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EXAMINING CALIFORNIA'S ASSEMBLY BILL 1629 AND THE LONG-TERM CARE REIMBURSEMENT ACT: DID NURSING HOME NURSE STAFFING CHANGE?

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

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LIST OF ABBREVIATIONS

AB.....Assembly Bill

ADL.....Activities of Daily Living

ALF.....Assisted Living Facility

BBA.....Balanced Budget Act

BLS.....Bureau of Labor Statistics

CANHR.....California Advocates for Nursing Home Reform

COSHPD.....California Office of Statewide Health Planning and Development

CMS.....Centers for Medicare and Medicaid Services

CON.....Certificate of Need

CNA.....Certified Nurse Assistant

CCRC.....Continuing Care Retirement Communities

CLHF.....Congregate Living Health Facility

COLA.....Cost of Living Adjustment

CHOW.....Change in Ownership

DHCS.....Department of Health Care Services

DHS.....Department of Health Services

DPH.....Department of Public Health

FD……First Difference

FRVS.....Fair Rental Value System

GAO.....Government Accountability Office

GIS.....Geographic Information System

HCFA.....Health Care Financing Administration

HHA.....Home Health Agency

HPRD.....Hours Per Resident Day

IADL.....Instrumental Activities of Daily Living

IOM.....Institute of Medicine

IV.....Instrumental Variable

ICF.....Intermediate Care Facilities

LDOA.....Labor Driven Operating Allocation

LPN.....Licensed Practical Nurse

LVN.....Licensed Vocational Nurse

MDS.....Minimum Data Set

MLRC.....Multi-Level Retirement Community

NA.....Nurse Aide

NCMI..... Nursing Case Mix Index

NLTCS.....National Long-Term Care Survey

NF.....Nursing Facility

NHC.....Nursing Home Compare

NHQI.....Nursing Home Quality Initiative

NHRA.....Nursing Home Reform Act

OLS.....Ordinary Least Squares

OSHPD.....Office of Statewide Health Planning and Development

OLS.....Ordinary Least Squares

OSCAR.....Online Survey Certification and Reporting

P4P.....Pay For Performance

PRD.....Per Resident Day

PPS.....Prospective Payment System

QAF.....Quality Assurance Fee

QM.....Quality Measure

QOC.....Quality of Care

QOL.....Quality of Life

RCFE.....Residential Care for the Elderly

RDT.....Resource Dependence Theory

RUG.....Resource Utilization Group

SNF.....Skilled Nursing Facility

SPA.....State Plan Amendment

USDHHS.....United States Department of Health and Human Services

ABSTRACT

EXAMINING CALIFORNIA'S ASSEMBLY BILL 1629 AND THE LONG-TERM CARE REIMBURSEMENT ACT: DID NURSING HOME NURSE STAFFING CHANGE?

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California's elderly population over age 85 is estimated to grow 361% by the year 2050. Many of these elders are frail and highly dependent on caregivers making them more likely to need nursing home care. A 1998 United States Government Accountability Office report identified poor quality of care in California nursing homes. This report spurred multiple Assembly Bills in California designed to increase nursing home nurse staffing, change the state's Medi-Cal reimbursement methodology, or both. The legislation culminated in Assembly Bill (AB) 1629, signed into law in September 2004, which included the Long-Term Care Reimbursement Act. This legislation changed

the state's Medi-Cal reimbursement from a prospective, flat rate to a prospective, cost-based methodology and was designed in part to increase nursing home nurse staffing. It is estimated that this methodology change moved California from the bottom 10% of Medicaid nursing home reimbursement rates nationwide to the top 25%. This study analyzed the effect of AB 1629 on a panel of 567 free-standing nursing homes that were in continuous operation between the years 2002 – 2007. Resource Dependence Theory was used to construct the conceptual framework. Ordinary least squares (OLS) and first differencing with instrumental variable estimation procedures were used to test five hypotheses concerning Medi-Cal resource dependence, bed size, competition (including assisted living facilities and home health agencies), resource munificence, and slack resources. Both a 15 and 25 mile fixed radius were used as alternative market definitions instead of counties. The OLS results supported that case-mix adjusted licensed vocational nurse (LVN) and total nurse staffing hours per resident day increased overall. Nursing homes with the highest Medi-Cal dependence increased only increased NA staffing more than nursing homes with the lowest Medi-Cal dependence post AB 1629. The fixed effects with instrumental variable estimation procedure provided marginal support that nursing homes with more home health agency competition, in a 15 mile market, had higher LVN staffing. This estimation procedure also supported that nursing homes with more slack resources (post AB 1629) increased nurse aide and total nurse staffing while nursing homes located in markets with a greater percentage of residents over the age of 85 had more nurse aide staffing.

CHAPTER ONE: INTRODUCTION

The Study Problem

The United States' population over 65 is expected to grow at a rapid pace over the next few decades as the Baby Boomer generation ages. This demographic, especially those over age 85, is more likely to require long-term care in nursing homes. However, nursing home care is expensive and predominantly publicly paid for through the Medicaid and Medicare programs. Federal and state legislatures have sought ways to control these ever increasing Medicaid and Medicare expenditures.

Legislative efforts have included reimbursement method changes such as those introduced by the 1997 Balance Budget Act (BBA) in which Medicare skilled nursing care reimbursement moved to a prospective, case-mix method. Additionally, most of the states have changed their Medicaid reimbursement methods from a retrospective, cost-based reimbursement to various prospective reimbursement methods. A number of states also introduced certificate of need (CON) or bed moratorium policies which sought to curb supply-induced demand for these services. These efforts at the federal and state levels are aimed at keeping nursing home payments down, but frequently Medicaid reimbursement rates are below nursing homes costs incurred in providing care to Medicaid patients (Castle, 2005). Consequently, nursing home staffing and quality of care may have decreased.

Studies have found that Medicaid reimbursement rates are an important factor positively associated with nursing home nurse staffing. Lower rates are generally associated with either reduced nurse staffing or a reliance on a less skilled nurse staff (Bostick, 2004; Harrington, Swan, & Carrillo, 2007), which may both impact the quality of care provided. Lower Medicaid rates have also been associated with lower quality of care (Amirkhanyan, Hyun, & Lambright, 2008; Grabowski, Angelelli, & Mor, 2004; Harrington et al., 2008). Additional research shows that prospective payment may not have lowered expenditures or that reduced expenditures may have resulted due to poorer quality of care (Chen & Shea, 2002). Thus, a key concern for legislators and policymakers is trying to obtain the highest level of nurse staffing and quality of care possible for their program dollars.

In response, California passed Assembly Bill (AB) 1629 in 2004 which contained the Long-Term Care Reimbursement Act. The legislation changed California's Medi-Cal (California's name for Medicaid) nursing home prospective reimbursement methodology from a flat-rate method based on peer groups, to a facility-specific, cost-based method. The legislation also increased reimbursement rates and was designed to provide the means necessary for California nursing homes to increase nurse staffing. Additionally, the legislation intended to effectively ensure individual access to appropriate long-term care services, promote quality care, increase wages and benefits for nursing home workers, support provider compliance with all applicable state and federal requirements, and encourage administrative efficiency (California Department of Health Care Services, 2004).

It has been suggested that nursing homes can respond to changes in reimbursement policies like California's in several ways. These responses include becoming more efficient, changing their size, altering their case-mix, changing the level of quality provided to Medicaid patients, and varying the number of Medicaid patients admitted (Feldstein, 1993). This study focuses on the question of whether California nursing homes, particularly those with high Medi-Cal dependence, increased nurse staffing in response to the new Medi-Cal reimbursement method.

Background

Changing demographics in the United States will impact the demand for nursing home care and the growing elderly population is the key change. According to U.S. Census Bureau projections, the United States' population over the age 84 is expected to increase from 5.8 million in 2010 to 19 million (231%) by 2050 (U.S. Census Bureau, 2008). Moreover, the Census Bureau predicts the number of elders between the ages of 65 to 84 will increase from 40.2 million in 2010 to 88.6 million (120%) by 2050. The explosive elderly population growth also holds true in California. California's population over age 84 is expected to increase from 628,000 in 2010 to 2.9 million (361%) by 2050, while the number of elders between ages 65 and 84 is anticipated to swell from 3.8 million in 2010 to 8.6 million (126%) by 2050 (California Department of Finance, 2007). The projected growth of the population over age 84, both nationally and in California, is of concern because members of this population are often frail and highly dependent on caregivers (Castle & Engberg, 2005) meaning they are the most likely to require long-term care (Hagen, 2004). Thus, it is readily apparent based on these

projections that nursing home demand is more than likely to increase across the United States and in California for the next few decades. This may be troubling to policymakers and legislatures because it may amplify nursing home nurse staffing and costs concerns. Appropriate nursing home nurse staffing levels and mix in U.S. nursing homes has been a major concern because it is the "structure" which enables quality care (Donabedian, 1980). Staffing has indeed been shown to be of pivotal importance in U.S. nursing homes. For instance, an inadequate level of nursing home nurse staff or the use of a less skilled nurse staffing mix (e.g., use of licensed vocational nurses [LVNs] instead of registered nurses [RNs]) has routinely been associated with poorer processes of care (Castle, Engberg, & Aiju, 2008; Schnelle et al., 2004; Weech-Maldonado, Meret-Hanke, Neff, & Mor, 2004), worse resident outcomes (Castle, Engberg et al., 2008; Weech-Maldonado et al., 2004), and higher numbers of inspection deficiencies (Harrington et al., 2000; Kim, Harrington, & Greene, 2009).

The high cost of nursing home care, particularly for public payers, has also been a concern. Nationally in 2005, Medicare and Medicaid combined to pay $72.8 billion versus the $49.9 billion paid out-of-pocket and by private insurance (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009). This difference is projected to increase, as the Baby Boom generation ages, with the average annual spending growth by public payers (7.2%) expected to outpace that of private payers (5.3%) (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009).

Study Aims and Research Questions

The first aim of this study is to examine the effect of AB 1629 on California

nursing home nurse staffing. More specifically, the study seeks to determine if RN, LVN, nurse assistants (NAs), and total nurse staffing hours per resident day (HPRD) changed in free-standing nursing homes following the passage of the legislation. The study also investigates whether a nursing home's dependence on Medi-Cal revenue influenced nurse staffing changes.

Resource dependence theory (RDT) provides the theoretical framework for this study. Thus, the second aim is to explore the RDT-based organizational characteristics and environmental factors associated with nurse staffing increases. Competition for scarce resources is a key consideration when using RDT, making it important to define properly a nursing home's competitors. Researchers conducting nursing home studies predominantly use the county to define the level of competition. Hence, the third aim of this study is to use a fixed geographic radius measurement (15 and 25 miles from each nursing home, respectively) of competition because it may be a more reliable and valid measure over using counties to determine markets (Grabowski, 2008). The study also aims to improve upon previous research by including assisted living facilities (ALFs) and home health agencies (HHAs) as competitors because they vie for some of the same patients and residents as nursing homes (Davis, Freeman, & Kirby, 1998; Grabowski, 2008; Gruneir, Lapane, Miller, & Mor, 2007; Swan, Kitchener, & Harrington, 2009).

There are four research questions for this study. First, did California nursing home nurse staffing increase following the passage of AB 1629 as designed? Second, did nursing homes with the highest levels of Medi-Cal dependence post AB 1629 increase staffing more than those nursing homes with lower dependence? Third, what were the

RDT-based organizational characteristics and environmental factors associated with nurse staffing? Fourth, did ALF and HHA competition effect nursing home staffing?

Current Study Significance

Each state has flexibility when deciding on Medicaid reimbursement method and rate levels. This is why state Medicaid programs have been called 50 individual state experiments (Little, 1992). This study's investigation of California's new reimbursement method can help determine if the "experiment" was successful at increasing nurse staffing levels in those nursing homes most affected by AB 1629 (i.e., those most dependent on Medi-Cal revenue). The analyses will also enable the examination of organizational characteristics and environmental factors that may influence nurse staffing. The results can inform other state legislatures and policymakers around the United States. This would allow California or other states interested in California's reimbursement method to tailor their own future Medicaid experiments accordingly. However, to accomplish this feat a few gaps in the literature need to be filled including improvements on three previous AB 1629 reports, using a fixed geographic radius to determine market competition, and including ALFs and HHAs as nursing home competitors.

The aforementioned three AB 1629 reports used California cost report information to examine staffing levels following the reimbursement method change, but they did have some shortcomings. The analysis in this study improves on these previous reports by using RDT to construct the conceptual model, by employing a fixed-effect panel data analysis to control for time invariant factors, and by analyzing a longer time

period including more recent financial data. Moreover, this study relies on audited financial data.

