** [4]	***% Δ*** [5]	***%Δ SDX*** [6]	***β (SE β)***	e^{b}	e^{b}***SDX***	***% Δ***	***%Δ SDX***
Staffing Characteristics										
Total Hprd[11]	-.021 (.034)	0.979	0.988	-2.1	-1.2	-.072 (.096)	.930	.958	-4.2	0.6
Staffing Turnover	.001 (.000) **	1.001	1.043	0.1	4.3	.003 (.001)**	1.004	1.134	13.5	36.4
Facility Characteristics										
Number of Beds	.002 (.000)*** [7]	1.003	1.130	0.2	13.0	.007 (.001)***	1.007	1.432	0.7	43.2
For Profit Facility[8]	.143 (.060)**	1.154	1.048	15.4	4.8	.298 (.178)*	1.347	1.100	34.7	10.0
Chan Membership[8]	-.014 (.035)	0.986	0.993	-1.4	-0.7	.022 (.100)	1.022	1.011	2.2	1.1
2005 Net Income	-.002 (.001)**	0.998	0.948	-0.2	-5.2	-.007 (.003)*	.993	.817	-0.7	-18.3
% Medi-Cal Days	.005 (.001) ***	1.005	1.132	0.5	13.2	.011 (.003)***	1.011	1.303	1.1	30.3
% Medicare Days	.002 (.002)	1.002	1.020	0.2	2.0	.018 (.007)	1.018	1.168	1.8	16.8
Family Council[8]	-.045 (.034)	0.956	0.978	-4.4	-2.2	-.054 (.094)	.947	.973	-5.3	-2.7
Resident Characteristics										
ADL[9] Score	-.002 (.001)	0.998	0.975	-.2	-2.5	-.010 (.004)**	.990	.874	-1.0	-12.6
CMI[10]	.057 (.068)	1.059	1.019	5.9	1.9	.413 (.187)**	1.511	1.147	51.1	14.7
% African American	-.001 (.001)	0.999	0.980	-.1	-2.0	-.001 (.004)	. 999	.980	-0.1	-2.0
% Asian	-.004 (.001) **	0.996	0.946	-0.4	-5.4	-.015 (.004)***	.985	.815	-1.5	-18.5
% Hispanic	-.001 (.001)	0.999	0.990	-0.1	-1.0	-.005 (.004)**	.995	.932	-0.5	-6.8
Market Characteristics										
Herfindahl Index	.206 (.176)	1.229	1.023	22.9	2.3	-.422 (.552)	.656	.954	-34.4	-4.6
Excess Bed Capacity	.421 (.580)	1.524	1.014	52.4	1.4	.850 (1.701)	2.339	1.029	133.9	2.9
% African American	-.018 (.005) ***	0.982	0.931	-1.8	-6.9	.033 (.015)*	1.034	1.139	3.4	13.9
% Hispanic	-.009 (.002) ***	0.992	0.901	-0.9	-9.9	-.008 (.007)	.992	.910	-0.8	-9.0
Median Family Income	$-2.22e^{-06}$ (1.94e)	1.000	1.027	0.0	2.7	$9.12e^{-06}$ (5.49e)*	1.000	1.115	0.0	11.5
Model										
Constant		2.957 (.230) ***					-1.621 (.674)*			
LR χ^2		244.160***					130.560***			
Pseudo R^2		.028					.032			
ℓn-alpha		.241					1.58			

Key: [1]NBREG: Negative binomial regression; [2]*β (SE β)*: Raw coefficient, *β*, and its associated standard error; [3] e^{β}: exp(β) = factor change in expected count outcome for unit increase in predictor variable;[4] e^{β} *StdX: exp(b*SD of X)* = change in expected count for a SD increase in X predictor variable;[5]*% Δ*: Percent change in expected count for unit increase in predictor variable; [6]*%Δ SDX*= percent change in expected count for SD increase in predictor variable; [7]Significant at *p-value* =: <.1*, <.05 ** , < .001***; [8] Comparison groups: Not for profit facilities, non-chain facilities, no family council; [9] ADL (Activities of daily living) summary score for three ADLs: Eating, transferring, toileting; [10]CMI: Case Mix Index derived from the Resource Utilization Groups (RUGs) system; [11]Hprd: Hours of nursing care per resident day.

Four additional predictors had coefficients that were significant, but with differing signs and at a less restrictive alpha levels (i.e., $p < .10$) as reported in Table 5.7, including: for profit status (β with a positive sign), NF net income ($-\beta$), the percentage of African American residents in the operating market population ($+\beta$), and median family income at the county level ($+\beta$).

Total Deficiencies

For total deficiencies, the various OLS models were also significant, however and as was the case for the bedfast and complaint outcome, the P-P plots indicated that the distribution of model residuals violated the assumptions of normality; therefore total deficiency data were also fitted to an NBREG model and based on a population of 1,031 NFs. Findings are reported Table 5.7 with the validated complaint data. The deficiency measure was developed by summing the number of federal and state deficiencies and the total number of state citations that each NF received in 2004 and 2005.

For the staffing measures, the total staffing level was not a significant contributor to the NBREG model, while higher levels of turnover among direct care staff (as hypothesized) predicted more total deficiencies ($\beta = 0.001$) (Table 5.7). For total deficiencies and as hypothesized for the organizational characteristics, the number of beds in each facility ($\beta = 0.002$), FP status ($\beta = 0.143$) and a higher percentage of Medi-Cal resident days ($\beta = 0.005$) were all significantly associated with more total deficiencies at the $p < .05$ level (Table 5.8). In contrast, and contrary to hypothesis, increased net income predicted fewer deficiencies ($\beta = -0.002$). Higher percentages of Asian American residents in each NF predicted fewer total deficiencies ($\beta = -0.004$). Similarly, the percentages of both African American ($\beta = -.018$) and Hispanic ($\beta = -.009$)

residents in each county, or operating market, were also negatively associated with the total number of deficiencies received by a NF.

Results Summary

While the pattern of significant relationships was not always congruent with hypotheses, it is clear that the five quality outcomes are related to an array of characteristics that have been reported in the HSR literature and that have been identified as important measures in theoretical models that account for the factors related to quality of care. The unanticipated and yet, seemingly, favorable findings related to racial/ethnic characteristics were particularly surprising. The implications of these findings, in the context quality of care theory, study aims and prior literature findings, are discussed in Chapter VI along with study limitations and implications for future research.

CHAPTER SIX: DISCUSSION

Dr. Laura Carstensen, the Founding Director of Stanford University's Center on Longevity, recently noted that in less than one century and among developed nations, life expectancy has increased by an average of 30 years. Dr. Carstensen also observed that "there are more people living longer in the world than ever before in human history and there are going to be many more in the future" (Hayutin, 2007). To assure that the nation's aging population is well-cared for, it is imperative for health services researchers, clinicians, policy makers and the general public to better understand the factors that influence quality of care in nursing facilities. Additional health services research (HSR) in LTC settings, in tandem with health policy changes and translation of findings into clinical practice, is congruent with the aim of Healthy People 2010: "to improve the health of individuals, communities and the nation" (US Department of Health and Human Services [USDHS], 2000).

The overall aim of this research was to examine relationships between staffing and organizational characteristics and three proxy measures of quality: federal QIs, validated complaints and total deficiencies. Projected increases in the number of individuals who will need some type of long term care accentuate the need to evaluate the complex factors that influence quality (Forum, 2000; KFF, 2005, 2007; U.S. Census Bureau, 2004). The need for this type HSR is further underscored by projected increases in the size of the nation's elderly population, increasing national health expenditures, and by a protracted history of inferior quality of care in the nation's nursing facilities (IOM, 1986, 1996, 2001, 2003). The unit of analysis for this study were individual NFs drawn from the population of free-standing facilities in California (N =1,080).

