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Nursing Homes' Compliance With State Nurse Staffing Standards And Its Relation To Quality-of-care Deficiencies

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NURSING HOMES' COMPLIANCE WITH STATE NURSE STAFFING STANDARDS AND ITS RELATION TO QUALITY-OF-CARE DEFICIENCIES

by

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ABSTRACT

The purpose of this dissertation is to examine nursing homes' compliance with state minimum nurse staffing standards and its relation to quality-of-care deficiencies. Specifically, this study, reviewing staffing standards from 50 states and the District of Columbia for the year 2007, proposes a unique algorithm to calculate the states' expected nurse staffing levels for individual nursing homes in order to investigate their compliance with the state nurse staffing standards. By using hierarchical linear modeling method, this study attempts to capture the impact of the staffing standards on actual nurse staffing levels under resource dependence perspectives. Path analysis using structural equation modeling was conducted to investigate both direct and indirect effects of the staffing standards on nurse staffing levels and quality-of-care deficiencies.

The major findings were as follows: (1) nursing homes in states with higher state staffing standards for the categories of RN, LN, and total nurse were found to have higher RN, LN, and total staffing levels, respectively; (2) higher nurse staffing levels resulting from higher state staffing standards were significantly associated with better quality of care (less quality-of-care deficiencies cited) in nursing homes; and (3) state staffing standards were found to have much stronger contribution to nurse staffing levels than any other organizational or contextual factors while nurse staffing levels, particularly licensed staff, were found to have stronger contribution to quality-of-care deficiencies than any other organizational factors.

The study findings suggest that if the goal is to increase nurse staffing levels for better quality, increasing the stringency of both federal and state nurse staffing standards would be the

most effective way. However, the staffing standards first need technical changes to reduce their ambiguity and ensure their fairness. If the goal is to achieve better quality, merely increasing nurse staffing levels may not be effective since the variation of the quality-of-care deficiencies explained by exogenous variables was smaller than random variation 5%. If state Medicaid reimbursements can be utilized for financial incentives for better performing nursing homes, nursing homes may improve their productivity by efficiently managing organizational personnel or increasing job satisfaction among nursing practitioners. Lastly, longitudinal analysis, considering variation in length of state staffing policy implementations, is encouraged to investigate the long-term effects of state staffing standards on nurse staffing levels and quality of care.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

The purpose of the study is to investigate the relationship between state minimum nurse staffing standards and nurse staffing levels in U.S. nursing homes certified by Medicare and Medicaid, and to examine their impact on quality of care. This study seeks to explore 1) variation in state minimum staffing standards across fifty states and the District of Columbia, 2) the degree to which state minimum staffing standards could affect nursing homes' nurse staffing levels, and 3) the extent that nurse staffing levels could contribute to the improvement of quality of care in nursing homes, controlling for the effect of organizational and environmental factors. This chapter presents the background and development of federal and state nurse staffing standards, significance of the study problem in relation to nurse staffing levels and quality of care in nursing homes, and research questions.

Background

Quality of care in nursing homes has been a national concern for the last fifty years (Wan, Breen, Zhang, & Unruh, 2010). Many studies have associated the poor quality of nursing home care to both quantity and quality inadequacy of nurse staffing (Akinci & Krolikowski, 2005; Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000; Kim, Harrington, & Greene, 2009; Schnelle et al., 2004; Weech-Maldonado, Meret-Hanke, Neff, & Mor, 2004). Because of the importance of nurse staffing levels to the processes and outcomes of care, there have been ongoing debates and investigations concerning the appropriate level of nurse staffing to ensure

adequate care quality for nursing home residents. Accordingly, minimum nurse staffing standards for nursing homes have become a major long-term care policy issue for improving the quality of care in nursing homes (Harrington, 2002; Wells, 2004).

In 1965, the Medicare and Medicaid programs were first enacted, along with federal regulations to ensure an acceptable quality of care provided in nursing homes. However, it was generally acknowledged that the quality of nursing home care remained low in the 1970s and 1980s (IOM, 1986). Responding to a growing concern about the poor quality of care in nursing homes, Congress commissioned a study by the Institute of Medicine (IOM) to find ways for improving the quality of care in nursing homes. The IOM report in 1986, broadly indentifying serious quality-of-care problems in nursing homes, strongly recommended the necessity for establishing stronger federal regulations on nursing homes (Kumar, Norton, & Encinosa, 2006). Subsequently, the federal government strengthened national nurse staffing standards for nursing homes through the Nursing Home Reform Act (NHRA), as a part of the Omnibus Budget Reconciliation Act of 1987 (OBRA '87).

The 1987 staffing standards require all nursing facilities certified for Medicare and Medicaid to have: (1) a registered nurse director of nursing (RN DON); (2) a registered nurse (RN) on duty 8 consecutive hours per day for 7 days a week; (3) a licensed nurse (LN) -- either RN or licensed vocational nurse (LVN)/licensed practical nurse (LPN) -- on duty for 24 hours per day for 7 days a week (including the required RN hours); and (4) a minimum of 75 hours of training for nursing aides (NAs). The standards allow DON and RN to be the same individual for nursing homes with fewer than 60 residents. In addition, the law requires that facilities have

"sufficient nursing staff" to provide nursing services to maintain the highest levels of physical, mental and psychosocial well being of residents (Zhang & Grabowski, 2004).

Significance of the Study Problem

Despite the new reinforced staffing standards, their adequacy and specificity have long been criticized by many consumer advocates and professional nursing organizations that have argued for better staffing policy by mandating specific staffing ratios for nursing homes (Harrington et al., 2000; Mueller et al., 2006). Since the federal staffing policy does not provide specific nurse-to-resident staffing ratios for RNs, LVNs/LPNs, or NAs, it is not fair to apply the same staffing policy to nursing homes which have different sizes or different acuity levels (i.e., severity of impairment) of residents. In addition, the lack of specificity in the regulation, because the federal policy does not mandate minimum hours per resident day (HPRD) for nursing aides (NAs), would make it difficult for the state surveyors to determine whether facilities are providing "sufficient nursing staff" to meet resident needs (CMS, 2000, 2001).

Although some of studies found positive impacts of OBRA '87 (especially the Resident Assessment Instrument[1]) on the improvement of quality of nursing home care (Fries et al., 1997; Hawes et al., 1997; Phillips et al., 1997), serious quality-of-care problems in nursing homes have

[1] The Resident Assessment Instrument (RAI) that all Medicare- and Medicaid-certified nursing facilities are mandated to use under OBRA '87 is a standardized uniform assessment process to assess and plan the care of residents. The RAI is mainly composed of two parts; (1) the Minimum Data Set (MDS) which is the core functional assessment instrument of the RAI and covers 13 domains with more than 400 items, including functional, cognitive, behavioral, and nutritional status; and (2) the Resident Assessment Protocols (RAPs) are guidelines for additional, more highly focused resident assessment, based on a unique set of problem conditions triggered by the MDS. Although it is originally developed for comprehensive resident assessment and individualized care planning, the RAI/MDS is variously used as data source to determine Medicare eligibility, generate quality indicators used in the inspection of nursing homes by government agencies, plan quality improvement activities by facilities, and regulate nursing home payment rates to reflect differences in the amount and type of care that residents need.

been cited in many other studies. A series of government reports found that more than 25 percent of nursing facilities nationwide had serious deficiencies[2] that caused actual harm to residents or the potential for death or serious injury, and more than 40 percent of these facilities were cited for the serious deficiencies again over time (GAO, 1998, 1999a, 1999b, 1999c). Some other government reports pointed out that these persistent quality-of-care problems were partially due to staffing issues such as inadequate levels of nursing home staff, high turnover, lack of training, and poor quality staff (OIG, 1999a, 1999b). Accordingly, since the enactment of OBRA '87, consumer advocacy, professional nursing organizations, and policy-makers have debated how the federal government should regulate nurse staffing levels and have called for establishing higher minimum federal nurse staffing requirements for nursing homes (Harrington, 2002, 2005b).

Several different minimum nurse staffing levels have been examined and proposed by experts in various fields. The Centers for Medicare and Medicaid Services (CMS) completed two comprehensive studies (Phase I and Phase II) of appropriateness of minimum nurse staffing ratios and presented evidence that there existed critical nurse staffing ratio thresholds below which nursing home residents are at a substantially increased risk of quality-of-care problems. In the phase I study, it was found that 2.75 hours per resident day (HPRD) for total nurse staffing

[2] To participate in Medicare and Medicaid programs, a nursing facility must meet federal and state standards of resident care and safety. Each state's survey agency under contract with CMS inspects all nursing facilities every 12 to 15 months to determine whether or not the minimum standards are being met. In addition to state specific standards, nursing homes must meet the requirements of 185 quality standards imposed by the federal government. When a nursing facility does not comply with one of these standards, the facility may be given a deficiency unless the facility applies for and receives an exemption. Deficiencies are classified into 17 major categories (e.g., quality of care, quality of life, resident behavior, or facility practices) containing 185 subcategories of specific deficiencies. They are also categorized by the scope (the number of patients adversely affected) and severity (the extent of patient harm) for enforcement purpose which covers various sanctions (e.g., civil monetary penalties, denial of payment, or termination) (GAO, 1999b; Park & Stearns, 2009).

levels was the critical threshold below which serious harm could result to residents. The 2.75 total nursing HPRD consists of licensed nurses of 0.75 HPRD including 0.2 HPRD of registered nurses (RNs) and 2.0 HPRD of nursing aides/assistants (NAs). The phase II study dividing quality measures by short- and long-term stays indicated a total of 3.55 HPRD (1.15 LN HPRD including 0.55 RN HPRD and 2.4 NA HPRD) for short-term stay residents and a total of 4.1 HPRD (1.3 LN HPRD with 0.75 RN HPRD and 2.8 NA HPRD) for long-term stay residents as the critical thresholds (CMS, 2000, 2001).

In addition to CMS studies, an expert panel sponsored by the Hartford Institute for Geriatric Nursing recommended a minimum nurse staffing standard, based on the expertise of a focus group of national experts on staffing and quality in nursing homes. Considering the administrative staffing level as well as direct care staffing level, the panel recommended one full-time RN DON and one RN nursing supervisor at all times (24 hr/day, 7 days/week). A full-time assistant DON and a full-time RN director of in-service education were also proposed for larger nursing homes with more than 100 beds. For LPN/LVN and NA staff, 0.70 and 2.70 HPRDs were suggested respectively. Overall, the expert panel recommended a minimum of 4.55 HPRD, which is slightly higher than the CMS studies (Harrington, Kovner, et al., 2000).

Another minimum nurse staffing ratio was examined by Zhang et al (2006). Using the production function approach, the study viewed the relationship between nurse staffing (input) and nursing home quality (output) as a production function relation which is non-linear and S-shaped. In the production function approach, increases in staffing lead to large improvements in quality at low levels of staffing (increasing marginal returns to staffing). At medium levels of

staffing, increases in staffing continue leading to improvements in quality, but at a decreasing rate (decreasing marginal returns to staffing). At high levels of staffing, increases in staffing produce only small improvements in quality and quality may even decrease (negative marginal returns to staffing). Linking nurse staffing levels to three different quality levels (50% [low], 75% [medium], and 90% [high]), the study found that 0.31 HPRD of RNs and 2.36 HPRD of total nurse staff are required to achieve the 50% quality level. The 75% quality level requires more nurse staffing for RNs (1.83 HPRD) and total nurse staffing (12.6 HPRD), and going from 75% to 90% requires even larger increases in staffing (Zhang, Unruh, Liu, & Wan, 2006).

Despite these continuing efforts and calls for stronger federal nurse staffing standards, the federal government has not changed its federal staffing standards since OBRA 1987 (Park & Stearns, 2009). Wiener (2003) described several reasons why the nursing home industry and many government officials oppose the imposition of recommended stronger staffing standards. First, staff management, which emphasizes how staff is organized, supervised, and motivated, is as important as the number of nurses. Second, more empirical, quantitative studies on what the minimum staffing level should be are required, adjusting for case-mix, which is the major determinant of staffing needs. Third, significant additional costs required for higher staffing standards are not economically efficient for quality improvement. Lastly, current staffing shortages would make it difficult to implement any policies to increase staffing levels (CMS, 2000; Wiener, 2003).

Subsequently, many states have established and continuously updated their own nurse staffing standards, which are more stringent than the federal ones, in the hope that their stronger

staffing standards would increase nurse staffing levels and accordingly improve quality of care in nursing homes (DHHS, 2003; Harrington, 2005a, 2005b). The state staffing standards vary widely across states in their form as well as in their level. According to Mueller et al., 40 states, by 2004, had their own stronger staffing standards while 11 states followed the federal staffing standards. Of the 40 states, 33 states specified their standards in either a minimum number of nursing care hours, nurse-to-resident or nurse-to-bed ratio. After quantifying the 33 states' staffing standards to HPRD, the study found that Oregon had the lowest HPRD standard (1.76 HPRD) and Florida had the highest one which is 3.60 HPRD. Currently, Florida requires 3.90 HPRD. The standard was amended in 2006 (Hyer, Temple, & Johnson, 2009; Mueller, et al., 2006).

Since long-term care services are labor intensive, the quality of care depends largely on the performance of the caregiving personnel. Thus, the amount and type of nursing personnel is critical to the processes and outcomes of resident care in nursing homes (IOM, 2001). Although there are also other policies affecting nursing home staffing levels, such as states' wage pass-through programs, which provide monetary incentives for the specific purpose of increasing compensation for direct-care workers in nursing homes, state minimum nurse staffing standards would play a more direct role to encourage nursing homes to have appropriate levels of nurse staffing because of their mandatory nature. As the relationship between poor quality of care and insufficient nurse staffing has been widely demonstrated, and each state, in response to such concern, has established its own minimum nurse staffing requirements, which have different levels of stringency, it may be an important question to ask whether the stringency of state

staffing standards has made any positive impact on actual nurse staffing levels and quality of care in nursing homes.

Research Questions

Ultimately, the purpose of the study is to review state minimum nurse staffing standards for the 50 states and the District of Columbia, determine whether the state staffing standards are related to nursing home staffing levels, and investigate the impact of nurse staffing levels on quality of care in nursing homes. Accordingly, three research questions are as follows:

Q1: What are the characteristics and variation in current minimum nurse staffing standards for nursing homes among the 50 states and the District of Columbia?

Q2: To what extent do state nurse staffing standards (including RN, LN, total, and NA staffing standards) help ensure the increase in nurse staffing levels (including RN, LN, total, and NA staffing standards) of nursing homes?

Q3: To what extent could nurse staffing levels contribute to the quality of care in nursing homes?

Chapter Summary

Due to the importance of nurse staffing levels to the processes and outcomes of care, minimum nurse staffing standards for nursing homes have become a major long-term care policy issue for improving the quality of care in nursing homes. Accordingly, the federal government strengthened its nurse staffing standards through OBRA 87. Nevertheless, many consumer

advocates and professional nursing organizations have called for higher minimum federal staffing requirements because of lack of adequacy and specificity in the staffing requirements.

Subsequently, many states have established their own nurse staffing standards, by using different forms and levels. The considerable difference in state staffing standards has not yet been systematically examined. Thus, the purpose of the study is to investigate the variation in states' minimum nurse staffing standards and the extent that the standards could influence the nursing homes' nurse staffing levels. Ultimately, in relation to their variation in nurse staffing levels, quality of care in nursing homes is to be examined.

CHAPTER TWO:
LITERATURE REVIEW AND ANALYTICAL FRAMEWORK

This study views nurse staffing levels in nursing homes as a result of organizational strategic adaptation to environmental factors, particularly federal and state staffing regulations and reimbursement policies, which require nursing homes to adjust themselves in order to secure their internal resources and obtain external resources for survival. Therefore, resource dependence theory is applied and serves as a theoretical framework for explaining nursing homes' reaction to such environmental forces. This chapter presents an overview of resource dependence theory, as well as a critical review of empirical studies related to the study topic. In addition, a conceptual framework of hypothesized relationships among the study variables is illustrated.

Literature Review

Several previous studies examined the effects of state minimum nurse staffing standards on staffing levels and/or quality of care in nursing homes. First of all, Harrington (2005a, 2005b) comprehensively reviewed state nurse staffing standards of the 50 states and the District of Columbia, where the state staffing standards were collected through an internet survey from 1999 to 2001. Harrington found that actual median nurse staffing levels in nursing homes (3.16 HPRD) were much higher than state average minimum standards (2.32 HPRD) and, accordingly, concluded that there was no evidence that state minimum staffing standards become the average staffing level. However, the study simply compared minimum staffing standards with actual

staffing levels without controlling factors such as resident case-mix levels that might affect actual staffing levels in nursing homes (Harrington, 2005a, 2005b).

Mueller et al. (2006) conducted a study on state nurse staffing standards and their relationship to nurse staffing levels in nursing homes, as an expansion of Harrington's previous studies. They first reviewed and updated all states' (the 50 states and the District of Columbia) staffing standards for the year 2004. Using the hierarchical linear model due to the difference of levels between nurse staffing standards (state level) and actual nurse staffing (facility level), the study found that facilities in states with high staffing standards had higher staffing levels than states with low or no staffing standards while there was no significant difference in facility staffing levels among states with low and no staffing standards (Mueller, et al., 2006).

A recent study on the effects of state minimum staffing standards on nursing home staffing and quality of care was conducted by Park and Stearns (2008). In the study, they investigated how changes in state nurse staffing standards from 1998 to 2001 influenced the staffing levels and quality of care in nursing homes. Controlling for two different levels of treatment effects, including (1) transition effects to capture the immediate short-term response of policy changes and (2) steady-state effects to capture the relatively long-term response of policy changes which is estimated with a 1-year lag in order to allow for a transition year, they found that changes in staffing standards are positively associated with all types (RN, LPN, NA, and total HPRD) of nurse staffing levels in low-staff, non-profit facilities. However, facilities that are already operating higher staffing than their state staffing standards did not show any improvement in their staffing levels. Furthermore, the hypothesized relationship between stricter

staffing standards and better quality of care was partially supported. More specifically, using six quality measures (preventable and treatable pressure sores, contractures, catheter use, physical restraints, and facility survey deficiencies), the study showed that the state staffing standards were associated with reductions in physical restraints and total number of deficiencies at all types of facilities (Park & Stearns, 2009).

In summary, the previous studies partially supported the positive impacts of state staffing standards on both actual nurse staffing levels and quality of care in nursing homes. Specifically, nursing homes with low staffing levels or nursing homes in states with higher staffing standards are found to respond more significantly to their state staffing standards. The reason why the policy impacts were undetected in some specific types of nursing homes could be that nursing home staffing levels were highly subject not only to the staffing policy but also to their organizational (e.g., resident acuity, facility size, and ownership type) and environmental factors (e.g., state Medicaid reimbursement rates and market factors).

For example, in order to save labor costs, nursing homes that operate nurse staffing levels above the minimum staffing standards may decrease their staffing levels to meet the standards and regard them as maximum requirements instead, if nursing homes assume that the minimum standards can ensure acceptable quality of care. This phenomenon is more likely to happen in for-profit nursing homes than non-profit ones (Mueller, et al., 2006; Park & Stearns, 2009).

Although these studies were conducted in well-developed analytical frameworks, their analyses could be improved by supplementing several points. First, previous studies used only two categories in the staffing standards (licensed nurse (RN+LPN/LVN) and total nurse staffing

standards) to examine effects of state staffing standards even though many states regulate their staffing standards not only for LN and total nurse staff but also for RN and NA staff. Second, since prior studies quantified the staffing standards without considering facility size, each state had one quantified staffing policy value in the analyses. However, many states require different numbers of nursing hours for smaller (usually fewer than 60 residents or beds) and larger nursing homes (usually larger than 60 residents or beds). Also, some states such as Montana detail facility size (e.g., for 51-75 beds, for 76-80 beds, for 81-90 beds, for 91-100 beds, and for greater than 100 beds) and require different numbers of nursing hours and different types of nurses according to the specific facility size. Last, RN DON staffing levels were not considered when actual staffing levels were measured. Since many states allow RNs to serve as RN DONs on duty for smaller nursing homes while they require a separate body of RN DON for larger nursing homes, actual RN staffing levels in nursing homes should be combined with RN DON staffing levels when they are measured. Therefore, combining these points with the previous studies, this study would add to the body of knowledge on how state staffing policy impacts nurse staffing and quality of care in nursing homes.

Resource Dependence Theory: Overview

Resource dependence theory is used in this study to examine the extent to which organizational and environmental factors may influence nursing homes' decisions with their nurse staffing levels. Resource dependence theory emphasizes the importance of the organization's abilities to procure and maintain essential resources from its environment in order to survive. Characterizing the organization as an open system inevitably dependent on

contingencies in the external environment, this theory seeks to explain how environmental uncertainty influences organizations and how organizations manage or adapt overtime (Hillman, Withers, & Collins, 2009; Pfeffer & Salancik, 1978; Shortell & Kaluzny, 2006).

The theory premises that no single organization can control all the resources necessary for survival, and, accordingly, must depend on its environment, which controls the vital resources. The dependency makes external constraint and control over organizational behavior possible, as power relations in the dependency become asymmetric (Zinn, Mor, Castle, Intrator, & Brannon, 1999; Zinn, Mor, Feng, & Intrator, 2007). For instance, multiple transaction partners in the environment (e.g. competitors, labor market, customers, governmental laws and regulations, social norms and beliefs, economic conditions etc.) somewhat control different types of resources that an individual organization wants to secure for survival and success but cannot generate by itself. Subsequently, organizational choices and actions are constrained when the transaction partners request a certain behavior based on situations of asymmetric dependency (Daft, 2001; Johnson, 1995).

While organizational behaviors are influenced by such environmental factors, the theory assumes that organizations can actively negotiate with their environment. To do so, they may use a variety of managerial strategies to reduce unwanted dependencies and enhance survivability (Banaszak-Holl, Zinn, & Mor, 1996; Zinn, Weech, & Brannon, 1998). Although the strategies are for common purposes like securing vital resources by satisfying demands of diverse transaction partners, there is much variation in choosing the strategies possibly because organizations have different levels of opportunity and threat in their environments as well as

different levels of strength and weakness in their organizations (Alexander, 2000; Poole & Van de Ven, 2004; Zinn, Proenca, & Rosko, 1997; Zinn, et al., 1998). This may explain why one often notices that some organizations are more effective than others in the same environment or similar organizations operate differently in different environments. Therefore, organizations' strategic decisions would be understood by their environmental factors (main effect) and organizational factors (mediating effect) under the theoretical perspective (Harrington & Swan, 2003; Harrington, Swan, & Carrillo, 2007; Zinn, et al., 1999).

Factors Related to Nurse Staffing Levels: Resource Dependence Perspective

Nursing homes vary widely in the type and amount of nursing staff possibly because they make different strategic decisions about their nurse staffing levels, which generally aim at controlling resource flows. Thus, the nursing homes' different nurse staffing decisions would be explained by identifying the internal and external context confronted by nursing homes. Subsequently, it would predict such variation (Harrington & Swan, 2003; Harrington, et al., 2007). For example, in a highly competitive market, nursing homes may decide to increase total nurse staffing levels or skilled nurse staffing levels, at the expense of increased operating costs in order to provide better quality of care; assuming that this strategy would attract more potential nursing home residents, particularly private paying residents with higher reimbursement than Medicaid, Medicare, and long-term care insurance payers, and accordingly enhance their market position. In addition, in compliance with the regulatory requirements of quality of care, nursing homes with a substantial proportion of high acuity residents who require more extensive care may want to hire more direct care staff, primarily nursing assistants, rather than administrative

nursing staff; otherwise, the nursing homes would suffer from sanctions such as civil monetary penalties for non-compliance. As resource dependence theory assumes that organizations make internal strategic choices and decisions to adapt to environmental constraints, the theory could help identify internal and external predictors on nurse staffing levels in nursing homes (Harrington & Swan, 2003; Harrington, et al., 2007; Poole & Van de Ven, 2004; Weech-Maldonado, et al., 2004).

State Minimum Nurse Staffing Standards

Organizations generally operate to reduce dependence where possible. However, if such dependence cannot be reduced, organizations adjust themselves to it. Organizations are made to conform to the requirements placed by the sources of their vital resources, to maintain access to the scarce resources and negotiate with their uncertain environment (Decker, 2008; Froelich, 1999).

The nursing home market is one of the most highly regulated markets in the United States (Kumar, et al., 2006; Zhang & Grabowski, 2004). Since 1965, when the Medicare and Medicaid programs were first introduced, federal and state governments have jointly regulated the minimum standards of resident care and safety that all nursing homes must meet to provide Medicare and/or Medicaid services (Harrington, Mullan, & Carrillo, 2004). Nursing homes' compliance is monitored through the annual survey and certification process. When nursing homes are found not to comply with any one of the requirements, they may be given a deficiency and then subjected to sanctions such as civil monetary penalties, denial of payment for new admissions, or termination, depending on the scope and severity (GAO, 1999b; IOM, 2001).

State nurse staffing standards, as one of the minimum standards of resident care and safety, apply a similar regulatory process to nursing homes. Each nursing facility is required to report on the type of nursing staff for a 2-week period prior to state agencies' annual facility survey. If violations of the federal quality of care requirements are identified, the state survey agencies will review the facility's staffing levels and may issue citations for the inadequacy of its nursing personnel, which could result in substantial costs from sanctions (Harrington, 2005a).

Due to the high degree of government involvement in the nursing home market, the government could be regarded as the most important regulator and resource provider that nursing homes must depend on or respond to. Hence, the state nurse staffing standards could serve as constraints significantly influencing nursing homes' decisions about the type and amount of nursing staff employed (Park & Stearns, 2009; Zhang & Grabowski, 2004). Furthermore, even though all minimum standards would be deemed equally important, nurse staffing standards may be one among the critical requirements since a violation in the staffing standards would be correlated with potential violations in other requirements related to the quality of resident care. As stated by several studies, both fewer nurse staffing hours and skilled nurses in nursing facilities serve as links to a larger number of deficiency citations (Akinci & Krolikowski, 2005; Harrington, Zimmerman, et al., 2000; Kim, et al., 2009).

Many states have established and amended their own nurse staffing standards, which are more stringent than the federal ones, as a part of their state licensing requirements that certified nursing homes must follow (Harrington, 2005a). Thus, nursing homes may manage their nurse staffing levels at or above their state minimum staffing regulation levels to avoid the penalties

which could negatively affect their survivability. Although some nursing homes may rationally decide to operate below their staffing standards if the cost of meeting standards is higher than that of non-compliance (Park & Stearns, 2009), the variation in staffing levels below the minimum standards would not deviate much from the standards (Pfeffer & Salancik, 1978). Therefore, nursing homes in states with higher nurse staffing standards are likely to have higher staffing levels than those with lower nurse staffing standards.

Medicare and Medicaid Reimbursement Rates

According to resource dependence theory, the need for vital resources obtained from the environment, including physical and financial resources, as well as information, makes organizations potentially dependent on the external source of these resources (Pfeffer & Salancik, 1978).

The government, as the dominant purchaser of nursing home care through the Medicaid and Medicare programs, covers approximately three quarters of nursing home residents. American Health Care Association (AHCA) in 2001 presented that Medicaid paid for the care of 67.7% of residents, Medicare paid for the care of 8.7% of residents, and the rest of them (23.5% or residents), including about 2% who have long-term care insurance), was privately paid (AHCA, 2001). In addition, partially due to the disproportionate distribution of private paying residents in relatively few nursing homes and the decline of the nursing home demand caused possibly by increasing availability of alternative care providers such as home health agencies and assisted living facilities, nursing homes have become more dependent on public payment systems (CMS, 2000). Therefore, the reimbursement policies of the Medicaid and Medicare

programs are essential to understanding the level of resources available to nursing homes and nursing home staffing levels (Harrington, et al., 2007; Wiener, 2003).