Another limitation in the literature is how nursing home competitors have been defined. The county has been the overwhelming choice used to define markets and identify competitors usually using a Hirschmann-Herfindahl Index (HHI) of market concentration (Cawley, Grabowski, & Hirth, 2006; Grabowski, 2001a; Grabowski, 2004; Harrington & Swan, 2003; Intrator et al., 2005; Kash, Castle, & Phillips, 2007; Konetzka, Norton, Sloane, Kilpatrick, & Stearns, 2006). An alternative method is to determine a fixed geographic radius around each facility and use that to identify each nursing home's market and define the level of competition accordingly (Baker, 2001). This method has been used in the study of nursing home arena using a 25 km radii (Grabowski & Stevenson, 2008) and improves on the prevalent method of using counties as markets to determine competition.

The final gap in the literature entails identifying non-nursing home competitors. It has been postulated that increased ALF and HHA use has lessened both nursing home occupancy rates and excess demand in markets because they are substitutable for low acuity patients (Allen, 2005; Grabowski, Feng, Intrator, & Mor, 2004; Grabowski, Gruber, & Angelelli, 2008). Thus, excluding these types of facilities may underestimate the level of competition that nursing homes face.

Theoretical Framework Overview

RDT serves as the theoretical framework for this study and is used to construct the conceptual model. RDT remains a useful theory 30+ years after being introduced

because it considers both organizational characteristics and environmental factors in an organization's response to resource dependencies, environmental changes and pressures, and uncertainty. These are all conditions that organizations face to varying degrees. RDT is particularly applicable to this study because California nursing homes may respond differently to AB 1629 based on their level of Medi-Cal dependence, other organizational characteristics, and environmental factors.

There are three RDT-based organizational characteristics of interest for this study. The first two are nursing home size and slack resources which may affect a nursing home's response to external changes or pressures. The third is resource dependence which is the product of resource importance (internal, organizational characteristic) and resource concentration (external, environmental factor). Additionally, resource munificence and competition are important environmental factors as they may also shape nursing home responses to environmental changes such as structural quality changes through changes in nurse staffing. Other pertinent control variables are included which may impact nurse staffing levels according to the empirical literature. These controls variables are the Medi-Cal reimbursement rate, nurse wage rates, and unemployment rates. The combination of all of these results is illustrated in the basic conceptual model shown in Figure 1.

Research Hypotheses

The following are the RDT derived hypotheses tested in this study:

H1: Nursing homes with the highest Medi-Cal dependence increased nurse

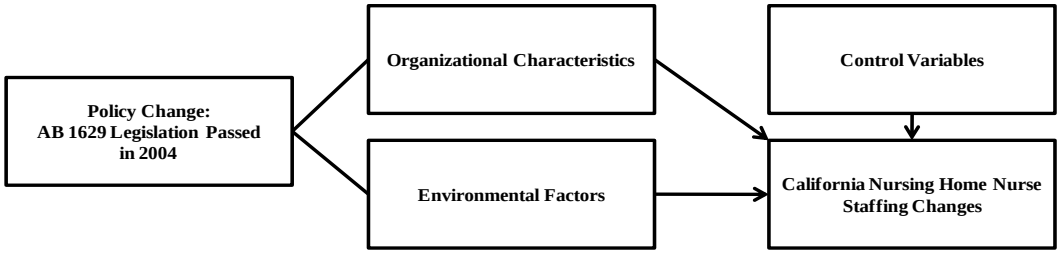

Figure 1. Basic conceptual model based on resource dependence theory.

staffing relative to nursing homes with lower Medi-Cal dependence post AB 1629, other things constant.

H2: Smaller nursing homes increased nurse staffing relative to large nursing homes post AB 1629, other things constant.

H3: Nursing homes with more slack resources, (e.g. higher cash flow) increased nurse staffing post AB 1629, other things constant.

H4: Nursing homes in more competitive markets had higher nurse staffing, other things constant.

H5: Nursing homes in markets with higher resource munificence (e.g., higher per capita income and greater percentage of population over 85) were positively associated with nurse staffing, other things constant.

Data Sources and Analyses

This study uses multiple retrospective data sources with most of it coming from California state agencies. The California Office of Statewide Health Planning and Development (COSHPD) provides most of the study's information including the data for all of the staffing dependent variables and all but three of the independent variables.

Other California data resources include the Department of Finance for county population over age 85, Department of Social Services for ALF information, Department of Health Care Services for Medi-Cal reimbursement rates, and the Department of Public Health for a change in ownership and nursing home closure listing. The University of Southern California Geographical Information System Lab provided the longitude and latitude information necessary to construct both the 15 and 25 mile radius from each free-standing nursing home. Additional data comes from the Bureau of Economic Analysis (BEA) for median per capita income, the Brown University Long-Term Care Focus website for case-mix information and the number of beds for hospital-based facilities, and the U.S. Bureau of Labor Statistics (BLS) for unemployment rates and the consumer price index (CPI).

California nursing home nurse staffing is the focus of this study. In particular, the number of RN, LVN, NA, and total nursing staff HPRD are studied pre and post AB 1629 in order to see if staffing increased following the legislation. Three models are run for each dependent variable. The first model is a simple ordinary least squares (OLS) interaction model without conditioning on any other variables to get at the root of the policy effect of AB 1629 on staffing. The second and third models use first differences, with instrumental variable estimation procedures, and includes all of the independent and control variables. One model will use a 15 mile radius to define nursing home markets while the other will use a 25 mile radius.

Remaining Chapter Outline

Chapter 2 describes nursing home care in California and includes the major concerns pertaining to nursing home care. The chapter further provides a comprehensive review of the legislation leading to AB 1629 as well as a detailed description of the new methodology. An examination of the empirical evidence on the association between reimbursement methods and rates on nursing home staffing closes the chapter. Chapter 3 provides the theoretical foundation for this study. The chapter describes RDT's major constructs, presents the study's conceptual model, and five hypotheses derived from RDT are presented. These hypotheses are based on a nursing home's organizational characteristics (resource dependence, size, and slack resources) and environmental factors (competition and resource munificence).

Chapter 4 covers this study's methodology including the study design, sample, data sources, variables and accompanying measurements, and the analytical techniques used in the study. Chapter 5 presents the results of the study while chapter six closes with a discussion of the results, recommendations for future research, and the study's limitations.

CHAPTER TWO: LITERATURE REVIEW

This chapter consists of three sections. The first section provides a background on nursing homes in the United States including a description of the various types of care, the licensed facilities in California that provide care to the elderly population, the major payers for nursing home care, broad factors driving demand for nursing home care, and the major concerns over nursing home care paying particular attention to staffing and quality. The second section introduces the history that led to the focus of this study: California's 2004 AB 1629 legislation, which included Article 3.8, The Long-Term Care Reimbursement Act. Section two also delves into the salient details of AB 1629 and the Long-Term Care Reimbursement Act including the legislative intent, reimbursement methodology and structure, as well as the major subsequent events related to the legislation. The last section reviews the empirical literature on the impact of reimbursement methods and rates on nursing home staffing while also accounting for organizational and environmental factors that may impact nurse staffing.

Nursing Home Background Information

Description of Care

Generally, the term "nursing home" is an overarching expression that may encompass long-term and/or post-acute nursing care. The focus of this research is on nursing homes that provide long-term care. Long-term care provided in nursing homes

normally consists both of custodial care and some measure of skilled nursing care for people with chronic conditions and/or functional limitations (Institute of Medicine, 2001). The U.S. Department of Health and Human Services (USDHHS) defines custodial care as "nonskilled, personal care, such as help with activities of daily living [ADLs] like bathing, dressing, eating, getting in or out of a bed or chair, moving around, and using the bathroom. It may also include care that most people do themselves, like using eye drops" (Centers for Medicare and Medicaid Services, 2008a). Functional limitations may either be physical or mental in nature, or both. Examples of physical limitations comprise difficulties in performing ADLs or instrumental activities of daily living (IADLs) such as preparing food or housekeeping. Conversely, mental disabilities may be due to conditions like dementia (Allen, 2005). The long-term care population served in the typical nursing home is characteristically frail, many are highly dependent upon caregivers, and this dependence often lasts several years (Castle & Engberg, 2005). Using California as an example, the typical nursing home patient had six to seven diagnoses and needed assistance with about three ADLs in 2005 (California Health Policy and Data Advisory Committee, December 12, 2005).

On the other hand, short-term, post-acute care encompasses skilled nursing care and/or rehabilitation and therapy. Short-term in this case is usually less than 100 days (Centers for Medicare and Medicaid Services, 2007) and typically follows an acute patient episode of illness and a recent stay in a hospital (Hagen, 2004). Thus, one difference between skilled care provided to long-term residents and post-acute patients involves the duration of care provided. The USDHHS defines skilled nursing facility

care as "a level of care that requires the daily involvement of skilled nursing or rehabilitation staff and that, as a practical matter, can't be provided on an outpatient basis" (Centers for Medicare and Medicaid Services, 2008b). The skilled nursing portion involves medical and skilled nursing care, therapy, and social services supervised by a licensed nurse 24 hours a day, while the physical rehabilitation services are designed to help patients attain their maximum functional capability (Muramatsu, Lee, & Alexander, 2000). Hence, another difference between long-term residents and post-acute patients entails the type of care received.

California's Licensed Facility Types

There are multiple facility types that provide long-term and/or short-term care for the elderly population in California. These facilities include three different categories (free-standing, distinct part or hospital-based, and sub-acute) of skilled nursing facilities (SNFs), nursing facilities (NFs), Congregate Living Health Facility (CLHFs), intermediate care facilities (ICFs), multi-level retirement communities (MLRCs), and continuing care retirement communities (CCRCs). All of these facilities will be used to calculate the nursing home competition variable because they compete with traditional nursing homes for at least a small segment of the traditional nursing home population. However, only the free-standing SNFs and NFs will be used in the main analyses. In addition, there are nonmedical facilities licensed for residential care for the elderly (RCFE) also known as ALFs. These facilities will be used to construct a separate competition measure.

Free-standing SNFs and NFs in California are stand apart health facilities licensed by the Department of Public Health to provide continuous skilled nursing or supportive care to patients on an extended basis (California Advocates for Nursing Home Reform, n.d.). Further, this care is provided 24 hours a day and includes physician, skilled nursing, dietary, an activity program, and pharmaceutical services. These facilities are also customarily dually certified as a SNF under the Medicare program and a NF under the Medicaid program (known as Medi-Cal in California). These are the facilities called nursing homes for the purpose of this study. However, some facilities may choose not to be certified by the Centers for Medicare and Medicaid Services (CMS) for one of the programs, or both (California Advocates for Nursing Home Reform, n.d.). For instance, a NF that strictly cares for private pay patients is not certified by Medicaid.

Distinct-part SNFs or distinct-part NFs in California are those that are a part of an acute care hospital. These Medicare certified facilities have a unit set aside for skilled nursing care for higher acuity patients and/or beds set aside for patients requiring post acute care. They may also be certified for Medi-Cal reimbursement (California Advocates for Nursing Home Reform, n.d.). These facilities are also commonly called hospital-based facilities and are not considered for the main analyses in this study because they have a separate reimbursement methodology.

There are also approximately 100 Medi-Cal subacute providers in California that provide adult or pediatric subacute care (California Advocates for Nursing Home Reform, n.d.). Subacute care refers to licensed and intensive skilled nursing care provided to patients who have a fragile medical condition and whose needs exceed those

that can be provided by a standard skilled nursing facility (Health Care Information Division, 2008). Most are located in distinct-part facilities although some freestanding nursing facilities have been also approved to provide this type of care (California Advocates for Nursing Home Reform, n.d.). These facilities are also excluded from the main analyses as the care they provide is much different than that provided in a typical nursing home. For instance, California's subacute residents require breathing assistance and are on ventilators (Mr. Nixon, personal communications, February 9, 2010).

Congregate Living Health Facility (CLHF) is a residential home generally with a maximum capacity of 12 beds. These facilities provide inpatient care including: medical supervision, 24-hour skilled nursing and supportive care, pharmacy, dietary, social, recreational. Furthermore, at least one type of the following services is provided: services for persons who are mentally alert, physically disabled persons, who may be ventilator dependent; services for persons who have a diagnosis of terminal illness, a diagnosis of a life threatening illness, or both; services for persons who are catastrophically and severely disabled. This care is generally less intense than that provided in general acute care hospitals but more intense than that provided in skilled nursing facilities (California Department of Public Health, 2011).