Generalizability and Study Population

The NFs and residents in this study account for about six percent of all facilities and residents in the U.S. This population shared an array of characteristics with the nearly 1.7 million residents who are cared for in the nation's 16, 500 NFs; these similarities speak to the generalizabilty of study findings. For example, the average number of beds in each NF in this study was 103 and the average facility occupancy rate was 88% (seeTables 5.1, 5.3); these figures are comparable to the average number of beds (107) and typical occupancy rates (89%) in all U.S. nursing facilities in 2007 (NCHS, 2000; AHCA, 2007).

Approximately 57% of facilities in this study were part of a multi-facility chain, which is comparable to the national figure of 56% (IOM, 2003). Total direct care staffing levels, or average hours of care per resident day (hprd), in this study were 3.4. Average RN staffing level in the study population was about .33 hours per day, or about 20 minutes per resident per 24 period, and turnover rates for nursing staff were about 59%. These staffing and turnover figures were both comparable to national data reported by the AHCA for 2007.

Among NF residents in this study, Medi-Cal and Medicare recipients accounted for 64% and 11% of resident days respectively; nationally, 68% of resident days in NF are funded through the nation's Medicaid programs (KFF, 2007). Approximately 67% of the resident population in this study was female compared to 66% nationally (KFF, 2007). Roughly 45% of residents in the study were between the ages of 65 and 85; 3% were younger than 45 years of age, 13% were between the ages of 45 and 65 and the remaining 40% were older than 85. Nationally and in 1999, 10% of NF residents were younger than

65 years of age, 43% were between the ages of 65 and 84, and about 47% of NF residents in the nation were 85 years of age and older compared to 35% in 1977 (Decker 2005).

While the above similarities indicate that the study findings have generalizability potential, there were substantive differences between the study population and the U.S. population of NFs and residents that may also limit generalization of findings beyond California. For example, 88% of facilities in this study were members of for-profit organizations, which is comparable to 86% of all California NFs (CHCF, 2007), but both figures are considerably higher than the 67% of facilities nationally that are classified as FP organizations (IOM, 2001). The average profit margin among the NFs evaluated in this study was 3% and average net income was about $294,000 during 2004. Comparable national income and profitability data for the country were not available for this analysis.

Additionally, the average length of stay (LOS) among residents in this study was shorter that comparable national figures from 1999 (Decker, 2005). For example, sixty-five percent of residents in the study had admissions that were less than three months compared to 18% nationally (Decker). In the California population of free-standing NFs, 25% of resident admissions lasted between three months and two years and the remaining 10% of residents stayed more than two years. Nationally, 25% of residents had a LOS between 3 months and one year, 30% of admissions were between one and three years in duration and about 27% of residents nationally had a LOS that exceeded 3 years (Decker).

The residents of California NFs are also more diverse than the residents in the nation's NFs. About 70% of residents in the study were self-classified as Caucasian compared to about 90 percent nationally (Sahyoun et al., 2001). Hispanic, African American and Asian residents respectively accounted for 13, 10 and 7% of the resident

population in this study, while minorities accounted for only about 10% of NF residents nationally in 1997 (Sahyoun).

In both the study populations and among the larger group of NF residents in the nation, the ADL dependency of residents is an important issue that has implications for staffing levels and quality. In this study, roughly 31% of residents were completely dependent on staff for assistance with three ADLs (i.e., eating [22% of residents were completely dependent], transferring [30%] & toileting [40%]). While comparable data for the national group of NFs was not available for this analysis, the percentages of residents nationally who required (some degree) of assistance with ADL steadily increased between 1977 and 1999 and that growth paralleled increases in the percentage of residents who were 85 years of age and older (Decker, 2005). For example and during 1999, 47% of all NF residents in the U.S. were dependent on staff for assistance with eating (vs. 33 % in 1977), 79% needed help to walk (vs. 67% in 1977), 87% needed assistance with dressing (vs. 70%) and about 94% need help with bathing compared to 87% in 1977 (Decker, 2005).

In terms of socio-demographic measures at the operating market level (i.e., the county in which a NF was located), the study population also differed from the nation. For example, median annual household income in California was $52,866 compared to $48,000 in the U.S. (Organization for Economic Co-operation and Development [OECD], 2006). African Americans individuals accounted for about 7% of county populations in this study, while individuals of Hispanic/Latino and Caucasian race/ethnicity, on average, accounted for 33% and 70% of county populations, respectively. In contrast and during 2000, 12% of the U.S. population self-identified as black or African American, while

about 13% were Hispanic or Latino, 4% were Asian and the remaining 75% were Caucasians (U.S. Census Bureau, 2000).

Regression Models: Overall Summary

The ordinary least squares (OLS) analytical models for each outcome were significant as indicated in Chapter Five; however and because of violations of the assumption of normality of residuals, OLS models were retained for only two of the five outcomes: weight loss and restraint prevalence. For the bedfast outcome, data were further analyzed with both a logistic (LR) and a negative binomial regression (NBREG) model. The remaining two outcomes, validated complaints and total deficiencies (state + federal deficiencies + state citations), were also analyzed with NBREG models because both of these outcomes (along with the bedfast measure) followed a "J-distribution", which was ill-suited to analyses with OLS models. Model summaries are briefly reported below and significant findings across all models are then reviewed for the major types of predictor variables including staffing, organizational, resident and market characteristics

Weigh Loss Quality Indicator Prevalence

The variables in the final OLS model specification for the weight loss are reported in Table 5.4. The untransformed OLS model for weight loss (N = 932 NFs) was significant (F =10.259, df $_{19, 912}$, p <. 001). The adjusted R^2 accounted for 15.9% of the variation in the weight loss outcome; a moderate level of observed variation in the facility-wide prevalence rate for weight loss among residents in each NF. The seim-partial-R^2 values for significant predictors ranged from .007 to .024. The unadjusted R^2 value for this model was 17.6%. The average prevalence rate for the weight loss QI

among the population of 932 NFs in this study was 7.5% with wide variation (i.e., $\pm$ *SD* 3.9).

Restraint Quality Indicator Prevalence

For the restraint QI, the final version of OLS model (Table 5.4) was also significant ($F = 6.620$, df $_{19, 946}$, $p <. 001$), and the optimally-weighted predictors (evaluated by the Adjusted-R^2 value) accounted for 10% of the observed variation in the prevalence rate for this outcome; however and as with weight loss QI, the semi-partial R^2 values (a measure of "explained variance") of the significant predictors were not particularly impressive with values between 0.001 and 0.009. The unadjusted coefficient of determination was approximately 12%. For this population of free-standing NFs (N=966), approximately 16% of residents were restrained in some manner (*SD* 10.7).

Bedfast Quality Indicator Prevalence

In contrast to both the weight loss and restraint prevalence QI models, the OLS models for both the transformed and untransformed bedfast QI outcome violated the assumptions of normality based on qualitative examination of residual plots. Therefore and using the same group of predictors that were included in the OLS models, the bedfast data were fitted to a logistic regression (LR) model (Table 5.5) to predict the likelihood of a NF having bedfast residents and the bedfast prevalence measure was also converted to a count variable and data were also analyzed with an NBREG model to retain the power of a continuous variable (Table 5.6). For the population of free-standing NFs (N =965), 4.8% of residents in were classified as bedfast (*SD* 4.9). In the population about 88% percent of facilities had (some level) of residents who were bed/chair-bound, while 12% of NF had no cases of this QI.