The Balanced Budget Act (BBA) of 1997 brought about significant changes in the reimbursement structure of both Medicaid and Medicare programs to nursing homes. The changes have caused nursing homes to face severe revenue restraints. This drives nursing homes to operate with lower costs and, accordingly, it may have a negative impact on nurse staffing levels in the nursing home (Weech-Maldonado, Neff, & Mor, 2003).

The BBA changed the reimbursement structure of the Medicare program, which was previously operated under a retrospective cost-based system, to a prospective payment system (PPS) with largely restricted overall Medicare funding, in order for the federal government to slow down the fast growth in Medicare costs (Konetzka, Yi, Norton, & Kilpatrick, 2004; Weech-Maldonado, et al., 2003). Prior to PPS, nursing homes were reimbursed for their Medicare services on the basis of their costs subject to per-diem limits on routine costs (e.g., regular room, dietary, and nursing services) but with no limits on ancillary services (e.g. rehabilitation therapy, drugs, labs, X-rays) and capital costs (e.g., depreciation) (Wodchis, Fries, & Hirth, 2004).

In contrast, under PPS, the facilities are being reimbursed by a fixed payment according to the resident case-mix before the care is actually delivered. Since the new Medicare PPS does not reimburse extra payments for additional services beyond the pre-determined payment level, it necessitates facilities to provide care efficiently, including choosing appropriate staffing levels, within the level or less (Konetzka, Norton, & Stearns, 2006). The reduction in the Medicare payment rates, by the implementation of PPS, was more intensified in some nursing homes, such

as hospital-based nursing homes and skilled nursing facilities (SNFs), which specialize in short stay and Medicare residents (CMS, 2000; Konetzka, et al., 2006). Also, it has been found that licensed nurse staffing hours (RNs and/or LPNs) noticeably declined after the Medicare PPS was implemented (Konetzka, et al., 2006; Unruh, Zhang, & Wan, 2006; White, 2005).

The Medicaid payment policy was also changed by the enactment of BBA. State Medicaid officials opposed the Boren amendment[3], which requires that Medicaid payments to providers be based on reasonable and adequate rates, since they believed that states were forced to spend too much on nursing homes at the cost of other services (Weech-Maldonado, et al., 2004). After the BBA was enacted, states have been allowed to have considerable freedom in setting the Medicaid reimbursement methods and rates. Given state budget shortfalls, there have been concerns that the reduction of Medicaid reimbursement rates to nursing homes would be a critical strategic target from the states' point of view, and subsequently it would adversely affect levels of nurse staffing and quality of nursing home care (Grabowski, Feng, Intrator, & Mor, 2004; Smith, Gifford, & Ramesh, 2003; Wiener & Stevenson, 1998).

Despite state cost containment efforts, the average Medicaid reimbursement amounts for nursing homes continued to grow between 1998 and 2002 (Grabowski, et al., 2004; Smith, et al., 2003). The increased Medicaid nursing home reimbursement rates accompanied increased state nurse staffing standards as well as increased nursing home staffing, through a variety of mechanisms, such as a bed tax, quality improvement fee, or wage pass-through. States used

3 As part of the Omnibus Reconciliation Act of 1980, the "Boren amendment" required that Medicaid nursing home rates be "reasonable and adequate to meet the costs which must be incurred by efficiently and economically operated facilities in order to provide care and services in conformity with applicable state and federal laws, regulations, and quality and safety standards" (Section 1902(a)(13) of the Social Security Act).

either bed tax or quality improvement fees to generate increased Medicaid revenues, which were then passed back to nursing homes to help increase their labor capital while some states implemented wage pass-through policies to induce facilities to spend the increased funding on staffing (DHHS, 2003; GAO, 2003).

Unlike Medicare PPS rates, which are nationally standardized, the Medicaid reimbursement rates for nursing homes vary by states. As Medicaid reimbursement rates are set partially based on facility costs including nurse staffing, nursing homes in states with higher Medicaid reimbursement rates may have more sufficient financial resources available for their staffing than others with lower Medicaid payment rates. Several studies found that state Medicaid reimbursement rates are positively associated with staffing in nursing homes (Grabowski, 2001a, 2001b; Harrington & Swan, 2003; Harrington, et al., 2007). For instance, Harrington et al. (2007) found that the average state Medicaid reimbursement rates are positively related to RN and total nursing hours per resident day. Therefore, nursing homes in states with higher Medicaid reimbursement rates may have higher nurse staffing levels than those with lower Medicaid reimbursement rates.

Payer Mix: The Proportion of Medicaid and Medicare Residents in Nursing Homes

Medicare reimbursement rates are generally considered to be less important sources of revenue for nursing homes than Medicaid because, as described earlier, Medicare is responsible for only about 9% of residents nationwide while about 68% of residents are covered by Medicaid (CMS, 2000). However, Medicare residents, transferred from acute care hospitals for short stays, may be quite important financial sources for nursing homes since operating margins for

Medicare residents are substantially higher than those for Medicaid residents. For this reason, before the new Medicare PPS, substantial proportions of nursing homes and national chains had aggressively targeted Medicare residents in order to supplement relatively lower Medicaid payment rates and margins (Konetzka, et al., 2006; Konetzka, et al., 2004).

Although the Medicare payment rates were considerably reduced after the new Medicare PPS was implemented, it is still much higher than Medicaid rates because of states' cost saving policies for Medicaid. In 2000, Medicaid rates were an average of $115 per day across the nation while Medicare rates were $269 for free standing facilities (Harrington, et al., 2007).

Thus, nursing homes with a higher proportion of Medicare residents may have more financial resources available for their nurse staffing because of Medicare's higher profit margins comparing to Medicaid. As stated by many studies, a higher percentage of Medicare residents proved to be positive predictor of nurse staffing levels (RN and/or total nurse staffing hours per resident day). On the other hand, higher proportions of Medicaid residents may have negative effects on staffing levels in nursing homes. Nursing homes that are more resource dependent on Medicaid residents are found to be hesitant to recruit all types of nurse staff even though, from a policy perspective, the care for Medicaid residents should be provided by same staffing levels as private or Medicare paying residents (Harrington & Swan, 2003; Harrington, et al., 2007; Konetzka, et al., 2004; Mueller, et al., 2006; Park & Stearns, 2009). Therefore, it is expected that nursing homes with higher proportions of Medicare residents will have higher nurse staffing levels and, in contrast, nursing homes with higher proportion of Medicaid residents will have fewer nurse staffing levels.

Resident Case Mix

Residents with higher case-mix needs require more extensive care. Thus, nursing homes should be able to provide more nursing services both in terms of amount of nurse staff time as well as the level of nursing expertise in order to meet their care needs. There has been general consensus on the strong positive relationship between resident case mix and nursing staffing time requirements (IOM, 1996). A number of studies found that higher resident case mix was mostly associated with higher nurse staffing hours including licensed nurse staffing and/or total nurse staffing hours per resident day (Harrington, Carrillo, Mullan, & Swan, 1998; Harrington & Swan, 2003; Harrington, et al., 2007; Mueller, et al., 2006).

This positive relationship between resident case mix and nurse staffing levels in nursing homes could be explained together with Medicaid reimbursement methods that states have adopted. Because of a strong association of resident case mix to nurse staffing time as well as nursing costs in nursing homes, Resource Utilization Groups[4] was originally developed and have been used for the Medicare PPS (Harrington, et al., 1998; Zhang & Grabowski, 2004).

In addition to the Medicare PPS, case mix reimbursement methods have been a growing trend with an increasing number of states adopting this approach for Medicaid reimbursement. Swan et al. (2001, 2002), comprehensively reviewing state Medicaid reimbursement methods and rates from 1979-1997, showed that states' Medicaid case mix systems increased from 3 to 26 states between 1979 and 1997, although detailed methods varied significantly across states

[4] Resource Utilization Groups (RUGs) is the resident classification system to categorize residents into specific groups based on residents' functional status and anticipated use of nursing care services and resources including the amount of staffing and therapy time required.

(Swan et al., 2001; Swan et al., 2000). By 2004, 35 states had implemented some form of case mix payment system approach for their Medicaid reimbursement (Zinn, Feng, Mor, Intrator, & Grabowski, 2008). This approach can generally allow higher Medicaid reimbursement rates for nursing homes that have residents with higher case mix levels (Harrington, et al., 1998).

For this reason, nursing homes may be more willing to accept Medicaid residents who have higher case-mix levels and take resident case mix levels into consideration in determining their staffing levels in order to take advantage of higher reimbursement (Harrington, et al., 2007; Swan, et al., 2000). For instance, Feng et al. (2006) found that case mix adjusted Medicaid payment systems have increased access to nursing home care for functionally more dependent Medicaid residents (Feng, Grabowski, Intrator, & Mor, 2006). Overall, it could be interpreted that admitting residents with higher case mix levels could bring more financial resources to nursing homes. These resources would potentially be allocated to increase their nurse staffing levels. Therefore, it is expected that nursing homes with higher case mix residents will have higher nurse staffing levels while nursing homes with lower case mix residents will have fewer nurse staffing levels.

Ownership

Even though ownership type is not clearly explained by resource dependence theory, it could be a potential organizational factor pertinent to an organization's strategic adaptation to environmental constraints. Some studies applied the resource dependence perspective to demonstrate that for-profit nursing homes, which probably are the most market-oriented facilities, usually make strategic decisions driven by profit motivation (Banaszak-Holl, et al.,

1996; McKay, 1991; Zinn, et al., 1999; Zinn, et al., 2007). Thus, it is likely that for-profit nursing homes attempt to maximize profit and reduce their operating costs possibly by having lower staffing levels (Harrington, et al., 1998).

Several studies consistently reported lower nurse staffing levels in for-profit nursing homes than non-profit and government-owned nursing homes (CMS, 2000; Harrington, et al., 1998; Harrington & Swan, 2003; Harrington, et al., 2007; Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001; Mueller, et al., 2006). Therefore, it is expected that for-profit nursing homes will have lower nurse staffing levels.

Market Competition

An organization's survival depends on how resources are allocated across competitors (Banaszak-Holl, et al., 1996). Since nursing homes in highly competitive market should inevitably share prospective nursing home residents, they may more perceive market competition in the shared pool of limited resources as threats to their survival than nursing homes in a less competitive market (Zinn, et al., 1998). Accordingly, nursing homes with many competitors may want to increase their nurse staffing levels in order to dominate more resources (i.e., attract more prospective residents) by providing better quality of care than their competitors.

Furthermore, CMS currently allows consumers to see how well nursing homes perform through online Website "Nursing Home Compare Tool" which provides basic information such as nursing homes' quality status and nurse staffing status. Thus, the consumers' right to select

nursing homes has been increasing. Therefore, it is expected that more competitors in the marketplace may have a positive effect on nurse staffing levels in nursing homes.

Market Demand

The proportion of the population aged 65 and older could be a factor potentially associated with nurse staffing levels in nursing homes. Kemper and Murtaugh (1991) conducted a study on lifetime use of nursing home care and found that the probability of nursing home use increased considerably for people aged 85 and older, as the probability was 17 percent for age 65 to 74, 36 percent for 75 to 84, and 60 percent for age 85 to 94 (Kemper & Murtaugh, 1991; Murtaugh, Kemper, & Spillman, 1990). Thus, the demand for and use of nursing home services would increase especially when nursing homes have higher proportions of people older than 65 in their market boundaries. In addition, the higher proportion of the aged 65 and older adults, because of their declining physical and mental functioning in general, may increase overall case mix levels in nursing homes (Harrington & Swan, 2003; Harrington, et al., 2007). Therefore, it is expected that nursing homes located in areas with a higher percentage of older adults will have higher nurse staffing levels.

Chain Affiliation

Large nursing home corporations have become a major force in the nursing home industry. Many of these are chains that are horizontally integrated by owning multiple nursing homes and/or hospitals within regions or nationally (Harrington, et al., 1998). Approximately 57 percent of nursing facilities are part of a chain (Zinn, et al., 2007). Regarding nurse staffing

levels, Kovner and Harrington (2000) found that freestanding nursing homes have significantly more staff than chain-affiliated nursing homes (Kovner & Harrington, 2000). But, differences in nurse staffing levels between chain-affiliated and freestanding nursing homes are still inconclusive.

Although it is generally believed that multi-institutional healthcare systems such as multi-hospital systems or chain-affiliated nursing homes may achieve cost savings by using various managerial practices (e.g., centralized management, joint-purchasing arrangements, the sharing of labor, or capital savings from decreased interest expenditures on buildings and equipment) (McKay, 1991), the impact of the system membership on cost savings or profitability could vary from positive to no effect, depending on the membership types (Tennyson & Fottler, 2000).

However, lower costs have been reported in chain-affiliated nursing homes, but the association of the lower costs with reduced nurse staffing levels has not yet been confirmed (Harrington, et al., 1998). To be consistent with other related studies, this study expects that chain-affiliated nursing homes will have lower nurse staffing levels.

Facility Size

Several studies reported the relationship between larger nursing homes and lower nurse staffing levels (Harrington, et al., 1998; Harrington, et al., 2007; Kovner & Harrington, 2000). It could be partially interpreted that larger nursing homes may be able to achieve economies of scale and these may apply to staffing levels (Harrington, et al., 1998; Harrington, et al., 2007). For instance, the economies of scale may occur when large nursing homes, enhancing the

productivity of their nurses, increase the number of resident days served. Therefore, it is expected that larger nursing homes will have lower nurse staffing levels.

Occupancy

Nursing homes with lower occupancy rates may be expected to have higher nurse staffing, in part, since the nursing homes must meet their state nurse staffing standards regardless of the number of residents that they have (Harrington & Swan, 2003). For example, many states have a requirement of 24 LN hours in their staffing standards, and the 24 LN hours are required for all nursing homes regardless of the number of beds or the number of residents. For this reason, nursing homes with lower occupancy rates may have to increase their staffing levels to comply with their state staffing standards. Therefore, it is expected that nursing homes with lower occupancy rates will have higher nurse staffing levels.

Hospital Affiliation

Substantially higher nurse staffing levels have been reported in hospital-based nursing homes because their residents are more Medicare residents, have higher acuity levels, and require short-term intensive care (Harrington, et al., 2007; Harrington, Zimmerman, et al., 2000). Furthermore, due to hospitals' incentive to limit inpatient length of stay, hospital-based nursing homes could more easily acquire patients who may be short-stay residents after hospitalization. For this reason, hospital-based nursing homes may have more financial resources available for increasing nurse staffing levels. Therefore, it is expected that hospital-based nursing homes will have higher nurse staffing levels than freestanding nursing homes.

Nurse Staffing Levels and Quality of Care in Nursing Homes: A Systems Framework

Defining Quality of Care in Nursing Homes

Quality of care in nursing homes is a multidimensional construct, encompassing diverse aspects of residents' health and well-being (Wan, et al., 2010; Zhang & Wan, 2005). Nursing home care includes not only clinical care and functional care, but also psychosocial and environmental supports to the residents. Furthermore, these different dimensions of quality are interrelated. Good nursing care, for instance, depends partially on the environment in which nurses work and the residents live. The interaction of these dimensions of care results in resident outcomes that are also multidimensional (Unruh & Wan, 2004).

Traditionally, quality of nursing home care has been measured and assessed by the widely accepted theoretical framework developed by Donabedian (1996), which distinguishes three dimensions of information about quality: structure, process, and outcome (S-P-O) (Donabedian, 2005). According to the S-P-O framework, structural measures of quality refer to organizational capacity for effective organizational performance. They include all the attributes of health care setting, such as material resources (e.g., physical facilities and equipment), financial resources, and human resources (e.g., physician and nurse staffing) (Donabedian, 1988; Flood, Zinn, & Scott, 2006). Process measures of quality refer to the organization's activities in carrying out work. They are the actions taken in giving and receiving care, encompassing patient activities in seeking care and carrying it out, as well as practitioner activities in making a diagnosis and implementing treatment (Donabedian, 1988). Lastly, outcome measures of quality are changes in patient's health status resulting from care processes (Unruh & Wan, 2004).

The three components in the Donabedian framework are conceptually linked; better structure and more appropriate process are expected to provide better outcomes (Kane, 1998). Unlike acute care such as hospital where successful outcomes are often achieved by providing necessary treatment of a disease and restoring previous levels of functioning, long-term care requires quite different criteria for successful outcomes such as maximizing quality of life and coping with reduced physical/cognitive functioning over an extended time, sometimes indefinitely. Therefore, health and quality of life outcomes (e.g., overall health status, specific medical conditions such as pressure sores, social and psychological well-being, satisfaction with care etc.) would be the end results of the structures and processes of care (IOM, 2001).

However, using outcomes to assess quality of care could have several limitations. First, while some outcomes (e.g., death) can be easily measured, some others (e.g., patient satisfaction, social restoration and physical disability, rehabilitation, quality of life etc.) are relatively difficult to define and measure (Donabedian, 2005). Second, outcomes can be affected by many factors outside of the medical care system and are difficult to manipulate (Mangione-Smith & McGlynn, 1998). In other words, many outcomes are influenced by genetic, environmental, or other factors unrelated to medical care. In this sense, medical care is only one of several determinants of health status (Castle & Ferguson, 2010). Third, there are conceptual and practical (e.g., cost) considerations in collecting information on patient's health status and quality of life (IOM, 2001). As a result, structure measures (e.g., nurse staffing levels) and/or process measures (e.g., rates of sedative use) are often used as proxies for outcome measures of quality of care in many nursing home studies (IOM, 2001; Kane, 1998).

In addition, since the relationship between three components in Donabedian's framework remains much more theoretical than empirical, there are no clear guidelines to differentiate between process measures and outcome measures when they are practically defined and measured under the SPO framework (Graber & Sloane, 1995; Unruh & Wan, 2004).

First of all, some survey deficiency citations - for example, physical restraint use, which is also used to measure quality of care in this study - have been used as either an outcome or a process measure of quality in nursing home studies. On the one hand, the inappropriate use of physical restraints, which could lead to negative impact on physical and mental health of nursing home residents(e.g., an increased risk of morbidity and mortality or cognitive decline), could be the result of inadequate nurse staffing (or poor structural quality). Thus, it is viewed as a process measure linked to outcomes (Graber & Sloane, 1995; Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005). On the other hand, since accelerated decline in a resident's mobility resulting from physical restraint use could be seen as violation of a resident's right to be free from physical restraints or quality of resident life, physical restraint use itself is used as an indicator of outcome components of nursing home quality (Castle, 2000; Graber & Sloane, 1995; Unruh & Wan, 2004; Wan, 2003).

Second, there possibly exists multidimensional causality between processes and outcomes of care, that is, one process of care could result in multiple outcomes while one outcome could be the result of multiple care processes (Wan, et al., 2010). As described earlier, physical restraints have been criticized because their use may cause various negative outcomes such as pressure sores, depression, and mental deterioration, and it may possibly have negative

impact on quality of resident life in terms of dignity or respect. On the other hand, pressure sore prevention and treatment may require complex action of diverse care processes such as keeping skin clean and dry, changing position hourly, and a good and balanced diet.

Lastly, processes and outcomes of care may be recursively related. Care processes are not fixed but should be continuously adjusted according to the changes in a patient's health status resulting from previous care processes. For example, pressure ulcer stage 2 can be alleviated to stage 1 or be developed to stage 3 in spite of appropriate care processes. Stage 1 and stage 3 would require different care approaches such as appropriate resident assessment, care plan, and medication usage.

Many nursing home studies have evaluated quality of care by measuring processes or outcomes of care, or both. Particularly, studies using nursing home survey deficiencies have defined the survey deficiencies as the process and outcome measures directly related to resident care and used them as a measure of overall quality of nursing home care (Akinci & Krolikowski, 2005; Harrington, Kovner, et al., 2000; Harrington, et al., 2001; Kim, et al., 2009). Thus, this study also views nursing home deficiencies as both processes and outcomes of care and uses them as a measure of quality of care in nursing homes.

Nurse Staffing as a Structural Factor to Quality of Care

How the quality of care varies in nursing homes has been explained by causally linking various structural factors (infrequently together with contextual factors) to the quality of care. Nursing homes' strategic decisions on the type and amount of nurse staff would consequently

affect the quality of care that the nursing homes provide. A number of studies have consistently demonstrated that a positive relationship existed between nurse staffing levels and quality of care in nursing homes (Akinci & Krolikowski, 2005; Harrington, Zimmerman, et al., 2000; Kim, et al., 2009; Schnelle, et al., 2004; Weech-Maldonado, et al., 2004). Thus, increased nurse staffing levels is expected to result in better quality of care. However, state nurse staffing standards, which may have direct impacts on nurse staffing levels, may not directly influence the quality of care since better outcomes of care could also be achieved by improving the nursing home's internal management or process. Nursing homes may improve their productivity by efficiently managing organizational personnel or increasing job satisfaction among practitioners (Park & Stearns, 2009). Thus, in this study, nurse staffing levels in nursing homes will be used as a predictor to examine quality of care in nursing homes.

As nursing homes' decisions on nurse staffing levels could be explained by various organizational and environmental factors, this study will assess the quality of nursing home care by examining the influences of several key organizational factors including (1) nurse staffing levels; (2) occupancy rates; (3) facility size; (4) ownership; (5) proportion of Medicaid and Medicare residents; (6) acuity index; (7) chain affiliation; and (8) hospital affiliation. According to the empirical evidence reviewed, it is expected that nursing homes with higher staffing levels, those with smaller size, those with lower occupancy rates, those with more Medicare residents, non-profit homes, and non-chained homes will have better quality of care than their counterparts.

Analytical Framework and Hypotheses Generation

Resource dependence theory provides an understanding of how environmental factors influence nursing homes and how nursing homes make strategic decisions to adapt to the environmental pressure, using internal resources. This study will employ Donabedian's SPO framework to examine the impact of organizational factors on the quality of nursing home care.

However, the framework does not encompass the extent that organizational structure could be influenced by environmental forces. Therefore, a systems framework proposed by Unruh and Wan (2004) is used in this study to investigate what extent the impact of regulatory factors (state nurse staffing standards and state Medicaid reimbursement rates) and market factors (market competition and market demand) would contribute to nurse staffing levels and quality of care in nursing homes. This advanced framework, as an expansion of the classical SPO approach, categorizes contextual factors surrounding a nursing home under the open system model, such as government regulations, market competition, and conformity to customs and rules (Unruh & Wan, 2004).

Figure 1 provides the conceptual model of nursing homes' decisions on nurse staffing levels and quality of care. This analytical framework illustrates how contextual and organizational factors influence quality of care in nursing homes. Specifically, as hypothesized by resource dependence perspective, nursing homes' staffing decisions would be explained by regulatory factors (state staffing standards and state Medicaid reimbursement rates) and market factors (market competition and market demand) as well as organizational characteristics and resources. As hypothesized by SPO perspective, this analytical framework would explain how

nursing homes' staffing decisions and organizational factors (structure) affect quality-of-care deficiencies (process & outcome).

Analytical Framework

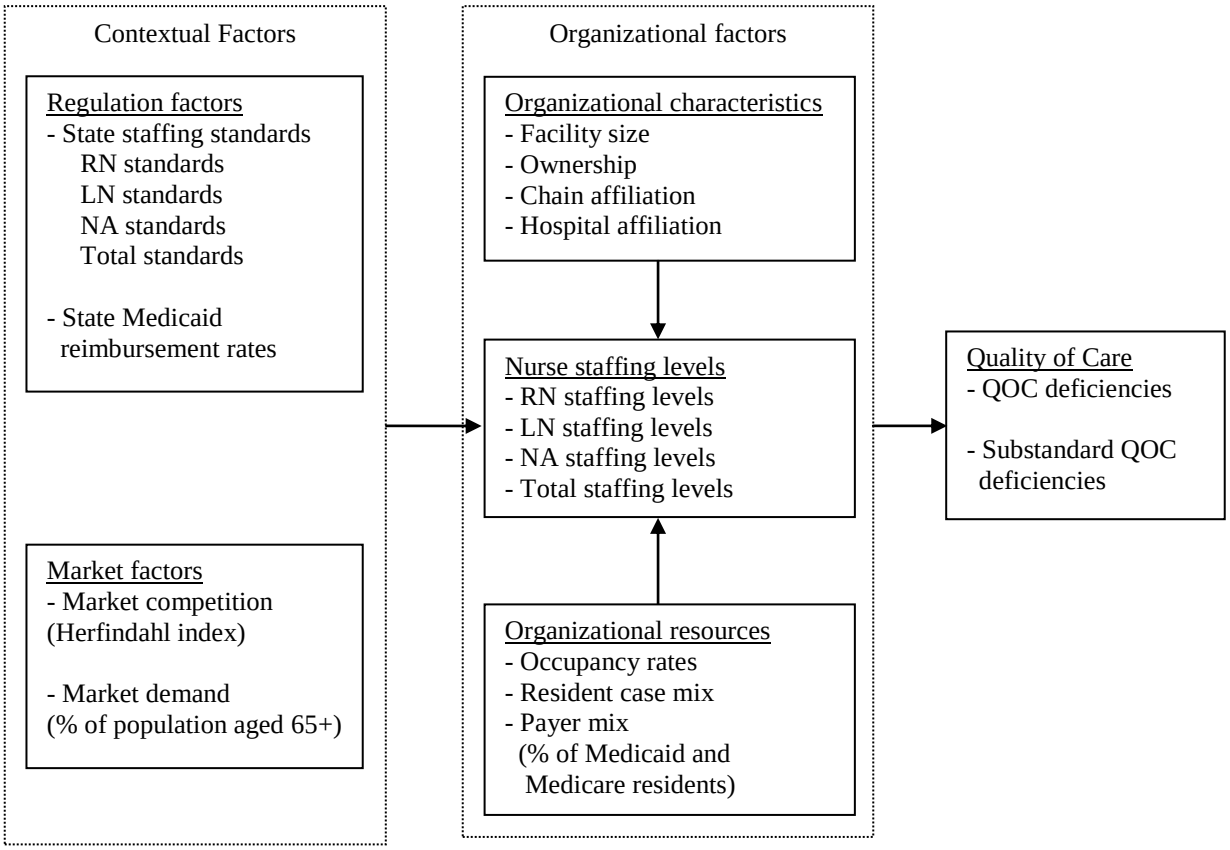

Figure 1. An Analytical Framework to Investigate Impacts of State Staffing Standards on Nurse Staffing Levels and Quality of Care in Nursing Homes

Hypotheses

According to the conceptual model presented, the study investigates the relationship of variables in two separate parts: (1) contextual and organizational factors as predictors for nursing

homes' decision on nurse staffing levels, and (2) nurse staffing levels as predictors for quality of care. The conceptual framework presents hypothesized relationships as follows:

H1: Nursing homes in states with higher RN (RN DON + RN) staffing standards will have higher RN (RN DON + RN) staffing levels than nursing homes in state with lower RN (RN DON + RN) staffing standards, controlling other regulation factors, market factors, organizational characteristics, and organizational resources.

H2: Nursing homes in states with higher LN (RN DON + RN + LPN) staffing standards will have higher LN (RN DON + RN + LPN) staffing levels than nursing homes in state with lower LN (RN DON + RN + LPN) staffing standards, controlling other regulation factors, market factors, organizational characteristics, and organizational resources.

H3: Nursing homes in states with higher total (RN DON + RN + LPN + NA) staffing standards will have higher total (RN DON + RN + LPN + NA) staffing levels than nursing homes in state with lower total (RN DON + RN + LPN + NA) staffing standards, controlling other regulation factors, market factors, organizational characteristics, and organizational resources.

H4: Nursing homes in states with higher NA staffing standards will have higher NA staffing levels than nursing homes in state with lower NA staffing standards, controlling other regulation factors, market factors, organizational characteristics, and organizational resources.