Intermediate care facilities in California are those that provide inpatient care to ambulatory or non-ambulatory patients who have a recurring need for skilled nursing supervision and supportive care, but do not require **continuous** nursing care (California Department of Health Services, 2005a). Thus, these facilities provide a lower level of care than SNFs and are not certified for Medicare reimbursement, although some receive

Medi-Cal reimbursement at a lower rate than the SNFs (California Advocates for Nursing Home Reform, n.d.). In the past, SNF and ICF care was usually provided in separate facilities, but now facilities generally have integrated both types of care thereby allowing residents to remain in the same facility as their needs change (Inlander, Donio, & Dodson, 1996). There is also a separate class of ICFs in California which care for developmentally disabled individuals and they are classified into four types: developmentally disabled, habilitative, nursing, and continuous nursing (California Department of Developmental Services, 2008). Facilities that provide care for the developmentally disabled are also excluded from the main analyses in the study because the care they require is much different than that provided in a typical nursing home.

MLRCs and CCRCs in California are facilities that provide an array of services. The continuum of services includes independent living services, assisted living services, and skilled nursing care all of which are on a single campus. The only difference between these two types of facilities is that CCRCs have obtained a certificate of authority to enter into continuing care contracts from the Department of Social Services, while MLRCs have not (California Department of Health Services, 2005a).

RCFEs are licensed by the California Department of Social Services and provide care for the elderly, but are not medical facilities unlike the others (California Advocates for Nursing Home Reform, n.d.). Thus, they are not certified to accept Medi-Cal or Medicare reimbursement and as such rely on private payers. These facilities are basically an assisted living arrangement that predominantly cares for residents over age 60 by providing varying levels of care and supervision (California Advocates for Nursing

Home Reform, n.d.). However, RCFEs can accept hospice, dementia, and other special medical conditions by applying for special exemptions and waivers (California Advocates for Nursing Home Reform, 2008).

Major Payers for Nursing Home Care

There are four major payers of nursing home care listed in order in terms of expenditures: Medicaid, private-pay out-of-pocket, Medicare, and private-pay insurance. Medicaid pays for long-term care services, which includes custodial care and skilled nursing for the poor and medically needy, and is the major payer for long-term care services in the United States. National Medicaid expenditures in 2005 for services provided in nursing homes, including intermediate care facilities for the developmentally disabled and CCRCs with on-site nursing facilities, were $53.7 billion, or 44.5% of the total nursing home expenditures (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009). In a similar vein, California nursing homes, ICFs, and residential care facilities with on-site nursing combined in 2005 received $3.2 billion or 51.4% of their net revenue from Medi-Cal (OSHPD, 2009). California nursing homes by themselves in 2005 received $2.8 billion or 53.8% of their net revenue from Medi-Cal (OSHPD, 2009).

While it is true that the Medicaid pays for the majority of nursing home care, a substantial amount of nonpublic program funds were also used. Nationally in 2005, residents and their families paid $31.5 billion or 26.1% of the expenditures for nursing home care, including ICFs and CCRCs with on-site nursing, and another $14.4 billion or 7.2% was paid for by private insurance (Centers for Medicare and Medicaid Services'

Office of the Actuary, 2009). Of that 2005 amount, nursing homes, ICF, and CCRC with on-site nursing in California received $897.8 million or 14.3% of their net revenues from out-of-pocket payers and another $447.3 million or 7.5% of their net revenue from managed care (OSHPD, n.d.). California nursing homes by themselves received $652.3 million or 12.5% of their net revenue from out-of-pocket payers and another $418 million or 8% from managed care (OSHPD, n.d.).

The Medicare program on the other hand pays principally for post-acute care. The program provides reimbursement for up to 100 days of skilled nursing care (per episode) for Medicare-eligible residents (normally those over the age 65) provided that the care occurred within 30 days of a hospital stay of at least 3 days and was certified as a medical necessity (Dummit, 2002; Hoffman, Klees, & Curtis, 2008). National Medicare expenditures in 2005, for services provided in nursing homes, ICFs, and CCRCs with on-site nursing facilities were $19.1 billion or 15.8% of the payments to these types of facilities (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009). Of that amount, California nursing homes, ICFs, and residential care facilities with on-site nursing combined received $1.7 billion or 26.7% of their net revenues from the Medicare program (OSHPD, 2009). California nursing homes received $1.3 billion or 25.8% of their net revenues from the Medicare program (OSHPD, 2009).

Broad Factors Driving Demand for Nursing Home Care

There are a few changing demographics in the United States that impact the demand for nursing home care. These demographic changes include an increase in the elderly population, but also a decrease in the younger population (generally under age 65)

that often provide "informal" support. Both of these changes are expected to increase the demand for long-term nursing home care. Conversely, the elderly population has better functional capabilities than in the past and potential competitors to traditional nursing home care have emerged. Both of these may have alleviated some of the need for nursing home care.

It is of no great surprise that the sheer numbers of the population over age 65 are increasing rapidly and are projected to do so for the next four decades because of the aging Baby Boomer generation. According to U.S. Census Bureau projections, the United States' elderly population over the age 84 is expected to increase from 5.8 million in 2010 to 19 million (231%) by 2050 (U.S. Census Bureau, 2008). Moreover, the Census Bureau predicts elders between the ages of 65 to 84 will increase from 40.2 million in 2010 to 88.6 million (120%) by 2050. California has even higher projected increases for these age groups. California's elderly population over age 84 is expected to increase from 628,000 in 2010 to 2.9 million (361%) by 2050, while the elder population between ages 65 and 84 is anticipated to swell from 3.8 million in 2010 to 8.6 million (126%) by 2050 (California Department of Finance, 2007).

The projected explosive growth of the population over age 84, both nationally and in California, is of greater concern because members of this population are often frail and highly dependent on caregivers (Castle & Engberg, 2005) meaning they are the most likely to require long-term care (Hagen, 2004). For instance, the 2008 CMS Nursing Home Data Compendium showed that there were over 37.9 million elders, between the ages of 65 and 84, in 2007 and 2.8 million (7.4%) of them had a nursing home stay that

year. Conversely, 21.8% of the 5.5 million elderly over the age of 84 required a nursing home stay that same year (Centers for Medicare and Medicaid Services, 2008b). Thus, it is readily apparent that nursing home demand is more than likely to increase both nationally and in California.

Life expectancy has also continued to rise and is projected to continue for decades to come. For instance in 2003, the projected life expectancy from birth in the United States was 77.5 years with differences across genders—males were expected to live 74.8 years and females 80.1 years (Shrestha, 2006). This was projected to increase over time with life expectancy estimates for 2025 and 2050 extended to 76.5 and 79.5 years for males and 82.6 and 84.9 years for females, respectively (U.S. Census Bureau, 2000). These are important projections as they mean a greater risk for aging into frailty (Spillman & Lubitz, 2002) and that long-term care in nursing homes may be required for longer periods of time (Hagen, 2004).

A decrease in informal support for the elderly is yet another important factor anticipated to increase the need for nursing home care, and other forms of long-term care, because informal providers such as family and friends are the primary providers of long-term care services in the United States (Allen, 2005). A general rule of thumb is that approximately 66% of the care provided for the elderly is via informal providers (Norton, 2000). However, this informal support network is shrinking and can be traced to more middle-aged women working, divorce for both elderly persons and their children thereby weakening family ties, fewer elders living with others, lower fertility rates, and the geographic dispersion of families (Allen, 2005; Bishop, 1999; Hagen, 2004). For

example, it is estimated that 1.2 million elderly people will live alone and without living children or siblings by the year 2020, more than double the number without family support in 1990 (Allen, 2005). These demographic changes are of vital concern because informal, unpaid caregivers continue to support care for the elderly living at home (Bishop, 1999) and expensive institutional care is more likely without it. However, a couple of factors have emerged that have decreased the need for nursing home care.

Factors that have decreased the need for traditional nursing home care include a decline in the prevalence of functional disability in the elderly population as well as nursing home substitutes such as ALFs and HHAs. Bishop (1999) found, upon examination of the National Long-Term Care Survey (NLTCS) data, that disability had declined substantially between 1984 and 1994 for both community-resident and institutionalized elders. More specifically, the proportion of elders with at least one difficulty in performing an IADL or ADL had fallen to 21.3% by 1994, down from 24.9% just a decade earlier (Bishop, 1999). Others point out that the raw number of elderly with disabilities remained fairly constant from 1984 to 1999, but the percentage of those with disabilities fell about 1% to 2% each year over the same time period due to the growth in this population (Allen, 2005). This means the positive benefit of greater functional ability in the elderly population will be overcome simply due to the sheer numbers of aging baby boomers as the total number of disabled elderly is projected to increase to as high as 12.1 million people by 2040 (Allen, 2005). Thus, increased functional capability may have decreased nursing home need in the short-run, but the

previously mentioned population demographics will sweep away this positive development.

HHAs and ALFs have had perhaps a stronger impact on the decreased demand for nursing home care due to their substitution effect. Nursing homes have been the dominant institutional providers of long-term care since the introduction of Medicaid in 1965, but have been challenged by HHAs and ALFs as witnessed by decreased occupancy rates in nursing homes (Castle, Engberg, Lave, & Fisher, 2009). HHA and ALF use has grown since the 1990s and this may have occurred in part because the per capita expenditure for nursing homes greatly exceeds the cost of the care provided in these alternative settings (Allen, 2005).

Home health care typically follows a hospital stay for an acute medical condition or a discharge from a different type of medical facility and encompasses medically oriented services paid, at least in part, by either Medicare, Medicaid, or private insurance (Hagen, 2004). By 1995, more elders were receiving health and personal care than ever before with 9.6% of all aged Medicare beneficiaries using home health care with approximately 80 visits per user (Bishop et al., 2008). However, the use of home health services decreased with the passage of the 1997 Balance Budget Act (BBA) since Medicare home health care benefits were decreased with this legislation (Spillman & Lubitz, 2002).

ALFs may attract people who need less assistance than the typical nursing home resident. These facilities offer a wide range of personal care and health-related services such as 24-hour emergency monitoring, supervision and dispensing of medication, and

assistance with one or more ADLs (Hagen, 2004). ALFs may also draw private-payers away from nursing homes because this type of care is less expensive (Allen, 2005) and in many cases offer more attractive physical surroundings and amenities (Hagen, 2004). Of note, Medi-Cal does not pay for assisted living services (California Health Policy and Data Advisory Committee, December 12, 2005) meaning that residents of these facilities are private payers either out-of-pocket or via insurance.

This is not to say that HHAs and ALFs are without detractors. Some question whether or not home health care actually reduces expenditures since some of the services previously were provided "free" by informal care providers (Allen, 2005). Additionally, others have questioned the safety of care provided in ALFs believing that regulation for these facilities is too lax (Kane & Kane, 2001), and that many residents in these types of facilities should at least be in intermediate care facilities (California Health Policy and Data Advisory Commission, June 15, 2004). Thus, increased use of HHAs and ALFs may have decreased the demand for nursing home care thereby making them important competitors (Bishop, 1999; Hawes, Phillips, Rose, Holan, & Sherman, 2003). However, their use may not decrease costs overall in the case of HHAs (Allen, 2005; Cohen & Spector, 1996) and may potentially put residents at risks in the case of ALFs (California Health Policy and Data Advisory Commission, June 15, 2004; Inlander et al., 1996; Kane & Kane, 2001).

There are numerous indicators that nursing home demand has declined despite a growing elderly population. One good indicator is that from 1973 to 1985, approximately 50 of every 1,000 people over age 65 lived in nursing homes, whereas in

1997 that number had decreased to about 43 per 1,000 (Hagen, 2004). Yet another good indicator is the shrinking number of nursing homes themselves. In 2007, there were 16,072 nursing homes that were certified for either the Medicare or Medicaid programs, or both (Centers for Medicare and Medicaid Services, 2008b). However, this had steadily dropped from a high of nearly 18,000 facilities in 1997, and the number of nursing homes decreased by about 4% between 2003 and 2007 (Centers for Medicare and Medicaid Services, 2008b). The number of certified nursing homes beds, per 1,000 people age 65 and older, has also fallen from 50.03 in 1999 to 44.43 in 2007 (Centers for Medicare and Medicaid Services, 2008b). Moreover, occupancy rates have fallen over time for nursing homes. In aggregate, nursing home occupancy rates fell from 92% in 1985 to 87% in 1995 (Bishop, 1999) and it was 84.3% in 2003, 84.2% in 2004 and 2005, 84.4% in 2006, and 83.8% in 2007 (Centers for Medicare and Medicaid Services, 2008b).

In sum, it is readily apparent that demand for nursing home care has decreased, particularly for elderly people over the age 65. This was illustrated by lower proportions of older adult and elderly people in nursing homes, a decreased number of nursing homes and certified beds nationally, and decreased occupancy rates in nursing homes. Some of these decreases may be due to substitutes such as HHAs and ALFs.