For the logistic model, the bedfast variable was dichotomized into a categorical variable model (i.e., the bedfast QI classified as present or absent). In this case, approximately 12% of NFs had zero cases of residents who were bedfast, while 88% of California free-standing facilities had some level of this QI outcome. The logistic model was significant with a *Pseudo-*R^2 value of 14.7% and with four exceptions the group of significant predictors was comparable to those in the NBREG model (Table 5.6). First, higher percentages of Hispanic residents predicted lower bedfast counts (β = -0.0009) in the NBREG model, while this characteristic was not significant in the logistic model. Second, in the LR model and as the markets became more competitive (measured by the Herfindahl-Hirschman Index) the likelihood of a NF have bedfast residents increased. Third and in contrast to the findings of the bedfast LR model, profit status (i.e., FP vs. NFP) was not a significant variable in the NBREG model at the $p < .05$ level. Lastly and in the NBREG model only, the total staffing level variable was significant (but with a sign that was contrary to hypothesis).

Validated Complaints

For the validated complaints outcome, the OLS models were significant; however, inspection of model residuals (using P-P standardized plots) indicated severe violations of normality assumptions and these count data were also analyzed with an NBREG model (Table 5.7). For the validated complaints measure, data from two years of observations (i.e., 2004 and 2005) were combined to increase power. The analysis was restricted to the population of 1,017 freestanding NFs in California with complete data for this outcome. The average number of validated complaints per facility was 2.3 (*SD* 3.9).

Total Deficiencies

For total deficiencies, OLS models residuals again violated assumptions of normality and deficiency data were also fitted to an NBREG model and based on a population of 1,031 NFs (Table 5.7). The deficiency measure was developed by summing the number of federal and state deficiencies and the total number of state citations that each NF received in 2004 and 2005. The mean number of total deficiencies per facility was 30.02 (*SD* 18.2).

Findings and Significant Predictors

Staffing Characteristics

The role of staff levels, staff turnover, competency, training/experience when coupled with unit and organizational characteristics can influence quality of care (e.g., Donnabedian, 1966, 1988; IOM, 2001, 2003; Shortell & Kaluzny, 2006).

Staffing Level. Across the final versions of the five analytical models (as well as in preliminary or alternate models) and contrary to hypotheses (Ho_3 and Ho_4), the total staffing total level variable (i.e., total hprd for RN, LPN/LVN and CNAs) was either unrelated to the quality outcome measures (i.e., weight loss prevalence, validated complaints and total deficiencies), or significant, but with a regression coefficient that carried an unexpected positive sign (i.e., OLS model and restraint prevalence model; bedfast and NBREG model). In the NGREG bedfast model, for example, a modest one percent increase in hours of total staffing (equivalent to about three additional minutes of care per resident day) was associated with a 20% increase in bedfast prevalence.

These positively-signed coefficients indicate that higher staffing levels are associated with more restraints and more cases of the bedfast QI; this is not only a

counterintuitive finding, but a result that is also contrary to information reported in most of the extant literature (Bates-Jensen et al., 2004a, 2004b; CMS, 2001; Kayser-Jones, 2002; IOM, 2003; Schnelle et al., 2004a, 2004b; Simmons et al., 2003). Other have reported such contrary findings (e.g., Miller, Papandonatos, Fennel & Mor, 2006) and the unforeseen outcomes in the present study likely speaks to one of two key problems: (a) the low total staffing levels in California facilities in general (Mean = 3.4, *SD* 0.61), which may have contributed to a lack of variability in the measure and lead to analyses that were underpowered; and, (b) failure to account for endogenous relationships in the analytical models, especially for analyses related to restraint prevalence. The latter problem has been noted in past literature (e.g., Harrington & Swan, 2003; O'Brien, Saxberg and Smith, 1983) and the issue will need to be better-explored in future research.

The total direct care staffing level of 3.4 hprd in this study (as well as nationally) was well below the optimal level of 4.1 or higher that have been suggested and/or recommended by USCMS (2001) and other sources (e.g., Schnelle et al., 2004b) and this (along with lack of variability in the measure) may account for the absence of significant relationships between staffing levels and three of the five outcome measures. Additionally, and when the total staffing variable was disaggregated and staffing level was evaluated by categories (i.e., <3.2 hprd, 3.2-4.1 hprd, and > 4.1 hprd) or skill ix levels (i.e., the level of RN staffing), the staffing level variables remained non-significant factors in the models. This surprising finding may, perhaps, be attributed to a lack of power because so few facilities (approximately 7%) in California met or exceeded the 4.1 threshold. This finding also raises concerns about the adequacy of California's minimum staffing standard (i.e., 3.2 hprd), which may be far to low to assure high quality care, at

least for the outcomes examined in this research. Other research evidence indicates that the low staffing levels in California may have contributed to the lack of significant findings. For example, Schnelle and colleagues (2004b) study of California NFs indicated that much higher staffing levels (i.e., ≥ 4.9 hprd hours of care) were necessary to assure that staff provided the best care processes related to preventing and/or reducing weight loss, bedfast status and the use of physical restraints.

Of further concern was that the average level of RN staffing in California NFs, which was only 0.33 hprd, or ≃ 20 minutes of RN care per resident per day (i.e., 60 minutes/hour multiplied by .33 hour of care per resident day). This level may have been too low to have had any significant effects on the quality outcomes, especially because an RN staffing level of at least 0.75 hprd (≃ 45 minutes per resident per day) has been implicated as an important threshold the extant literature (e.g., Akinci & Krolikowski, 2005; CMS, 2001; Johnson et al., 2004 a, b, c; Kim & Whall, 2006; Kramer & Fish, 2001; Wan et al., 2006; Zhang et al., 2006; Zimmerman et al., 2002). Low levels of RN staffing may, therefore, have also underpowered the analysis and limited the ability to detect significant relationships (if any) between staffing levels and outcomes that have been reported in prior studies.

In addition to a potentially-underpowered analysis, it is also important to note that this study did not evaluate the influence of staff training, tenure and/or the role of leadership characteristics and other important factors on both QI outcomes and the other proxy measures of quality. In addition to inadequate staffing levels, poor quality has been related, for example, to a lack of training and a dearth of supervision; which, in turn, has been associated with inadequate incontinence care, inadequate repositioning and not

enough mouth care (Bowers & Becker, 1992). Inadequate supervision of CNA staff, for example, has also been implicated as key factor in insufficient nutritional intake and increased prevalence rates of malnutrition and dehydration among NF residents (Kayser-Jones 1996, 1997; Kayser-Jones & Schell, 1997; Kayser-Jones et al., 1999). Avoidable weight loss has also been related to: unattractive food, unpleasant mealtime environments, food choices that lack sufficient nutrients and calories, restricted diets that can be both unappealing and flavorless, and, menus that do not accommodate resident preferences (Chan & Kayser-Jones, 2005; Kayser-Jones, 1996, 1997; Kayser-Jones & Pengilly, 1999; Kayser-Jones & Schell, 1997; Kayser-Jones et al., 1998; Porter et al., 1999). None of these characteristics were evaluated in this study and for QI outcomes and it is important to consider these factors in tandem with adequate staffing levels; particularly when potential policy or clinical solutions are offered.