H5: Nursing homes with higher RN (RN DON + RN) staffing levels will have better quality of care (less quality-of-care deficiencies) than nursing homes with lower RN (RN DON +

RN) staffing levels, controlling LPN and NA staffing levels, organizational characteristics, and organizational resources.

H6: Nursing homes with higher LN (RN DON + RN + LPN) staffing levels will have better quality of care (less quality-of-care deficiencies) than nursing homes with lower LN (RN DON + RN + LPN) staffing levels, controlling NA staffing levels, organizational characteristics, and organizational resources.

H7: Nursing homes with higher total (RN DON + RN + LPN + NA) staffing levels will have better quality of care (less quality-of-care deficiencies) than nursing homes with lower total (RN DON + RN + LPN + NA) staffing levels, controlling organizational characteristics and organizational resources.

H8: Nursing homes with higher NA staffing levels will have better quality of care (less quality-of-care deficiencies) than nursing homes with lower NA staffing levels, controlling RN (RN DON + RN) and LPN staffing levels, organizational characteristics, and organizational resources.

Chapter Summary

This chapter provided an overview of resource dependence theory which serves as the theoretical foundation for the study. Several internal and external factors are hypothesized to have impact on nursing homes' strategic decisions on designing nurse staffing levels. In addition, a literature review of empirical studies related to the area of interest provides a sound evidence-based framework for the study by examining the extent that nurse staffing levels could contribute

to quality of care in nursing homes. The hypotheses generated expect that stronger nurse staffing standards would lead to higher nurse staffing levels in the facilities, which ultimately would contribute to a better quality of care.

CHAPTER THREE: METHODOLOGY

Chapter three presents the methodology employed to investigate the hypothesized relationships mentioned in the previous chapter. The study design and data sources with the operational definitions of the study variables are presented. In addition, the presentation on how each variable is to be operationally defined and quantified in this study will clarify the measurement issues. Finally, the statistical method used in the analysis is presented.

Study Design

This study uses a cross sectional design with four different datasets: (1) State Minimum Nurse Staffing Standards of 2007; (2) Online Survey Certification and Reporting System (OSCAR) of 2007 for facility characteristics; (3) Area Resource File (ARF) of 2005 for market factors; and (4) Average State Medicaid Reimbursement Rates from a research performed jointly by Department of Social & Behavioral Sciences at University of California and Department of Applied Gerontology at University of North Texas (Harrington et al., 2008).

State minimum nurse staffing standards for 2007 were obtained through each Web site of the states' department of health and human services. Additionally, this study referred to Harrington's published study titled "Nursing Home Staffing Standards in State Statutes and Regulations" (Harrington, 2008) when states staffing rules or regulations were not available through the Internet. The published study specifies nurse staffing requirements of the 50 states and the District of Columbia in detail. Furthermore, the staffing requirements were converted to

a number by estimating hours per resident day (HPRD) for a 100-bed nursing home to get standardized values of nurse staffing levels required by states.

In the process of collecting the rules and regulations for state nursing home staffing standards, it was noticed that the state of Oregon recently increased staffing hours of nursing assistants. The law, which was effective August 1, 2004 required a ratio of 1 nursing assistant to 10 residents on the day shift, 1 to 15 for evenings, and 1 to 25 for nights, and the ratio converts to 1.65 NA HPRD. From March 1, 2008, the law increased NA staffing from 1.65 HPRD to 2.07 HPRD (1 NA to 8 residents for days, 1:12 residents for evenings, and 1:20 for nights) and again increased from 2.07 HPRD to 2.31 HPRD from April 1, 2009 (1:7 for days, 1:11 for evenings, and 1:18 for nights).

The Online Survey Certification and Reporting System (OSCAR) is a national database of all nursing homes federally certified for Medicaid and Medicare in the United States, except veterans' affairs (VA) facilities or those located in the trust territories and Puerto Rico. OSCAR data are collected through an annual survey and certification process conducted by state inspectors to verify compliance with all federal and state regulatory requirements. In addition, the resident conditions are self-reported by nursing homes. OSCAR data includes three types of comprehensive facility-level information including (1) facility characteristics, including all categories of nurse staffing; (2) resident census and characteristics; and (3) deficiency citations about regulatory compliance of nursing homes. For this study, OSCAR data were used to obtain information about nurse staffing, facility characteristics including facility size, ownership, chain-

affiliation status, and hospital affiliation and facility resources including occupancy rate, resident case mix, and percentage of Medicaid and Medicare residents.

The Area Resource File (ARF) is a national county-level health resources information system commonly used in health service research. ARF is a collection of data from several sources, containing market competition, geographic and demographic information about the nursing home service environment. The ARF of 2005 data is used for the study to obtain information of market competition and percentage of population aged 65 and older. Both OSCAR and ARF data were available in the Public Affairs Ph.D. program at the University of Central Florida.

Average state Medicaid reimbursement rates were obtained from the research titled "State Data Book on Long Term Care, 2007: Program and Market Characteristics" performed by a joint research team of the Department of Social & Behavioral Sciences at the University of California, San Francisco and the Department of Applied Gerontology at the University of North Texas. This data represents the average Medicaid reimbursement rate for nursing homes in dollars from all 50 states and District of Columbia (Harrington, et al., 2008).

Measurement of the Study Variables

Endogenous Variables

Nurse Staffing Levels:

OSCAR data provide information about the nurse staffing category in the form of full-time equivalence. To be consistent with other nursing home studies, the staffing FTEs were

converted to hours per resident day (HPRD) using the following formula: (FTEs*70/14)/total number of residents. Four categories of nurses used in the study are: (1) RNs (RN DON + RN); (2) LNs (RN DON + RN + LPN); (3) total nurses (RN DON + RN + LPN + NA); and (4) NAs.

Unlike other nursing home studies, this study combines RN DON with RN to measure actual nurse staffing HPRD in nursing homes for the reason that many states, like the federal staffing standards, allow RNs to serve as RN DONs for smaller nursing homes while they require a separated body of RN DON for larger nursing homes.

For example, the federal staffing standards require nursing homes to have (1) 1 RN 8 hours/7days/week; (2) 1 LN (either RN or LPN/LVN) 24 hours/7days/week; (3) 1 RN DON 8 hours/5days/week (6 RN DON hours/day); (4) if fewer 60 residents, DON may also be the charge nurse. If nursing homes have 1 RN 8 hours/day and 1 LPN/LVN 16 hours/day, they would satisfy both requirement (1) and (2), assuming that nursing homes may want to hire LPN/LVN rather than RN in order to minimize labor costs. However, according to the requirements (3) and (4), nursing homes with more than 60 residents are required to have 1 extra RN 8 hours/5 days/week (6 RN DON hours/day), as a director of nursing since the DON may not be counted as the registered nurse on duty.

In sum, nursing homes are required to have 24 LN hours/day to avoid violations of the federal staffing requirements, where the 24 LN hours/day includes 1 RN 8 hours/day and 1 LPN/LVN 16 hours/day. In addition, if nursing homes have more than 60 residents, they should have 30 LN hours/day because they must have additional 1 RN DON 6 hours/day.

From this example, it is noticed that the main difference of the staffing requirements between smaller and larger nursing homes is regarding whether nursing homes are required to have different individuals serve as an RN DON. Although smaller and larger nursing homes are both mandated by the federal requirements to have an RN on duty for 8 hours per day, the RN in a smaller nursing home may sacrifice a portion of clinical service time for administering and supervising other caregivers' practices while the RN in a larger nursing home can spend full 8 hours for the services without compromising their resident care-related productivity since the facility has a separated body of RN DON. RN DONs who mainly have the authority and responsibility to administer and supervise nursing services would play an important role in the process of delivering care to residents in nursing homes. In addition, this type of supervisory nursing staff are responsible for the integration of nursing care with other professional services, which would contribute to the improvement in overall nursing home quality. This study views that this little difference in the staffing requirements between smaller and larger nursing homes may make significant difference in quality of nursing home care.

Some states have stronger RN staffing requirements, including higher RN DON staffing standards than others. The study combines the RN staffing part with the RN DON staffing part in measuring both state staffing standards and actual nurse staffing levels in nursing homes. This approach may provide a better understanding of the effects of state nurse staffing standards on nurse staffing levels and quality of care in nursing homes.

Quality of Care:

Nursing home survey deficiencies have been widely used in nursing home studies as a measure of overall quality of nursing home care. Since a deficiency citation is given to a nursing home that does not comply with federal and state regulatory requirements of resident care and safety, more deficiencies are obviously regarded as lower quality (Akinci & Krolikowski, 2005; Harrington, Zimmerman, et al., 2000; Kim, et al., 2009).

There are about 185 specific deficiency items, including both processes and outcomes of care. Process-related deficiencies are based on evaluation of appropriate procedures used in nursing home care while outcome-related deficiencies are based on examination of negative outcomes such as pressure sores (Wan, et al., 2010). The CMS categorizes the 185 items into 17 major categories in its State Operations Manual, which include (1) resident rights; (2) admission, transfer and discharge rights; (3) resident behavior and facility practices; (4) quality of life; (5) resident assessment; (6) quality of care; (7) nursing services; (8) dietary services; (9) physician services; (10) rehabilitation services; (11) dental services; (12) pharmacy services; (13) infection control; (14) physical environment; (15) administration; (16) laboratory and radiology services; and (17) other.

Also, each deficiency is cited with a label from A (least) to L (most) for enforcement purposes, according to the scope and level of severity. Nursing homes with deficiencies from A to C level are considered to be in ‘substantial compliance with federal quality requirements’ while those with D or higher level deficiencies are considered to be ‘not in substantial compliance’. Nursing homes with deficiencies at the C level or below are not subject to sanctions

or corrective actions, but appropriate sanctions are imposed against nursing homes with D or higher level deficiencies, depending on the level of deficiencies (GAO, 1999a, 1999b).

More specifically, nursing homes with D or E level deficiencies are mandated to provide a plan of correction; those with deficiencies from F to I level are required to receive a denial of payment for new admissions or civil money penalties (CMPs) of $50 to $3,000 per day of noncompliance; and those with deficiencies from J to L level are punished by sanctions such as temporary management, termination, and/or CMPs of $3,000 to $10,000 per day of noncompliance (GAO, 1999a, 1999b; Harrington, et al., 2004).

Among the 17 categories, the CMS further designates three categories (quality of care, quality of life, and resident behavior and facility practices), which include a total of 50 deficiency items as *substandard quality of care* because any violations in the 50 items could more directly harm health and safety of residents (OIG, 1999a). When a nursing home is cited for any of F or higher level deficiencies (except G level) in the substandard quality of care category, the law regards the violation as a significant deficiency that could put residents in immediate jeopardy and mandates the nursing homes to have extended quality inspections with immediate sanctions and/or corrective actions including the removal of authority to conduct nurse aide training (Harrington, et al., 2004; OIG, 1999a).

In many nursing home studies, the *substandard quality of care* appears to be a standard criterion to select specific quality-of-care related deficiencies in order to measure quality of nursing home care. Of the 185 deficiencies, several quality-of-care related deficiencies (e.g., physical restraint use, treatment with dignity and respect, medically related social services,

pressure sores, etc.), which are deficiency items in the *substandard quality of care*, are used individually as a single quality measurement, or are combined together as an aggregated index for measuring overall quality (Akinci & Krolikowski, 2005; Castle, 2000; Graber & Sloane, 1995; Harrington, Zimmerman, et al., 2000; Wan, 2003).

In this study, quality of care in nursing homes is measured by using nursing home deficiencies in two ways: (1) the number of deficiencies in the quality of care category (25 dichotomous items); and (2) the number of deficiencies in the substandard quality of care category (46 dichotomous items). The substandard quality of care category includes totally 50 deficiencies. However, four deficiencies, which are (1) qualifications of activity director (F249); (2) qualifications of social worker (F251); (3) housekeeping and maintenance services (F253); and (4) private closet space in each room (F255), may not be directly associated with nurse staffing levels in nursing homes. Thus, the four deficiencies are not considered in this study. The definition and tag number for the deficiencies used in this study are presented in Appendix A.

Exogenous Variables

State Minimum Staffing Standards:

This study divides state nurse staffing standards into four different categories according to the categories that most states commonly have used in their staffing requirements: (1) RN (RN DON + RN) staffing standards; (2) LN (RN DON + RN + LPN) staffing standards; (3) total (RN DON + RN + LPN + NA) staffing standards; and (4) NA staffing standards. Due to considerable variations in state nurse staffing standards, this study develops an algorithm to calculate states'

expected nurse staffing levels (i.e., nurse staffing levels required by states) for individual nursing homes in order to investigate their compliance with the state nurse staffing standards. The next chapter (Chapter 4) presents variations in state staffing standards and the algorithm in detail.

Control Variables

To examine the hypothesized relationships, other proposed organizational and contextual factors which may influence nurse staffing levels and/or quality of care in nursing homes are controlled. The control variables for organizational characteristics include facility size, ownership, chain affiliation, and hospital affiliation. The control variables for organizational resources include occupancy rate, payer mix, and resident case mix. The control variables for market factors are market competition and market demand while state Medicaid reimbursement rates are controlled as a regulation factor.

Facility size represents the total number of beds in each facility. Ownership is measured as categorical variable representing three categories: for-profit, non-profit, and government-owned nursing homes. Chain affiliation is used as a dichotomous variable coded as 1 for chain-affiliated and 0 or non-chain-affiliated status. Occupancy rate is quantified by total number of residents divided by total number of beds. For payer mix, the percentage of Medicaid and Medicare residents is measured by the ratio of the number of residents with Medicaid and Medicare residents to the total number of residents in each facility. Resident acuity index is used for resident case mix. Resident acuity index, which is the aggregated facility level, represents the severity of residents living in nursing homes, reflecting both activities of daily living and health

status measures. Resident acuity index5 used in this study is a weighted case mix index developed by the Cowles Research Group (1997) with possible scores of 0-38.

Market competition is measured by the Herfindahl-Hirschman Index and calculated as:

H-H index = $\sum_{i=1}^{n}$ (number of beds in a nursing home/total number of beds in a county)2, where i is the number of nursing homes in a county. Higher value of the H-H score indicates less competition. Market demand was measured by the percentage of people 65 year or older in the county where a nursing home is located. Lastly, state Medicaid reimbursement rates are the dollar amount of average daily payment rates in state level. Operational definition of the study variables is presented in Table 1.

5 Sum [totally dependent for eating x 3] + [requiring assistance from one or two staff with eating x 2] + [either independent or requiring supervision eating] + [totally dependent of toileting x 5] + [requiring assistance of one or two staff with toileting x 3] + [independent or requiring supervision with toileting] + [totally dependent for transferring x 5] + [requiring the assistance from one or two staff with transferring x3] + [independent or requiring supervision for transferring]+ [bedfast x 5] + [chair bound x 3] + [ambulatory]+ [receiving respiratory care] + [receiving suctioning] + [receiving intravenous therapy] + [receiving tracheostomy care] + [receiving parenteral feeding].

Table 1. Operational Definitions of the Study Variables

Variables	Operational Definition	Sources
Endogenous Variables		
Nurse Staffing Levels		
RN staffing levels	RN (RN DON+RN) staffing HPRD	OSCAR
LN staffing levels	LN (RN DON+RN+LPN/LVN) staffing HPRD	OSCAR
Total staffing levels	Total (RN DON+RN+LPN/LVN+NA) staffing HPRD	OSCAR
NA staffing levels	NA staffing HPRD	OSCAR
Quality of Care (QOC)		
QOC deficiencies	The number of QOC deficiencies cited (25 items)	OSCAR
Substandard QOC deficiencies	The number of substandard QOC deficiencies cited (45 items)	OSCAR
Exogenous Variables		
State Staffing Standards		
States' expected RN HPRD	State RN (RN DON+RN) staffing standards	Rules and regulations for nursing home staffing standards from each state government's Web site
States' expected LN HPRD	State LN (RN DON+RN+LPN/LVN) staffing standards	
States' expected total HPRD	Total (RN DON+RN+LPN/LVN+NA) staffing standards	
States' expected NA HPRD	State NA staffing standards	
Control Variables		
Organizational Variables		
Ownership	1 = For-profit; 2 = Non-profit; 3 = Government-owned	OSCAR
Chain affiliation	1 = Chain affiliated; 0 = Non-chain affiliated	OSCAR
Hospital affiliation	1 = Hospital based ; 0 = Non-hospital based	OSCAR
Facility size	Total number of beds	OSCAR
Occupancy rate	Total number of residents/Total number of beds	OSCAR
Percent Medicaid	The number of Medicaid residents/Total number of residents	OSCAR
Percent Medicare	The number of Medicare residents/Total number of residents	OSCAR
Acuity index	Resident acuity index	OSCAR
Contextual Variables		
Market competition	Herfindahl-Hirschman Index	OSCAR/ARF
Market demand	Percent of 65 or over population in county	ARF
State Medicaid	State average daily Medicaid reimbursement rates ($)	Harrington et al. (2007)

Method of Analysis

The study is initially conducted by employing hierarchical linear modeling (HLM) and then applying structural equation modeling methods, using maximum likelihood estimation to investigate impacts of state minimum nurse staffing standards on nurse staffing levels and quality of care in nursing homes. First, the study applies HLM to examine how state staffing standards, including RN, LN, total, and NA staffing standards are related to actual staffing levels in nursing homes. HLM, also known as multi-level analysis, allows variance in outcome variables to be analyzed at multiple hierarchical levels, while in linear regression, all effects are modeled to occur at a single level (Singer, 1998). Nursing homes are nested within states; the variables of interest are in two different levels including facility level (actual staffing level in nursing homes) and state level (states' nurse staffing standards); therefore, HLM is appropriate for the purpose of dealing with the nested data (Mueller, et al., 2006).

Secondly, to analyze the relationship between nurse staffing levels and quality of care in nursing homes, with other control variables, a path analysis using structural equation modeling (SEM) is performed in this study. SEM allows building an analytical (causal) model with multiple exogenous and endogenous variables (Wan, 2002). In addition, since the path analysis enables one to examine the total, direct, and indirect effects of the variables at a time, direct effects of nurse staffing levels on quality of care could be investigated, and simultaneously possible indirect effects of state staffing standards on quality of care are examined.

Quality of care in nursing homes is measured by using deficiencies in two different ways, which are (1) QOC deficiencies and (2) substandard QOC deficiencies. Since the two QOC

measures are overlapped with each other, this study independently conducts two separated structural equation models in order to avoid issues of variable redundancy and multicollinearity. Likewise, four state nurse staffing standards (RN, LN, total, and NA staffing standards) somehow contain duplicated information, for example, total nurse staffing standards include LN and NA staffing requirements while LN staffing standards contains RN staffing requirements. Therefore, a total of 8 structural equation models are built to investigate impacts of each category of state nurse staffing standards on quality of care in nursing homes. Following four figures (Figure 2, Figure 3, Figure 4, and Figure 5) presents analytical models for investigating the influences of environmental and organizational factors, and levels of nurse staffing on quality of care in nursing homes. Briefly, Figure 2 is an analytical model to investigate the impacts of state RN staffing standards and total nurse staffing levels on quality of care in nursing homes. Figure 3, Figure 4, and Figure 5 are analytical models for impacts of state LN, total, and NA staffing standards on quality of care in nursing homes, respectively. Each analytical model is implemented two times separately by replacing the two different QOC measures: (1) QOC deficiencies and (2) substandard QOC deficiencies.

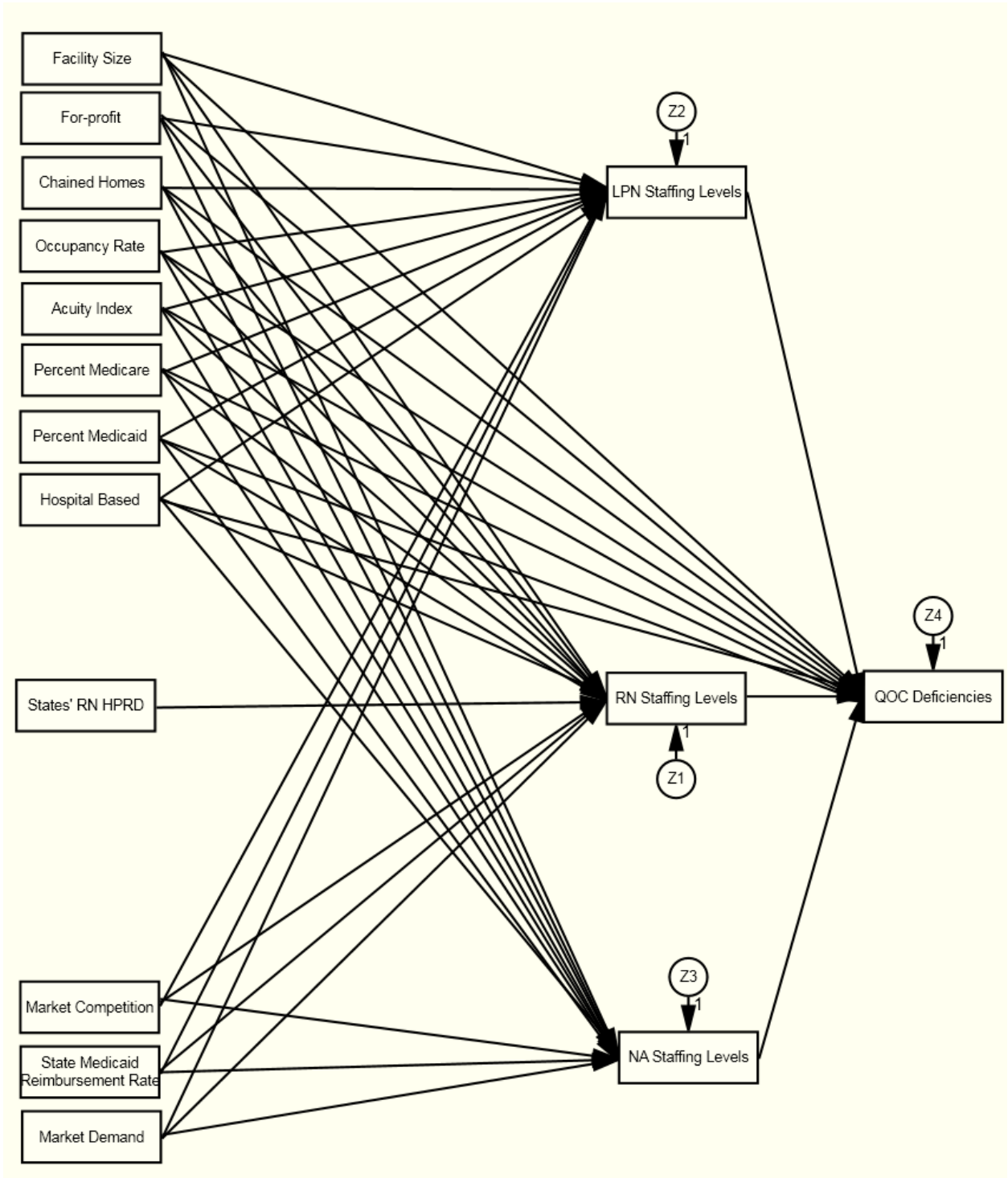

Figure 2. A Structural Equation Model to Investigate Impats of State RN Staffing Standards and RN Staffing Levels on Quality of Care in Nursing Homes

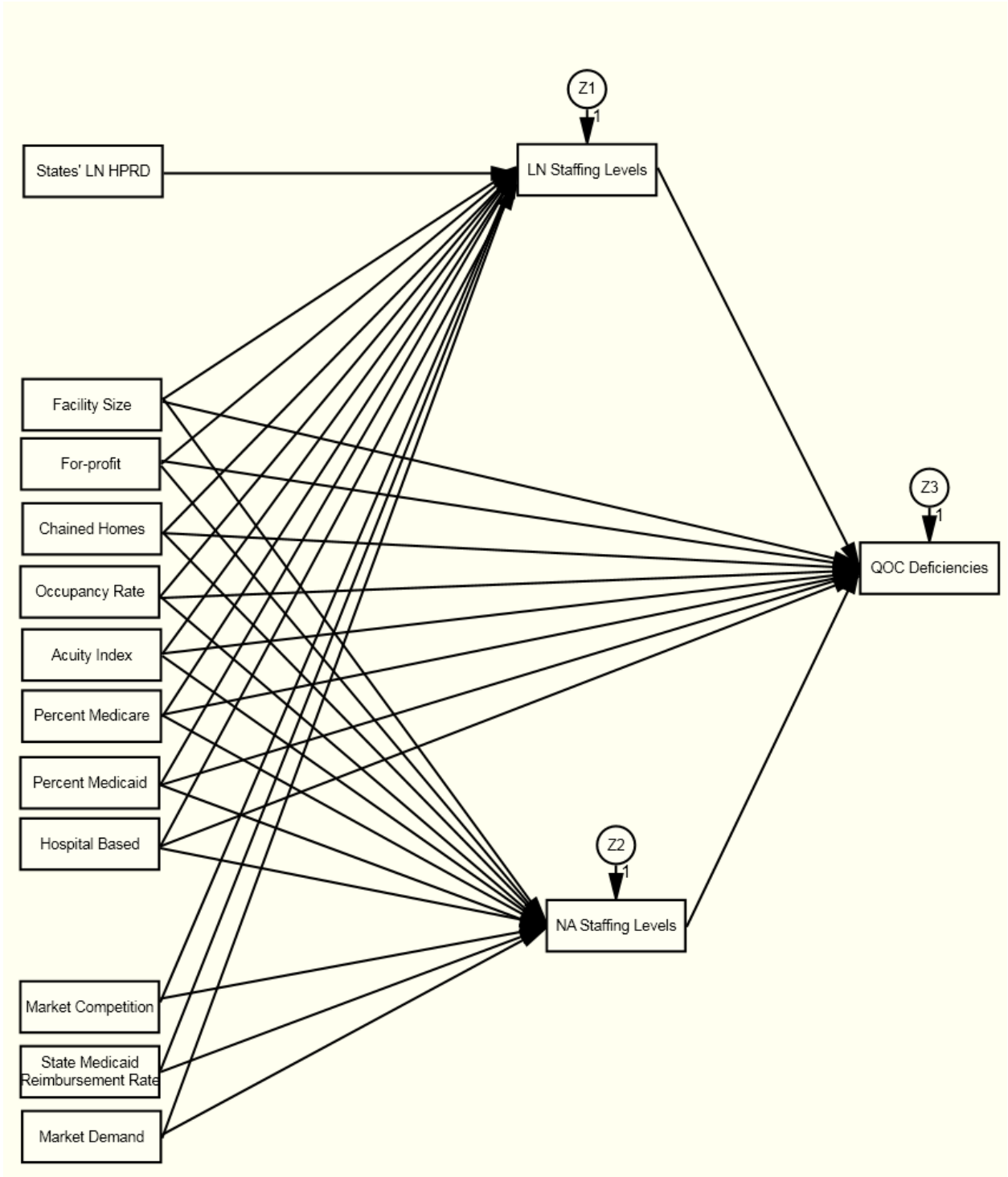

Figure 3. A Structural Equation Model to Investigate Impacts of State LN Staffing Standards and LN Staffing Levels on Quality of Care in Nursing Homes