Major Concerns About Nursing Home Care

There are multiple concerns about nursing home care, but perhaps the biggest are the nurse staffing and the quality of care provided to patients, access to nursing care, and the high costs for the care provided. Similarly, these may also be thought of in terms of effectiveness (quality), equity (access), and efficiency (costs) using the Aday model

(Aday, Begley, Lairson, & Balkrishnan, 2004). Various stakeholders may focus more on one over the others, but a review of the literature shows each is important in its own right.

Nursing Home Quality Concerns

Apprehension over nursing home quality is not a new phenomenon as the general public, policy makers, and the nursing home industry itself have been concerned about it for decades (Arling, Job, & Cooke, 2009). Books such as Mendelson's, Tender Loving Greed (1974) and Vladeck's, Unloving Care: The Nursing Home Tragedy (1980), vividly portrayed an industry motivated at the time by profit at the expense of quality of care. Later, reports by the Institute of Medicine (IOM) in 1986 and 2001 also called attention to the importance of nursing home quality of care thereby leading to important legislation such as the 1987 Nursing Home Reform Act (NHRA). By and large, concerns over nursing home quality involve inadequate nurse staffing, poor quality overall, and uneven quality of care (QOC).

Appropriate nursing home nurse staffing levels and mix in U.S. nursing homes has been a major concern as it is, in Donabedian's terminology, the "structure" which enables quality care (Donabedian, 1980). More specifically, Donabedian considers staffing an indirect measure of quality of care (QOC), but "probably the most important means of protecting and promoting quality of care" (1980, p. 82). Staffing has indeed been shown to be of pivotal importance in U.S. nursing homes. For instance, an inadequate level of nursing staff or the use of a less skilled nurse staffing mix (e.g., use of LVNs instead of RNs) has routinely been associated with poorer processes of care (Castle, Engberg et al., 2008; Schnelle et al., 2004; Weech-Maldonado et al., 2004),

worse resident outcomes (Castle, Engberg et al., 2008; Weech-Maldonado et al., 2004), and higher numbers of inspection deficiencies (Harrington et al., 2000; Kim et al., 2009). Numerous governmental reports have questioned the overall QOC in nursing homes (Office of the Inspector General, 2003; Office of the Inspector General, 2008; Office of the Inspector General, March, 1999; U.S. General Accounting Office, October, 2002). Nongovernmental reports by entities such as the IOM and consumer advocate groups have done the same. For instance, the IOM's 1986 report stated that, despite years of extensive government regulation, serious problems concerning the QOC and quality of life (QOL) persisted in nursing homes in every state (Institute of Medicine, 1986). The report also stated that there was broad consensus that government regulation of nursing homes at the time was inadequate because it allowed far too many marginal and substandard nursing homes to continue operations. As a follow-up, the IOM's 2001 report acknowledged improvement in nursing home QOC and QOL. However, the report stated that serious QOC problems persisted in some nursing homes and recommended that the Health Care Financing Administration (HCFA) require a RN's presence 24 hours per day in nursing homes and that minimum nurse staffing levels (number and skill mix) for direct care patient care be developed and based on case-mix (Institute of Medicine, 2001). Furthermore, the California Advocates for Nursing Home Reform (CANHR) issued a 2006 report depicting troublesome abuse in a number of California nursing homes to include physical and sexual assaults as well as mental and verbal cruelty (CANHR, 2006).

There have also been concerns over uneven quality of care provided by nursing homes. These concerns rest on geographical differences or characteristics of patients who may receive different QOC. Geographical concerns have entailed nursing home quality of care differences both across states and regions within states. For example, states vary widely in their deficiency rates and enforcement actions. Furthermore, there was a variation in the amount and type of deficiencies issued to facilities within each state due to different inspection teams (Harrington & Carrillo, 1999; Harrington, Mullan, & Carrillo, 2004). Also, states have the ability to enact more stringent staffing requirements over federal standards and 40 states had done so by 2006 (Mueller et al., 2006). Another study of nursing homes, which involved physical restraints, found significant regional variation in clinical practices that would ostensibly impact the quality of care provided (Phillips et al., 1996). Thus, there may be quality difference both between and within states due to different state inspection standards and nurse staffing standards, variable enforcement actions, deviations in clinical practices, and different inspection teams.

There have also been concerns that quality of care is uneven based on factors such as race or socioeconomic status (Konetzka & Werner, 2009; Mor, 2004; Smith, 2008). Some empirical evidence shows that Blacks and Hispanics are more likely than Whites to rely on Medicaid in nursing homes because of lower incomes and higher chronic illness rates (Meyer, 2001; Norton, 2000). In turn, they may be provided a lower quality of care because both lower state Medicaid reimbursement rates (Cohen & Spector, 1996; Grabowski & Angelelli, 2004; Grabowski, Angelelli et al., 2004) and a higher Medicaid

census (Castle, 2005; Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000) in facilities have been associated with a lower quality of care in nursing homes.

There have been numerous actions taken in response to these staffing and QOC shortcomings. These responses can be broken down into legislative/regulatory actions at the federal and state level and the encouragement of market mechanisms to spur the provision of higher quality of care. A prime example of legislative efforts to improve the quality of care in the nursing home industry was the NHRA of 1987. This Act followed the 1986 IOM report and required nursing homes to use the Resident Assessment Instrument (Stewart, Grabowski, & Lakdawalla, 2009), of which the Minimum Data Set (MDS) is a major part, required that all states establish complaint investigations (Stevenson, 2005), required all Medicare and Medicaid certified nursing homes to be regularly inspected (Werner et al., 2009), and included some minimal staffing standards (Institute of Medicine, 2001) among other stipulations. States such as California have also used legislation such as AB 1629 to employ quality assurance fees (QAFs), and increased Medicaid reimbursement in an effort to increase staffing and thereby improve quality of care in nursing homes (California Assembly Bill 1629, 2004).

Market mechanisms on the other hand are a relatively new phenomenon when compared to legislation and regulation and these mechanisms include the publication of quality information and pay-for-performance. The HCFA began the nursing home compare (NHC) website in 1998 to provide prospective patients and their families a tool to examine quality in nursing homes thereby allowing them to "shop" amongst them. The site contents included quality deficiency citations issued by state inspectors, staffing

levels, and basic facility characteristics (Fermazin, Canady, Bauer, & Cooper, 2003). In 2002, Centers for Medicare and Medicaid Services (CMS) (the new name for HCFA as of June 2001), launched the Nursing Home Quality Initiative (NHQI) which expanded the NHC website by additionally publishing nationwide quality measures (QMs) meant to provide an indication of how well individual nursing homes manage various aspects of resident care (Zinn, Spector, Hsieh, & Mukamel, 2005). States such as California have also published their own versions of quality information with various levels of information.

Another market mechanism is pay-for-performance (P4P) programs which have been used longer in the hospital setting, but are increasingly being used in the nursing home arena. In essence, nursing homes are rewarded with higher reimbursement for meeting various QOC goals. For instance, Minnesota is said to have the most extensive P4P program based on the five QMs of staff retention, staff turnover, use of pool staff, survey deficiencies, and a MDS summary score based on quality indicators (Miller, Mor, Grabowski, & Gozalo, 2009).

Nursing Home Access Concerns

Access to nursing home care has caused trepidation in addition to staffing and QOC concerns. This unease can be broken down into access to nursing home care in tight markets (Medicaid patients in particular) and access to care for "heavy" needs patients. The former was more of a concern 15-20 years ago, but still exists today in nursing home markets with a lower supply of available nursing home beds thereby creating excess demand conditions and tight markets (Nyman, 1988, 1994). Basically,

this scenario provided nursing homes the option to choose the types of patients they wanted to serve. Since private pay patients customarily had a higher reimbursement rate, they were usually preferred over Medicaid patients resulting in decreased access to care for the Medicaid population (Bishop, 1988; Ettner, 1993; Grabowski, 2002; Meyer, 2001; Swan et al., 2009). However, lower overall excess demand in nursing home markets and falling average occupancy rates make tight markets much less common. Access to heavy needs patients has also been a concern. This is because there is not an incentive for nursing homes to treat these patients if the reimbursement method does not account for case-mix or patient needs. In this case, it is easier and more profitable to treat patients with lower care needs (Bishop, 1988; Cohen & Dubay, 1990).

There are multiple mechanisms that can be been used in an attempt to increase access to nursing home care, particularly for Medicaid patients. First, Medicaid eligibility criteria could be changed to enable more people to qualify for the program (Meyer, 2001; Swan, Kitchener, & Harrington, 2009). This, of course, would increase state costs (Norton, 2000) and does not guarantee a nursing home would admit these patients, particularly in tight markets. Second, CON and bed moratoriums could be removed or relaxed by states thereby enabling more nursing homes to enter markets (Nyman, 1994; Starkey, Weech-Maldonado, & Mor, 2005). For example, California repealed its CON in 1987 (Cauchi et al., 2009). The assumption here is that this action would decrease excess demand conditions in markets by increasing the supply of beds and services. Third, Medicaid reimbursement rates or methods could be changed. For instance, higher Medicaid reimbursement rates have been associated with greater access

to care (Grabowski & Angelelli, 2004; Meyer, 2001). The type of reimbursement method has also been shown to make a difference in access. For example, facility-specific reimbursement methods have been shown to increase access to care over flat-rate methods (Institute of Medicine, 2001). Moreover, access for patients with heavy care needs has increased in states that have employed a case-mix reimbursement adjustment (Feng, Grabowski, Intrator, & Mor, 2006; Grabowski, 2002) although not in every case (Swan et al., 2009). However, improving access for heavy needs residents may come at the detriment to those who require lighter care (Institute of Medicine, 2001).

Nursing Home Cost Concerns

The high cost of nursing home care is the final concern discussed here. Nationally in 2005, Medicare and Medicaid combined to pay $72.8 billion versus the $49.9 billion paid out-of-pocket and by private insurance (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009). This difference in amount paid by public funds versus private funds is projected to increase, as the Baby Boom generation ages, with the average annual spending growth by public payers (7.2%) expected to outpace that of private payers (5.3%) (Centers for Medicare and Medicaid Services' Office of the Actuary, 2009). This is naturally a concern for federal and state legislatures and policymakers. However, costs are also a concern for potential residents and their families because nursing home care is very expensive with a 2009 national average median annual rate of $74,208 for a private room (Genworth Financial Inc., 2009). Therefore, it is not uncommon that a person may enter nursing homes initially as a

private-payer and "spend down" his or her assets until he or she qualifies for Medicaid coverage (Stewart et al., 2009).

Consumers have used a number of strategies to control costs. These strategies include a continued reliance on informal providers (Allen, 2005; Grabowski, 2008; Norton, 2000) and alternatives to nursing homes such as HHAs and ALFs when possible (Davis et al., 1998; Grabowski, 2001b; Grabowski & Angelelli, 2004; Swan et al., 2009). This is in part due to costs, but also because institutional care in a nursing home is a last resort for many (Grabowski & Gruber, 2007).

Federal and state governments have also used a variety of tactics to control costs through legislation designed to either keep costs down or reduce nursing home demand. The federal government passed the 1997 BBA which established prospective payment for short-term, post-acute skilled nursing care in an attempt to control skyrocketing Medicare costs (Kitchener, Bostrom, & Harrington, 2004; Konetzka, Yi, Norton, & Kilpatrick, 2004; Weech-Maldonado, Neff, & Mor, 2003; Zhang, Unruh, & Wan, 2008). States have also switched from retrospective, cost-based methods to prospective payment reimbursement methods to control Medicaid costs (Chen & Shea, 2002; Coburn, Fortinsky, McGuire, & McDonald, 1993; Institute of Medicine, 2001). Besides creating a prospective payment system (PPS), the 1997 BBA repealed the Boren Amendment which stipulated that a state's Medicaid nursing home payment rates had to be adequate to cover the costs of care (Grabowski, Angelelli et al., 2004). This provided states an even greater opportunity to cut Medicaid reimbursement rates for nursing home care (Grabowski, Angelelli et al., 2004) which was a commonly used tactic to control costs

(Bishop, 1988; Grabowski & Angelelli, 2004). States have also attempted to reduce Medicaid demand, and therefore expenditures, through CON laws and construction moratoria (Banaszak-Holl, Berta, Bowman, Baum, & Mitchell, 2002; Grabowski & Angelelli, 2004; Grabowski, 2004). Preadmission screening of both Medicaid and potential spend-down patients has been used as well (Bishop, 1988; Meyer, 2001; Reschovsky, 1998).