Staffing Turnover. Castle (2006) reviewed 38 publications that appeared in the indexed/peer-reviewed literature between 1990 and 2003. Despite limitations, the literature generally reports negative relationships between increased turnover and quality (Castle, 2006; CMS, 2001; IOM, 2003). In this study, the mean staff turnover rate in the sample was about 59% and the effects of increased turnover were as hypothesized and consistent with prior literature. Consistent with hypotheses and extant literature (e.g., Castle, 2006; IOM, 2003), staff turnover rates were a significant predictor of poor quality in two of the five models at the $p < .05$ level (i.e., the NBREG models for validated complaints and total deficiencies). A one percent increase in turnover, for example, predicted a 13.5 percent increase in the number of complaints (this is equivalent to one more validated complaint per facility for every three point increase in turnover rate). In

addition, the coefficients for turnover rate carried the expected sign in both the OLS restraint and in the bedfast NBREG models, but only at the $p < .10$ level. These findings are consistent with previous research and with the notion that higher levels of staff turnover lead to poor continuity of care; which may, in turn, lead to higher levels of resident dissatisfaction (measured by more complaints) and/or more problems with overall quality (evaluated by total deficiencies). The lack of significant relationships between turnover and the three QI outcomes (i.e., at the $p < .05$ level) was unexpected. This may indicate that turnover is, perhaps, not substantially related to these three QI outcomes (although the coefficients in the restraint and bedfast model suggests otherwise), or that it may be useful to evaluate these outcomes in a more sophisticated manner by categorizing turnover levels into groups (e.g., low, medium or higher levels) to examine data for evidence of differential outcomes based on the level of turnover. This approach could entail evaluating data for evidence of non-linear relationships or the existence of interactions between turnover and quality, a phenomenon that has been reported in recent literature (i.e., Castle & Engberg, 2006 & 2007).

Organizational Characteristics

Profit Status. In addition to evaluating relationships between quality and staffing characteristics, the second major focus of this study was to evaluate differences in quality between for-profit (FP) and not-for-profit (NFP) facilities. In this study FP facilities accounted for about 88% of all facilities and this raises concerns that NFP may have been under represented, even though they accounted for 12% (or about 130 facilities) in the study. Existing literature along with the strategic management models described in Shortell and Kaluzny's (2006) text, indicate that profit status, or ownership type, facility

size or number of beds, and strategic alliances (e.g., chain membership) can influence quality of care (Hillmer et al., 2005). In addition to these types of measures, this study included analyses to evaluate the relationship between quality and four other organizational characteristics: net income, the percentages of both Med-Cal and Medicare resident days, and the role of family councils. While past literature has addressed most of these measures (e.g., Hillmer et al., 2005; O'Brien et al.1983; Rosenau & Linder, 2003), the relationship between quality and the presence/absence of family councils has not been explored.

Hypothesis Ho_1, projected that NFP nursing facilities compared to their FP counterparts, would have a lower prevalence rates for the three QIs (weight loss, restraint use and bedfast outcome). This hypothesis was supported for the restraint prevalence outcome ($\beta = 3.49$, $p < .05$), but not for either the weight loss prevalence rate or bedfast count at the .05 alpha levels. The coefficient for the profit status variable in the restraint QI model indicates that among FP facilities, and when all other factors in the model were held constant, the restraint prevalence rate was 3.9% higher than NFP facilities and this is likely an underestimate given that the QI is probably underreported (Schnelle et al., 2004b). This type of finding was also reported in a study of NFs in New York (Miller et al., 2006), but in this case the increased risk for being restrained was limited to Caucasian residents only. An alternate explanation may be that FP facilities may do a better job of documenting the use of restraints, which is certainly commendable, though unlikely (Schnelle et al, 2004c). While elucidating the relationship between profit status and this QI is informative, this finding should not diminish the notion that restraints are dangerous

and that their continued use (at any type of facility) should be discouraged (Castle & Mor, 1998; Evans et al., 1997; Phillips, Hawes & Fries, 1993; Sullivan et al., 1999).

Surprisingly, the coefficient for profit status variable in the weight loss model carried a negative sign that was significant at a less conservative alpha level ($p < .10$). This indicates that weight loss was less of a problem (or that it is detected and treated more effectively) in FP facilities than in NFP nursing facilities. Given findings in prior literature (e.g., Hillmer et al., 2005; O'Brien et al.1983; Rosenau & Linder, 2003), this conclusion seems improbable and it may be likely that nursing staff in FP facilities are less apt to detect resident weight loss than staff in NFP facilities, which would lead to lower reported rates for the weight loss QI. In forthcoming research, it may be worthwhile to explore these measures more fully by evaluating the QI variables for potentially endogenous relationships with other important variables (i.e., staffing level, profit status and case mix). For example, the disparate findings for the QI outcomes and profit status may possibly be attributable to staffing levels in FP facilities, which are typically lower than in NFP facilities. However the staffing levels and outcomes were not analyzed by profit status subgroups.

Additionally and consistent with hypothesis Ho_2, FP status predicted higher counts of total deficiencies ($\beta = .143$, $p < .05$) as well as more validated complaints ($\beta = .298$), but only at the .10 level for the latter outcome. The NBREG models predicted about 15% more deficiencies and 35% more complaints among FP facilities when compared to NFP organizations. Although this study did not include sub-analyses to evaluate deficiencies by scope and severity, any factor that predicts more deficiencies is troubling because this measure indicates that FP nursing facilities continue to have

serious quality of care problems that have been reported elsewhere. Such findings raise questions about the ongoing role of FP organizations in NFs. Future research will address the relationship between profit status and both scope and severity of deficiencies and the type of validated complaints. This is an important avenue of inquiry; because, for example, worsening scope and/or severity of deficiencies indicates that NF residents are at risk for immediate harm or jeopardy. Research that identifies important factors (e.g., profit status, unsafe staffing levels, etcetera) and that can help to reduce such risks is still needed.

Facility Size. In addition to FP status, residents cared for in larger facilities (i.e., those with more beds) were more likely to have had restraints applied and NFs with more beds larger facilities were also more likely to have received more total deficiencies than smaller NFs. Similarly and for validated complaints, a larger number of beds in a facility predicted more complaints. For example and for a one standard deviation in the number of beds (an admittedly large change) from the mean value of 106 beds to 154, the predicted number of complaints increased by 43%. The explanation for this finding is unclear, but larger facilities may have less resident-focused (or more impersonal) care and this may be associated with more complaints. This type of finding is ideal for exploration with a qualitative study or a study that includes staff and resident interviews to better identify bed size related factors that are associated with complaints. Future research could also further explore these findings by categorizing NFs (based on number of beds or, perhaps, the number of beds/unit) to determine if there is optimal number of beds; a subject that has implications for NFs and other types of LTC institutions.

Chain Affiliated Nursing Facilities. Chain membership was a significant variable in one of the five models (i.e., restraint prevalence [β = -2.23]) and the coefficient indicates that restraints were less commonly used in NFs that were part of a chain when compared to single facility or non-chain organizations. This finding was contrary to hypothesis, but congruent with the notion that a corporate culture that emphasizes the need to eliminate, or reduce, restraint use (in accordance with the intent of the NHRA) may be a vehicle to effect desirable changes on a larger scale (vs. initiatives that are limited to a single operator or stand alone facility). This study did not evaluate the use of chemical restraints in NFs, although there is evidence that reductions in the use of physical restraints have sometimes been accompanied by concomitant increases in the administration of pharmaceutical agents, which effectively "restrain" NF residents (Miller et al., 2006).