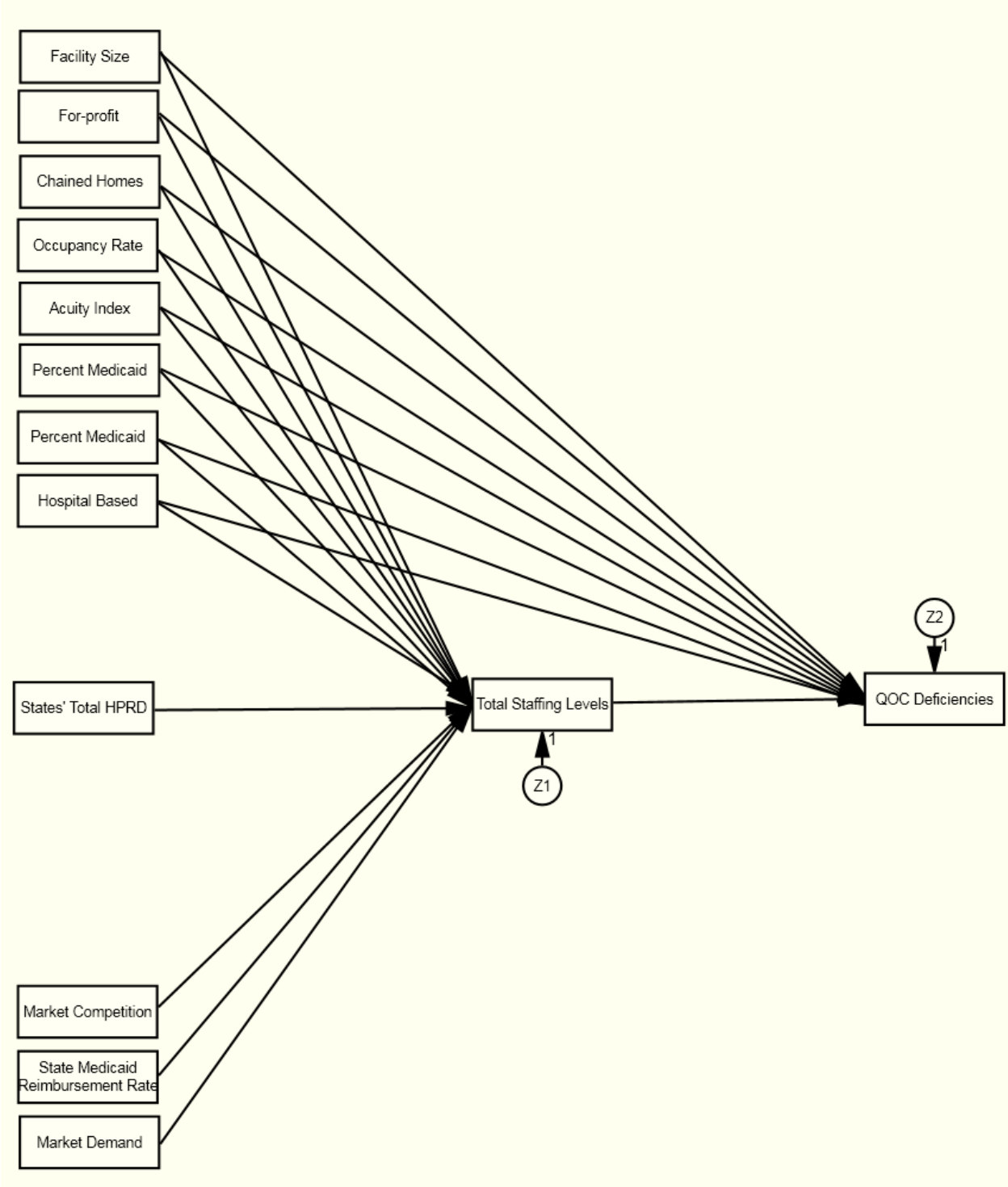

Figure 4. A Structural Equation Model to Investigate Impacts of State Total Staffing Standards and Total Nurse Staffing Levels on Quality of Care in Nursing Homes

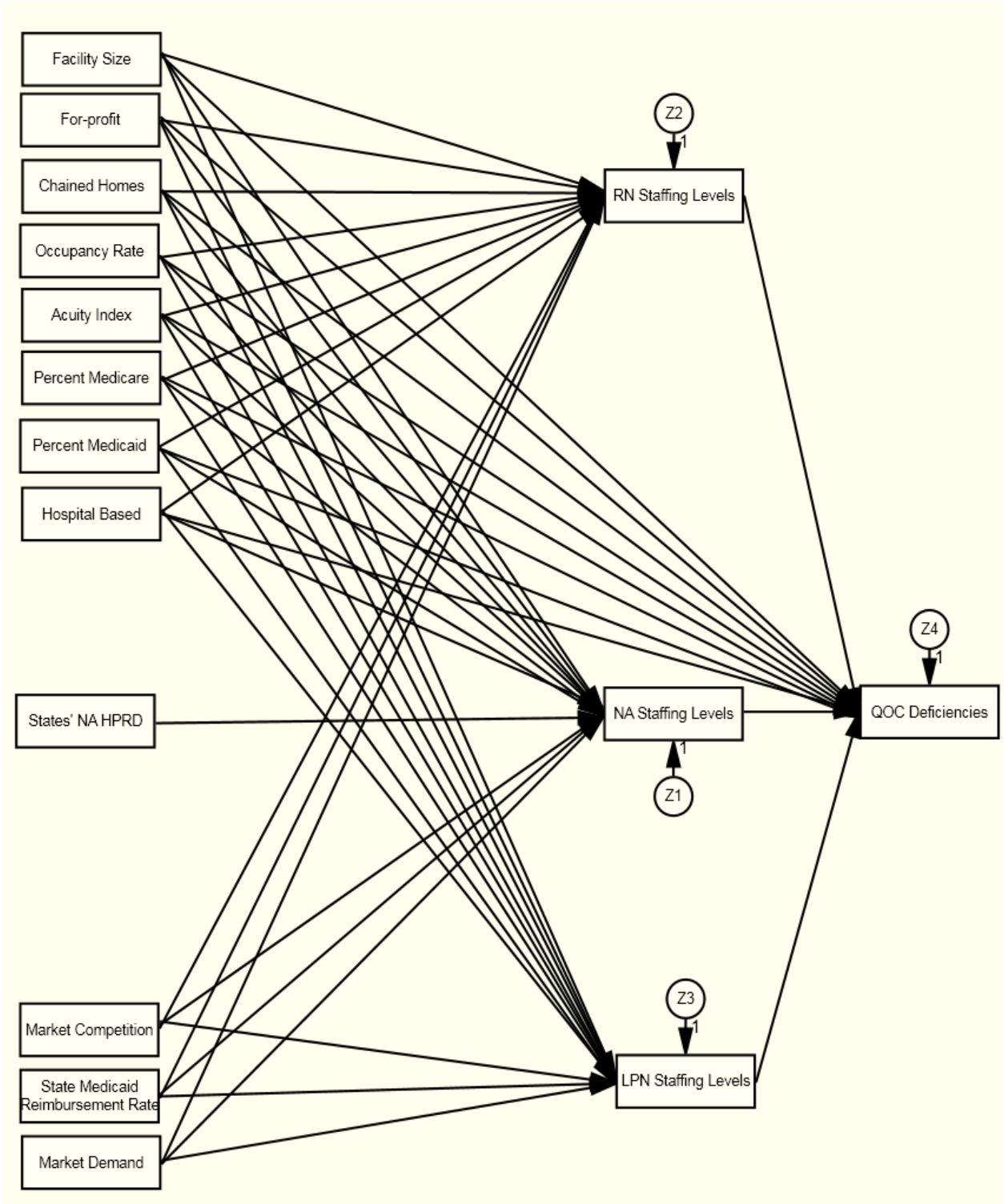

Figure 5. A Structural Equation Model to Investigate Impacts of State NA Staffing Standards and NA Staffing Levels on Quality of Care in Nursing Homes

Chapter Summary

This cross-sectional study is conducted by using secondary information from several databases, research articles, and related web sites. Unlike previous studies, this study encapsulates RN DON staffing, which is varied across nursing homes' facility size, into the minimum nurse staffing standards measures, assuming that RN DON plays an important role in administering and supervising nursing practices in the facilities. The standardized measures of nurse staffing levels are used by converting number of nursing hours per day per week to nursing hours per resident day (HPRD). The study applies hierarchical linear modeling and structural equation modeling methods using maximum likelihood to deal with multilevel modeling and examining the relationship between the study variables through path analysis.

CHAPTER FOUR:
VARIATION IN STATE NURSE STAFFING STANDARDS

Chapter four provides an overview of state nurse staffing standards. Firstly, variation in state staffing standards is comprehensively reviewed. Secondly, the algorithm that this study developed for calculating states' expected nurse staffing levels for individual nursing homes is introduced. Finally, this chapter provides tables including expected staffing levels for each state, which are used in the study analyses.

Variation in State Minimum Nurse Staffing Standards

All 50 states and the District of Columbia have their own nurse staffing standards, which mostly are more stringent than the federal ones. However, the standards vary widely across states in their levels and forms. Firstly, different states require different levels of nurse staffing. For example, Florida requires 3.9 total nursing HPRD while Tennessee requires 2.0 total nursing HPRD. Likewise, North Dakota requires 1 RN 8 hours/7 days/week while Hawaii requires 1 RN 24 hours/7 days/week.

Secondly, states have set their nurse staffing standards in four main different forms: (1) minimum staffing hours; (2) the number of staff by shift; (3) staff-to-resident ratio; and (4) hours per resident day (HPRD). Some states set their nurse staffing standards in the form of staff-to-resident ratio (e.g., Arkansas requires a ratio of 1 licensed direct care staff to 40 residents on the day shift, 1 to 40 for evenings, and 1 to 80 for nights) while some other states set their standards

in the form of HPRD (e.g., Indiana requires 0.5 licensed nurse hours per resident per day). As well, states set their standards either in the form of the number of staff by shift or in the form of minimum staffing hours. For example, Missouri requires a RN on the day shift and either a LPN or a RN on both the evening and night shifts while Kansas requires a licensed nurse on duty 24 hours/7 days/week.

Furthermore, the different standards forms were also noticed within states as well as across states. Michigan requires total 2.25 HPRD with its equivalent staff-to-resident ratio (1 nursing personnel to 8 patients during a morning shift, 1 to 12 during an afternoon shift, and 1 to 15 during a nighttime shift). Florida, using different standards forms for different type of nurse staff, requires one full-time registered nurse as a Director of Nursing (minimum staffing hours), one licensed nurse on each shift (the number of staff by shift), a minimum weekly average of certified nursing assistant and licensed nursing staffing combined of 3.9 hours of direct care per resident per day (HPRD), and at least one licensed nurse per 40 residents (staff-to-resident ratio).

Some states have used other forms for their staffing standards in addition to the four main forms. For example, Maine sets licensed staffing requirement in the form of staff-to-bed ratio (e.g., an additional licensed nurse added for each 50 beds on the day shift); Georgia's standards are indicated in the form of licensed nursing personnel-to-total nursing personnel ratio (e.g., at least 1 RN/LPN for every 7 total nursing personnel); and Delaware regulates staffing hours with a clear formula: Number of beds ÷ 100 x 40 = _____ hours per week minimum required for a part-time assistant RN DON and a director of in-service education for nursing homes with fewer than 100 beds.

Due to these variations, it is hard to determine which states have more or less stringent nurse staffing requirements. Therefore, this study uses HPRD as the standardized unit of measuring nurse staffing levels required by each state.

RN (RN DON + RN) Staffing Standards

Almost all states have their own RN DON and RN staffing standards in the form of minimum staffing hours or the number of staff by shift, or both. Only two states (Ohio and Oregon) use different forms in their RN requirements. Ohio requires 0.2 RN HPRD while Oregon requires 1 RN hours per resident per week in addition to the form of minimum staffing hours (1 RN 8 consecutive hours).

Like the federal RN requirements, states also require a separate body of RN DON for larger nursing homes. But, definitions of larger nursing homes differ across states. A total of 17 states (CA, DC, DE, IL, KS, ME, MI, MN, MS, MT, NJ, OH, RI, SC, VA, WV, and WY) use the number of beds for defining larger nursing homes while other states uses either the number of residents or the number of occupied beds. In addition, while the federal staffing standards use 61 residents or more as a threshold for defining larger nursing homes, some states use more detailed size requirements. For example, Montana requires 8 RN hours for nursing homes with 50 or fewer beds; 16 RN hours for 51-70 beds; 24 RN hours for 71-90 beds; and 32 RN hours for 91+ beds, where the required RN hours include the full-time RN DON for 41+ beds.

Federal RN staffing requirements have only two categories (RN DON and RN), whereas some states use other categories in addition to the two categories. District of Columbia and

Delaware, in addition to the two categories, have 'RN nursing services supervisor' and 'RN director of in-service education' categories, respectively. Or, some states use different categories in their RN DON or RN requirements, instead of the two categories. Iowa and Nevada have 'Health Service Supervisor' and 'Chief Administrative Nurse' requirements respectively, instead of RN DON.

Some states do not specify minimum staffing hours of RN DON even though they state stronger duties or responsibilities than the federal requirements of RN DON. Four states (AK, MI, ND, and TN) have clear duties or responsibilities of RN DON but do not clearly indicate minimum RN DON hours. Likewise, some states (e.g., AR, AZ, FL, GA, LA, MA, MI, NM, VA, WY) do not clearly specify minimum RN hours even though they have more stringent RN DON requirements than the federal ones.

Table 2 presents expected nurse staffing levels by states with the application of following algorithms: first, to convert RN DON + RN requirements to HPRD, this study uses the formula: Minimum staffing hours of RN DON and RN ÷ Number of residents in each nursing home. Second, if states use the form of the number of staff by shift in their RN DON and RN requirements, the number of shift is converted to minimum staffing hours, assuming that one day (24 hours) consists of 3 shifts (each 8-hour shift). Then, the hours are divided by the number of residents that nursing homes have. Third, if states have duplicated RN DON or RN requirements (e.g., Oregon requires both 0.143 RN HPRD and 1 RN 8 consecutive hours), more stringent rules are selected. Fourth, for states which do not clearly indicate minimum RN DON or RN hours, the federal requirements (8 RN hours for 60- residents and 14 RN hours (6 RN DON hours + 8 RN

hours) for 61+ residents) are applied because this study assumes that states, at a minimum, must rely on the federal staffing requirements. Fifth, if states' expected HPRD is lower than the minimum level indicated by federal standards, the federal standards are applied.

Table 2. States' Expected RN (RN DON+RN) Staffing Levels

State	Conditions	States' expected RN HPRD
AK	totres <= 60	14/the number of residents
	totres >= 61	38/the number of residents*
AL	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
AR	totres <= 60	8/the number of residents*
	61 <= totres <= 70	14/the number of residents*
	totres >= 71	14/the number of residents*
AZ	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
CA	beds <= 59	8/the number of residents*
	For 60-99 beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
	beds >= 100	30/the number of residents
CO	totres <= 59	24/the number of residents
	totres >= 60	30/the number of residents
CT	beds <= 60	24/the number of residents
	61 <= beds <= 120	30/the number of residents
	beds >= 121	36/the number of residents
DC	beds <= 30	24/the number of residents
	beds >= 31	30/the number of residents
DE	For 1-99 beds	
	totres <= 60	(8+2*(the number of beds/100*40/7)) /the number of residents*
	totres >= 61	(14+2*(the number of beds/100*40/7)) /the number of residents*
	For 100+ beds	
	totres <= 60	20/the number of residents*
	totres >= 61	26/the number of residents*

State	Conditions	States' expected RN HPRD
FL	totres <= 60	8/the number of residents*
	61 <= totres <= 120	14/the number of residents*
	totres >= 121	20/the number of residents*
GA	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
HI	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
IA	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
ID	totres <= 59	8/the number of residents
	60 <= totres <= 89	28/the number of residents
	totres >= 90	36/the number of residents
IL	Beds <= 49	8/the number of residents
	For 50+ beds	
	totres <= 99	14/the number of residents
	totres >= 100	20/the number of residents
IN	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
KS	beds <= 60	8/the number of residents
	beds >= 61	14/the number of residents
KY	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
LA	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
MA	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
MD	totres <= 60	8/the number of residents
	61 <= totres <= 99	14/the number of residents*
	100 <= totres <= 199	16/the number of residents
	200 <= totres <= 299	24/the number of residents
	totres >= 300	32/the number of residents
ME	beds <= 20	8/the number of residents
	21 <= beds <= 139	14/the number of residents
	140 <= beds <= 199	22/the number of residents
	200 <= beds <= 299	38/the number of residents
	300 <= beds <= 399	46/the number of residents
	400 <= beds <= 499	54/the number of residents

State	Conditions	States' expected RN HPRD
MI	beds <= 29	8/the number of residents*
	For 30+ beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
MN	beds <= 60	8/the number of residents*
	For 61+ beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
MO	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
MS	beds <= 60	8/the number of residents
	61 <= beds <= 179	14/the number of residents
	beds >= 180	20/the number of residents
MT	beds <= 50	8/the number of residents
	51 <= beds <= 70	16/the number of residents
	71 <= beds <= 90	24/the number of residents
	beds >= 91	32/the number of residents
NC	totres <= 59	8/the number of residents
	totres >= 60	14/the number of residents
ND	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents*
NE	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
NH	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
NJ	beds <= 150	14/the number of residents
	beds >= 151	36/the number of residents
NM	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents*
NV	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
NY	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents

State	Conditions	States' expected RN HPRD
OH	For 1-59 beds	
	totres <= 40	8/the number of residents*
	totres >= 41	0.2 RN HPRD
	For 60+ beds	
	totres <= 10	8/the number of residents*
	totres >= 11	0.2+(6 RN DON hours/the number of residents)
OK	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents*
OR	totres <= 56	8/the number of residents
	57 <= totres <= 60	0.143 HPRD
	totres >= 61	0.143+(6 RN DON hours/the number of residents)
PA	totres <= 59	24/the number of residents
	60 <= totres <= 250	30/the number of residents
	251 <= totres <= 500	54/the number of residents
	501 <= totres <= 1000	86/the number of residents
	totres >= 1001	166/the number of residents
RI	beds <= 30	24/the number of residents
	beds >= 31	30/the number of residents
SC	totbeds <= 22	8/the number of residents*
	For 23+ beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
SD	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
TN	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
TX	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents
UT	No conditions	14/the number of residents
VA	beds <= 59	8/the number of residents*
	For 60+ beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*
VT	totres <= 60	8/the number of residents
	totres >= 61	14/the number of residents

State	Conditions	States' expected RN HPRD
WA	totres <= 60	16/the number of residents*
	totres >= 61	22/the number of residents*
WI	totres <= 59	8/the number of residents
	60 <= totres <= 74	14/the number of residents
	75 <= totres <= 99	22/the number of residents
	totres >= 100	30/the number of residents
WV	beds <= 59	8/the number of residents
	beds >= 60	14/the number of residents
WY	beds <= 60	8/the number of residents*
	For 61+ beds	
	totres <= 60	8/the number of residents*
	totres >= 61	14/the number of residents*

Note: *: The federal RN requirements (8 RN hours for 60- residents and 14 RN (RN DON + RN) hours for 61+ residents) were applied; State staffing standards for Medicaid were included if there were specific requirements; Since only few states include a condition about the number of units in nursing homes in their requirements, the number of units in nursing homes was not considered; For simplicity purposes, full-time for RN DON was considered to work 6 hours per day while full-time for other categories (RN, LPN/LVN, or NA) was considered to work 8 hours per day.

For example, Alaska and Hawaii do not indicate hours of RN DON while the federal rules indicate 6 RN DON hours. Since the federal rules require a separated body of RN DON for 61+ residents, additional 6 RN DON hours are added to both Alaska's and Hawaii's RN hours for nursing homes with 61+ residents.

California requires 6 RN DON + RN hours for nursing homes with less than 99 beds, while the federal rules requires 8 RN DON + RN hours for 60- residents and 14 RN DON + RN hours for 61+ residents. Since California and federal requirements use different definitions of facility size (the number of beds vs. the number of residents), the number of residents required by the federal requirements is considered together with the number of beds required by the California requirements. More specifically, for 59- beds, the California's 6 RN DON + RN hours are replaced by the federal 8 RN DON + RN hours since nursing homes with 59- beds could not have more than 60 residents. For 60-99 beds, the California's 6 RN DON + RN hours are

replaced by the federal 8 RN DON + RN hours for nursing homes with 60- residents and the federal 14 RN DON + RN hours for nursing homes with 61+ residents.

Oregon uses two forms of RN requirements (0.143 RN HPRD and 8 RN consecutive hours). In HPRD unit, 0.143 RN HPRD is generally more stringent than 8 RN hours for nursing homes with more than 57 residents. Thus, 8 RN hours are applied for 56- residents while 0.143 RN HPRD is applied for 57+ residents. Also, additional 6 RN DON hours are added to nursing homes with more than 60 residents because Oregon requires a separated body of RN DON for 61+ residents.

LN Staffing Standards

Most states have set their LN (RN DON + RN + LPN/LVN) requirement in the form of minimum staffing hours or the number of staff by shift while some other states set their LN requirements in the form of HPRD or staff-to-resident ratio. A total of 16 states (AR, CA, CT, DC, FL, GA, IA, IL, IN, MA, MD, NJ, TN, TX, VT, and WI) use more than one form (mostly minimum staffing hours and HPRD) for their LN requirements. Among the states, Georgia specifies LN staffing levels by using not only minimum staffing hours but also licensed nursing personnel-to-total nursing personnel ratio (1 RN/LPN : 7 total nursing personnel).

Some states have somehow less stringent LN requirements than the federal ones because some categories of nurse are not specified in their requirements. For example, Arizona requires 1 RN DON full-time and a minimum ratio of 1 nurse to 64 residents, but does not clearly indicate staffing levels of either RN or LPN/LVN. Thus, when Arizona's LN requirement is converted to

HPRD, 0.185 LN HPRD is required for nursing homes with 100 residents while the federal LN rules require 0.30 LN HPRD for nursing homes with 100 residents. In this case, the federal LN requirements (24 LN hours for 60- residents and 30 LN hours (24 LN hours + 6 RN DON hours) for 60+ residents) are applied. Using same algorithms for states' expected RN DON+RN staffing levels, Table 3 presents expected LN staffing levels by states.

Table 3. State's Expected LN (RN DON + RN + LPN) Staffing Levels

State	Conditions	States' expected LN HPRD
AK	totres <= 60	24/the number of residents
	totres >= 61	38/the number of residents*
AL	totres <= 60	24/the number of residents*
	totres >= 61	30/the number of residents*
AR	totres <= 48	24/the number of residents
	49 <= totres <= 60	0.5 HPRD
	totres >= 61	0.5+(6 RN DON hours/the number of residents)*
AZ	totres <= 60	24/the number of residents*
	61 <= totres< = 192	30/the number of residents*
	totres >= 193	0.125+(6 RN DON hours/the number of residents)
CA	For 1-59 beds	
	totres <= 24	24/the number of residents
	totres >= 25	0.987 HPRD
	For 60+ beds	
	totres <= 24	30/the number of residents
	totres >= 25	0.987+(6 RN DON hours/the number of residents)
CO	totres <= 59	24/the number of residents
	totres >= 60	30/the number of residents
CT	For 1-60 beds	
	totres <= 37	24/the number of residents
	totres >= 38	0.64 HPRD
	For 61-120 beds	
	totres <= 37	30/the number of residents
	totres >= 38	0.64+(6 RN DON hours/the number of residents)
	For 121+ beds	
	totres <= 37	36/the number of residents
	totres >= 38	0.64+(12 RN DON hours/the number of residents)

State	Conditions	States' expected LN HPRD
DC	For 1-30 beds	
	totres <= 29	24/the number of residents
	totres = 30	0.57+(24 RN hours/the number of residents)
	For 31+ beds	
	totres <= 29	30/the number of residents
	totres >= 30	0.57+((6 RN DON hours+24 RN hours)/the number of residents)
DE	For 1-15 beds	24/the number of residents*
	For 16-99 beds	
	totres <= 13	24/the number of residents*
	totres >= 14	1.2+(6 RN DON hours/the number of residents) +2*(the number of beds/100*40/7/the number of residents)
	For 100+ beds	
	totres <= 5	24/the number of residents*
	totres >= 6	1.2+(18 RN DON hours/the number of residents)
FL	totres <= 24	24/the number of residents
	25 <= totres <= 60	1.0 HPRD
	61 <= totres <= 120	1.0+(6 RN DON hours/the number of residents*
	totres >= 121	1.0+(12 RN DON hours/the number of residents)*
GA	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
HI	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
IA	totres <= 60	24/the number of residents
	totres >= 61	0.4+(6 RN DON hours/the number of residents)*
ID	totres <= 59	24/the number of residents
	60 <= totres <= 89	36/the number of residents
	totres >= 90	36/the number of residents
IL	For 1-49 beds	
	totres <= 48	24/the number of residents
	totres >= 49	0.5 HPRD
	For 50+ beds	
	totres <= 48	30/the number of residents
	49 <= totres <= 99	0.5+(6 RN DON hours/the number of residents)
	totres >= 100	0.5+(12 RN DON hours/the number of residents)
IN	totres < = 48	24/the number of residents
	49 <= totres <= 60	0.5 HPRD
	totres >= 61	0.5+(6 RN DON hours/the number of residents)

State	Conditions	States' expected LN HPRD
KS	beds <= 60	24/the number of residents
	beds >= 61	30/the number of residents
KY	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
LA	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
MA	totres <= 40	30/the number of residents
	totres >= 41	0.6+(6 RN DON hours/the number of residents)
MD	totres <= 60	24/the number of residents
	61 <= totres <= 299	30/the number of residents*
	totres >= 300	32/the number of residents
ME	beds <= 20	24/the number of residents
	21 <= beds <= 69	30/the number of residents
	70 <= beds <= 99	38/the number of residents
	100 <= beds <= 139	54/the number of residents
	140 <= beds <= 149	62/the number of residents
	150 <= beds <= 199	70/the number of residents
	200 <= beds <= 209	86/the number of residents
	210 <= beds <= 249	94/the number of residents
	250 <= beds <= 279	102/the number of residents
	280 <= beds <= 299	110/the number of residents
	300 <= beds <= 349	126/the number of residents
	350 <= beds <= 399	142/the number of residents
	400 <= beds <= 419	158/the number of residents
	420 <= beds <= 449	166/the number of residents
	450 <= beds <= 489	174/the number of residents
MI	beds <= 29	24/the number of residents*
	For 30+ beds	
	totres <= 60	24/the number of residents*
	totres >= 61	30/the number of residents*
MN	beds <= 60	24/the number of residents*
	For 60+ beds	
	totres <= 60	24/the number of residents*
	totres >= 61	30/the number of residents*
MO	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
MS	beds <= 60	40/the number of residents
	61 <= beds <= 179	46/the number of residents
	beds >= 180	52/the number of residents

State	Conditions	States' expected LN HPRD
MT	beds <= 40	24/the number of residents
	41 <= beds <= 75	32/the number of residents
	76 <= beds <= 80	48/the number of residents
	81 <= beds <= 90	56/the number of residents
	beds >= 91	64/the number of residents
NC	totres <= 59	24/the number of residents
	totres >= 60	30/the number of residents
ND	totres <= 60	32/the number of residents
	totres >= 61	38/the number of residents*
NE	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
NH	totres <= 60	32/the number of residents
	totres >= 61	38/the number of residents*
NJ	For 1-149 beds	
	totres <= 36	24/the number of residents*
	totres >= 37	0.5+(6 RN DON hours/the number of residents)
	For 150+ beds	
	totres <= 48	36/the number of residents
	totres >= 49	0.5+(12 RN DON hours/the number of residents)
NM	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
NV	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
NY	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
OH	For 1-60 beds	24/the number of residents*
	For 61+ beds	
	totres <= 60	24/the number of residents*
	61 <= totres <= 120	30/the number of residents*
	totres >= 121	0.2+(6 RN DON hours/the number of residents)*
OK	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents*
OR	totres <= 60	24/the number of residents
	61 <= totres <= 210	30/the number of residents
	totres >= 211	0.143 RN HPRD

State	Conditions	States' expected LN HPRD
PA	totres <= 150	30/the number of residents
	151 <= totres <= 500	54/the number of residents
	501 <= totres <= 1000	86/the number of residents
	totres >= 1001	166/the number of residents
RI	beds <= 30	24/the number of residents
	beds >= 31	30/the number of residents
SC	For 1-22 beds	24/the number of residents
	For 23+ beds	
	totres <= 44	30/the number of residents
	totres >= 45	46/the number of residents
SD	totres <= 60	24/the number of residents
	totres >= 61	30/the number of residents
TN	totres <= 60	24/the number of residents
	totres >= 61	0.4+(6 RN DON hours/the number of residents)*
TX	totres <= 60	24/the number of residents
	totres >= 61	0.4+(6 RN DON hours/the number of residents)
UT	beds <= 16	24/the number of residents
	beds >= 17	30/the number of residents
VA	beds <= 59	24/the number of residents*
	For 60+ beds	
	totres <= 60	24/the number of residents*
	totres >= 61	30/the number of residents*
VT	totres <= 24	24/the number of residents
	25 <= totres <= 60	1.0 HPRD
	totres >= 61	1.0+(6 RN DON hours/the number of residents
WA	No conditions	30/the number of residents
WI	totres <= 48	24/the number of residents
	49 <= totres <= 59	0.5 HPRD
	totres >= 60	0.5+(6 RN DON hours/the number of residents)
WV	beds <= 59	24/the number of residents
	beds >= 60	30/the number of residents
WY	beds <= 60	24/the number of residents
	beds >= 61	30/the number of residents

Note: *: The federal LN requirements (24 LN hours for 60- residents and 30 LN (6 RN DON hours + 24 LN hours) hours for 61+ residents) were applied; State staffing standards for Medicaid were included if there were specific requirements; Since only few states include a condition about the number of units in nursing homes in their requirements, the number of units in nursing homes was not considered; For simplicity purposes, full-time for RN DON was considered to work 6 hours per day while full-time for other categories (RN, LPN/LVN, or NA) was considered to work 8 hours per day.