In summary, there are numerous nursing home care concerns including high cost of care, access to care for Medicaid patients and those with heavy care needs, and the QOC provided including adequate nurse staffing levels. There have been numerous responses to all three of these concerns including legislation and regulation, the use of alternative facilities such as HHAs and ALFs, the encouragement of market mechanisms, and a change in Medicaid reimbursement rates and methods. As shown in the next section, California passed AB 1629 in response to some of these concerns, but the focus of this study is how AB 1629 impacted nurse staffing.

California's AB 1629 and the Long-Term Care Reimbursement Act

History

There were five major events that occurred within 6 years of AB 1629 and all were instrumental directly or indirectly in the passage of the legislation. These events either called attention to inadequate quality of resident care in California nursing homes, attempted to improve staffing and quality of care, and/or established the foundation for AB 1629 itself. The five events, listed chronologically, were a 1998 United States

Government Accountability Office (GAO) report and the passage of four California Assembly Bills: AB 1107, AB 1731, AB 1075, and AB 1762.

The first major event was a 1998 U.S. GAO report that specifically targeted the quality of resident care in California nursing homes. The report examined allegations of death due to poor quality of care via a records review, evaluated the adequacy of federal and state efforts in monitoring nursing home care, and assessed the degree to which federal and state efforts enforced compliance with requirements (Avruch et al., 1998). The report found poor quality of care overall and inadequate federal and state efforts in monitoring and enforcing compliance with nursing home regulations. For instance, the report found that residents had received unacceptable care in 34 of the 62 cases of resident deaths sampled. Although the authors were unable to examine causation because autopsies were not performed, the findings were grim nonetheless. Furthermore, certain nursing homes in the state had not been sufficiently monitored to guarantee the safety and welfare of their residents. Even more troubling was the finding that when discrepancies were discovered by surveyors, enforcement actions were inadequate to correct the problems and ensure they did not reoccur. This was especially disturbing because the GAO's analysis of federal survey and state complaint investigations discovered that approximately 1 in 3, or 407, of the 1,370 California nursing homes at the time were cited by state surveyors for having serious or potentially life-threatening care problems. The results of this audit painted an overall poor quality picture of California nursing home care and no doubt was a precursor to future legislation aimed at improving the QOC. AB 1107, signed in to law on July 22, 1999, was the first relatively recent legislation

which impacted AB 1629. It was directed at improving wages for direct-care nursing home staff as well as improving the QOC in California nursing homes through minimum staffing ratios (A.B. 1107, 1999). Direct-care staff salaries, wages, and benefits were increased through a 5% wage pass-through provision effective August 1, 1999 (A.B. 1107, 1999). The legislative intent for this provision was not included in the bill, but was probably perceived as necessary due to difficulties in attracting and retaining direct-care nurse staffing. The revision of the minimum nurse staffing to patient ratio was the other important provision of the bill. It increased the minimum number of nursing (RNs, LVNs, nurse aides and nursing assistants) HPRD in skilled nursing facilities from 3.0 hours to 3.2 hours effective January 1, 2000. Higher direct-care staffing equating to higher quality of care was the likely logic behind these requirements. Thirty-six million dollars was appropriated from California's General Fund to support both provisions (A.B. 1107, 1999). Although its impact on AB 1629 may not have been direct, AB 1107 did recognize the importance of staffing and quality of care both of which were directly addressed by AB 1629.

AB 1731 was the next important piece of California legislation. It was signed on September 14, 2000 and tackled staffing issues and QOC in nursing facilities thereby creating a solid foundation for AB 1629. In fact, the legislative intent of AB 1731 was to "ensure that nursing home facilities in California provide safe and secure environments for residents and their families and that they have the highest quality of care possible" (2000, p. 9). It attempted to accomplish this via reformed nursing home standards, stronger enforcement of those standards, and the promotion of resident and family rights.

The bill also included a requirement for a staffing study to be accomplished by May 1, 2001. Additionally, the legislature intended to increase nurse HPRD to 3.5 or another level deemed appropriate by the aforementioned staffing study in order to provide California nursing home residents with a safe environment and quality skilled nursing care (A.B. 1731, 2000). However, the biggest impact may have been the appropriation of $500,000 to conduct a study examining alternatives to the Medi-Cal flat rate methodology employed at the time. Several alternatives were to be examined which included a case-mix type reimbursement, direct care labor-based factors, and geographical or regional differences in the cost of operating facilities and providing resident care. The results were to be reported in a formal report to the legislature and included both the statutory changes necessary to implement the recommendations as well as the projected costs associated with the changes. Thus, this bill was the impetus behind and foundation of what would become AB 1629 in a few years.

AB 1075, signed on October 10, 2001, was the third bill in the legislative chain leading to AB 1629. It entailed more specifics on staffing ratios and a requirement to have a new Medi-Cal reimbursement methodology in place by August 1, 2004 (A.B. 1075, 2001). The bill required the California State Department of Health Services (DHS) to create regulations effective August 1, 2003 that established direct caregiver staff-to-patient ratios in skilled nursing facilities. Direct caregivers were defined as RNs, LVNs, certified nurse assistants (CNAs), and psychiatric technicians. Noteworthy, DHS split into the Department of Public Health (DPH) and the Department of Health Care Services (DHCS) on July 1, 2007 with the latter retaining responsibility for calculating Medi-Cal

long-term care reimbursement rates (Harrington, et al., 2008). It also required DHS to consult with consumers, advocates, providers, and collective bargaining agents to determine the sufficiency of the staffing by January 1, 2006 and every 5 years thereafter. However, the requirement to have a Medi-Cal facility-specific rate-setting methodology in place by August 1, 2004 was the much more pivotal provision of this bill. This was especially true since AB 1075 directed the examination of facility-specific cost-based rate models used in other states whereas AB 1731 did not. DHS was also required to submit annual status reports to the legislature by April 1 in the years 2002-2004.

AB 1762 was the last piece of significant legislation passed before AB 1629 and it was signed on August 9, 2003. The three key provisions of this bill were the extension of the required date to have the new Medi-Cal reimbursement methodology in place, Medi-Cal reimbursement rates were frozen for free-standing nursing and intermediate care facilities, and QAFs were introduced for ICFs serving the developmentally disabled (A.B. 1762, 2003). This bill extended the requirement to have the new Medi-Cal reimbursement methodology in place thereby making it effective August 1, 2005. During this time period, AB 1762 states that California "faces a fiscal crisis that requires that unprecedented measures be taken to reduce General Fund expenditures" (2003, p. 41). As such, the second key provision was that it froze nursing facility rates for 2003/04 and 2004/05 at the August 1, 2003 level. This was important because AB 1629 would later repeal this rate freeze and add a cost-of-living adjustment (COLA). The bill's final key provision was the introduction of a QAF for ICFs designed to support quality improvement efforts. This was a critical provision because it appears that this was the

state's first foray into QAFs (at least for the long term care provider community). This experience would prove to be crucial because AB 1629 relied heavily of QAFs.

The five important events discussed here were paramount to the passage of AB 1629 in one respect or another. The GAO report drew critical attention to the plight of nursing home residents in California and the need for government intervention. Three of the pieces of subsequent California legislation sought to improve this quality of care by addressing nursing facility staffing (AB 1107, AB 1731, and AB 1075). Correspondingly, three of them recognized that the Medi-Cal reimbursement methodology for long-term care was inadequate to provide the quality of care desired for the state's elderly population and passed legislation to improve this methodology (AB 1731, AB 1075, and AB 1762). This is not to say other vital federal or state events did not occur. However, the ones presented here were the most recent and most applicable to AB 1629 which included an Act seeking to improve the nurse staffing through a new reimbursement methodology.

Legislative Intent of AB 1629

In September 2004, the California Governor signed AB 1629 (of which Article 3.8, the Long-Term Care Reimbursement Act, was an important part) into law. This ushered in the beginning of a new Medi-Cal reimbursement methodology for long-term nursing home care that was prospective, facility-specific, and cost-based. The previous methodology was prospective, peer-grouped (median facility determined the rate for that group), and employed flat-rates. These peer-groups were based on two bed size categories, 59 beds or fewer and greater than 60 beds (California Health Data and Public

Information Committee, January 12, 2006), as well as the three geographic regions of Los Angeles County, the Bay Area, and all others (California Health Policy and Data Advisory Commission, 2004). All nursing homes in Los Angeles county were assigned the Los Angles rate while the Bay Area consisted of the Alameda, Contra Costa, Marin, San Francisco, San Mateo and Santa Clara counties until the 2002/2003 rate year. The Napa and Sonoma counties were moved from the "All Others" category and added to the Bay Area starting with the 2002/2003 rate year according to Sandra Kristensen of the California Association of Health Facilities (personal communications, June 21, 2010). This flat-rate methodology effectively controlled Medi-Cal costs, but its primary criticism was that it did not provide nursing homes the resources necessary to improve the quality of care (California Health Policy and Data Advisory Commission, 2004). However, the new legislation, built on the aforementioned events, reflected California's continued efforts to address staffing and the quality of care among other aims. California was in the bottom 10% of Medicaid (Medi-Cal) nursing home reimbursement rates prior to the implementation of the AB 1629, but the new legislation was expected to bring the state near the top 25% in national rankings (California Health Policy and Data Advisory Committee, 2005).

The purpose of the Long-Term Care Reimbursement Act was to implement a facility-specific rate setting system that "reflects the costs and staffing levels associated with quality of care for residents in nursing facilities" (California Department of Health Care Services, 2004). More specifically, the legislative intent was meant to effectively ensure individual access to appropriate long-term care services, promote quality care,

advance wages and benefits for nursing home workers, support provider compliance with all applicable state and federal requirements, and encourage administrative efficiency (A.B. 1629, 2004). In addition, the legislation lifted a 2-year rate freeze and provided a COLA (5.68% average) retroactive to August 1, 2004 (California Department of Health Services, 2004; California Health Policy and Data Advisory Committee, 2005). In sum, the new legislation replaced a reimbursement methodology aimed solely at controlling costs with one intended to improve staffing and the quality of care among other aims.

The Act was primarily directed toward those facilities providing skilled nursing care in the traditional setting (i.e., nursing homes), but it also affected many other types of facilities. AB 1629's primary target was free-standing skilled nursing facilities although freestanding skilled adult subacute nursing facilities were also required to pay the quality assurance fees (QAF). Free-standing nursing facilities (the facilities of interest for this study) are licensed and certified skilled nursing facilities, not part of an acute care hospital, that meet the standards of participation in Medi-Cal (California Department of Health Services, 2005a). Interestingly, some of facilities may meet the Medi-Cal participation standards, but not provide care to Medi-Cal eligibles because they serve private-pay patients.

There were also facility types that were exempt from paying the QAF, but benefited from a subsequent higher reimbursement rate due to the new reimbursement methodology. These included CCRCs, MLRCs, and publicly owned and operated nursing facilities (California Department of Health Services, 2005a). Distinct-part nursing facilities (hospital-based) were also excluded from paying the QAF, but did not

benefit from a higher reimbursement rate because they had a separate reimbursement methodology. Hence, the primary targets were the free-standing skilled nursing facilities that provide traditional nursing home services, but subacute facilities and those which are part of an MLRC or CCRC benefited as well through higher reimbursement.

Legislators set two important conditions to be met before the Long-Term Care Reimbursement Act could be implemented and they also established an initial sunset date for the Act as July 31, 2008 (A.B. 1629, 2004). The first condition was that CMS had to approve both the QAF and the State Plan Amendment (SPA) for the new reimbursement methodology. CMS approval was necessary as it increased the federal participation percentage paying for California's Medi-Cal long-term care via the QAF. CMS approved the QAF in June 2005 and the SPA in September 2005. The QAF fees and new rate methodology were retroactively implemented to August 1, 2005 (California Department of Health Care Services, 2008a). Interestingly, the Medi-Cal share percentages were 50% California and 50% federal before the legislation, but Nancy Reagan of the California Association of Health Facilities (personal communication, September 25, 2009) estimated that the QAF has decreased California's share to 42% and increased federal financial participation to 58% of total costs for skilled nursing facility services. The second condition was that California needed to make appropriations from both the General Fund and the Federal Trust Fund. These two appropriations were necessary to fund the reimbursement rate increases for SNFs as well as the actual implementation of the bill. Both appropriations were included as part of AB 1629 when the Act was passed

(A.B. 1629, 2004). Therefore, the two important requirements were met making implementation of the Act possible.