Family Councils. Residents in NFs with a family council were more likely, than their counterparts in NFs with a council, to have had restraints applied in the six day assessment period before an MDS assessment. The family council variable (n.b., the measure was dichotomized as present or absent) was significant at .05 level and the coefficient carried a positive in the OLS model (β = 1.71). The exact role of family councils cannot be inferred from the data sources, but in the case of restraints, perhaps these groups operate under the assumption that restraints help prevent injuries. Whatever the nature of the relationship, this restraint QI finding is undesirable because as Castle and others have noted (e.g., Evans et al., 1997), restraints do not provide security or safety for NF residents and they been associated with negative consequences including the development of pressure ulcers, loss of mobility, increased agitation, depression, falls,

loss of dignity, social isolation and, in the most serious of circumstances, death (IOM, 2001; Castle, 2001).

In contrast, the presence of a family council in a NF was associated with a 13% reduction in bedfast status when compared to facilities without a family council. This too was unanticipated and noteworthy finding, which again raises questions about how councils operate and how exactly do they influence day-day resident care. The variable also carried a negative sign in the weight loss OLS model, though the coefficient was only significant at the alpha < .10 level. Perhaps these groups advocate for an environment (or facility policies) that encourage better nutrition and/or more effective weigh loss detection programs. Similarly, these councils may advocate for activity programs to combat immobility/bedfast problems. Findings from well-designed qualitative research in NFs does suggest that active families and improved communication can play an important role in improving quality of care (e.g., Chan & Kayser-Jones, 2005; Kayser-Jones, 2002; Kayser-Jones et al., 2003). It may be that family councils fulfilled a similar function in the outcomes examined in the present study.

These types of outcome have, again, not been widely reported in the literature and the specific role/functioning of family councils could not be determined in this study. However, the findings do indicate that such councils influence quality of care and this area, like the validated complaint findings, is also ripe for exploration and further study at the resident/family level.

Medicare and Med-Cal Resident Days. The percent of Medicare and/or Medi-Cal days was related to several of the quality of care outcomes. First and for the weight loss QI, higher percentages of Medicare resident days in NFs predicted more weight loss. This

is not an entirely surprising finding because these residents also tend to have higher levels of acuity (which may be associated with weight loss) and this seems to be the case in the weight loss model because CMI, one of the two case mix measures, was also significant. However, these finding are troubling because Medicare reimbursement levels far exceed those of state Medicaid/Med-Cal programs and this differential ought to mean that NF residents (in facilities with higher percentages of Medicare reimbursement) receive sufficient care to assure that quality problems are detected, avoided and/or reversed, avoidable including weight loss and unnecessary restraint use. The QI captures weight loss between two or more points in time and while residents admitted with weight loss problems could generate higher prevalence rates. Over the long term it is reasonable to expect NFs with more resources to detect and, more importantly, combat weight loss; at present, however, it is clear that NFs have failed to reduce the rate of this harmful outcome in California.

Similarly, increases in the percentages of Medi-Cal residents predicted higher levels of the bedfast QI. This was not entirely surprising because facilities with higher proportions Medi-Cal resident days (compared to Medicare) have lower revenues, which is usually accompanied by lower levels of direct care staff (though recall that the staffing variable unexpectedly carried a positively-signed coefficient these regression models. Figures 5.4 & 5.5). Such deficits may place residents at risk for inactivity, which can manifest itself by increased prevalence rates for the bedfast QI. In the study population in the LR model, a 1% increase in Medi-Cal days was associated with a comparable 1.5% increase in the number of NFs that cared for who were classified as bedfast. Comparably

and at a less rigorous alpha level, increased percentages of Medicare resident days also predicted more restraint use.

In addition and as the percentage of Med-Cal resident days increased, NFs were more likely to have had more validated complaints and higher levels of total deficiencies. These disturbing findings indicate that these Medi-Cal funded residents received lower quality of care and/or that they (or their advocates) were more likely to voice concerns about quality that were subsequently validated by state investigators. For both validated complaints and total deficiencies, a 1% increase in the proportion Medi-Cal funded days, predicted a about a 1% increase in number of both outcomes. More dramatically and for (an admittedly, large) one standard deviation increase in the percentage of Medi-Cal residents, the model predicted a large 30% increase in the number of validated complaints and a 13% increase in the number of total deficiencies.

Collectively, these finding replicate evidence in the LTC literature and provide further confirmation that Med-Cal recipients continue to receive inadequate care. Given that NFs are primarily funded through Med-Cal (or Medicaid nationally), the scope of this problem is substantial and speaks to the need for policy and regulatory changes to assure that NFs improve quality of care and that they are adequately compensated through Medi-Cal/Medicaid programs to assure that residents are well-cared for.

Resident Characteristics

Racial/Ethnic Diversity. For resident characteristics, several quality outcomes were related to the racial/ethnic characteristics of residents. Negatively-signed coefficients across each of the regression models indicates that increased racial/ethnic diversity in some way, and quite unexpectedly, seemed to foster better quality, especially

for the QI outcomes. This benefit persisted even given the fact that most resident care in this study was funded by Med-Cal and the quality of care in Medi-Cal/Medicaid funded facilities has generally been poor compared to private pay or Medicare funded days (Mor, Zinn, Angelelli, Teno & Miller, 2004). While strategic management underscores the importance of patient/resident characteristics, the literature contains few examples where increased racial/ethnic diversity is associated with better quality. In fact, the HSR research literature, across many settings, clearly indicates that racial/ethnic minorities (compared to Caucasians) receive less adequate care and minority populations are far more likely to experience adverse outcomes than Caucasians (Fennell, Miller & Mor, 2000; Smith, Feng, Fennell, Zinn & Mor, 2007). Some of these adverse outcomes and disparities reported in the published literature may be attributed to the conclusion that minorities tend to enter lower quality homes (Angelelli, Grabowski & Mor, 2006) or that minorities tend to enter NFs that care for relatively high proportions of Medicaid recipients (Mor et al., 2004), which may mean that adequate resources to provide good quality of care are not available. However, in the present study and despite the high proportion of Medi-Cal funded resident days, quality of care for racial and ethnic minorities was better than expected, at least for the QIs outcomes that were examined. In the current study information on the past quality of NFs, the degree of racial/ethnic integration or segregation, or the degree of segregation by the level of Medi-Cal funding was not explored, but these issues represent promising avenues for future research.

In this study, increased percentages of Asian American residents in a NF, for example, predicted fewer validated complaints and fewer total deficiencies and lower prevalence rates for each of the three QIs evaluated: weight loss, restraint and bedfast.

Similarly, higher percentages of African American residents in a NF predicted significantly lower prevalence rates for both the weight loss and the restraint QI. This relationship was also reported (for restraints) by Miller and colleagues (2006). Unfortunately and in the Miller study, less use of physical restraint was accompanied by administration of more chemical restraints to African American residents, which suggests substitution of restraint therapies may be occurring. In the present study and at a less rigorous alpha level, NFs with more Latino residents also had lower prevalence rates for the weight loss QI. In addition, the analytical models indicate that NFs with more Hispanic/Latino residents had lower restraint and bedfast rates as well as a reduced risk of having any bedfast residents. For example and as the percent of Asian and Hispanic resident increased by one percent, the number of residents who were not classified as bedfast decreased by just less than one percent. Similarly and expressed as a standard deviation change, a one standard deviation change in the percent Asian and Hispanic resident respectively was associated with a 9.5 and 11.5 percent decrease in the prevalence rates for the bedfast QI. Recall that the bedfast measure was: (a) converted to a count variable or the NBREG model; and, (b) dichotomized as a zero prevalence rate or a rate greater than zero for the logistic regression models. These types of unforeseen findings have not been widely reported in the literature and despite the small coefficients and semi-partial R^2 values (i.e., .026-.029), this phenomena would benefit from additional qualitative and observational studies to help account for the (seemingly, beneficial) effects of racial/ethnic diversity. Kayser-Jones and colleagues (2003) for example have reported that increased family involvement is a crucial factor and one that leads to more favorable resident outcomes. Similarly, Chan and Kayser-Jones (2005) noted that NFs

can improve quality of care by adapting interventions to account for diverse cultural preferences that influence care and that are, in part, engendered by increased racial diversity. It is quite conceivable that California's diverse population, and changing care practices related to that diversity, may have contributed to the favorable QI findings here.