For example, California requires 24 LN hours for 59- beds in its licensed staff requirements and at the same time, requires 0.987 LN HPRD in its direct care staff requirements. In HPRD unit, 0.987 LN HPRD is generally more stringent than 24 LN hours for nursing homes with more than 24 residents. Likewise, California requires 30 LN hours (24 LN hours + 6 RN DON hours) for 60+ beds. But, since California does not allow hours of RN DON to be included in 0.987 LN HPRD, 6 additional RN DON hours should be added to 0.987 LN HPRD for 60+ beds. Thus, for 60+ beds, 0.987 LN HPRD with additional 6 RN DON hours are also more stringent than 30 LN hours for nursing homes with more than 24 residents.

Florida requires both 24 LN hours and 1.0 LN HPRD. In HPRD unit, 1.0 LN HPRD is more stringent than 24 LN hours for nursing homes with more than 24 residents. Furthermore, Florida requires 1 full-time RN DON and 1 assistant RN DON for 121+ residents. However, for nursing homes with 60- residents, 1 full-time RN DON would be included in 24 LN hours, assuming that nursing homes tend to follow their staffing requirements at a minimum. Thus, 6 RN DON hours are added to 1.0 LN HPRD for nursing homes with 61-120 residents, and 12 RN DON hours (6 RN DON hours + 6 assistant RN DON hours) are added to 1.0 LN HPRD for nursing homes with 121+ residents.

Total Nurse Staffing Standards

Among the 50 states and District of Columbia, 31 states have their own total nurse staffing standards, mostly using the form of either HPRD or staff-to-resident ratio. Two states (MT and WV) use different forms for their total nurse staffing requirements. Montana uses the

form of staff-to-bed ratio while West Virginia uses specific hours by the number of residents in addition to HPRD.

Unlike other relevant studies, this study considers states' LN requirements together with their total staffing HPRD since for smaller nursing homes, LN requirements usually exceed total staffing requirements. For example, Florida requires 24 LN hours and 3.9 total staffing HPRD. If nursing homes have fewer than 7 residents, the compliance with the 24 LN hours would result in the staffing levels that already exceed 3.9 HPRD. Applying same algorithm above, expected total nurse staffing levels by states are presented in Table 4.

Table 4. States' Expected Total (RN DON + RN+ LPN + NA) Staffing Levels

State	Conditions	States' expected total nurse staffing HPRD
AR	totres <= 8	24/the number of residents
	9 <= totres <= 60	2.8 HPRD
	totres >= 61	2.8+(6 RN DON hours/the number of residents)*
CA	For 1-59 beds	
	totres <= 7	24/the number of residents
	totres >= 8	3.2 HPRD
	For 60+ beds	
	totres <= 7	30/the number of residents
	totres >= 8	3.2+(6 RN DON hours/the number of residents)
CO	totres <= 12	24/the number of residents
	13 <= totres <= 59	2.0 HPRD
	totres >= 60	2.0+(6 RN DON hours/the number of residents)
CT	For 1-60 beds	
	totres <= 12	24/the number of residents
	totres >= 13	1.90 HPRD
	For 61-120 beds	
	totres <= 12	30/the number of residents
	totres >= 13	1.90+(6 RN DON hours/the number of residents)
	For 121+ beds	
	totres <= 12	36/the number of residents
	totres >= 13	1.90+(12 RN DON hours/the number of residents)

State	Conditions	States' expected total nurse staffing HPRD
DC	For 1-30 beds	
	totres <= 6	24/the number of residents
	7 <= totres <= 29	3.5 HPRD
	totres = 30	3.5+(24 RN hours/the number of residents)
	For 31+ beds	
	totres <= 8	30/the number of residents
	9 <= totres <= 29	3.5 HPRD
	totres >= 30	3.5+((6 RN DON hours+24 RN hours)/the number of residents)
DE	For 1-15 beds	
	totres <= 6	24/the number of residents*
	totres >= 7	3.67 HPRD
	For 16-99 beds	
	totres <= 4	24/the number of residents*
	totres >= 5	3.67+(6 RN DON hours/the number of residents) +2*(the number of beds/100*40/7/the number of residents)
	For 100+ beds	
	totres = 1	24/the number of residents*
	totres >= 2	3.67+(18 RN DON hours/the number of residents)
FL	totres <= 6	24/the number of residents
	7 <= totres <= 60	3.9 HPRD
	61 <= totres <= 120	3.9+(6 RN DON hours/the number of residents)*
	totres >= 121	3.9+(12 RN DON hours/the number of residents)*
GA	totres <= 12	24/the number of residents
	12 <= totres <= 60	2.0 HPRD
	totres >= 61	2.0+(6 RN DON hours/the number of residents)*
IA	totres <= 12	24/the number of residents*
	13 <= totres <= 60	2.0 HPRD
	totres >= 61	2.0+(6 RN DON hours/the number of residents)*
ID	totres <= 7	24/the number of residents
	7 <= totres <= 59	2.4+(6 RN DON hours/the number of residents)
	totres >= 60	2.4+(12 RN DON hours/the number of residents)
IL	For 1-49 beds	
	totres <= 9	24/the number of residents
	totres >= 10	2.5 HPRD
	For 50+ beds	
	totres <= 9	30/the number of residents
	10 <= totres <= 99	2.5+(6 RN DON hours/the number of residents)
	totres >= 100	2.5+(12 RN DON hours/the number of residents)

State	Conditions	States' expected total nurse staffing HPRD
KS	For 1-60 beds	
	totres <= 12	24/the number of residents
	totres >= 13	2.0 HPRD
	For 61+ beds	
	totres <= 12	30/the number of residents
	totres >= 13	2.0+(6 RN DON hours/the number of residents)
LA	totres <= 15	24/the number of residents
	16 <= totres <= 60	1.5 HPRD
	totres >= 61	1.5+(6 RN DON hours/the number of residents)
MA	totres <= 9	30/the number of residents
	totres >= 10	2.6+(6 RN DON hours/the number of residents)
MD	totres <= 12	24/the number of residents
	13 <= totres <= 60	2.0 HPRD
	totres >= 61	2.0+(6 RN DON hours/the number of residents)*
ME	For 1-20 beds	
	totres <= 8	24/the number of residents
	totres >= 9	2.93 HPRD
	For 21+ beds	
	totres <= 8	30/the number of residents
	totres >= 9	2.93+(6 RN DON hours/the number of residents)
MI	For 1-30 beds	
	totres <= 10	24/the number of residents*
	totres >= 11	2.25 HPRD
	For 31+ beds	
	totres <= 8	24/the number of residents*
	totres >= 9	2.25+(6 RN DON hours/the number of residents)
MN	For 1-60 beds	
	totres <= 12	24/the number of residents*
	totres >= 13	2.0 HPRD
	For 61+ beds	
	totres <= 9	24/the number of residents*
	totres >= 10	2.0+(6 RN DON hours/the number of residents)

State	Conditions	States' expected total nurse staffing HPRD
MS	For 1-60 beds	
	totres <= 14	40/the number of residents
	totres >= 15	2.8 HPRD
	For 61-179 beds	
	totres <= 14	46/the number of residents
	totres >= 15	2.8+(6 RN DON hours/the number of residents)
	For 180+ beds	
	totres <= 14	52/the number of residents
	totres >= 15	2.8+(12 RN DON hours/the number of residents)
MT	beds <= 8	24/the number of residents
	9 <= beds <= 15	28/the number of residents
	16 <= beds <= 20	36/the number of residents
	21 <= beds <= 25	48/the number of residents
	26 <= beds <= 30	56/the number of residents
	31 <= beds <= 35	64/the number of residents
	36 <= beds <= 40	72/the number of residents
	41 <= beds <= 45	88/the number of residents
	46 <= beds <= 50	100/the number of residents
	51 <= beds <= 55	108/the number of residents
	56 <= beds <= 60	112/the number of residents
	61 <= beds <= 65	124/the number of residents
	66 <= beds <= 70	136/the number of residents
	71 <= beds <= 75	140/the number of residents
	76 <= beds <= 80	152/the number of residents
	81 <= beds <= 85	160/the number of residents
	86 <= beds <= 90	168/the number of residents
	91 <= beds <= 95	176/the number of residents
	beds >= 96	184/the number of residents
NC	totres <= 11	24/the number of residents
	12 <= totres <= 60	2.1 HPRD
	totres >= 61	2.1+(6 RN DON hours/the number of residents
NJ	For 1-149 beds	
	totres <= 7	24/the number of residents*
	totres >= 8	2.5+(6 RN DON hours/the number of residents)
	For 150+ beds	
	totres <= 9	36/the number of residents
	totres >= 10	2.5+(12 RN DON hours/the number of residents)
NM	totres <= 9	24/the number of residents
	10 <= totres <= 60	2.5 HPRD
	totres >= 61	2.5+(6 RN DON hours/the number of residents)*

State	Conditions	States' expected total nurse staffing HPRD
OH	For 1-60 beds	
	totres <= 8	24/the number of residents*
	totres >= 9	2.75 HPRD
	For 61+ beds	
	totres <= 6	24/the number of residents*
	totres >= 7	2.75+(6 RN DON hours/the number of residents)
OK	totres <= 8	24/the number of residents
	9 <= totres <= 60	2.86 HPRD
	totres >= 61	2.86+(6 RN DON hours/the number of residents)*
PA	totres <= 8	30/the number of residents
	totres >= 9	2.7+(6 RN DON hours/the number of residents)
TN	totres <= 12	24/the number of residents
	13 <= totres <= 60	2.0 HPRD
	totres >= 61	2.0+(6 RN DON hours/the number of residents)*
VT	totres <= 8	24/the number of residents
	9 <= totres <= 60	3.0 HPRD
	totres >= 61	3.0+(6 RN DON hours/the number of residents)
WI	totres <= 9	24/the number of residents
	10 <= totres <= 59	2.5 HPRD
	totres >= 60	2.5+(6 RN DON hours/the number of residents)
WV	For 1-59 beds	
	totres <= 2	24/the number of residents*
	3<= totres <= 10	48/the number of residents
	11 <= totres <= 20	56/the number of residents
	21 <= totres <= 30	72/the number of residents
	31 <= totres <= 40	90/the number of residents
	41 <= totres <= 50	113/the number of residents
	51 <= totres <= 60	2.25 HPRD (detailed hours are listed in Appendix C)
	totres >= 61	2.25+(6/the number of residents)
WY	For 1-59 beds	
	totres <= 10	24/the number of residents
	totres >= 11	2.25 HPRD
	For 60+ beds	
	totres <= 10	30/the number of residents
	totres >= 11	2.25+(6 RN DON hours/the number of residents)
OR		State's expected LN HPRD + 1.65 NA HPRD
SC		State's expected LN HPRD + 1.87 NA HPRD

Note: *: The federal LN requirements (24 LN hours for 60- residents and 30 LN (6 RN DON hours + 24 LN hours) hours for 61+ residents) were applied; State staffing standards for Medicaid were included if there were specific requirements; Since only few states include a condition about the number of units in nursing homes in their requirements, the number of units in nursing homes was not considered; For simplicity purposes, full-time for RN DON was considered to work 6 hours per day while full-time for other categories (RN, LPN/LVN, or NA) was considered to work 8 hours per day.

In addition to the 31 states, two more states (OR and SC) were added into Table 4. Both Oregon and South Carolina do not have specific total staffing levels requirements but have NA requirements (OR: 1.65 NA HPRD and SC: 1.87 NA HPRD). Thus, expected total nurse staffing levels by those two states could be obtained by the sum of the NA requirements and LN requirements.

NA Staffing Standards

Totally, 8 states (CA, DE, FL, MT, OH, OR, SC, and VT) have NA staffing requirements in the form of HPRD or staff-to-resident ratio. Additionally, expected staffing levels for 25 states which have their total staffing requirements were obtained by subtracting LN staffing requirements from total staffing requirements and were used in the analysis (not presented in Table 5).

Table 5. States' Expected NA Staffing Levels

State	Conditions	States' expected NA HPRD
CA	No condition	2.22 HPRD
DE	No condition	2.47 HPRD
FL	No condition	2.90 HPRD
MT	beds <= 8	0/the number of residents
	9 <= beds <= 15	4/the number of residents
	16 <= beds <= 20	12/the number of residents
	21 <= beds <= 25	24/the number of residents
	26 <= beds <= 30	32/the number of residents
	31 <= beds <= 35	40/the number of residents
	36 <= beds <= 40	48/the number of residents
	41 <= beds <= 45	56/the number of residents
	46 <= beds <= 50	68/the number of residents
	51 <= beds <= 55	76/the number of residents
	56 <= beds <= 60	80/the number of residents
	61 <= beds <= 65	92/the number of residents
	66 <= beds <= 70	104/the number of residents
	71 <= beds <= 75	108/the number of residents
	76 <= beds <= 85	104/the number of residents

State	Conditions	States' expected NA HPRD
	86 <= beds <= 95	112/the number of residents
	beds >= 96	120/the number of residents
OH	No condition	2.0 HPRD
OR	No condition	1.65 HPRD
SC	No condition	1.87 HPRD
VT	No condition	2.0 HPRD

Note: State staffing standards for Medicaid were included if there were specific requirements; Since the federal staffing rules does not regulate any hours of NA staffing, no federal rules were applied; 25 states' expected NA staffing levels were obtained and used in the analysis (AR, CO, CT, DC, GA, IA, ID, IL, KS, LA, MA, MD, ME, MI, MN, MS, NC, NJ, NM, OK, PA, TN, WI, WV, and WY).

In conclusion, state staffing standards are much more complex than federal ones and differ markedly across states. Because of this complexity and difference, it is hard to compare the stringency of or nurse staffing levels required by the staffing requirements across states. In addition, it leads to a complication in identifying the variation in how the staffing requirements are differently applied to nursing homes which have different numbers of beds or residents within states. Thus, this study uses HPRD as standardized unit of measuring nurse staffing levels required by each state. By employing HPRD, this study not only compares nurse staffing levels required by each state but also investigates nursing homes' actual nurse staffing levels in regards to states' expected staffing levels.

Additionally, most states require LN staffing levels in the form of minimum staffing hours while they require total nurse staffing levels in the form of HPRD. However, for smaller nursing homes, complying with their total nursing HPRD requirements could lead to violating their LN-hour requirements (e.g., for nursing homes with 6- residents, compliance with Florida's 3.9 total nursing HPRD requirement would lead to non-compliance with Florida's 24 LN-hour requirement or for nursing hmes with). For this reason, this study, considering states' LN requirements together with their total staffing HPRD, selected more stringent requirements to identify minimum nurse staffing levels expected by states.

Chapter Summary

This chapter comprehensively reviewed state nurse staffing standards. Different states require different levels of nurse staffing, using various forms. Furthermore, these variations occur according to the type of staff as well as the facility size which is also differently defined in different states. Because of the variation in state staffing standards, it would be hard to measure nurse staffing levels required by states. Thus, this study proposed an approach to determine expected nurse staffing levels for individual nursing homes by considering both state and federal staffing standards. By using this proposed approach, more accurate staffing levels required by states could be estimated.

CHAPTER FIVE: STUDY RESULTS

This study conducted two major steps for data analysis: (1) hierarchical linear modeling for examining the relationship between state nurse staffing standards and nurse staffing levels; and (2) path analysis using structural equation modeling for investigating how state staffing standards and nurse staffing levels influence quality of care in nursing homes. This chapter presents the study results, hypotheses testing, and their interpretations. Additionally, descriptive statistics for the study sample are presented.

Study Samples

Data Cleaning

To eliminate extreme outliers and erroneous numbers, data cleaning rules used in relevant literatures using OSCAR datasets were applied as follows: this study excluded (1) facilities with more residents than beds or no residents (more than 100% occupancy rate or 0% occupancy rate); (2) facilities reporting no total nursing HPRD (RN + LPN + NA) or more than 24 total nursing HPRD; and (3) facilities in the top 1% and bottom 1% within each staffing category that this study used in order to eliminate outliers having extremely high or low numbers.

More specifically, this study used 4 categories of nurse staffing according to nurse categories in state staffing standards, which are RN (RN DON + RN), LN (RN DON + RN + LPN/LVN), Total (RN DON + RN + LPN/LVN + NA), and NA categories. All 50 states and

District of Columbia have their own RN and LN requirements while only 33 states have their own total nurse staffing and NA staffing requirements. Thus, for total staffing and NA categories, this study first excluded 18 states which do not have their total staffing and NA staffing requirements, and then eliminated facilities in the top 1% and bottom 1% within categories of total and NA staffing among those 33 states.

After data cleaning, a total of 15,348 facilities for the RN and LN staffing analyses, 10,716 facilities for the total staffing analysis, and 10,542 facilities for the NA staffing analysis remained in this study, representing about 96.9%, 97.1%, and 95.5% of all nursing facilities in OSCAR 2007, respectively.

Descriptive Statistics

Descriptive statistics for the study variables are presented in Table 6. Since facilities in the top 1% and bottom 1% within each staffing category were excluded independently, 4 different datasets which have different sample sizes were used separately for 4 different analyses (RN, LN, total, and NA staffing analyses). Thus, descriptive statistics for the dependent variables (4 nurse staffing variables which represent actual nurse staffing levels in nursing homes) and independent variables (4 state nurse staffing standards variables which represent states' expected staffing levels) were obtained from their respective datasets. However, descriptive statistics for other dependent variables (2 quality-of-care variables) and control variables (organizational and contextual variables) were obtained from the dataset for RN staffing analysis because it was noticed that there is not much variation in descriptive statistics of the variables among the 4 datasets.

Table 6. Descriptive Statistics for the Study Variables (n=15,348)

Variables	Mean or Percent	Std. Dev	Min	Max
Dependent Variables				
QOC deficiencies	1.851	1.863	0	13
Substandard QOC deficiencies	2.725	2.649	0	20
RN staffing levels (n=15,348)	0.459	0.482	0.062	4.100
LN staffing levels (n=15,348)	1.277	0.722	0.393	6.476
Total staffing levels (n=10,716)	3.538	1.150	0.930	10.667
NA staffing levels (n=10,542)	2.271	0.636	0.007	5.301
Independent Variables				
States' RN HPRD (n=15,348)	0.221	0.214	0.010	8
States' LN HPRD (n=15,348)	0.605	0.491	0.022	12
States' Total HPRD (n=10,716)	2.633	0.585	1.045	12
States' NA HPRD (n=10,542)	1.959	0.466	0	3.619
Control Variables				
Ownership				
For-profit	67.29%			
Non-profit	26.82%			
Government	5.89%			
Chain affiliation				
Chain Affiliated	53.29%			
Non-chain Affiliated	46.71%			
Hospital affiliation				
Hospital Based	7.27%			
Non-Hospital Based	92.73%			
Facility size	108.883	66.527	2	1550
Occupancy rate	0.836	0.159	0.008	1
Percent_Medicare	0.149	0.161	0	1
percent_Medicaid	0.609	0.230	0	1
Acuity index	10.180	1.581	3	24.739
Market demand	0.136	0.039	0.037	0.351
Market competition	0.207	0.241	0.004	1
State Medicaid reimbursement rate	145.241	32.379	99.580	384.160

For endogenous (dependent) variables, Table 6 shows that an average score of deficiencies that nursing homes received among 25 quality-of-care deficiency items was 1.85 while an average score of deficiencies that nursing homes received among 45 substandard quality-of-care deficiency items was 2.72. Additionally, among the 45 substandard quality-of-care deficiency items, an average score of deficiencies at F-level or above given to nursing homes was 0.046. In Table 6, it is noticed that the mean of actual RN staffing levels was 0.46 hours per resident day (HPRD). The means of actual LN staffing, total staffing, and NA staffing levels were 1.28, 3.54, and 2.27 HPRD, respectively.

For predictor variables, Table 6 reveals that the mean of states' expected RN staffing levels was 0.22 HPRD; States' expected LN staffing levels was 0.60 HPRD on average; and total staffing and NA staffing levels expected by states were 2.63 HPRD and 1.96 HPRD, respectively. The medians of states' expected staffing levels for respective staffing categories were also calculated (but not presented in the table), and they were 0.18 (RN), 0.50 (LN), 2.60 (total), and 2.00 (NA) HPRD.

The minimum and maximum of states' expected RN staffing levels were 0.0104 and 8.00 HPRD, respectively. The minimum (0.0104) was noticed for one nursing home with 1389 beds and 1346 residents in NY because New York requires 14 RN DON + RN hours for 60+ residents. Likewise, the maximum (8.00) was recorded for one nursing home with 120 beds and 1 resident in TX since Texas requires 8 RN DON + RN hours for 60- residents. As well, the minimum of states' expected total staffing levels was 1.045 HPRD noticed for one nursing home with 186 beds and 176 residents in MT (e.g., Montana requires 184 hours of total nurse staffing

for 96+ beds) while the maximum of states' expected total staffing levels was 12.00 HPRD noticed for one nursing home with 17 beds and 2 residents in KS (e.g., Kansas requires 24 hours of total nurse staffing for 60- beds with 12- residents).

For control variables, all facilities averaged 109 beds and had an average occupancy rate of 83.6%. Among those facilities, 67.29% were for-profit, 26.82% were non-profit, and 5.89% were government-owned nursing homes. Of all facilities, 53.29% were chain-affiliated while 46.71% were independent. Lastly, an average of Medicaid reimbursement rates across all states and District of Columbia was 145.24 dollars.

Hierarchical Linear Models

Table 7 and Table 8 present results of the hierarchical linear models (HLMs) for investigating effects of states' expected nurse staffing levels on actual nurse staffing levels in nursing homes. The HLMs were conducted by using 'Proc Mixed' of SAS program, treating all 51 intercepts (or 51 state effects) as randomly varying.

To examine variations in actual nurse staffing levels in nursing homes within and between states, intraclass correlations, which are between-state variance as a proportion of total variance, were calculated for unconditional models without entering any predictor and control variables as fixed effects.

The intraclass correlations indicated that about 88% of variance in actual RN staffing levels is explained within states while about 12% of variance in actual RN staffing levels is explained between states. For the LN staffing model, about 95% of variance in actual LN

staffing levels was explained within states while 5% of variance in actual LN staffing levels was explained between states. Variances in actual total and NA staffing levels were about 92% and 87% explained within states respectively, while their respective variances were about 8% and 13% explained between states. Therefore, actual nurse staffing levels for all categories (RN, LN, total, and NA) varied more within states than between states.

RN Staffing Model

The coefficient for states' expected RN staffing levels, which is statistically significant, was 0.835. Rejecting the null hypothesis that there is no relationship between states' expected RN staffing levels and actual RN staffing levels in nursing homes, this coefficient shows that nursing homes in states with higher RN staffing requirements had more RN staffing levels. Therefore, the hypothesis 1 is statistically supported. As expected, the facility size (-0.00032) and occupancy rate (-0.24) were negatively associated with actual RN staffing levels in nursing homes. The coefficients of the percentage of Medicare and Medicaid residents were 0.8034 and -0.1289, respectively, indicating that nursing homes with more Medicare residents have more RN staffing levels while nursing homes with more Medicaid residents have less RN staffing levels. Acuity index (0.01084) was also positively related to the RN staffing levels.

Regarding ownership, for-profit nursing homes had relatively low RN staffing levels as compared to non-profit ones. But, the difference in actual RN staffing levels between government-owned and non-profit nursing homes was not statistically significant. As expected, chained facilities had lower RN levels than non-chained facilities while hospital-based facilities had higher RN levels than independent facilities.

For contextual variables, the coefficients of market competition and state Medicaid reimbursement rate, which are statistically significant, were -0102 and 0.0012 respectively. It means that nursing homes in highly competitive market or states with higher Medicaid reimbursement rate have higher RN staffing levels. Unlike the study expectation, market demand which is the percentage of people age 65+ in each county, was negatively related to actual RN staffing levels in nursing homes.

Table 7. Results of HLM for RN and LN Staffing Models (n=15,348)

	RN_Staffing_Model		LN Staffing Model	
Variables	Estimate	Std Err	Estimate	Std Err
States' RN HPRD	0.8349**	0.015		
States' LN HPRD			0.5162**	0.0105
Facility Size	-0.0003**	0.000	-0.0005**	0.0001
Occupancy Rate	-0.2408**	0.019	-0.7200**	0.0296
Acuity Index	0.0108**	0.002	0.0509**	0.0027
Percent_Medicare	0.8034**	0.022	1.2129**	0.0341
Percent_Medicaid	-0.1289**	0.015	-0.1706**	0.0234
For-profit (vs. Non-profit)	-0.0991**	0.006	-0.1148**	0.0098
Government (vs. Non-profit)	-0.0218	0.012	-0.0006	0.0182
Chain (Yes vs. No)	-0.0242**	0.005	-0.0465**	0.0082
Hospital Based (Yes vs. No)	0.5053**	0.011	0.6712**	0.0175
Market Competition	-0.1020**	0.013	-0.1963**	0.0196
Market Demand	-0.2393**	0.078	-0.5852**	0.1199
State Medicaid Reimbursement Rate	0.0012**	0.000	0.0019**	0.0005
Unconditional Model Variance				
Level 1 (Facility)	0.2178**	0.002	0.5024**	0.0057
Level 2 (State)	0.0302**	0.007	0.0278**	0.0074
Fitted Model Residual Variance				
Level 1 (Facility)	0.0920**	0.001	0.2182**	0.0025
Level 2 (State)	0.0088**	0.002	0.0192**	0.0042
Change in Residual Variance				
Level 1 (Facility)	-58%		-57%	
Level 2 (State)	-71%		-31%	

* Significant at the 0.05 level.
** Significant at the 0.01 level.

LN Staffing Model

Higher states' expected LN staffing levels (0.516) were found to be significantly associated with higher actual LN staffing levels in nursing homes. Rejecting the null hypothesis that there is no relationship between expected LN staffing levels by states and actual LN staffing levels in nursing homes, it indicates that nursing homes in states with higher LN staffing requirements had higher LN staffing levels. Thus, Hypothesis 2 is statistically supported.