The QAF, also known as provider tax, was the linchpin of the new reimbursement methodology, but it was not unique to California. Grabowski, Feng et al. (2008) outlined the relatively short history of provider taxes and found that 31 states had implemented them by 2004. They further stated that the original mechanism enabling the QAF was a 1991 legislative change that amended the federal Medicaid statute and permitted states to levy taxes on the gross patient revenues of health care providers as long as certain rules were followed. Federal funds were then matched with these provider taxes thereby providing the ability to increase Medicaid reimbursement rates (Grabowski, Feng et al., 2008). Thus, California's introduction of the QAF followed a long line of states which had already done so in an attempt to increase the federal participation rate. This ultimately enabled higher Medicaid reimbursement rates for long-term nursing home care.

The QAF became a condition of licensure meaning that all licensed facilities in California, except the before mentioned exempt facilities, had to pay the fee regardless of whether or not they treated Medicaid patients (California Health Policy and Data Advisory Committee, 2005). The QAF was expected to generate $120 million 2004/05 and about $760 million between 2005/06 through 2007/08 (California Department of Health Services, 2005a). It was hoped that this additional amount would provide the needed funding to help increase Medi-Cal reimbursement rates enough to support increased staffing and other quality improvement efforts in California's nursing homes.

California's DHS calculated the QAF using aggregated net revenue and projected patient days from all of the applicable facilities (California Department of Health Services, 2005a). Net revenue was defined as the total gross resident revenue for routine and ancillary services provided to all skilled nursing facility residents minus Medicare revenue and payer discounts and applicable contractual allowances (A.B. 1629, 2004). Once eligible revenue was determined, the aggregate projected net revenue for all facilities was multiplied by the appropriate percentage, 3% percent for 2004/05 and 6% thereafter, then divided by the projected total resident days of all providers subject to the fee (A.B. 203, 2007). As a hypothetical example, the QAF would have initially been $3 per resident day if the projected net revenue for all applicable facilities as $1 billion dollars multiplied by 3% and then divided by projected total resident days of 10 million (1,000,000,000 * .03 / 10,000,000 = $3 per resident day). Two different QAF rates were also established for facilities with fewer than 100,000 resident days and those with greater than 100,000 resident days. Of note, the QAF is a per-resident day fee and they are listed by each rate year in Table 1.

The QAF has been called a provider tax by some (Grabowski, Feng et al., 2008) and California's QAF may also appropriately be termed a provider tax. This is because the Medicare revenue is excluded from the QAF calculation and the QAF is returned to facilities for all Medi-Cal resident days via a pass-through discussed next in the section. Thus, it is essentially a tax on private-pay patients.

Table 1

Quality Assurance Fee (QAF) Per Resident Day (PRD)

Rate Year	QAF ≤ 100,000 Days	QAF > 100,000 Days
2004-2005	3% of net revenue, $3.66 PRD	3% of net revenue, $3.17 PRD
2005-2006	6% of net revenue, $7.31 PRD	6% of net revenue, $6.33 PRD
2006-2007	6% of net revenue, $7.79 PRD	6% of net revenue, $6.81 PRD
2007-2008	6% of net revenue, $8.27 PRD	6% of net revenue, $7.55 PRD
2008-2009	6% of net revenue, $9.05 PRD	6% of net revenue, $8.05 PRD

Source: California Department of Health Care Services (2007); California Department of Health Care Services (2008b); California Department of Health Services (2005a); California Department of Health Services (2006b).

Reimbursement Methodology

California's new reimbursement methodology is a unique prospective, facility-specific, and cost-based approach to Medi-Cal reimbursement for nursing homes. However, it is not case-mix adjusted meaning that patient acuity is not taken into account (California Health Policy and Data Advisory Committee, 2005). This makes this reimbursement method different from the majority of states because 35 states had employed some version of a case-mix reimbursement methodology by 2004 (Feng, Grabowski, Intrator, Zinn, & Mor, 2008). Further, only two other states employed a cost-based reimbursement system (Harrington, et al., 2008). Three key aspects of the new methodology were the structure of the reimbursement rate across the five cost categories, reimbursement caps based on both peer groups and maximum annual weighted averages, and the time lag of the cost reports used to calculate the reimbursement rates. A more

detailed description of the cost categories, and Table 2 which summarizes the cost categories, concludes this section.

Reimbursement Description

California's new Medi-Cal reimbursement method was a prospective, facility-specific, and cost-based approach. It was a prospective approach because facility rates were determined for each year; therefore, each facility generally knew beforehand the Medi-Cal reimbursement rate. It was facility-specific because each facility potentially had a different reimbursement rate whereas the previous methodology was a simple flat rate methodology based on one of three geographical areas and two bed size categories. The exception was the time between the new rate year (August 1) and the publication of the new rates which always occurred after this date. It was cost-based because it was based on past facility costs with added inflation adjustments. This Medicaid type of reimbursement method is relatively rare because, after the passage of AB 1629, California was only one of three states that used it.

The reimbursement rate itself was based upon five cost categories. The five cost categories were: (a) labor costs; (b) indirect care, nonlabor costs; (c) administrative costs; (d) capital costs; and (e) direct pass-through costs. A facility's applicable costs for each of the first three categories were divided by the total number of skilled nursing days to create that portion of the per diem (Department of Health Care Services, 2009). The capital costs and direct pass-through components were more complex and are not covered here. The Medi-Cal facility-specific, cost-based per diem reimbursement rate equaled the sum of these five categories. There were also two important considerations when

Table 2

Facility-Specific Reimbursement Methodology Cost Category Summary

Cost Categories of Reimbursement Rates	Percentile Ceiling Based on Peer-Group	Category Caps	Category Components	Inflation Adjustment
Labor costs	90%	Labor-driven operating allocation (LDOA) could not exceed 5% of reimbursement rate.	Entailed facility employed full-time and part-time direct care staff, contracted and temporary direct care staff, indirect care staff employed and contracted including housekeeping and plant operations and maintenance, and the labor-driven operating allocation.	Adjusted using labor inflation index.
Indirect-care, nonlabor costs	75%	N/A	In essence the supplies needed for direct care, and indirect care services such as housekeeping, laundry and linen, and plant and operations.	Adjusted using California consumer price index for all-urban consumers.
Administrative	50%	N/A	Administrative and general expenses needed to operate facility, allowable home office costs, and property insurance.	Adjusted using California consumer price index for all-urban consumers.
Capital	N/A	2005/2006 could not exceed Dept. Health Services' 2004/2005 estimate and subsequent	Accounted for capital-related assets such as mortgage principal and interest, leases, leasehold improvements, depreciation of real property, equipment,	N/A

Table 2 - continued

Cost Categories of Reimbursement Rate	Percentile Ceiling Based on Peer-Group	Category Caps	Category Components	Inflation Adjustment
		years could not exceed 8% of the previous year's Fair Rental Value System (FRVS).	and other capital-related expenses, but uses a FRVS methodology.	
Direct pass-through	N/A	N/A	Encompassed property taxes, facility license fees, caregiver training costs, liability insurance costs, the Medi-Cal portion of QAF, and any new state and federal mandates for the applicable rate year.	Adjusted using the California Consumer Price Index for All-Urban Consumers for caregiver training costs and liability insurance. The property tax pass-through was updated 2% annually.

Note. The sum of these five categories made up the facility-specific Medi-Cal reimbursement rate. There was also a maximum weighted average increase per year in the aggregate which was 8% for 2005/2006, 5% for 2006/2007, 5.5% for both 2007/2008 and 2008/2009.

calculating the rates. First, the methodology did not allow costs within a specific category to be shifted to another (California Department of Health Services, 2005b). Second, costs associated with residential care in CCRCs and MLRCs were excluded from the rate calculations (Department of Health Care Services, 2009). Table 2 derived from the October 2005 California Medi-Cal Provider Bulletin, summarizes the facility-specific reimbursement methodology's cost categories.

Reimbursement Cost Control

Two cost control restrictions were put into place to protect California from inflationary trends and unbridled cost increases due to the new reimbursement methodology (California Health Policy and Data Advisory Committee, 2005). The first important restriction on cost growth was a ceiling on three of the five cost-based categories based on a facility's membership in one of seven peer-groups. These peer groups were created via a cluster analysis using 2003 COSHPD cost data and were based on direct care cost per diem cost per county and whether or not the county in which the facility was located was rural or urban. It was determined that four rural peer groups and three urban peer groups were necessary based on size and distinctly different median direct care costs between clusters (Navigant Consulting, 2005). Of note, a facility's peer group is the same for each of the five cost categories. A facility's maximum reimbursement rate was based on its peer group membership and the percentile limits for the applicable cost categories in that peer group. As an example, Crestwood Geriatric Treatment Center (Fremont) is in peer-group seven. In rate year 2008-2009, the facility had a direct care labor cost calculated at $133.77 (California Department of Health Care

Services, 2009b). However, the 90th percentile for direct labor cost in peer group seven was a mere $122.98 (California Department of Health Care Services, 2009a). Therefore, this facility received the lower rate of $122.98 for direct-care labor because its costs exceeded the 90th percentile in its peer group (California Department of Health Services, 2005b).

The second cost control restriction was achieved through a couple of category caps (Table 2, column 3) and an overall reimbursement cap (Table 2, last line). The labor driven operating allocation (LDOA) was capped at a 5% maximum of the facility reimbursement rate, while the Fair Rental Value System (FRVS) was capped at a maximum of 8% over the previous year's amount for each facility. There was also an overall reimbursement cap that pertained to all facilities and limited the maximum annual weighted average Medi-Cal reimbursement rate increase. This cap was based on the weighted average of the reimbursement rate from the previous year, after adjusting for the change in costs due to the QAF and the total projected costs of complying with new state and federal mandates (California Department of Health Services, 2005b). The maximum weighted average increase for the study period was 8% for 2005/06, 5% for 2006/07, and 5.5% for both 2007/08 and 2008/09 (A.B. 203, 2007; California Department of Health Services, 2005b). For example, the projected weighted average rate across all nursing homes for the 2008-2009 rate year was $163.46, which exceeded the 2007/08 weighted average rate after considering mandate adjustments and multiplying by 5.5% ($153.37 * 1.055 = $161.81). Hence, each facility's AB1629 rate

was capped at 98.9903% ($161.81 / $163.46) for the 2008-2009 rate year (Department of Health Care Services, 2009).

Time Lag Used to Calculate Medi-Cal Rates

The time lag of the cost reports used to create each year's current reimbursement rate was an important aspect of the new methodology. In general, there was about an 18-24 month time lag between the cost report and the beginning of the new rate year that occurred on August 1st of each year (California Department of Health Services, 2005a). For instance, the retrospective rates established for 2005/06 were based on California Office of State-Wide Health Planning and Development (COSHPD) disclosure reports that had facility fiscal period end dates in 2003 while the 2006/07 rates were based on COSHPD disclosure reports ending in 2004, etc. (California Department of Health Services, 2006a). Inflation adjustments were used to compensate for this lag in cost report data (California Department of Health Services, 2005b).

Detailed Cost Category Descriptions

Each of the five cost categories varied in their calculations. Percentile ceilings based on peer group membership and different inflation adjustments may have been included depending on the cost category. Moreover, the calculations based on each category were based on the applicable facility cost for the category divided by the number of SNF days except for the capital cost category and the direct pass-throughs such as the LDOA and QAF. Unless indicated otherwise, the following detailed information for each cost category came from the October, 2005 Medi-Cal Provider Bulletin (California Department of Health Services, 2005b).

The labor cost category consisted of both direct and indirect labor resident care costs as well as the LDOA component. The direct resident care labor costs pertained to facility employed full-time and part-time employees and included their salaries, wages, and benefits. Furthermore, expenditures for contract, registry or temporary agency staffing for individuals provided direct resident care were also included in this category. The indirect care labor costs included services related to the delivery of care, but without direct resident contact. This category included labor for services such as dietary, housekeeping, laundry and linen, in-service education for staff, and plant operations and maintenance costs. A facility's direct and indirect care labor costs were also updated from the midpoint of each individual facility's cost reporting period to the midpoint of each rate year based on a labor inflation index which used the most recent industry-specific historical wage data. Further, this category employed a 90^{th} percentile ceiling in each of the seven peer groups.