The racial/ethnic composition of the resident population was also a significant factor in the models for validated complaints and total deficiencies, but these findings run counter to the (seemingly) favorable QI findings related to racial/ethnic diversity of residents. For complaints, the model coefficients for both the percentage of Asian American and Hispanic residents carried negative negatively signs, which indicates that increase diversity led to fewer complaints to state agencies. For example, a 1% increase in the percentage of Asian American and Hispanic residents respectively was associated with 18.5 and 6.8% fewer validated complaints. Similarly and in the total deficiency model, increased percentages of Asian American residents predicted fewer deficiencies. These data may indicate that minority residents are less likely to voice concerns about poor quality care to state agencies, but given the favorable QI findings, it may be that minority residents and/or their advocates are more likely to intervene at the facility level to address quality problems and thereby avoid involvement of regulatory agencies. Kayser-Jones (2002) discussed the effects of improved communication (between residents, family, nursing staff and providers) and while this factor was not explored in this study it may have played a role the outcomes. The findings related to the family council variable suggest this possibility. The disparity between the QI and deficiency/complaint findings warrants further research at the resident/advocate resident/provider levels to disentangle the nature of relationships between diversity and

quality. In addition and as Fennell and colleagues (2000) discussed, it may also be appropriate in future research to consider the level of integration/segregation in NFs as one considers the effects of racial/ethnic minorities on quality. For example, they noted that increased segregation predicted poorer quality, but the reciprocal situation may have been a factor in California studies with more diverse NFs providing better care. Future research can help to clarify this phenomenon by including measures in analytical models that account for the degree of segregation/integration in a facility (e.g., the Dissimilarity Index described by Smith et al., 2007).

Resident Case Mix. The resident case mix measures (ADL dependency and CMI) were significant factors in several of the models as predicted. These measures were used to account for variations in resident acuity, which is a particularly important component of this research and one that permits less biased comparisons between different types of facilities (Arling, et al., 1987; Fries, 1990; Fries et al., 1994), especially given that the QIs were not designed do not account for resident acuity or co-morbidities. The significant coefficients generally carried positive signs in the models, but the significant measure varied depending on the outcome. The ADL dependency measure, for example, was significant and positively-signed coefficient in the restraint prevalence QI model, but not in the weight loss OLS model. The CMI variable was a significant factor in both the weight loss OLS and the bedfast NBREG models.

Moreover and in the bedfast model, both acuity measures were significant and each carried a positively signed coefficient; this indicates that residents who were more dependent on nursing and therapy staff for help with ADLs and those were who were expected to need more staff/therapy time were more likely to be classified as bedfast. In

this model, a one standard deviation increase in either of the two acuity measures lead to a corresponding 22-26% increase in bedfast status. Or expressed in percentages, a 1% increase in ADL dependency, for example (i.e., score derived from the percentages of NF residents who were dependent on staff for assistance with eating, ambulation and toileting), was associated with a 1.5% increase in the percentage of resident who were classified as bedfast.

These findings indicate that NFs with residents who were more dependent provided lower quality of care, even though both measures were not significant in all of the QI models. The lack of uniformly signed coefficients for both measures in the analytical models (other than the bedfast models) is curious and suggests that these two variables may not be equivalent measures of case mix, even though they are both been used (interchangeably) in the literature to account for case mix. This is somewhat surprising because the ADL dependency measure is a component of the RUGs system, which is the source for the CMI measure (Fries et al., 1994). Disparate findings related to the case mix measures was especially evident and perplexing in the validated complaint NBREG models in which both acuity measures were significant, but the coefficients carried opposite signs. In this case, increased ADL dependency of residents (i.e., at the facility level) predicting 12.6 percent fewer complaints (β = -0.010), while higher CMI predicted 14.7 percent more complaints (β = 0.413). Neither of the two resident acuity measures was significant in the deficiency model, which is again peculiar because deficiencies can be preceded by validated resident complaints.

Market Characteristics

Racial/Ethnic Diversity. For the operating market characteristics (i.e., measures evaluated at the county level for each NF) and for the weight loss and restraint outcomes, the OLS models included surprising findings related to the race and ethnicity of residents in each county. For example, higher percentages of African American and Hispanic residents at the county level were all associated with lower prevalence rates for both QIs, though at a less rigorous alpha level for weight loss for the former group. The comparison group for this analysis was Caucasian residents. These types of findings have not been reported in the HSR literature and the explanation may be that racial and ethnic minorities are not as closely scrutinized for this QI, this is not entirely unlikely because evidence suggests that NFs provide poorer care to minorities. However, it may also be that family members and/ resident advocates in the larger community are more likely to monitor nutritional status and weight loss of NF residents, or they may provide supplemental and culturally-sensitive nourishment as reported by Kayser-Jones (e.g., 1996, 1997). By doing so, resident advocates may help to detect, prevent or reverse weight loss, which would also account for the lower QI rate of this avoidable outcome. In addition to racial/ethic factors and for the weight loss QI, higher median family incomes at the county level were also associated with lower prevalence rates, indicating that NF residents in wealthier communities were less likely to suffer weight loss.

The racial/ethnic composition of a county's population was also a significant and negatively-signed predictor in the total deficiency model. For example, a one percent increase in Hispanic and African American individuals in the operating market was predictive of one-two percent fewer deficiencies per facility. For the validated complaints

measure and at a less rigorous alpha level (i.e., $p < .10$), these relationships persisted for increased percentages of African Americans in the operating market. Also at a less rigorous alpha, median family incomes (at the county level) carried a positively signed coefficient for the validated complaint measure. This indicates that as family median income increased at the county level, there was a trend toward more complaints.

Again and as with the racial/ethic characteristics of NF residents, is not at all clear what causative role, if any, that a diverse county-level community has on the occurrence of these quality outcomes. It may be that NFs in relatively diverse counties provide better care (as evidenced by fewer deficiencies), though that would be a novel finding. Alternatively, NFs in diverse counties may perhaps be subject to less scrutiny from regulatory agencies or family members and/or residents of racial/ethnic minorities may be less inclined to voice complaints, while residents and/or family members in wealthier counties may tend to voice more complaints. It is reasonable to speculate that multicollinearity between county-level racial/ethic characteristics and income may be a problem in the model because these types of measures are typically related, but the correlation between these measure (e.g., percent Hispanic and median income at the county level) were low-moderate and the VIF and tolerance statistics were stable and when both types of measures were included in the same model.