For organizational variables, both facility size and occupancy rate were negatively related to actual LN staffing levels in nursing homes. Higher proportion of Medicare residents was significantly associated with higher LN staffing levels while higher proportion of Medicaid residents was significantly associated with lower LN staffing levels. Acuity index was also positively related to actual LN staffing levels in nursing homes.

For-profit nursing homes had lower LN staffing levels than non-profit ones. Like the results in the RN staffing model, no significant difference of actual LN staffing levels between government-owned and non-profit facilities was found. Non-chained facilities and hospital-based facilities were found to have significantly higher LN staffing levels than chained facilities and independent facilities, respectively.

For contextual factors, both market competition and state Medicaid reimbursement rate were positively associated with LN staffing levels in nursing homes. Contrary to the study expectation, higher proportion of people age 65+ in each county was significantly related to lower LN staffing levels.

Total Staffing Model

The coefficient of states' expected total nurse staffing levels, which is statistically significant, was 0.421. Rejecting the null hypothesis, it indicates that nursing homes in states with higher total nurse staffing requirements had higher total nurse staffing levels. Therefore, this study statistically supports Hypothesis 3.

Table 8. Results of HLM for Total and NA Staffing Models

	Total Staffing Model (n = 10,716)		NA Staffing Model (n = 10,542)	
Variables	Estimate	Std Err	Estimate	Std Err
States' Total HPRD	0.4210**	0.0373		
States' NA HPRD			-0.0997**	0.0250
Facility Size	-0.0017**	0.0001	-0.0004**	0.0001
Occupancy Rate	-1.7350**	0.0661	-0.5615**	0.0425
Acuity Index	0.1007**	0.0057	0.0614**	0.0036
Percent_Medicare	1.2523**	0.0752	-0.1981**	0.0479
Percent_Medicaid	-0.5116**	0.0515	-0.3365**	0.0325
For-profit (vs. Non-profit)	-0.3436**	0.0219	-0.2275**	0.0138
Government (vs. Non-profit)	0.1353**	0.0405	0.1186**	0.0256
Chain (Yes vs. No)	-0.1773**	0.0179	-0.1205**	0.0113
Hospital Based (Yes vs. No)	0.8786**	0.0380	0.0388	0.0245
Market Competition	-0.2738**	0.0465	0.0147	0.0295
Market Demand	-0.5528*	0.2678	-0.2861	0.1694
State Medicaid Reimbursement Rate	0.0040**	0.0015	0.0041**	0.0014
Unconditional Model Variance				
Level 1 (Facility)	1.2105**	0.0166	0.3407**	0.0047
Level 2 (State)	0.1069**	0.0289	0.0531**	0.0136
Fitted Model Residual Variance				
Level 1 (Facility)	0.7521**	0.0103	0.2927**	0.0040
Level 2 (State)	0.0628**	0.0173	0.0559**	0.0145
Change in Residual Variance				
Level 1 (Facility)	-38%		-14%	
Level 2 (State)	-41%		5%	

* Significant at the 0.05 level.
** Significant at the 0.01 level.

As expected, nursing homes with larger number of beds, those with higher occupancy rates, those with higher proportion of Medicaid residents, and chained nursing homes were significantly related to lower total nurse staffing levels. As well, acuity index and proportion of Medicare residents were positively associated with total nurse staffing levels. As compared to non-profit nursing homes, for-profit homes were relatively low in total staffing levels while government-owned homes were relatively high in total staffing levels.

Like the results of the RN and LN staffing models, market competition and state Medicaid reimbursement rate were positively associated with total nurse staffing levels in nursing homes. But, market demand was negatively related to total staffing levels, which is contrary to what this study expects.

NA Staffing Model

Higher states' expected NA staffing levels were found to be significantly related to lower actual NA staffing levels in nursing homes. It is contrary to the fourth hypothesis that nursing homes in states with higher NA staffing requirements are more likely to have higher NA staffing levels. Thus, Hypothesis 4 is not supported.

Facility size, occupancy rate, and proportion of Medicaid residents were negatively associated with actual NA staffing levels. Also, higher acuity index was significantly related to higher NA staffing levels, as expected. Contrary to the study expectation, nursing homes with higher proportion of Medicare residents were found to have lower NA staffing levels.

For organizational variables, for-profit nursing homes had lower NA staffing levels than non-profit ones while government-owned nursing homes had higher NA staffing levels than non-profit ones. Chained nursing homes were also negatively related to actual NA staffing levels. However, the relationship between hospital-based homes and NA staffing levels was not statistically significant.

Among three contextual variables (state Medicaid reimbursement rate, market competition, and market demand), only state Medicaid reimbursement rate was positively associated with NA staffing levels in nursing homes. Other 2 variables were not statistically significant.

Structural Equation Models

To investigate the relationship between nurse staffing levels and quality of care in nursing homes, path analysis using structural equation modeling (SEM) was conducted by using AMOS program. As described earlier, 8 different SEMs were separately performed, since there are four nurse staffing variables (RN, LN, total, and NA staffing variables) and two quality-of-care variables (QOC deficiencies and substandard QOC deficiencies).

In each model, two endogenous variables were used: (1) actual nurse staffing levels, and (2) quality of care in nursing homes. More specifically, the actual nurse staffing levels as the first endogenous variable were hypothesized to be influenced by seven organizational factors -- (1) facility size; (2) occupancy rate; (3) ownership; (4) acuity index; (5) proportion of Medicare and Medicaid residents; (6) chain affiliation; and (7) hospital affiliation -- and four contextual factors

-- (1) state nurse staffing standards; (2) state Medicaid reimbursement rates; (3) market competition; and (4) market demand. At the same time, the quality of care as another endogenous variable was hypothesized to be influenced by the actual nurse staffing levels.

After conducting the structural equation modeling, relatively stable estimates for the path coefficients were observed throughout the eights models. This suggests the application of common rules for improving the model performance as follows: (1) eliminating variables which have statistically insignificant path coefficients; (2) eliminating relatively unimportant variables by examining standardized path coefficients; (3) eliminating variables that are highly correlated with many other exogenous variables (i.e., the principle of parsimony is used to guide the logical selection of the predictors when multicollinearity is observed); and (4) adding intercorrelations among exogenous variables as suggested by modification indices (Wan, 2002).

RN Staffing Levels and Quality of Care in Nursing Homes

Model 1: Impacts of RN Staffing Levels on QOC Deficiencies

The proposed model depicted in Figure 2 was conducted to investigate the relationship between actual RN staffing levels and quality of care as determined by QOC deficiencies. The proposed model shows that states' expected RN staffing levels were positively associated with actual RN staffing levels, and higher RN staffing levels were significantly related to lower QOC deficiencies. However, LPN and NA staffing levels were not found to be significantly related to QOC deficiencies.

Expected relationships between RN staffing levels and seven organizational factors were statistically supported in this proposed model. For contextual factors, market competition and state Medicaid reimbursement rate were found to be positively related to RN staffing levels. Contrary to the study expectation, however, market demand was found to be negatively related to RN staffing levels. Furthermore, by comparing standardized coefficients of all variables, states' expected RN staffing levels were found to be the strongest predictor to actual RN staffing levels (standardized gamma = 0.431) while actual RN staffing levels were found to be the strongest predictor to QOC deficiencies, with an inverse relationsip (standardized gamma = -0.104).

The model fit summary of the proposed model shows a χ^2 = 28843.68 with 75 degrees of freedom, which results χ^2/df = 384.582. In addition, the Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) were 0.812 and 0.659, respectively while the Root Mean Square Error Approximation (RMSEA) was 0.158, indicating that this proposed model is poor-fit and needs modifications for improving the goodness of fit performance. Thus, the suggested common rules were applied.

LPN and NA staffing levels were first eliminated from the model due to their statistically insignificant effects on QOC deficiencies. Second, the proportion of Medicare residents was removed in order to avoid the issue of variable redundancy because the proportions of Medicare and Medicaid are negatively correlated in general. As suggested by Pearson's correlation, they appeared to have large effect size (r = -0.611). Furthermore, unlike Medicare PPS rates, which are nationally standardized, the Medicaid reimbursement rates which vary widely across states could have potential impact on the variability of nurse staffing levels. Thus, this study retained

the proportion of Medicaid residents, rather than the proportion of Medicare residents. By removing the variable Percent_Medicare, the chi-square value decreased from 28843.68 to 15212.11 with GFI = 0.855, AGFI = 0.765, and RMSEA = 0.143.

Third, facility size, occupancy rate, and market competition were removed from the model, due to their relatively small impacts on RN staffing levels and QOC deficiencies (standardized gamma = -0.039, -0.071, and -0.017, respectively) as well as their high intercorrelations with most exogenous variables. For instance, as indicated by modification indices, facility size had too high intercorrelations with hospital affiliation (M.I. = 404.37), states' expected RN staffing levels (M.I. = 1377.425), market competition (M.I. = 500.95), proportion of Medicaid residents (M.I. = 520.45), and Acuity Index (M.I. = 165.42).

Chain affiliation, which also had a relatively small impact on endogenous variables, was found to be highly intercorrelated with ownership (e.g., approximately 78% chain-affiliated nursing homes were for-profit). Hence, it was removed from the model. Similarly, ownership and hospital affiliation were as well found to be highly intercorrelated as around 90 percent of hospital-based nursing homes are either non-profit or government-owned nursing homes. Even though the variable hospital affiliation had stronger contribution to RN staffing level, compared to ownership, this study selected to eliminate hospital affiliation since a large number of SNFs is not hospital-affiliated and the removal of this variable would result in a large decrease in chi-square value.

As well, acuity index, theoretically one of most important predictors to nurse staffing levels, was intercorrelated with almost all exogenous variables; thus, this analysis could not

retain the variable. By removing those variables, the chi-square value decreased from 15,212.11 to 2,446.52.

The revised model depicted in Figure 6 presents states' expected RN staffing levels as the strongest predictor for actual staffing levels, followed by percent Medicaid, ownership status, and Medicaid reimbursement rate. The modification indices suggested allowing some intercorrelations among the exogenous variables in order to obtain better fit of the data. The model fit summary for the revised model shows a $\chi^2 = 34.32$ with 4 degrees of freedom, which results $\chi^2/df = 8.58$. In addition, the GFI and AGFI were 0.999 and 0.996, respectively while the RMSEA was 0.022, indicating that the model fit is reasonable and acceptable.

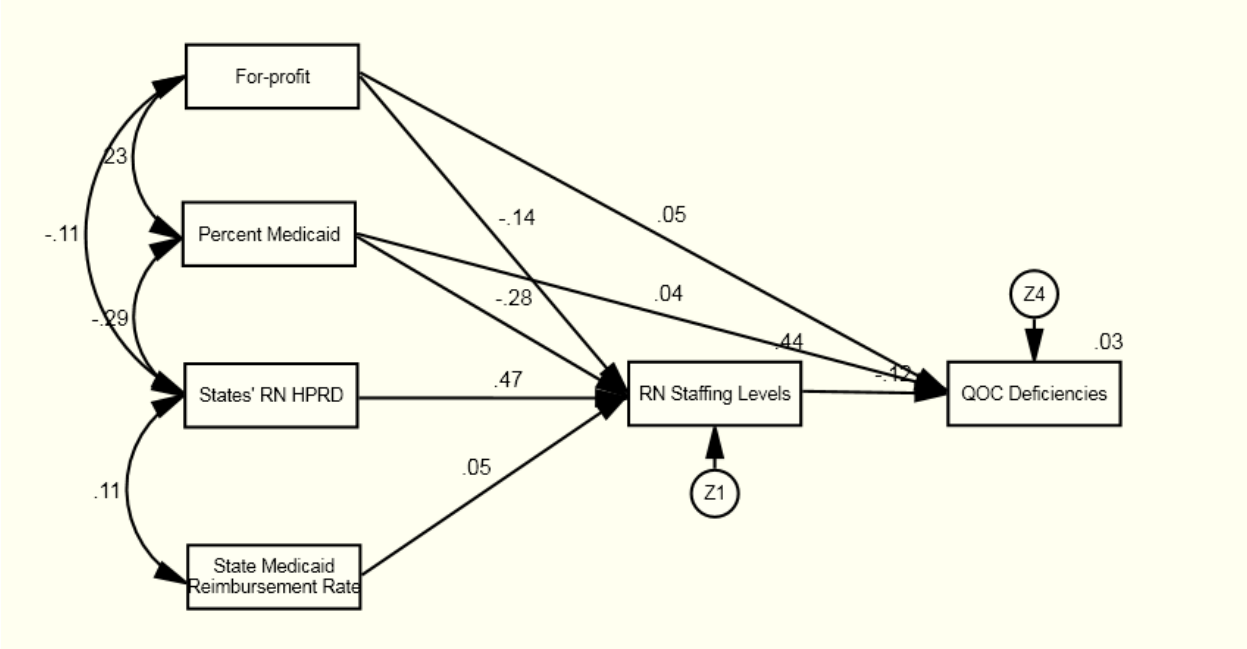

Figure 6. Revised Model to Investigate Impacts of State RN Staffing Standards and RN Staffing Levels on QOC Deficiencies

The standardized coefficient for RN staffing levels on QOC deficiencies, which is statistically significant, was -0.118. Also, the standardized coefficient for states' expected RN staffing levels on actual RN staffing levels, which is statistically significant, was 0.472. Rejecting the null hypothesis that that there is no relationship between RN staffing levels and quality of care in nursing homes, these coefficients show that nursing homes with higher RN staffing levels resulting from higher state RN staffing standards had better quality of care. Therefore, Hypothesis 5 is statistically supported.

Table 9 reveals that the standardized coefficient for RN staffing levels on QOC deficiencies (-0.118) was largest among three exogenous variables while the standardized coefficient for states' expected RN staffing levels on actual RN staffing levels (0.472) was largest among four exogenous variables. It indicates that actual RN staffing level was the strongest predictor for QOC deficiencies, and likewise states' expected RN staffing level was the strongest predictor for actual RN staffing levels in this model.

Squared multiple correlations, which indicate variance explained by exogenous variables, were 0.436 and 0.026 for RN staffing levels and QOC deficiencies, respectively. It indicates that around 44% of total variance of RN staffing levels was explained by 4 exogenous variables including states' expected RN staffing levels while around 2.6% of total variance of QOC deficiencies was explained by three exogenous variables including RN staffing levels.

Table 9. Results of SEM for Investigating Impacts of State RN Staffing Standards and RN Staffing Levels on Quality of Care

		Model 1		Model 2	
Effect		Standardized Regression Coefficient	Critical Value	Standardized Regression Coefficient	Critical Value
States' RN HPRD	on RN Staffing Levels	0.472	73.897**	0.472	73.897**
For-profit	on RN Staffing Levels	-0.144	-23.127**	-0.144	-23.127**
Percent Medicaid	on RN Staffing Levels	-0.275	-42.457**	-0.275	-42.457**
State Medicaid Rate	on RN Staffing Levels	0.051	8.305**	0.051	8.305**
RN Staffing Levels	on QOC	-0.118	-12.998**	-0.106	-11.783**
For-profit	on QOC	0.054	6.537**	0.068	8.241**
Percent Medicaid	on QOC	0.037	4.115**	0.060	6.643**
Squared Multiple Correlations (R^2)					
RN Staffing Levels		0.436		0.436	
QOC		0.026		0.031	
Goodness of Fit Statistics					
χ^2		34.320		32.310	
df		4		4	
χ^2/df		8.580		8.078	
(p-value)		(< 0.01)		(< 0.01)	
GFI		0.999		0.999	
AGFI		0.996		0.996	
NFI		0.997		0.997	
TLI		0.990		0.991	
RMSEA		0.022		0.021	

Model 1: Model for impacts of RN staffing levels on QOC deficiencies
Model 2: Model for impacts of RN staffing levels on substandard QOC deficiencies
* Significant at the 0.05 level.
** Significant at the 0.01 level.

Model 2: Impacts of RN Staffing Levels on substandard QOC Deficiencies

The revised model for examining the relationship between RN staffing levels and substandard QOC deficiencies is depicted in Figure 7. The model fit summary for this revised model shows a $\chi^2 = 32.31$ with 4 degrees of freedom, which results $\chi^2/df = 8.078$. In addition, the GFI and AGFI were 0.999 and 0.996, respectively while the RMSEA was 0.021, indicating that the model fit is acceptable.

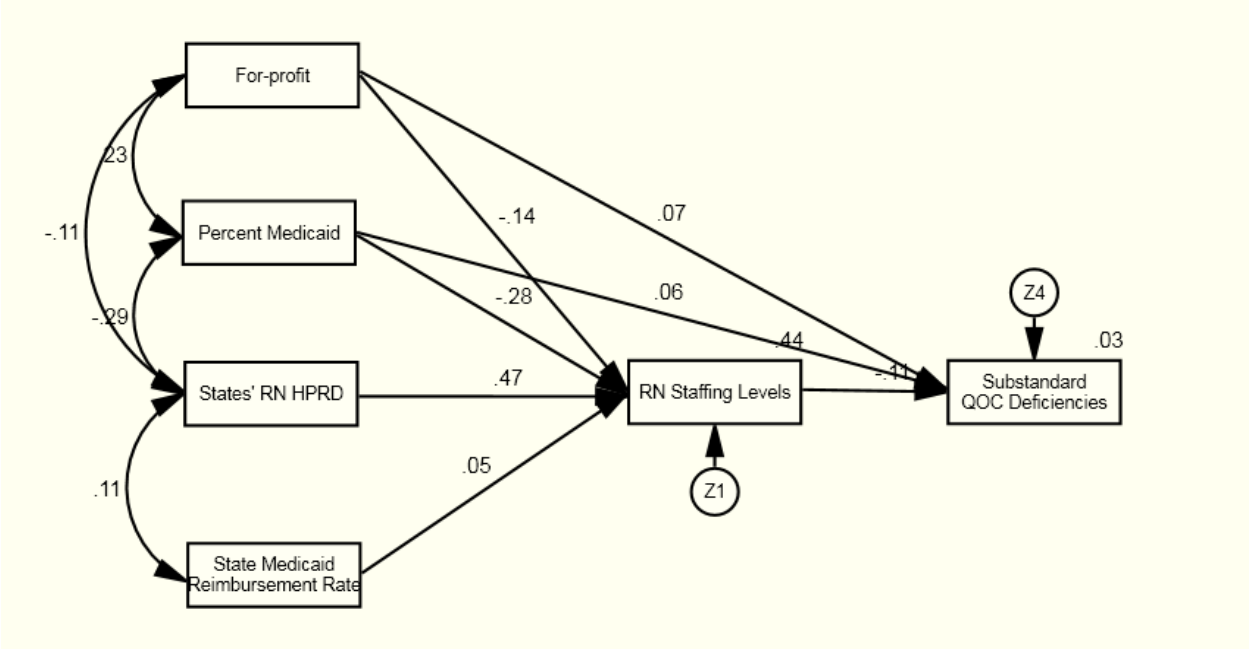

Figure 7. Revised Model to Investigate Impacts of State RN Staffing Standards and RN Staffing Levels on Substandard QOC Deficiencies

Higher RN staffing levels were found to be significantly associated with lower substandard QOC deficiencies (-0.106). Additionally, states' expected RN staffing levels were positively related to actual RN staffing levels (0.472). Rejecting the null hypothesis, these coefficients indicate that nursing homes with higher RN staffing levels resulting from higher

state RN staffing requirements had better quality of care. Therefore, Hypothesis 5 is statistically supported.

Table 9 shows that the standardized coefficients for both RN staffing levels on substandard QOC deficiencies (-0.106) and states' expected RN staffing levels on RN staffing levels (0.472) were largest among their respective exogenous variables. Squared multiple correlations indicates that 44% of the total variance in RN staffing levels was explained by four exogenous variables while around 3.1% of the total variance in substandard QOC deficiencies was explained by three exogenous variables.

LN Staffing Levels and Quality of Care in Nursing Homes

Model 1: Impacts of LN Staffing Levels on QOC Deficiencies

The proposed model depicted in Figure 3 was conducted to investigate the relationship between actual LN staffing levels and quality of care as determined by QOC deficiencies. The analysis of the proposed model shows that states' expected LN staffing levels were positively associated with actual LN staffing levels, and higher LN staffing levels were significantly related to lower QOC deficiencies. However, NA staffing levels were not found to be significantly related to QOC deficiencies.

Expected relationships between LN staffing levels and seven organizational factors were statistically supported. For contextual factors, market competition and state Medicaid reimbursement rate were found to be positively related to LN staffing levels. Unlike the study expectation, however, market demand was found to be negatively related to LN staffing levels.

The model fit summary for this proposed model shows a χ^2 = 27824.81 with 72 degrees of freedom, which results χ^2/df = 386.456. In addition, GFI and AGFI were 0.801 and 0.669, respectively while RMSEA was 0.158, indicating that this proposed model is poor-fit and needs modifications. Thus, the suggested rules for improving the model performance were applied.

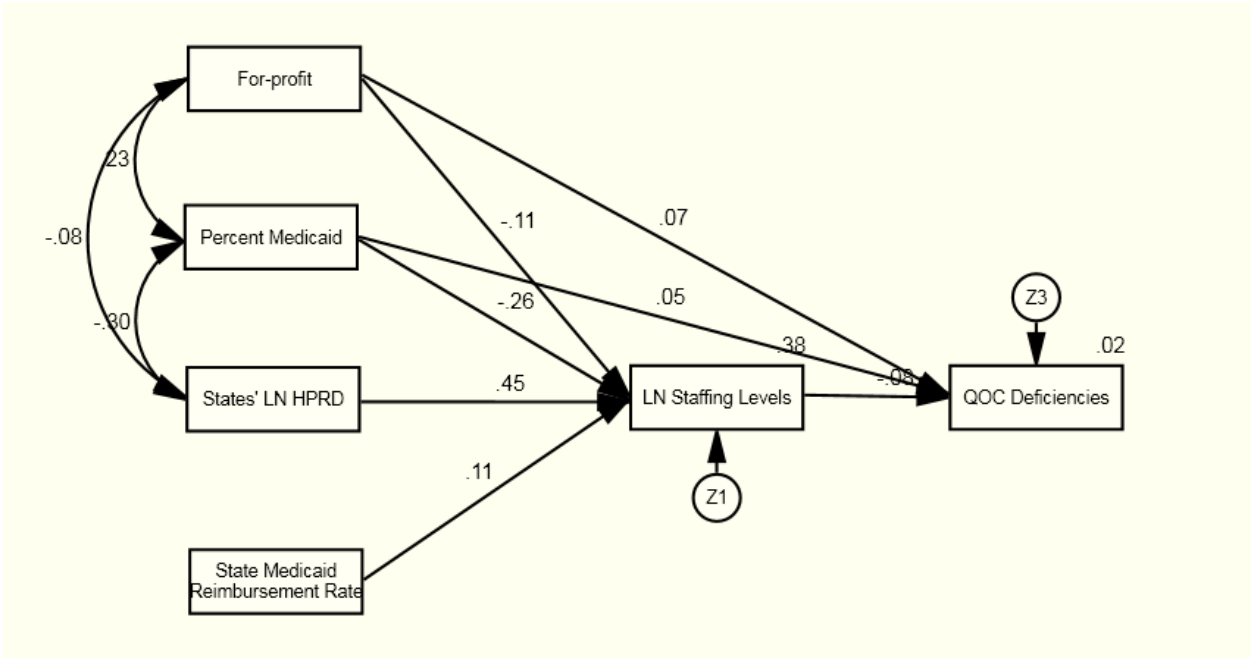

Figure 8. Revised Model to Investigate Impacts of State LN Staffing Standards and LN Staffing Levels on QOC Deficiencies

Figure 8 illustrates the revised model of the impacts of LN staffing standards on LN staffing levels and QOC deficiencies. The model fit summary for this revised model shows a χ^2 = 32.95 with 5 degrees of freedom, which results χ^2/df = 6.59. In addition, the GFI and AGFI were 0.999 and 0.997, respectively while the RMSEA was 0.019, indicating that the model fit is improved and acceptable.

The standardized coefficient for LN staffing levels on QOC deficiencies, which is statistically significant, was -0.080. Also, the standardized coefficient for states' expected LN

staffing levels on actual LN staffing levels, which is statistically significant, was 0.450. Rejecting the null hypothesis that that there is no relationship between LN staffing levels and quality of care in nursing homes, these coefficients indicate that nursing homes with higher LN staffing levels resulting from higher state LN staffing standards had better quality of care. Therefore, Hypothesis 6 is statistically supported.

Table 10 shows that the standardized coefficient of LN staffing levels on QOC deficiencies (-0.080) was largest among 3 exogenous variables while the standardized coefficient of states' expected LN staffing levels on actual LN staffing levels (0.450) was largest among four exogenous variables. It indicates that actual LN staffing level was the strongest predictor for QOC deficiencies, and states' expected LN staffing level was the strongest predictor for actual LN staffing levels.

Squared multiple correlations, which were 0.384 and 0.021 for LN staffing levels and QOC deficiencies, respectively, indicate that around 38% of total variance of LN staffing levels was explained by four exogenous variables while around 2.1% of the total variance in QOC deficiencies was explained by three exogenous variables.

Table 10. Results of SEM for Investigating Impacts of State LN Staffing Standards and LN Staffing Levels on Quality of Care

		Model 1		Model 2	
Effect		Standardized Regression Coefficient	Critical Value	Standardized Regression Coefficient	Critical Value
States' LN HPRD	on LN Staffing Levels	0.450	67.705**	0.450	67.705**
For-profit	on LN Staffing Levels	-0.108	-16.56**	-0.108	-16.56**
Percent Medicaid	on LN Staffing Levels	-0.258	-37.88**	-0.258	-37.88**
State Medicaid	on LN Staffing Levels	0.112	17.633**	0.112	17.633**
LN Staffing Levels	on QOC	-0.080	-9.034**	-0.074	-8.426**
For-profit	on QOC	0.066	7.975**	0.078	9.421**
Percent Medicaid	on QOC	0.054	6.07**	0.074	8.358**
Squared Multiple Correlations (R^2)					
LN Staffing Levels		0.384		0.384	
QOC		0.021		0.027	
Goodness of Fit Statistics					
χ^2		32.954		25.059	
df		5		5	
χ^2/df		6.591		5.012	
(p-value)		(<0.01)		(<0.01)	
GFI		0.999		0.999	
AGFI		0.997		0.998	
NFI		0.997		0.998	
TLI		0.992		0.994	
RMSEA		0.019		0.016	

Model 1: Model for impacts of LN staffing levels on QOC deficiencies
Model 2: Model for impacts of LN staffing levels on substandard QOC deficiencies
* Significant at the 0.05 level.
** Significant at the 0.01 level.

Model 2: Impacts of LN Staffing Levels on substandard QOC Deficiencies

The revised model for examining the relationship between LN staffing levels and substandard QOC deficiencies is depicted in Figure 9. The model fit summary for this revised model shows a $\chi^2 = 25.06$ with 5 degrees of freedom, which results $\chi^2/df = 5.012$. In addition, the GFI and AGFI were 0.999 and 0.998, respectively while the RMSEA was 0.016, indicating that the model fit is improved and acceptable.