The LDOA is an intriguing part of the labor cost category and it was a mechanism to reward nursing homes for directly employing staff. The LDOA included an amount equal to 8% of direct and indirect resident care labor costs after subtracting expenditures for agency staffing such as contract staffing and temporary agency costs. However, the total LDOA was capped at 5% of the facility's total Medi-Cal reimbursement rate as previously described. The LDOA in essence led to a higher reimbursement rate, which was an indirect method to increase the quality of care through additional staffing. The LDOA has been called a profit component by some (Harrington, et al., 2008), although this terminology was not used in the legislation or subsequent revisions (J. McCraw,

personal communications, September 25, 2009). However, a key point to remember is that the cost data was lagged 18-24 months meaning that it would take awhile for facilities to realize higher Medi-Cal reimbursement rates by hiring additional staff. The indirect care, nonlabor cost category was the second component of the reimbursement rate. This category was designed to capture the nonlabor costs associated with such things as nursing, housekeeping, laundry and linen, in-service education for staff, plant operations, and maintenance costs. This category was updated at the midpoint of the rate year using the California Consumer Price Index for All-Urban Consumers created by the State Department of Finance (California Department of Health Services, 2005b). The ceiling for this category was at the 75th percentile for each facility's peer-group. This percentile threshold was set less than labor, but higher than the administrative costs, to allow them to spend what was necessary on these types of costs without exceeding reasonable parameters (Mr. Nixon, personal communications, February 9, 2010).

The administrative costs category was the third element of the reimbursement rate. This category consisted of administrative and general expenses associated with operating the facility including expenditures related to allowable home office costs and property insurance costs. This category was limited to a 50th percentile ceiling in the facility's peer-group and it was adjusted for inflation in the same manner as the indirect care, non-labor cost category.

The capital costs category was the next piece of the reimbursement rate. This category accounted for the value of the capital related assets needed to care for Medi-Cal

residents including mortgage principal and interest, leases, leasehold improvements, depreciation of real property, equipment, and other capital related expenses. However, a FRVS methodology was used to account for these costs instead of reimbursing the costs of these assets directly. The FRVS was based on a complex formula to assess the facility value based on age, condition, and a market interest factor (California Department of Health Services, 2005b). There were also limits on this category as the 2005-2006 rate year could not exceed DHS' estimated value for this category for the 2004-2005 rate year because it had to be budget neutral at inception (Mr. Nixon, personal communication, February 9, 2010). For 2006-2007 and subsequent rate years, the maximum annual increase for the capital cost category, for all facilities in the aggregate, could not exceed 8% of the prior rate year's FRVS cost component.

Direct pass-through costs were the fifth and final category for the new reimbursement rate. This cost category consisted of property taxes, facility license fees, caregiver training costs, and liability insurance costs. The Medi-Cal portion of QAF and any new state and federal mandates for the applicable rate year were included as well. This category also had a couple of inflation adjustments. First, the California Consumer Price Index for All-Urban Consumers was applied to update caregiver training costs and liability insurance. Second, the property tax pass-through was increased 2% annually. Both were updated from the mid-point of the cost report period to the mid-point of the rate year. Conversely, facility license fees and the Medi-Cal portion of the QAF were applied on a prospective basis for each rate year meaning that they did need an inflation adjustment.

In summary, there were numerous parts to the new reimbursement methodology. Some were subject to ceilings and caps while others were adjusted for inflation. This was indeed a much more complicated reimbursement methodology than the prior flat-rate methodology. However, the new methodology was also designed in such a way that a facility could potentially be reimbursed for the full costs for their Medi-Cal patients as long the cost stayed below the particular percentile ceilings for each cost category established for its peer-group. Additionally, the LDOA provided incentive to hire additional permanent staff because a facility could be reimbursed eight percent over their labor costs up to a cap of 5% of the total Medi-Cal reimbursement rate. Another key point was that the QAF was returned to each facility for each Medi-Cal patient through the direct pass-through category. This meant that a facility with a higher Medi-Cal census would have a lower QAF burden. Another way to think about it is that CMS patients were excluded from the QAF since Medicare patient revenue was excluded from its calculation and the QAF was returned to the facility for Medi-Cal patients. This in essence made the QAF a tax on non-CMS patients.

Subsequent Events

There were many important events that occurred after the passage of AB 1629 that are related to this research. These events presented chronologically include: (a) CMS' approval of the new Medi-Cal reimbursement methodology, (b) retroactive payments for cost-of-living adjustments as well as retroactive QAFs, (c) the establishment of the new facility-specific rates with the accompanying retroactive

payment, and (d) two extensions to the sunset date of the Act. These are all summarized in Figure 2, along with the aforementioned legislation leading up to AB 1629.

The first two events occurred when CMS approved California's QAF in June 2005 and the California SPA for the new Medi-Cal reimbursement methodology, on September 9th, 2005 (California Department of Health Care Services, 2008a). These were key steps, as previously mentioned, because the new methodology could not be implemented without them. Additionally, the legislation stated that the new methodology became effective on August 1, 2005 even though the CMS approval date occurred afterwards. The Act was to be implemented the first day of the month following CMS approval; thus, it was implemented October 1, 2005 (A.B. 1629, 2004).

Once CMS approval was granted and AB 1629 implemented, the retroactive payments for COLA ensued as well as the retroactive collection of the QAF. The retroactive COLA payments were meant to overcome the 2-year rate freeze effective August 1, 2003 (A.B. 1629, 2004). This payment process began in October 2005, was completed for the most part by December 2005, and paid the facilities on average a 5.68% COLA retroactive to August 1, 2004 (California Health Policy and Data Advisory Committee, December 12, 2005). Facilities were also awaiting DHS payment for 2004/05 Medi-Cal QAFs around the same time frame. Facilities were then charged their non-Medi-Cal QAFs for 2004/05 after receipt of this payment (California Health Policy and Data Advisory Committee, December 12, 2005). Facilities were paid the QAF pass-through first and then charged their appropriate QAFs because CMS would not allow an offset (D. Nixon, personal communication, November 17, 2009). Mr. Nixon

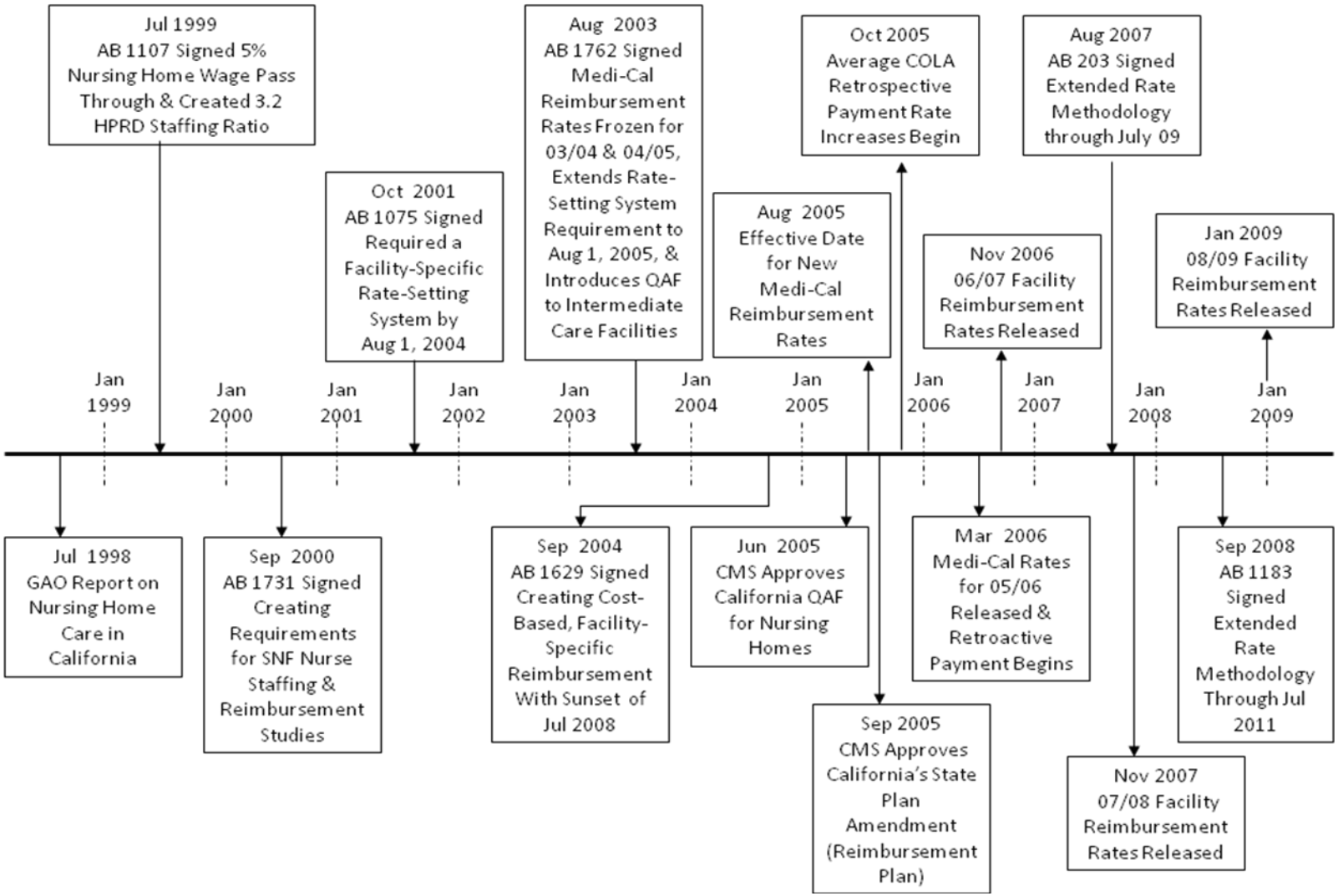

Figure 2. AB 1629 timeline of events.

also indicated that the timeframe for QAF reimbursement and payment was between November 2005 to February 2006.

The creation of the new facility specific rates and the retrospective payment back to August 1, 2005 were the next significant events. The new rates for 2005-2006 were finalized March 7, 2006 (J. McCraw, personal communication, September 25, 2009) and retrospective payment began shortly thereafter. Also, these payments should have been recorded in each facility's current fiscal period, rather than restating prior periods, according to Generally Accepted Accounting Principles for changes in estimates handled retrospectively (T. Christensen, personal communication, October 14, 2009). This is important because the true effect of AB 1629 should be reflected in 2006 and later cost reports. The 2006-2007 rates were released in November 2006 (California Department of Health Services, 2006c), 2007-2008 rates in November 2007 (California Department of Health Services, 2006d), and 2008-2009 rates in January 2009 (California Department of Health Care Services, 2009c).

AB 1629's original sunset date was July 31st, 2008, but it was subsequently extended twice through legislation. First, the governor approved AB 203 on August 27, 2007 which extended the methodology until July 31, 2009 (A.B. 203, 2007). Afterwards, the governor approved AB 1183 on September 30th, 2008 which prolonged the methodology until July 31, 2011 (A.B. 1183, 2007).

Empirical Evidence Concerning Reimbursement and Staffing

Researchers have investigated the relationship of both the reimbursement method and rate when examining nurse staffing in nursing homes. A literature review on both

reimbursement method and rate is appropriate because AB 1629 changed the Medi-Cal reimbursement method and increased the rates. These studies have entailed examination of Medicare and/or Medicaid methods and/or reimbursement levels using national (Bourbonniere et al., 2006; Cawley et al., 2006; Cohen & Spector, 1996; Dummit, 2002; Feng et al., 2008; Grabowski, 2001a; Grabowski, 2001b; Grabowski, 2002; Grabowski, 2004; Harrington et al., 2007; Intrator et al., 2005; Konetzka et al., 2004; Mueller et al., 2006; White, 2005; Zinn, Feng, Mor, Intrator, & Grabowski, 2008); multi-state (Swan & Pickard, 2003); and single-state data (Harrington, et al., 2008; Harrington & Swan, 2003; Kash, Castle, Naufal, & Hawes, 2006; Kash, Castle, & Phillips, 2007; Schnelle, Mukamel, Sato, & Chang, 2007; Zinn, 1993). Organizational and market/environmental factors have also been included as either independent or control variables depending on the theoretical or conceptual framework used for that particular study. This study seeks to examine if the change in California's Medi-Cal reimbursement method, along with its more generous reimbursement rate, is positively associated with changes in nursing home nurse staffing, particularly for nursing homes highly dependent on Medi-Cal revenue. Thus, both streams of literature are reviewed and summarized.

Reimbursement Methods and Staffing

Reimbursement method has been linked with nurse staffing in nursing homes. There are basically three different types of reimbursement methodologies: (a) prospective; (b) retrospective; and (c) a combination system (Grabowski, Feng et al., 2004). Grabowski and colleagues (2004) defined prospective methods as those that set rates in advance regardless of actual facility costs during the rate year. These rates were

generally based on previous year's facility and/or resident-level information. They further stated that there were four prospective method subclasses: (a) facility-specific based on historical costs and other factors; (b) class method also known as flat-rate; (c) resident-specific based on resident characteristics also known as case-mix reimbursement; and (d) both facility and resident specific. Retrospective reimbursement methods pay nursing homes a facility-specific interim rate based on a base year's cost along with an inflation adjustment. If the actual costs (usually up to a ceiling) were different from the interim rate, the state either paid the facility or the facility paid the state the difference (Institute of Medicine, 2001). Medicare retrospective payment was pre-1997 BBA and the employment of this type of methodology for Medicaid reimbursement is uncommon.