Bed Supply and Competition. Excess bed capacity measure, a market level measure of competition based on occupancy rate, did not contribute significantly to any of the five models (contrary to expectations). This finding was contrary to recent research, which found that competition (measured by lower occupancy rates) had favorable effects on eight of fifteen Nursing Home Compare quality measures (Castle, Engberg & Liu,

2008). The relationship was especially consistent for the short stay measures (Castle, et al) and the beneficial effects of competition did not extend those QIs that evaluate care for long-stay residents, including the three QIs that were evaluated during this dissertation research. The three QI measures in this study (and in the Castle et al., study) were not significantly sensitive to the effects of competition, as measured by occupancy rate or excess bed capacity.

However and in contrast, the Herfindahl-Hirschman Index (HHI), a more commonly used measure of competition, or market saturation, was a significant factor in two of five models (i.e., bedfast and restraint QIs), but only at an alpha level of $p < .10$ for the restraint measure. In the bedfast model and as the value of the index increased, the measure was predictive of more bedfast residents. For example, as the value of HHI increased by one standard deviation, the average number of bedfast residents in each NF increased by approximately 11%. This indicates that as operating markets become more concentrated (i.e., less competitive) residents were more likely to be in bed or in a chair unnecessarily. Even though this finding is in the direction hypothesized, it is rare for this predictor to be significant factor in regression models in the LTC literature. This typer of finding may lend credence to demands for market driven approaches, or to consumer choice models (Castle et al., 2008), to stimulate quality improvement because the findings from this study suggests that NFs may not have an incentive to improve care in operating markets characterized by less competition. It would be illustrative to further evaluate data by subgroup analysis to determine if outcomes differed by the level of competition and the type of ownership.

In contrast and for the restraint QI model, the coefficient for HHI was negative (i.e., $\beta = -6.39$, $p < .10$), indicating that there is a trend toward less restraint use in more concentrated markets. This trend was contrary to findings reported by Miller and colleagues (2006), in a study in which increased occupancy rate was the measure of competition.

Limitations

Even though the study population shares important characteristics with the national sample of NFs, this study has several important limitations. First, analyses are based on federal and state data sources which have been subject to repeated concerns about their accuracy, reliability and utility in quality of care research. Literature related to these issues is discussed in some detail in Chapter Three. However, to illustrate the problem, it is worthwhile to consult the findings in a well-designed prospective study of California NFs (Schnelle et al., 2004c). The authors provided empirical evidence that underscores concerns about the inaccuracy/validity of NF medical records; they repeatedly found instances in which the content of resident medical records contrasted sharply with the meticulous clinical observations of the research team. This is a serious issue, because resident medical records are the key source of data for federal/state agencies, especially for data related to the MDS.

The utility of the findings drawn from this study are also inherently limited by the cross-sectional design of the analyses, potentially endogenous relationships among variables, and by the measurement of outcomes at the facility level. Each of these deficits is challenging, but the measurement of variables at a single point in time is particularly problematic because it prevents causal inferences (i.e., temporal distinctions or temporal

ordering) between selected predictors and outcomes (Hulley et al., 2001). This is an especially critical problem for the QI outcomes because it would be ideal to prospectively observe and evaluate the relationships between the (significant) predictors reported in this study and resident outcomes. Prospective analysis can provide important contextual information and better account for the specific role of key independent variables.

In contrast, the strengths of a cross-sectional design include the ability to: (a) efficiently generate descriptive information about the prevalence of selected outcomes, (b) study several quality-related outcomes at once, and (c) examine networks of causal links among variables of interest (Hulley et al, 2001). While the findings from a single year of data and the absence of resident level observations are serious concerns, the study has laid the groundwork for a more comprehensive and forthcoming longitudinal analysis based on multi-year data for California (i.e. 2001-2006). That analysis will include more rigorous evaluation of the relationships between resident, staffing, ownership characteristics and quality of care in California NF. These models will also include additional market, regulatory, political and financial variables that were not thoroughly evaluated during this study.

Conclusions

The predictor and outcome variables evaluated in the various analytical models for this research are comparable to measures that have been reported in the empiric HSR literature. In addition to being representative of existing literature, these variables were selected because they are typical of the types of measures that have been evaluated in analyses based on a structure, process, outcome (SPO) and strategic management (SM) frameworks. The analytical model included important characteristics of the operating and

clinical environments. The model offered a useful lens through which to evaluate the relationships between quality of care, staffing, organizational, resident and operating market characteristics. In addition, the use of a conceptual model that is grounded in SM theory added new insights into the HSR and organizational behavior literatures by providing a framework to assess the influence of economic, social, and competitive pressures on the quality of care provided in the nation's NFs. The findings generated from this study complement existing literature and add important information that can be used in California, and other jurisdictions, to improve care for the nation's geriatric population; especially because conclusions from this type of research can be disseminated to non-academic audiences to guide changes in both clinical practice and health policies related to NFs.

In their conception of the important domains of managerial activity (or agency), Shortell and Kaluzny (2006) (as well as their coauthors, Flood, Zinn & Scott), emphasize the key role that managers can fill in creating high-performing health care organizations. As they suggest, an organization's managers make decisions based on an array of controllable and relatively uncontrollable factors that influence organizations and alter outcomes. These factors can include environmental, interorganizational, organizational, unit, patient/resident, and the various provider characteristics that that were evaluated in this study (i.e., Figures 2.1). While this study did not include a broad array of measures for each of these important types of factors, the conceptual (Figure 2.3) and analytical models included variables that represent organizational and unit characteristics (e.g., facility size; ownership type; funding, reimbursement and income measures; staffing levels; and turnover rates), along with measures that characterize the environmental and

interorganizational features of the operating market (e.g., market level measures of competition and data related to chain membership). The study also did not include variables to account for provider characteristics (e.g., type of training, years of experience or acquisition of specialized geriatric care competencies) that have been shown to be of important components of quality (e.g., Bowers & Becker, 1992; IOM, 2001; Kayser-Jones & Schell, 1997). The analytical models did, however, include an array of sociodemographic and case mix measures to account for the characteristics of NF patients/residents and characteristics of county-level populations.

The use of the most reliable federal quality indicators (i.e., the weight loss, restraint and bedfast QIs) as key outcomes and total deficiencies complements existing HSR literature. This study also extended the health quality literature by evaluating factors that are associated with the total number of validated complaints, a consumer-centered quality measure that has not been well-studied and that may be of use on a national scale to evaluate quality in all NFs. Complaints provide valuable information about multiple dimensions of NF care including, for example, staffing factors, mistreatment of residents and violations of residents rights and these measures may, as Stevenson (2005, 2006) has suggested, be more relevant measures of quality because they reflect resident/family perceptions about the caliber of care provided in nursing facilities.

In addition to these benefits, HSR based on California data offered an excellent opportunity to explore NF quality of care because the state has comprehensive data sources (especially related to staffing & financial measures) that are more extensive than measures available in federal information sources. As Harrington and Swan (2003) noted, California provides an ideal model to evaluate the complex relationships between quality

of care and resident, staffing, organizational, financial and market characteristics because it is one of the few states with uniform, relatively comprehensive and mandatory reporting system, including a public dataset of state level citations and deficiencies that are not typical of other states. California agencies also collect an extensive array of financial measures that provide detailed information about NF revenues and expenditures that are not captured in federal data sources. Combining these comprehensive state datasets with extensive federal sources (including Census & operating market data) permitted a thorough analysis of the factors that influence quality of care.

Findings drawn from California are also important because the state provides the largest percentage (7%) of NF beds of any jurisdiction in the nation (Harrington et al., 2000c). Moreover, the findings from this study may be generalizable to NF residents in other states, because NFs in California share characteristics with those in other states, including similar payer sources as well as comparable staffing levels and occupancy rates that were described earlier.