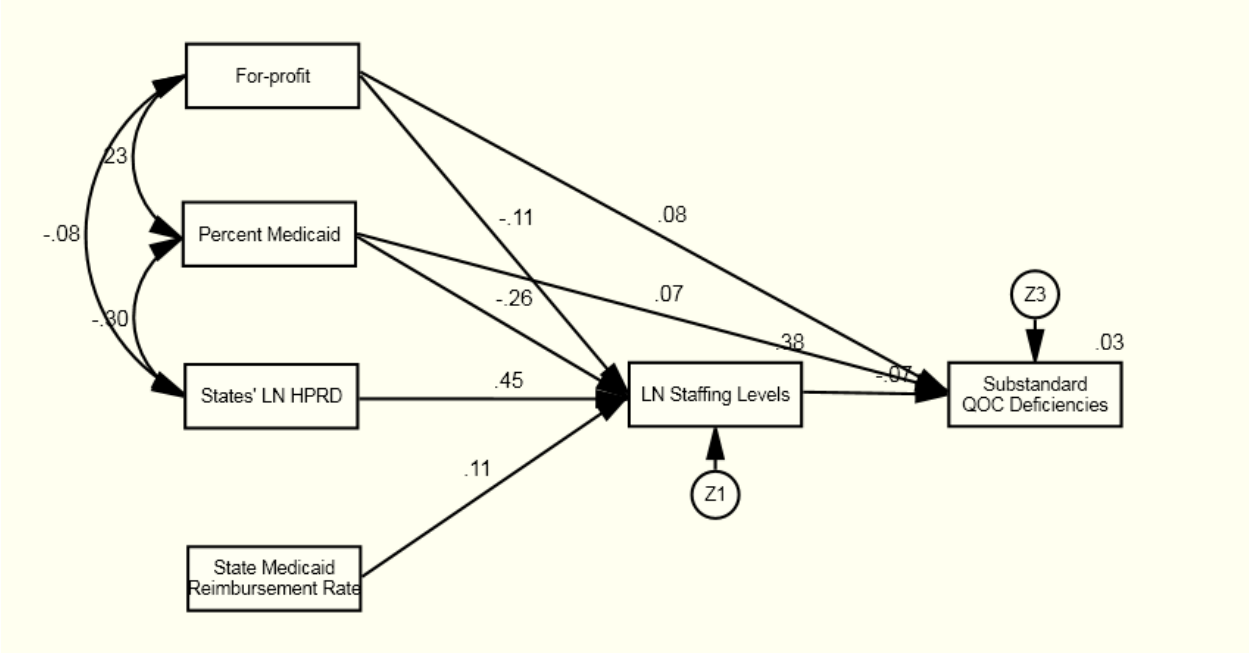

Figure 9. Revised Model to Investigate Impacts of State LN Staffing Standards and LN Staffing Levels on Substandard QOC Deficiencies

Higher LN staffing levels were found to be significantly associated with lower substandard QOC deficiencies (-0.074). Additionally, states' expected LN staffing levels were positively related to actual RN staffing levels (0.450). Rejecting the null hypothesis, these coefficients indicate that nursing homes with higher LN staffing levels resulting from higher

state LN staffing requirements had better quality of care. Therefore, Hypothesis 6 is statistically supported.

Squared multiple correlations for LN staffing levels (0.384) and substandard QOC deficiencies (0.027), indicate that around 38% of the total variance in LN staffing levels was explained by four exogenous variables while around 2.7% of the total variance in substandard QOC deficiencies was explained by three exogenous variables.

Total Nurse Staffing Levels and Quality of Care in Nursing Homes

Model 1: Impacts of Total Nurse Staffing Levels on QOC Deficiencies

The proposed model depicted in Figure 4 was performed to examine the relationship between total nurse staffing levels and QOC deficiencies. The proposed model shows that states' expected total staffing levels were positively associated with actual total staffing levels. Additionally, higher total staffing levels were found to be significantly associated with lower QOC deficiencies.

Expected relationships between total staffing levels and 7 organizational factors were statistically supported. For contextual factors, market competition and state Medicaid reimbursement rate were found to be positively related to total staffing levels. Contrary to the study expectation, however, market demand was found to be negatively related to total staffing levels.

The model fit summary shows a $\chi^2 = 17029.555$ with 70 degrees of freedom, which results $\chi^2/df = 243.279$. In addition, GFI and AGFI were 0.818 and 0.727, respectively while

RMSEA was 0.150, indicating that this proposed model is poor-fit and needs modifications. Thus, the suggested rules for improving the model performance were applied.

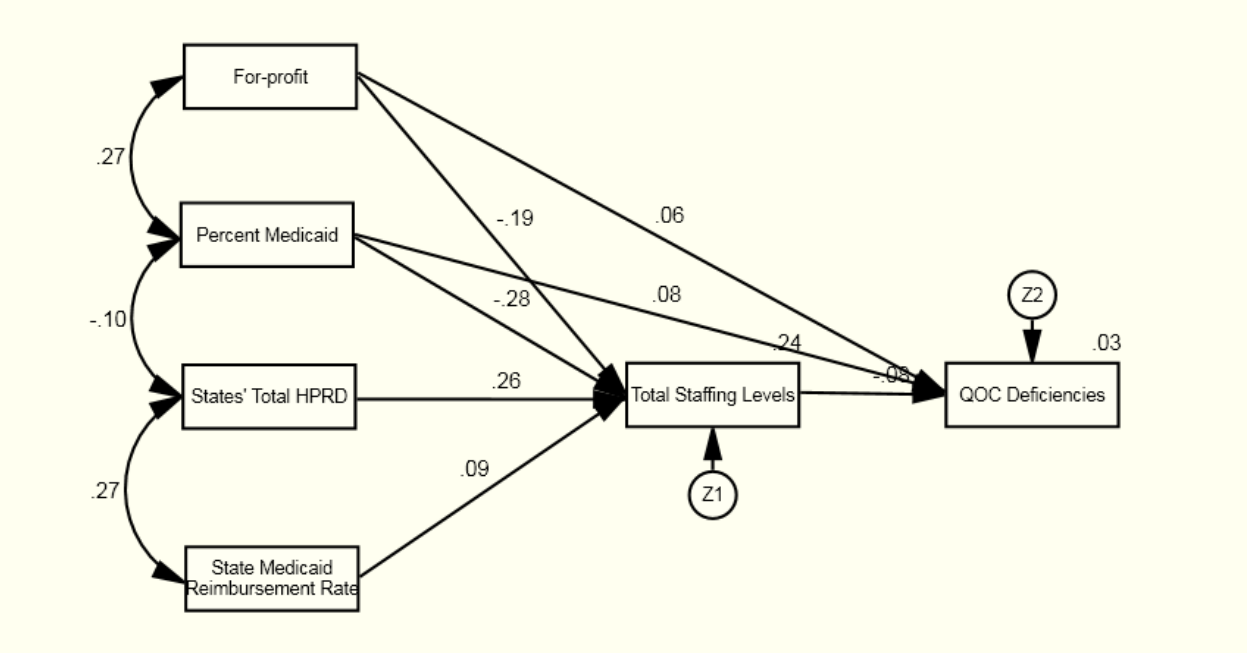

Figure 10. Revised Model to Investigate Impacts of State Total Staffing Standards and Total Staffing Levels on QOC Deficiencies

The model fit summary for this revised model illustrated in Figure 10 shows a χ^2 = 36.553 with 5 degrees of freedom, which results χ^2/df = 7.311. In addition, the GFI and AGFI were 0.999 and 0.995, respectively while the RMSEA was 0.024, indicating that the model fit is improved and acceptable.

The standardized coefficient for total staffing levels on QOC deficiencies, which is statistically significant, was -0.084. Also, the standardized coefficient for states' expected total staffing levels on actual total staffing levels, which is statistically significant, was 0.260. Rejecting the null hypothesis that that there is no relationship between total nurse staffing levels and quality of care in nursing homes, these coefficients indicate that nursing homes with higher

total nurse staffing levels resulting from higher state total nurse staffing standards had better quality of care. Therefore, Hypothesis 7 is statistically supported.

Table 11. Results of SEM for Investigating Impacts of State Total Staffing Standards and Total Staffing Levels on Quality of Care

		Model 1		Model 2	
Effect		Standardized Regression Coefficient	Critical Value	Standardized Regression Coefficient	Critical Value
States' Total HPRD	on Total Staffing Levels	0.260	29.542**	0.260	29.542**
For-profit	on Total Staffing Levels	-0.188	-21.530**	-0.188	-21.530**
Percent Medicaid	on Total Staffing Levels	-0.277	-31.630**	-0.277	-31.630**
State Medicaid	on Total Staffing Levels	0.093	10.610**	0.093	10.610**
Total Staffing Levels	on QOC	-0.084	-8.148**	-0.064	-6.165**
For-profit	on QOC	0.057	5.707**	0.076	7.578**
Percent Medicaid	on QOC	0.077	7.368**	0.098	9.410**
Squared Multiple Correlations (R2)					
Total Staffing Levels		0.243		0.243	
QOC		0.026		0.03	
Goodness of Fit Statistics					
χ^2		36.553		50.088	
df		5		5	
χ^2/df		7.311		10.018	
(p-value)		(<0.01)		(<0.01)	
GFI		0.999		0.998	
AGFI		0.995		0.993	
NFI		0.993		0.990	
TLI		0.981		0.973	
RMSEA		0.024		0.029	

Model 1: Model for impacts of total nurse staffing levels on QOC deficiencies
Model 2: Model for impacts of total nurse staffing levels on substandard QOC deficiencies
* Significant at the 0.05 level.
** Significant at the 0.01 level.

Table 11 reveals that the standardized coefficient of total staffing levels on QOC deficiencies (-0.084) was largest among 3 exogenous variables. However, the standardized coefficient of states' expected total staffing levels on actual total staffing levels (0.260) was second largest among four exogenous variables. The proportion of Medicaid residents was found to be the strongest predictor for QOC deficiencies (-0.244).

Squared multiple correlations for total staffing levels (0.243) and QOC deficiencies (0.026) indicate that around 24% of the total variance in total staffing levels was explained by four exogenous variables, including states' expected total staffing levels, while only 2.6% of the total variance in QOC deficiencies was explained by three exogenous variables, including total staffing levels.

Model 2: Impacts of Total Nurse Staffing Levels on substandard QOC Deficiencies

The revised model for examining the relationship between total staffing levels and substandard QOC deficiencies is depicted in Figure 11. The model fit summary for this model shows a $\chi^2 = 50.088$ with 5 degrees of freedom, which results $\chi^2/df = 10.018$. In addition, the GFI and AGFI were 0.998 and 0.993, respectively while the RMSEA was 0.029, indicating that the model fit is acceptable.

Higher total staffing levels were found to be significantly associated with lower substandard QOC deficiencies (-0.064). Higher states' expected total staffing levels were significantly related to actual total staffing levels (0.260). Rejecting the null hypothesis, these coefficients indicate that nursing homes with higher total staffing levels resulting from higher state total staffing standards had better quality of care. Therefore, Hypothesis 7 is statistically

supported. Squared multiple correlations indicate that around 24% of total variance of total staffing levels was explained by 4 exogenous variables while around 3% of total variance of substandard QOC deficiencies was explained by 3 exogenous variables.

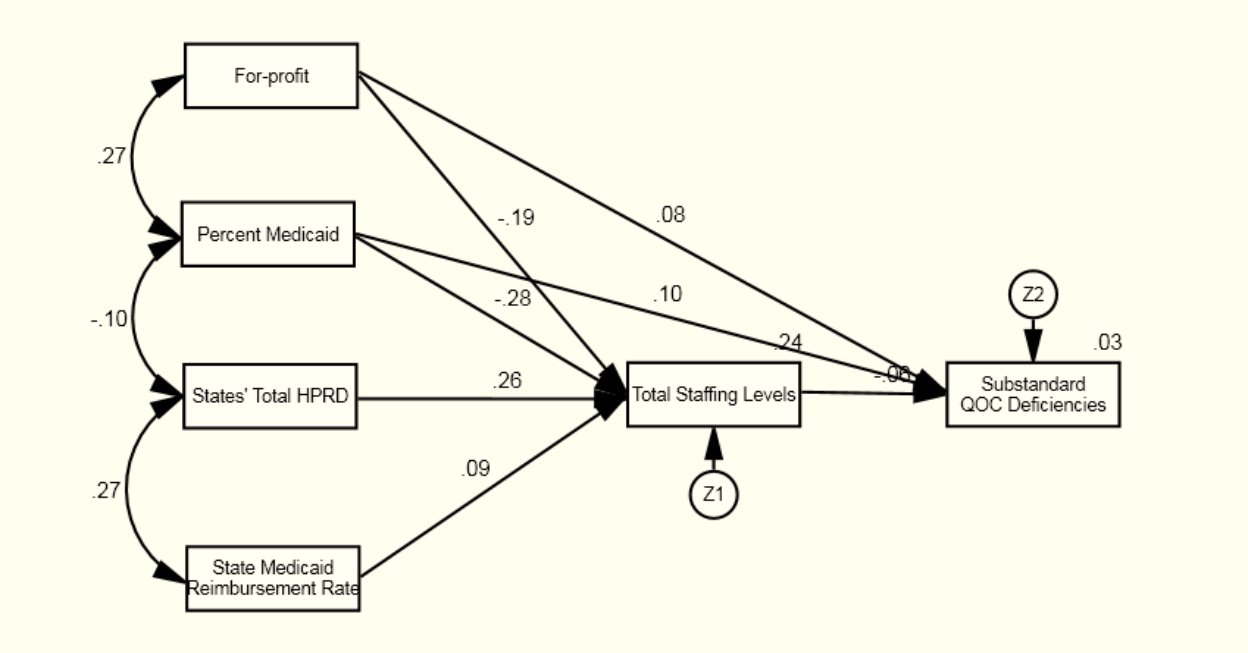

Figure 11. Revised Model to Investigate Impacts of State Total Staffing Standards and Total Staffing Levels on Substandard QOC Deficiencies

NA Staffing Levels and Quality of Care in Nursing Homes

Model 1: Impacts of NA Staffing Levels on QOC Deficiencies

The proposed model depicted in Figure 5 was conducted to investigate the relationship between NA staffing levels and QOC deficiencies. The proposed model shows that higher NA staffing levels were related to lower QOC deficiencies. State's NA staffing standards were found to be positively related to actual NA staffing levels. Additionally, higher RN staffing levels were

found to be significantly related to lower QOC deficiencies. However, LPN staffing levels were not significantly related to QOC deficiencies.

Expected relationships between actual NA staffing levels and seven organizational factors were statistically supported. For contextual factors, market competition and state Medicaid reimbursement rate were found to be positively related to NA staffing levels. However, market demand was not statistically significant for NA staffing levels.

The model fit summary shows a $\chi^2 = 18760.014$ with 75 degrees of freedom, which results $\chi^2/df = 250.134$. In addition, GFI and AGFI were 0.813 and 0.661, respectively while RMSEA was 0.154, indicating that this proposed model is poor-fit and needs a modification. Thus, the suggested rules for improving the model performance were applied.

The model fit summary for this revised model illustrated in Figure 12 shows a $\chi^2 = 20.072$ with four degrees of freedom, which results $\chi^2/df = 5.018$. In addition, the GFI and AGFI were 0.999 and 0.997, respectively while the RMSEA was 0.020, indicating that the model fit is acceptable.

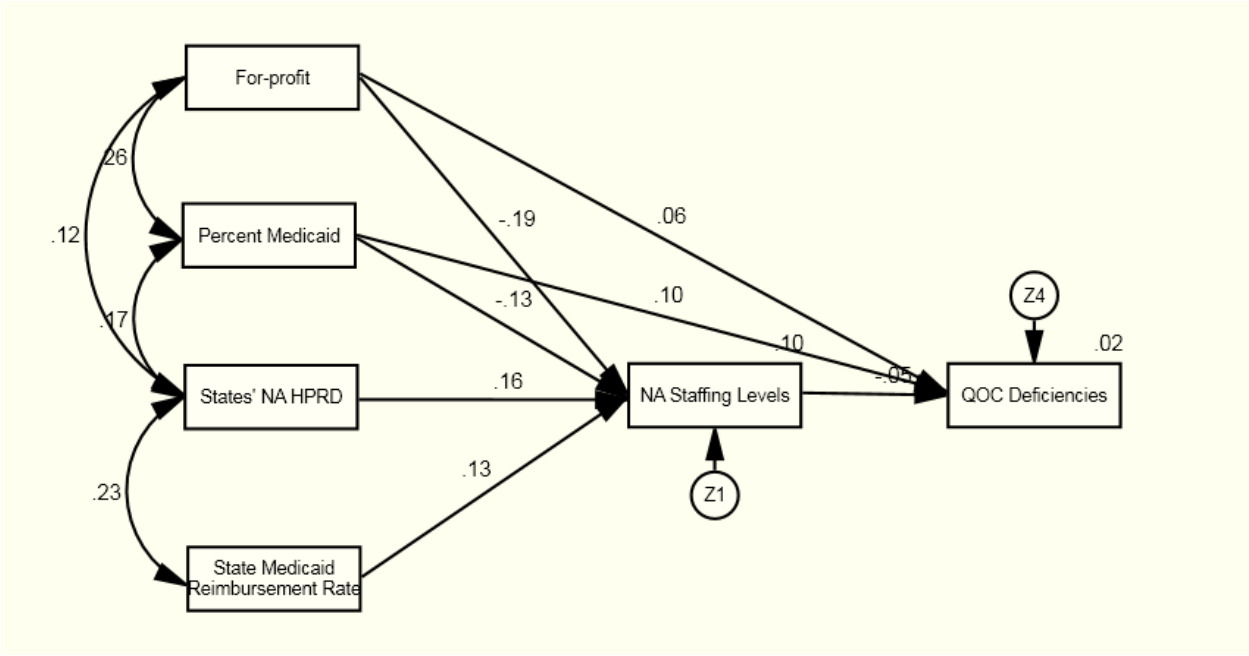

Figure 12. Revised Model to Investigate Impacts of State NA Staffing Standards and NA Staffing Levels on QOC Deficiencies

As presented in Table 12, the standardized coefficient for NA staffing levels on QOC deficiencies, which is statistically significant, was -0.050. Also, the standardized coefficient for states' expected NA staffing levels on actual LN staffing levels, which is statistically significant, was 0.164. Rejecting the null hypothesis that that there is no relationship between NA staffing levels and quality of care in nursing homes, these coefficients indicate that nursing homes with higher NA staffing levels resulting from higher state NA staffing standards had better quality of care. Therefore, Hypothesis 8 is statistically supported.

Squared multiple correlations indicate that around 10.5% of the total variance in NA staffing levels was explained by four exogenous variables including states' expected NA staffing levels while around 2.2% of total variance of QOC deficiencies was explained by three exogenous variables including NA staffing levels.

Table 12. Results of SEM for Investigating Impacts of State NA Standards and NA Staffing Levels on Quality of Care

Effect		Model 1 Standardized Regression Coefficient	Model 1 Critical Value	Model 2 Standardized Regression Coefficient	Model 2 Critical Value
States' NA HPRD	on NA Staffing Levels	0.164	16.977**	0.164	16.977**
For-profit	on NA Staffing Levels	-0.187	-19.470**	-0.187	-19.470**
Percent Medicaid	on NA Staffing Levels	-0.128	-13.290**	-0.128	-13.290**
State Medicaid	on NA Staffing Levels	0.134	14.173**	0.134	14.173**
NA Staffing Levels	on QOC	-0.050	-5.098**	-0.031	-3.106**
For-profit	on QOC	0.062	6.146**	0.081	7.999**
Percent Medicaid	on QOC	0.100	9.922**	0.115	11.468**
Squared Multiple Correlations (R2)					
NA Staffing Levels		0.105		0.105	
QOC		0.022		0.028	
Goodness of Fit Statistics					
$\chi 2$		20.072		41.921	
Df		4		4	
$\chi 2$/df		5.018		10.480	
(p-value)		(<0.01)		(<0.01)	
GFI		0.999		0.999	
AGFI		0.997		0.993	
NFI		0.994		0.987	
TLI		0.981		0.956	
RMSEA		0.020		0.030	

Model 1: Model for impacts of NA staffing levels on QOC deficiencies
Model 2: Model for impacts of NA staffing levels on substandard QOC deficiencies
* Significant at the 0.05 level.
** Significant at the 0.01 level.

Model 2: Impacts of NA Staffing Levels on substandard QOC Deficiencies

The revised model for examining the relationship between NA and substandard QOC deficiencies is depicted in Figure 13. The model fit summary for this model shows a $\chi^2 = 41.921$ with four degrees of freedom, which results $\chi^2/df = 10.480$. In addition, the GFI and AGFI were 0.999 and 0.993, respectively while the RMSEA was 0.030, indicating that the model fit is acceptable.

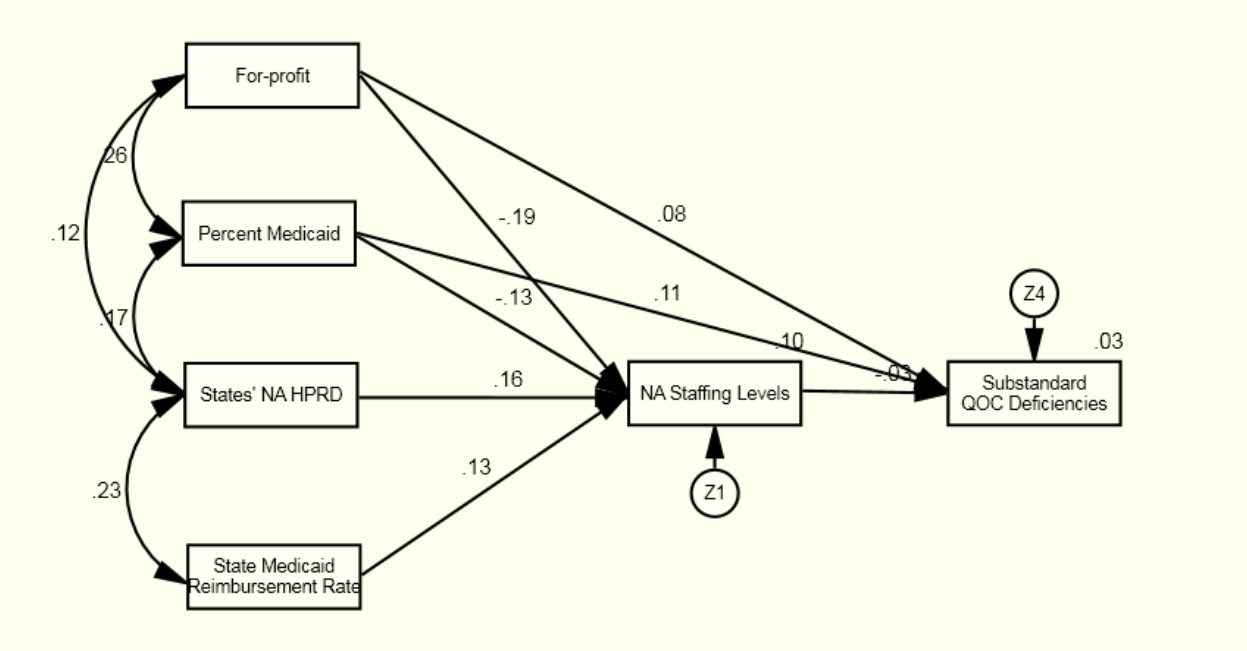

Figure 13. Revised Model to Investigate Impacts of State NA Staffing Standards and NA Staffing Levels on Substandard QOC Deficiencies

Higher NA staffing levels were found to be significantly associated with lower substandard QOC deficiencies (-0.031). Also, higher states' expected NA staffing levels were significantly related to higher actual NA staffing levels (0.164). Rejecting the null hypothesis, these coefficients indicate that nursing homes with higher NA staffing levels resulting from higher state NA staffing requirements had better quality of care. Therefore, this study statistically

supports the hypothesis 8. Squared multiple correlations indicate that around 10.5% of the total variance in total staffing levels was explained by four exogenous variables while around 2.8% of the total variance in substandard QOC deficiencies was explained by three exogenous variables.

Chapter Summary

The study employed hierarchical linear modeling (HLM) and structural equation modeling (SEM) to investigate impacts of state minimum nurse staffing standards on nurse staffing levels and quality of care in nursing homes. Firstly, four HLMs were separately conducted to examine how state staffing standards (RN, LN, total, NA staffing standards) are related to actual nurse staffing levels in nursing homes. Rejecting the null Hypotheses 1, 2, and 3, the first 3 models (RN, LN, and total staffing models) showed that nursing homes in states with higher RN/LN/total staffing standards had higher RN/LN/total nurse staffing levels. However, this study failed to reject the 4th null hypothesis that there is no relationship between state NA staffing standards and actual NA staffing levels in nursing homes.

Secondly, to analyze the relationship between nurse staffing levels and quality of care in nursing homes (QOC deficiencies and substandard QOC deficiencies), eight SEM models were separately performed. The results based on all eight models show the rejection of the null hypothesis that there is no relationship between nurse staffing levels and quality of care in nursing homes. Higher state staffing standards were found to be significantly related to higher nurse staffing levels for all categories (RN, LN, total, and NA).

Overall, it was noted that nursing homes with larger size, with higher occupancy and higher proportion of Medicaid residents, and for-profit/non-hospital-based/chained nursing homes had consistently lower nurse staffing levels for all categories than their counterparts. For contextual factors, state Medicaid reimbursement rate and market competition were positively related to nurse staffing levels. However, unlike the study expectation, market demand was often negatively associated with nurse staffing levels or less often demand was not found to be statistically significant to nurse staffing levels.

CHAPTER SIX: IMPLICATIONS AND CONCLUSIONS

The purpose of this dissertation is to examine nursing homes' compliance with state minimum nurse staffing standards and its relation to quality of care. Specifically, this study proposed a unique algorithm to calculate states' expected nurse staffing levels for individual nursing homes in order to investigate their compliance with the state nurse staffing standards. By using the hierarchical linear modeling method, this study attempted to capture the impact of state staffing policy on actual nurse staffing levels under resource dependence perspectives. Path analysis using structural equation modeling was conducted to examine both the direct and indirect impact of state nurse staffing standards on staffing levels and quality of care in nursing homes. This chapter provides the discussion of major findings, theoretical and methodological issues drawn from the research process and results, policy implications, limitations, and suggestions for future study.

Major Findings

Three research questions were proposed in this study. The major findings of three research questions are as follows:

Q1: What are the characteristics and variation in current minimum nurse staffing standards for nursing homes among the 50 states and the District of Columbia?

Indeed, state nurse staffing standards are much more complex than the federal ones and differ considerably across states. Because of this complexity and difference, it is hard to compare the stringency of nurse staffing levels required by the staffing requirements across states. In addition, it leads to a complication in identifying the variation in how the staffing requirements are differently applied to nursing homes that have different numbers of beds or residents within states.

Several previous studies, which attempted to investigate the impact of state nurse staffing standards on nurse staffing levels and/or quality of care, employed similar way of measuring nurse staffing levels required by state staffing standards. First, while state staffing requirements generally include four staffing categories (RN (RN DON + RN), LN (RN DON + RN + LPN/LVN), total, and NA staffing, previous studies measured the staffing policy only for two staffing categories (LN and total staffing). Since state LN requirements already include three different categories of nurse staffing (RN DON, RN, and LPN/LVN), this simplistic categorization could limit the accuracy of capturing the policy impact. Second, prior studies independently measured the staffing policy for one nurse category without considering another nurse category, and it could wash out any positive or negative effects of the staffing policy on different size nursing homes. In general, states' total staffing requirements could lead to violating their LN-hour requirements (e.g., for nursing homes with 6- residents, Florida's 3.9 total nursing HPRD requirement would lead to non-compliance to Florida's 24 LN-hour requirement). Last, RN DON staffing levels were not considered when actual staffing levels were measured, even though many states allow RNs to serve as RN DONs on duty for smaller nursing homes while they require a separate body of RN DON for larger nursing homes. This could lead to difficulty

in detecting impacts of RN DONs on quality of care, assuming that quality of nurse staffing is as important as quantity of nurse staffing on nursing home quality.

For this reason, unlike previous studies considering the staffing policy at state level, this study developed an algorithm to calculate states' expected nurse staffing levels for individual nursing homes in order to investigate their compliance with the state nurse staffing standards. This algorithm could make it possible to compare states' expected nurse staffing levels at facility level as well as state level. Furthermore, this study found that although all 50 states and the District of Columbia have stronger staffing standards than the federal one, simply meeting the state staffing standards could lead to violating the federal staffing standards, particularly for smaller nursing homes. Thus, state staffing HPRD is not precise enough for all nursing homes and needs technical adjustment.