Lastly, California has an ethnically diverse population that offered an unparalleled opportunity to evaluate the relationship between quality of care and the racial/ethnic characteristics of both NF residents and communities. The surprising findings from these analyses indicate that racial/ethnic diversity at both the facility and county level was associated with relatively better quality. Additional research in this area (that includes primary data collection) is indicated, especially because of projected increase in the diversity of the U.S. population and also since the findings are generally contrary to earlier HSR; research which has generally reported that minorities in nursing facilities receive less adequate care than their Caucasian counterparts.

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APPENDIX

DATA SOURCES

Automated Certification Licensing Administrative Information & Management System

The ACLAIMS dataset is a public database maintained by the California Licensing and Certification Program (L&C). In California, officials of the L&C Program are responsible for surveying and certifying nursing facilities (NFs) on behalf of the Centers for Medicare and Medicaid Services (CMS). The dataset includes information about both facility and resident characteristics, along with the number, scope and severity of state and federal deficiencies. This data seta also includes information on state level citations which are combined with the number of state and federal deficiencies and treated as an outcome variable for this study. In addition to these measures, the ACLAIMS data set also includes data collected (by L&C staff) during complaint investigations, which may occur at anytime (i.e., outside the annual certification survey). The number of validated complaints was treated as an outcome in this study. The data drawn from each of these sources is intended to be used as a tool to assure that the nursing home residents receive quality care in a safe and comfortable environment that is in accordance with rules established by CMS (USCMS, 2006) and based on the language and goals that were codified in the 1987 Nursing Home Reform Act (OBRA-1987). The ACLAIMS database is regarded as a good source of information because these data are directly collected and inputted by L&C staff during annual (on-site) and/or periodic complaint surveys of NFs.

California Office of Statewide Health Planning and Development

The *CA-OSHPD* dataset includes key financial information that is reported on annual and mandatory cost reports submitted, by NF operators, to the State Department of Health. This dataset includes information from all certified NFs, except for those that are federally owned. In contrast to the relatively limited financial data available from CMS, the CA-OSHPD reports include year-round cost data for each NF, including detailed information on staffing levels, revenues and expenditures. The database also includes data on profit status and county level factors that was used to construct the Herfindahl-Hirschman Index. For analyses, one must rely on the face validity of reports submitted to CA-OSHPD staff members, who are required to review the content of the reports during a desk-audit and they also ask facilities to submit corrections or resolve discrepancies as needed. The reports are not, however, subject to on-site audits or direct verification for accuracy by CA-OSHPD staff. The information available from CA-OSHPD cost reports include: (a) facility characteristics, including county and region, ownership, facility size (number of beds), occupancy rates and the percentages of Medi-Cal (which is the name of California's Medicaid program), Medicare and private pay funded days in each NF; (b) staffing characteristics, which include hours of care per resident day (Hprd) of care provided by each type of staff, and measures of staff turnover; (c) financial measures (i.e., wage and benefit expenditures per employee); and, (d), socio-demographic characteristics of residents (i.e., gender, age, race/ethnicity, length of stay).

Online Survey Certification and Reporting System

The OSCAR system is a uniform, public and national administrative database maintained by CMS. This computerized database includes a variety of facility and

resident-level information, which is entered by facility staff and/or by personnel from state survey agencies during onsite certification surveys that occur every nine to fifteen months. In California, these data are subject to audit/verification by personnel from the California L&C program. During this study, information in the OCSAR databases will be used during analyses to account for resident dependency related activities of daily living (ADL); this a case mix measure for each NF that is derived from the degree of dependency among all NF residents and based on three tasks: eating, transferring and toileting.

Minimum Data Set

Both the resource utilization groups (RUGs) classification system and the quality indicators (QIs) that were analyzed in this study are created from Minimum Data Set (MDS) reports. These MDS reports include resident-level assessments that are submitted to CMS, on at least a quarterly basis, by each Medicare and/or Medicaid certified NF (Fries et al., 1994; Zimmerman et al., 1995), and contains information on each resident's health, physical functioning, mental status, and general well-being. These data are reviewed by NF inspectors during the course of surveys, but the information is not formally audited to assess accuracy. These data are used by NFs to assess resident needs and to develop unique plans of care for each resident. A related measure, the case mix index (CMI) for each NF, is a summary of the RUGs classification data that was also used in this study (together with ADL dependency) to control for resident case mix.

Resource Utilization Groups.

The RUGs classification system (now in its third iteration and known as RUGs-III) is based on an assessment of three dimensions that quantify the expected levels of nursing

and/or therapy staff time (described as level of resource consumption) that is needed to care for residents who are classified into one of 44 homogenous and mutually exclusive categories (Clauser & Fries, 1992; Fries, 1990; Fries & Cooney, 1985; Fries et al., 1994). To uniquely classify each NF resident, individuals are first assigned to one of seven hierarchal categories, based on the anticipated levels of nursing and therapy care needed by each resident, including: special rehabilitation, extensive care, special care, clinically complex care, impaired cognition, behavioral problems and reduced physical functioning (Fries & Cooney). Second, each resident's activities of daily living (ADL) needs are evaluated using the MDS-ADL subscales, which conceptualize ADL ability by evaluating each resident's level of independence for the following tasks: eating, toileting, bed-chair transfers, and bed mobility for residents who were classified as bed-bound (Fries & Cooney). Third, the type and duration of necessary specialty services is projected for each resident (e.g., the level of therapy, rehabilitation care and specialty services such as social workers, dentist, and speech language pathologists) (Fries & Cooney).

Quality Indicators

The initial quality indicators (QIs) constructed by Zimmerman and colleagues (1995) were developed in consultation with a broad array of LTC clinical disciplines and interest groups (including nursing, medicine, medical records social work, dietetics, physical occupational and speech therapy, facility administrators and resident advocates). The QIs were selected to assess the clinical, functional, and psychosocial dimensions that are thought to be important components in NF quality. The final group of CHSRA measures evaluate 11 different aspects of resident care that are similar to the quality

domains described by the Institute of Medicine (IOM, 2001) including: (a) accidents, (b) behavioral and emotional patterns, (c) clinical management, (d) cognitive functioning, (e) elimination and continence, (f) infection control, (g) nutrition and eating, (h) physical functioning, (i) psychotropic drug use, (j) quality of life;, and (k), skin care (Zimmerman, 2003; Zimmerman et al., 1995). For this research, three of the fourteen current QIs currently reported by CMS, and based on the CHRSA measures, were analyzed as dependent variables: (a) nutrition and eating, assessed by the prevalence of weight-loss, an outcome measure in the CHSRA classification schema (Zimmerman et al., 1995); (b) physical functioning assessed by prevalence of bedfast residents, another outcome measure; and (c), quality of life, assessed by the prevalence of daily physical restraint application, a process measure in Zimmerman's typology (Zimmerman, 2003).

Financial and Census data

Market level socio-demographic and economic measures, from the year 2000, were obtained or developed from both the county-level Area Resource File (ARF) that is maintained the U.S. Department of Health and Human Services, and constructed from U.S. Census and Bureau of Labor Statistics data, and the California Department of Finance population measures. These variables include, for example, population descriptors (age, gender, race/ethnicity, etc.), income data, disability and average educational level in each California county.

PUBLISHING AGREEMENT

It is the policy of the University to encourage the distribution of all theses and dissertations. Copies of all UCSF theses and dissertation will be routed to the library via the Graduate Division. The library will make all theses and dissertations accessible to the public and will preserve these to the best of their abilities, in perpetuity.

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