Q2: To what extent do state minimum nurse staffing standards (including RN, LN, NA, and total nurse staffing standards) help ensure the increase in nurse staffing levels (including RN, LN, NA, and total nurse staffing levels) of nursing homes?

Four different HLMs (RN, LN, total, and NA staffing models) were independently conducted to examine the relationship between state staffing standards and nurse staffing levels in nursing homes. Rejecting the null Hypotheses 1, 2, and 3, the results of the first three models (RN, LN, and total staffing models) indicated that nursing homes in states with stronger state RN, LN, or total staffing standards were more likely to have higher RN, LN, or total nurse staffing levels, respectively. However, contrary to Hypothesis 4, nursing homes in states with stronger state NA staffing standards were found to have lower NA staffing levels. This could be

possibly explained by the correlation between licensed (RN or LN) staffing standards and non-licensed (NA) staffing standards in states which have their total nurse staffing requirements.

In this study, states' expected NA staffing levels were obtained by subtracting LN staffing requirements from total nurse staffing requirements. Thus, only 33 states which have their total or NA staffing requirements were used for the NA staffing model. Among the thirty-three states, an interesting pattern was noticed, that is, if states have stronger total nurse staffing requirements, they usually have stronger licensed staffing requirements (both RN and LN staffing requirements) but have relatively less strong NA staffing requirements. Whereas, their actual licensed (RN and LN) staffing levels were positively related with their total and NA staffing levels.

Using the thirty-three states, Pearson's correlation analysis was conducted to statistically confirm this pattern. The result showed that the states' RN and LN staffing requirements were positively correlated with their total staffing requirements ($r = 0.307$ and 0.644, respectively) while those were negatively related to their NA staffing requirements ($r = -0.347$ and -0.155, respectively). However, actual licensed (RN and LN) staffing levels in nursing homes were positively correlated with actual total and NA staffing levels ($r = 0.697$ and 0.863; and $r = 0.208$ and 0.300, respectively).

HLM used in this study could make it possible to capture this pattern. Unlike ordinary least squire method (OSL) which obtains a single set of coefficients, HLM first obtains multiple sets of coefficients and then derives single set of coefficients by estimating reliability of the multiple sets of coefficients. In this case, since a total of thirty-three states were used in the NA

staffing model, 33 coefficients for NA staffing standards were obtained separately state by state. At this step, HLM could detect a pattern that in most states out of the thirty-three states, state NA staffing requirements were negatively associated with actual NA staffing levels. Thus, state NA staffing standards were found to be negatively related to actual NA staffing levels in the NA staffing model.

To confirm this, regression analysis was separately conducted state by state. Of thirty-three regression models, seventeen models (CO, CT, GA, IA, ID, IL, KS, LA, MA, MD, MI, MT, NC, NJ, OK, PA, and TN) showed negative relationships between NA staffing standards and NA staffing levels; only 1 model (AR) indicated positive relationship between NA staffing standards and NA staffing levels; 8 models (DC, ME, MN, MS, NM, WI, WV, and WY) showed statistically insignificant relationships; and 8 models (CA, DE, FL, OH, OR, SC, and VT) could not be conducted because the independent variable, state NA staffing standards, has no variation (only one single value).

For organizational factors, as expected, facility size, occupancy rate, and proportion of Medicaid residents were found to be negatively associated with actual nurse staffing levels for all categories. Also, higher acuity index was significantly related to higher nurse staffing levels in nursing homes. For-profit nursing homes had relatively low nurse staffing levels, as compared to non-profit ones including government-owned nursing homes. Chained nursing homes were consistently found to have lower nurse staffing levels than non-chained nursing homes.

However, unlike the study expectation, the proportion of Medicare residents and hospital-based nursing homes were negatively associated with NA staffing levels while they were

positively associated with other staffing categories (RN, LN, and total staffing). This could be probably explained by organizational characteristics of hospital-based nursing homes.

As previous literature indicated that hospital-based nursing homes are more likely to have a lower proportion of Medicaid residents; have higher licensed staff; be smaller; and be Medicare-only-certified (Harrington, et al., 2007; Harrington, Zimmerman, et al., 2000), this study noticed that hospital-based nursing homes have smaller numbers of beds (median = 42 vs. 101) while they have much higher licensed staffing levels (mean of RN staffing levels = 1.631 vs. 0.398 and mean of LN staffing levels = 2.768 vs. 1.669). Hospital-based homes were found to have higher proportion of Medicare residents (36% vs. 13%) and lower proportion of Medicaid residents (40% vs. 62%).

Since for smaller nursing homes, states' LN requirements generally exceed their total staffing requirements (e.g., In Florida requiring both 24 LN hours and 3.9 total staffing HPRD, for a nursing home with fewer than 7 residents, the compliance to the 24 LN hours would result in the staffing levels that already exceed the 3.9 HPRD), hospital-based nursing homes which are usually smaller, by complying with their states' LN requirements, may not need more NA staff in order to meet their state nurse staffing standards, assuming that nursing homes tend to minimally comply with the staffing policy.

For contextual factors, higher state Medicaid reimbursement rate and higher market competition were consistently related to higher nurse staffing levels for all categories. However, contrary to the study expectation, market demand which is the percentage of people age 65+ in

each county was negatively related to nurse staffing levels except NA staffing levels (e.g., market demand was not significantly related to NA staffing levels).

In order to clearly understand the relationship between nurse staffing levels and market demand, regression analysis only with market demand was conducted. The results indicated that RN and total staffing levels in nursing homes were not found to be statistically significantly associated with market demand while LN staffing levels were negatively associated with market demand. But, R^2, value which is the amount of the total variation explained by exogenous variables, was negligible (0.2%), and it is relatively low as compared to random error (5%).

Q3: To what extent could nurse staffing levels contribute to the variation in the quality of care in nursing homes?

To analyze the relationship between nurse staffing levels (RN, LN, total, and NA staffing levels) and quality of care in nursing homes (QOC deficiencies and substandard QOC), 8 SEM models were separately performed. In each SEM model, two endogenous variables were used: (1) actual nurse staffing levels, and (2) quality of care in nursing homes in order to investigate both direct and indirect impact on state nurse staffing standards on nurse staffing levels and quality of care in nursing homes.

Rejecting the null Hypotheses 5, 6, 7, and 8, the results indicated that nursing homes with higher nurse staffing levels for all categories had better quality of care (lower deficiencies) for all two quality-of-care deficiencies. In addition, the higher nurse staffing levels were statistically found to be significantly associated with stronger state nurse staffing standards.

However, the relationship between state NA staffing standards and actual NA staffing levels was not consistent between HLM and SEM analyses. HLM analysis showed a negative relationship while SEM analysis showed a positive relationship. As described earlier, states with stronger total nurse staffing standards are more likely to have stronger licensed staffing standards (both RN and LN staffing requirements) but have relatively less strong non-licensed (NA) staffing requirements. Whereas, their actual licensed staffing levels were positively associated with their total and NA staffing levels.

HLM could capture this pattern by estimating multiple component coefficients for each group while path analysis (SEM), which is based on regression method, could not capture this pattern by estimating single coefficient. But, the results between HLM and SEM should be consistent in general. The inconsistent results could be partially due to insufficient number of groups in the model fitting process. As mentioned previously, 33 regression analyses were separately conducted state by state. Although the negative relationships between NA staffing standards and NA staffing levels were found in seventeen states out of thirty-three states, positive or non-significant relationships were found in the other sixteen states. This lack of model fitting from the sixteen states could possibly influence the positive coefficient in SEM.

From findings on squared multiple correlations, which indicate variance explained by exogenous variables, it was noticed that actual licensed (RN and LN) staffing levels were the strongest predictors for the quality of care, and likewise, state licensed (RN and LN) staffing standards were also the strongest predictors to their respective nurse staffing levels. For instance, the SEM model for investigating relations between RN staffing levels and QOC deficiencies

indicated that around 44% of total variance of RN staffing levels was explained by four exogenous variables (state RN staffing standards, ownership, the proportion of Medicaid residents, and state Medicaid reimbursement rates) while around 2.6% of the total variance in QOC deficiencies was explained by three exogenous variables (RN staffing levels, ownership, and the proportion of Medicaid residents).

In order to better understand the impact of state RN staffing standards on RN staffing levels and RN staffing levels on quality of care, a SEM model with state RN staffing standards as the only one exogenous variable was performed. Squared multiple correlations indicated that state RN staffing standards accounted for 33% of the total variance in actual RN staffing levels while actual RN staffing levels accounted for around 2.2% of the total variance in QOC deficiencies.

This means that among the 44% of total variance of RN staffing levels explained by four exogenous variables, 33% was explained only by the state RN staffing standards while 11% was explained by three exogenous variables. Thus, the state RN staffing standards used in this study were found to have stronger prediction power than other organizational/environmental factors for actual RN staffing levels in nursing homes. Likewise, among 2.6% of the total variance in QOC deficiencies explained by three exogenous variables, 2.2% was explained only by actual RN staffing levels while 0.4% was explained by other two exogenous variables (ownership, and the proportion of Medicaid residents). Therefore, RN staffing levels were found to have much stronger impacts on QOC deficiencies than other organizational factors.

Theoretical Implications

This study attempted to explain variation in nurse staffing levels in nursing homes, using resource dependence perspectives. As the theory indicated, nursing homes really take resource into consideration in determining their nurse staffing levels. Since the resource could be mostly obtained from the federal and state governments, nursing homes are heavily dependent on the government regulations and reimbursement policies.

Specifically, this study found that nursing homes in states with stronger staffing regulations have higher nurse staffing levels for RN, LN, and total staffing categories. In fact, meeting/violating the staffing regulations may not be directly related to acquiring/losing vital resources for nursing homes. However, since the staffing regulations are related to many other regulations which directly/indirectly deal with vital resources for nursing homes, violating the staffing regulations may imply the violation of other regulations and lead to significantly negative effects for their survival (e.g., nursing homes with poor quality resulted from inadequacy of nurse staffing are subjected to sanctions such as civil monetary penalties, denial of payment for new admissions, or termination). As confirmed by the path analysis using SEM, state nurse staffing standards have much stronger contribution to nurse staffing levels than any other organizational or contextual factors, implying that the federal and state governments appear to be the most important regulators and resource providers that nursing homes must depend on.

In addition, nursing homes were found to be dependent on relatively direct resources such as Medicare and Medicaid reimbursement rates. For instance, this study found that nursing homes in states with higher Medicaid reimbursement rates were more likely to have higher nurse

staffing levels for all categories. Since such government reimbursement policies are also directly related to other policies such as case-mix adjusted reimbursement policies, relevant variables used in the study (e.g., the proportion of Medicare or Medicaid residents, acuity index, and hospital-based nursing homes) were found to be significantly associated with nurse staffing levels.

Lastly, this study found that market factors had some effects on nurse staffing levels. As expected, nursing homes in highly competitive market were more likely to have higher nurse staffing levels. This implies, as stated by the resource dependence theory, organization's response to the demands of groups in environment, that control critical resources, is more critical in competitive environment (Pfeffer & Salancik, 1978).

However, this study failed to prove that higher market demand would be associated with higher nurse staffing levels. This may imply that nursing homes staffing decisions could be influenced by perceived market demand, rather than actual market demand. According to Zinn et al. (1988), perceived market factors such as market competition do contribute to nursing homes' strategic decision making while other, presumably objective, indicators such as Herfindahl index do not (Zinn, et al., 1998). Further studies may need to focus more on subjective assessment of market demand (e.g., the manager's perceived market demand and perceived scarcity of potential resources in managerial processes).

Methodological Implications

To investigate how nursing homes' staffing decisions are affected by environmental and inter-organizational factors and influence their quality of care, this study adopted the expanded 'structure-process-outcome' approach as an analytical framework (Unruh & Wan, 2004), which considers that nursing homes' staffing decisions are contingent on environmental influences in addition to the conventional S-P-O concepts. The path analysis using SEM employed in this study could be a potential tool for examining the systematic linkages.

The study findings have confirmed the conceptual S-P-O linkage; better structural and more appropriate processes are expected to provide better outcomes. Additionally, organization's structural quality which is mostly about resource-based attributes such as material resources (e.g., physical facilities and equipment), financial resources, and human resources (e.g., physician and nurse staffing) (Donabedian, 1988; Flood, et al., 2006), were significantly dependent on environment that controls critical resource for its survival.

According to Unruh and Wan (2004), the three quality components in the S-P-O framework would be somehow overlapped when they are practically measured and linked to each other because the S-P-O approach remains much more theoretical than empirical. Thus, the nurse staffing component could be separated from other structural factors possibly because not only it is influenced by other structural components but also it is intersected with nursing care process (Unruh & Wan, 2004).

Like many previous literatures, this study also found that licensed (RN and LN) staffing levels, rather than total or NA staffing levels, were the strongest predictors for quality of nursing

home care. This clearly means that nurse staffing levels, unlike other structural factors which are hard to manipulate, were highly interlocked with nursing care processes and outcomes. Thus, staff management or managerial leadership, which focuses on how the staff is organized, supervised, and motivated, can be more important than the number of nurses (Unruh & Wan, 2004; Wan, 2003; Wan, et al., 2010).

Policy Implications

Because of the importance of nurse staffing levels to the process and outcome of care in nursing homes, the appropriate level of nurse staffing has been a major long-term care issue for ensuring adequate care quality for nursing home residents. If the goal is to increase nurse staffing levels for better quality, increasing the stringency of both federal and state nurse staffing standards would be the most effective way to achieve this goal, as clearly confirmed by the study findings. The detailed recommendations are presented as follows.

First of all, states' efforts to reduce some ambiguity in their staffing requirements are required. Quite a few of the states do not have specific requirements for some nurse categories that the federal staffing requirements have. Because of the omission of some nurse categories, simply complying with the state staffing standards could lead to violating the federal staffing standards. For instance, both Alaska and Hawaii require higher RN staffing levels than federal standards. But, since they do not have RN DON requirements, meeting their staffing requirements could lead to violating the federal 6 RN DON requirements for 61+ residents. As well, since California does not specify 8 RN hours for 99- beds, the federal 8 RN hours for 60-

residents and 14 RN DON + RN hours for 61+ residents would be more stringent than California's RN DON + RN requirements for nursing homes with fewer than 100 beds.

Secondly, states should use a licensed staff-to-resident ratio in order to ensure fairness of nursing care for residents between smaller and larger nursing homes. For example, Colorado requires 24 LN hours and also 2.0 total nursing HPRD. Because of the state's 2.0 HPRD requirement, this state's staffing requirements seem to be fair for all facilities regardless of their size (e.g., nursing homes with 50, 100, and 150 residents must equally provide 2.0 nursing HPRD [100, 200, and 300 nursing hours, respectively]). However, the licensed staff-to-resident ratio would decrease significantly when the number of residents increase since nursing homes can minimally provide only 24 LN hours as regulated by the state (e.g., for nursing homes with 50, 100, and 150 residents, the state's licensed staff-to-resident ratio would be 0.48, 0.24, and 0.16, respectively). This situation was noticed in many states. Assuming that licensed staff is more important for improving quality of nursing home care, state staffing standards should provide an adequate proportion of skilled nursing staff in relation to the number of residents, particularly in larger nursing homes.

Lastly, if the ultimate goal is to improve the quality of care, increasing nurse staffing levels would be the most effective way for better quality as clearly confirmed by the study findings. However, the findings also imply that the quality of care would hardly be achieved merely by increasing nurse staffing levels.

Although this study statistically supported the relationship between nurse staffing levels and quality of care, the variation of the quality of care explained by exogenous variables

including nurse staffing levels, which were the strongest predictor, was relatively low (less than random variation 5%). This implies that achieving adequate levels of nursing home quality may require more than increasing nurse staffing levels.

Also, from S-P-O perspective, simply increasing nurse staffing levels may lead to better structural quality but may not efficiently fill the latent gap in-between structural and process components, assuming that nurse staffing (structural component) rather than any other organizational factors is greatly interlocked with nursing care process (process component).

Other areas that could be considered may include enhancing staff motivation and job satisfaction, as several studies have confirmed its relation to better organizational performance (Wan, 2002, 2003). The study findings make two suggestions for it. First, if state Medicaid reimbursements can be utilized for incentives for better performing nursing homes, nursing homes may improve their productivity by efficiently managing organizational personnel or increasing job satisfaction among practitioners. Eventually, it would have a positive impact on nursing home quality.

Second, this study found that RN DON and RN staffing was a stronger predictor for nursing home quality than any other types of nurse. This implies that RN DONs who mainly have the authority and responsibility to administer and supervise nursing services play an important role in the process of delivering care to residents in nursing homes. Furthermore, such administrative nursing staff can provide the leadership for enhancing an organization's productivity through efficient staff management and effective staff motivation. Thus, a comprehensive study of contribution of RN DON may be significantly meaningful.

Limitations and Suggestions for Future Study

There are several study limitations and suggestions for future study. First, state staffing standards would be potentially associated with states' perceptions and concerns about long-term care quality. States' long-term care policies would not be implemented independently of states' other long-term care policies (e.g., states' increased nurse staffing requirements are implemented together with their increased Medicaid funding and methods) (DHHS, 2003). Many consumer advocates' and professional nursing organizations' efforts to improve quality of care are also involved in states' long-term care policies. Thus, state-by-state systematic investigation together with those states' cultural factors would be useful to understand the impact of state staffing policy on quality of care.

Second, states have continuously updated their staffing standards in different time points. Thus, there would be some impacts of variation in length of the state staffing policy implementations on nurse staffing levels. For instance, if a state recently increased its staffing requirements, nursing homes may not quickly respond to the new staffing requirements. Likewise, if state staffing standards have been effective for a longer period time, the rate of nursing homes' compliance with the standards would be high. Therefore, the impact of the length of the staffing policy should be investigated for future study.

Third, both HLM and SEM that this study employed need to be methodologically compatible for future study. In this study, HLM was conducted for investigating the proportion of variance in nursing homes' staffing levels that occur across states, rather than within states (i.e., investigating whether or not nesting makes difference). Whereas, path analysis was

employed for delineating the direct and indirect effects of state staffing standards on nurse staffing levels and quality of care. Since HLM is two-level analysis while SEM is not, the results of both HLM and SEM were slightly different and interpreted separately. Therefore, multilevel structural equation modeling with a balanced design (equal number of facilities per state) is suggested to combine two separated modeling methods.

Fourth, because of the difficulty of separating the process and outcome component of care in the S-P-O framework, this study combined the process and outcomes of care for measuring nursing home quality, by using nursing home survey deficiencies. However, practically, an effort to separate the two components is needed for future study in order to more clearly evaluate how nursing care process and performance influence quality of care in nursing homes. Wan (2003) suggested a possibility of the practical separation between process and outcome dimensions. Investigating the relationship between two conceptualized constructs (nursing care adequacy and nursing care quality), this study demonstrated that a positive association exists between the process and outcome dimensions of quality of nursing care under the S-P-O framework (Wan, 2003).

Lastly, longitudinal study design would provide more reliable effects of state staffing standards on nurse staffing levels and quality of care in nursing homes. As described earlier, this study provided the inconsistent effects of state NA staffing standards between HLM and SEM analyses possibly because regression analysis could not be performed in many states. Rather than the cross-sectional design that this study used, longitudinal design would mitigate the issue of the lack of model fitting.

Chapter Summary

State nurse staffing standards have been a major long-term care policy issue for improving quality of care. This study attempted to explore the variation in state nurse staffing standards and investigate its impact of nurse staffing levels and quality of care.

The study findings proposed that state nurse staffing standards need technical changes to reduce ambiguity and increase fairness. Since many states do not have specific requirements for some categories of nurse, nursing homes complying with their state staffing policy could lead to violating the federal staffing policy. Also, since states' total nursing HPRD in their staffing requirements would not ensure an adequate proportion of skilled nursing staff in relation to the number of residents particularly in larger nursing homes, state staffing standards need to change the focus from quantity of nurse to quality of nurse. In addition, a market-incentive approach for improving quality of care was suggested. If state Medicaid reimbursements can be utilized for incentives for better performing nursing homes, nursing homes may improve their productivity by efficiently managing organizational personnel or increasing job satisfaction among practitioners.

Lastly, several limitations found in the study provide motivation for future study. States' cultural factors, such as the degree of consumer advocacy involvement in long-term care policy making or average nursing staff wage may be possible confounding factors associated with variation in state staffing standards and nurse staffing levels. Thus, state-by-state investigation together with those states' cultural factors would be useful for understanding the impact of state staffing policy on quality of care. Also, a systematic study of the impact of nursing care

performance (more about nursing activity or process of nursing care), rather than nurse staffing levels (more about structure) on quality of care is encouraged for future study. Lastly, longitudinal analysis, considering variation in length of staffing policy implementation, is encouraged to investigate long-term effects of state staffing standards on nurse staffing levels and quality of care.

APPENDIX A
THE DEFICIENCIES USED IN THE STUDY

F-tags	Definition
Resident Behavior and Facility Practices	
F0221	Resident has the right to be free from any physical restraint for purposes of discipline or convenience.
F0222	Resident has the right to be free from any chemical restraint for purposes of discipline or convenience.
F0223	Resident has the right to be free from verbal, sexual, physical and mental abuse, corporal punishment, and involuntary seclusion.
F0224	Facility must have written policies and procedures that prohibit abuse and neglect.
F0225	Facility may not employ persons who have been found guilty of abuse.
F0226	Facility must develop and implement written policies and procedures that prohibit mistreatment, neglect, and abuse of residents, and misappropriation of resident property
Quality of Life	
F0240	Facility must promote/enhance quality of life.
F0241	Facility must promote care that maintains or enhances dignity.
F0242	Resident has the right to choose activities, schedules, interact with members of community, and make choices about aspects of life in the facility.
F0243	Resident has the right to organize and participate in resident groups.
F0244	Facility must listen and respond to resident or family group.
F0245	Resident has the right to participate in social, religious, and community activities.
F0246	Facility should have policies that accommodate residents' needs and preferences.
F0247	Resident to receive notice before room or roommate in the facility is changed.
F0248	Facility is to provide ongoing program of activities that fit resident.
F0249*	Facilities director must be fully qualified.
F0250	Facility must provide medically-related social services.
F0251*	Facility with more than 120 beds must employ a qualified social worker on a full time basis.
F0252	Facility must provide a safe, clean, comfortable, and homelike environment.
F0253*	Facility must provide housekeeping and maintenance services necessary to maintain a sanitary, orderly, and comfortable interior.
F0254	Facility must provide clean bed and bath linens that are in good condition.
F0255*	Facility must provide private closet space in each resident's room.
F0256	Facility must provide adequate and comfortable lighting levels in all areas.
F0257	Facility must provide comfortable and safe temperature levels.
F0258	Facility must provide comfortable sound levels.
Quality of Care	
F0309	Facility to provide necessary care for the highest practicable physical, mental, and psychosocial well being.
F0310	Activities of daily living do not decline unless unavoidable.
F0311	Resident is given treatment to improve abilities.
F0312	Activities of daily living care is provided for dependent residents.
F0313	Resident receive treatment to maintain hearing and vision.
F0314	Proper treatment to prevent or treat pressure sores.
F0315	Resident is not catheterized, unless unavoidable.
F0316	Appropriate treatment for incontinent resident.
F0317	No reduction of range of motion, unless unavoidable.
F0318	Resident with limited range of motion receives appropriate treatment.
F0319	Appropriate treatment for mental or psychosocial problems.
F0320	No development of mental problems, unless unavoidable.
F0321	No naso-gastric tube, unless unavoidable.
F0322	Proper care and services for resident with naso-gastric tube.
F0323	Facility is free of accident hazards.
F0324	Resident receives adequate supervision and assistance devices to prevent accidents.

F0325	Facility must maintain acceptable parameters of nutritional status, unless unavoidable.
F0326	Resident receives therapeutic diet, when required.
F0327	Facility must provide sufficient fluid intake to maintain proper hydration and health.
F0328	Facility must ensure that proper treatment and care is provided.
F0329	Each resident's drug regimen must be free from unnecessary drugs.
F0330	No use of antipsychotic drugs, except when necessary.
F0331	Residents who use antipsychotic drugs receive gradual dose reductions.
F0332	Facility must ensure that it is free of medication error rates of five percent or greater.
F0333	Residents are free of any significant medication errors.

Sources: Office of Inspector General (1999) 'Nursing Home Survey and Certification: Deficiency Trends' (OEI-02-98-00331)
*: The deficiency item was not used in the study

APPENDIX B
MINIMUM NURSE-TO-RESIDENT RATIO REQUIRED BY WEST VIRGINIA

TABLE 64-13A

Minimum Ratios of Resident Care Personnel to Residents

	Total Resident Care Personnel			Total Resident Care Personnel			Total Resident Care Personnel			Total Resident Care Personnel	
No of Residents	Hours per day	# Pers per day	No of Residents	Hours per day	# Pers per day	No of Residents	Hours per day	# Pers per day	No of Residents	Hours per day	# Pers per day
3 to 10	48	6	91	205	26	136	306	38	181	408	51
11 to 20	56	7	92	207	26	137	309	39	182	410	51
21 to 30	72	9	93	210	26	138	311	39	183	412	52
31 to 40	90	11	94	212	27	139	313	39	184	414	52
41 to 50	113	14	95	214	27	140	315	39	185	417	52
51	115	14	96	216	27	141	318	40	186	419	52
52	117	15	97	219	27	142	320	40	187	421	53
53	120	15	98	221	28	143	322	40	188	423	53
54	122	15	99	223	28	144	324	41	189	426	53
55	124	16	100	225	28	145	327	41	190	428	54
56	126	16	101	228	29	146	329	41	191	430	54
57	129	16	102	230	29	147	331	41	192	432	54
58	131	16	103	232	29	148	333	42	193	435	54
59	133	17	104	234	29	149	336	42	194	437	55
*60	135	17	105	237	30	150	338	42	195	439	55
61	138	17	106	239	30	151	340	43	196	441	55
62	140	18	107	241	30	152	342	43	197	444	56
63	142	18	108	243	30	153	345	43	198	446	56
64	144	18	109	246	31	154	347	43	199	448	56
65	147	18	110	248	31	155	349	44	200	450	56
66	149	19	111	250	31	156	351	44	201	453	57
67	151	19	112	252	32	157	354	44	202	455	57
68	153	19	113	255	32	158	356	45	203	457	57
69	156	20	114	257	32	159	358	45	204	459	57
70	158	20	115	259	32	160	360	45	205	462	58
71	160	20	116	261	33	161	363	45	206	464	58
72	162	20	117	264	33	162	365	46	207	466	58
73	165	21	118	266	33	163	367	46	208	468	59
74	167	21	119	268	34	164	369	46	209	471	59
75	169	21	120	270	34	165	372	47	210	473	59
76	171	21	121	273	34	166	374	47	211	475	59
77	174	22	122	275	34	167	376	47	212	477	60
78	176	22	123	277	35	168	378	47	213	480	60

79	178	22	124	279	35	169	281	35	214	482	60
80	178	22	125	282	35	170	383	48	215	484	61
81	180	23	126	284	36	171	385	48	216	486	61
82	183	23	127	286	36	172	387	48	217	489	61
83	185	23	128	288	36	173	390	49	218	491	61
84	187	23	129	291	36	174	392	49	219	493	62
85	189	24	130	293	37	175	394	49	220	495	62
86	194	24	131	295	37	176	396	50	221	498	62
87	196	25	132	297	37	177	399	50	222	500	63
88	198	25	133	300	38	178	401	50	223	502	63
89	201	25	134	302	38	179	403	50	224	504	63
90	203	25	135	301	38	180	405	51	225	507	63

*60 and less may include director of nurse

Number of personnel per day are full-time personnel equivalents based on forty (40) hours per week

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