Combination methods are a hybrid of both prospective and retrospective reimbursement methods. This methodology sets the rate in advance for some cost components and afterward for others based on actual costs (Grabowski, Feng et al., 2004). Thus, combination systems allow some portion of the rate to reflect actual facility costs (Swan et al., 2000).

Most researchers examining nursing home reimbursement methodologies have studied prospective payment over the past decade. These studies have examined either a change in reimbursement methodology explicitly (Grabowski, 2002; Harrington, et al., 2008; Schnelle et al., 2007; Swan & Pickard, 2003; White, 2005; Zinn et al., 2008) or compared different reimbursement methodologies across states (Feng et al., 2008; Grabowski, 2001a; Grabowski, 2001b; Grabowski, 2004; Harrington & Swan, 2003).

Medicare has used PPS to reimburse nursing home post-acute care since 1997. The payment bundles nursing, therapy, and capital payments into a single per diem amount (Institute of Medicine, 2001). Furthermore, the per diem payment is based on a combination of national and facility-specific payment amounts with a case-mix adjustment based on resource utilization groups (RUGs).

Most studies have found support that prospective payment was related to nursing home staffing. Many of these studies have examined the relationship between Medicare adoption of PPS and staffing. White (2005), in a national study using 1997 and 2000 data, found a large decline in RN, licensed practical nurse (LPN), CNA, and total nurse time per resident day in nursing homes following Medicare PPS, particularly among those with for-profit ownership. Likewise, Konetzka et al. (2004) found that RN and professional nurse staff (RNs + LPNs) HPRD in nursing homes decreased following PPS using national 1996-2000 data. Zinn et al. (2008) studied nursing home administrative nurse staffing using a 1997 - 2004 national panel study of nursing homes. They found higher administrative nurse staffing after the introduction of Medicare PPS.

The strength of these studies is that they were able to show that facilities may have adapted their nursing staffing structure in response to a reimbursement change. Further, the studies used national, longitudinal data. However, the weakness in national nursing home staffing studies is that they depend on CMS' Online Survey Certification and Reporting (OSCAR) data. The reliability and validity of OSCAR staffing data has been questioned since each facility is required to report the number of staffing hours, by category, worked in the 14 days before their periodic survey (Feng, Katz, Intrator,

Karuza, & Mor, 2005). These periodic inspections are relatively predictable and facilities may increase staffing just before them to make staffing numbers appear more favorable (Kash, Hawes, & Phillips, 2007).

The majority of states also use Medicaid prospective payment to pay for Medicaid residents' nursing home care (Institute of Medicine, 2001). A purely prospective payment methodology is expected to be associated with lower staffing in nursing homes because there is an incentive to minimize costs (Institute of Medicine, 2001; Konetzka et al., 2004). Adding a case-mix adjustment to a prospective methodology may increase total nurse staffing because higher rates are tied to or adjusted for residents that require more complex care and therefore more staffing (Harrington et al., 2007). However, others argue that case-mix reimbursement should not change staffing since it is "budget neutral" in that it is not specifically designed to increase or decrease staffing. Rather, it is designed to reimburse facilities for higher patient complexity and the accompanying higher costs of care (Feng et al., 2008).

Empirical studies of Medicaid prospective payment based on facility-specific costs and its relationship with nursing home staffing are rare. This is in large part because only two other states had employed a Medicaid prospective payment method based on facility-specific costs before California passed AB 1629 in 2004 (Harrington et al., 2008). However, three nonpeer reviewed reports have been published pertaining to AB 1629 and its relationship with nursing home staffing.

Harrington et al. (2008) examined the impact of AB 1629 on nursing facilities, subacute facilities, and multi-level retirement communities (MLRCs). The researchers

specifically examined the effect of the legislation on revenues, access to care, quality (complaints, inspection deficiencies, staffing levels, and turnover rates), and facility wages and benefits. The study found that total direct care nurse staffing HPRD increased by 3% and RN HPRD increased by 1.5% between 2004 and 2006. However, the study was limited in that it only had 2001-2006 data, it used a series of paired t-tests to test mean differences between 2001 and 2006 and 2004 and 2006, and it employed a repeated measures analysis to test differences across five groups (ownership type, chain membership, facility size, percent Medi-Cal revenues, and geographical areas) and 12 variables using 2004 and 2006 data. Three of the 12 variables were the number of RN HPRD, the total nurse HPRD, and the nursing assistant HPRD (Harrington et al., 2008). Schnelle et al. (2007) also evaluated AB 1629 and sought to determine if revenues and expenditures increased; if there were quality improvements in terms of inspection deficiencies, CMS NHC measures (high and low risk pressure ulcers, physical restraints, and decline in functional status), and staffing levels; and if wages increased for nursing staff. They found that revenues and expenditures had indeed increased, inspection deficiencies had increased, there were inconsistent QM findings, licensed nurse staffing increased, CNA staffing decreased, turnover increased, and there was not a correlation between expenditures and QOC. However, this study also only had data 2001-2006 and it did not specifically account for organizational and market variables in the regression analysis.

A progress report required on AB 1629, as part of the legislation itself, was also presented to the California legislature in January 2009 (California Department of Public

Health, 2009). The report found gradual increases of the number of SNFs meeting the state's minimum staffing standard and increased staffing retention rates for RNs, LVNs, and CNAs. The number of severe deficiencies increased in calendar years (CYs) 2004-2006 and dropped in CY 2007 while the number of state citations dropped in 2004 and 2005 only to rise in 2006 and 2007. The shortcoming of this report is that it relied on simple descriptive statistics for the comparisons (California Department of Public Health, 2009).

The strengths of these three reports were that they explicitly investigated California nursing home staffing both before and after AB 1629. This permitted an examination of nurse staffing anchored on the reimbursement method change. The studies also used state Medi-Cal cost report data for their staffing measures instead of the less reliable OSCAR data. However, the first two studies only had data through 2006 which may not have been enough time to see staffing changes. Moreover, the statistical analyses did not use a multivariable statistical approach that accounted for organizational characteristics and environmental factors that may have affected nurse staffing changes.

Medicaid prospective payment with a case-mix adjustment has also been commonly examined. Feng et al. (2008) used national panel data to explicitly examine the adoption of a Medicaid prospective payment methodology with a case-mix adjustment. They found that nursing homes in states that adopted a Medicaid prospective payment method with a case-mix adjustment had less RN and LPN HPRD when compared to states that had Medicaid prospective payment without a case-mix adjustment. Grabowski (2004), also used national panel data to compare reimbursement

methods and found that nursing homes in states with a Medicaid prospective payment case-mix adjustment had a lower LPN HPRD, but higher CNA HPRD than those in states that employed Medicaid prospective payment without a case mix adjustment. Swan and Pickard (2003) explicitly studied Medicaid prospective payment adoption with a case-mix adjustment in three states. They found the average number of nursing HPRD increased in Minnesota nursing homes following the adoption of a case-mix methodology after a move from a facility-specific prospective payment system without a case-mix adjustment. Unfortunately, this study was not able to examine staffing changes in the other two states of Texas and South Carolina due to data limitations. A case-mix adjustment was considered for California's new Medi-Cal reimbursement methodology, but it was not ultimately chosen (California Assembly Bill 1731, 2000).

The strength of the first two studies lies in a national examination of the relationship between Medicaid reimbursement methods and nurse staffing. However, the reliance on national OSCAR staffing data remains a weakness. A strength of the Swan and Pickard (2003) study was that it used state cost reports which were more reliable than the OSCAR data (Feng et al., 2005). However, this study was descriptive in nature, it examined different time periods for each state, and the same data elements were not available in each state.

The use of flat rates is another variant of Medicaid prospective payment and it has been examined in a few studies. Cohen and Spector (1996) found in a national, cross-sectional study of nursing homes that a flat-rate reimbursement methodology was associated with lower RNs and LPNs per 100 residents when compared to a cost-based

(retrospective) methodology. Another national nursing home study using cross-sectional data found a flat-rate methodology was associated with about two fewer RNs per nursing home when compared to prospective facility-specific methodology (Grabowski, 2001b). Before AB 1629, California was only one of three states that employed a flat-rate reimbursement method for Medi-Cal (Kitchener et al., 2004) and it was blamed for inadequate staffing and QOC problems in the state's nursing homes (California Health Policy and Data Advisory Commission, 2004; Harrington, et al., 2008). Recent nursing home studies of Medicaid prospective payment using flat rates are rare.

The second type of reimbursement methodology is a retrospective approach. Contemporary studies of this Medicaid reimbursement method are uncommon because by 1996 only Nebraska employed a purely retrospective-based methodology (Grabowski, 2001a). However, a cross-sectional examination of U.S. nursing homes found that states with a Medicaid retrospective reimbursement methodology had a higher number of RNs when compared to states with a prospective methodology (Grabowski, 2001a).

The final type of reimbursement methodology is a combination of the prospective and retrospective methods. A national, cross-sectional study investigated the relationship between nurse staffing and different Medicaid reimbursement methods including a combination reimbursement methodology (Grabowski, 2001b). The study found that nursing homes in states with a Medicaid combination reimbursement method had less RNs when compared to nursing homes in states that used a prospective reimbursement method.

In summary, these reimbursement studies have shown a relationship between reimbursement method and nursing home staffing. National studies have either explicitly examined a reimbursement method change, the BBA in particular, or compared reimbursement methods across states. However, these studies suffer from a dependence on OSCAR data that is thought to be less reliable than state cost reports. There have been reimbursement method studies using state cost reports, but these have simply been descriptive in nature or have not accounted for organizational characteristics and environmental factors in a multivariable analysis.

Reimbursement Rates and Staffing

Most studies of the relationship between reimbursement rates and nursing home nurse staffing have entailed Medicaid rate levels (Cohen & Spector, 1996; Feng et al., 2008; Grabowski, 2001a; Grabowski, 2001b; Grabowski, 2004; Harrington et al., 2007). However, others have also investigated the relationship between nurse staffing and Medicare rates (Dummit, 2002; Harrington et al., 2007) as well as private-pay rates (Grabowski, 2004). The national studies did not explicitly investigate rate changes, but rather compared rates across states. Conversely, the single-state studies compared rates across facilities within each state.

National studies of reimbursement rates have used average state reimbursement rates collected as part of a number of published state data books (Harrington, Swan, Wellin, Clemena, & Carrillo, 1999) or through primary research (Grabowski, Feng et al., 2004). These sources were used for national studies because state cost reports vary in the type of data available (Swan & Pickard, 2003) and their definitions of data elements

(Feng et al., 2005). There were also endogeneity concerns between rates and nursing home staffing (Cohen & Spector, 1996; Grabowski, 2004; Grabowski, 2004; Harrington et al., 2007). National studies of reimbursement rates have also customarily controlled for reimbursement methodology through the use of dummy variables.

National panel data studies generally show a positive relationship between Medicaid reimbursement rates and nursing home nurse staffing. One such study of nursing homes found that states with higher Medicaid rates were positively associated with LPN HPRD, but negatively associated with CNA HPRD (Grabowski, 2004). Similarly, Feng et al. (2008) in a panel study of nursing homes discovered found that higher state Medicaid rates were positively associated with LPN, CNA, and total nurse HPRD, but negatively associated with RN HPRD.

National, cross-sectional studies of nursing homes have also by and large shown a positive relationship between Medicaid reimbursement and staffing. For example, a positive relationship was found between RNs per resident and Medicaid reimbursement rates (Grabowski, 2001a) as well as RN HPRD and total nurse HPRD (Harrington et al., 2004). Additionally, Cohen and Spector (1996) found that a higher Medicaid rate was positively associated with a higher number of LPNs per 100 residents (Cohen & Spector, 1996). Moreover, Mueller et al. (2006) discovered a positive association between Medicaid rate and total nurse staff, licensed nurse staff, and CNA HPRD (Mueller et al., 2006). Also of interest, a pooled independent cross-sectional study by Intrator et al. (2005) found that higher state Medicaid rates were associated with a greater likelihood

that a nursing home would hire a physician assistant or nurse practitioner (Intrator et al., 2005).

The relationship between Medicare rates on nursing home nurse staffing has also been examined. Harrington et al. (2007) in a national, cross-sectional study found a positive relationship between average state Medicare SNF reimbursement rates and RN HPRD, but a negative relationship with total nurse HPRD (Harrington et al., 2007). Additionally, a 2002 GAO report found that the passage of the Benefits Improvement and Protection Act of 2000 did not improve SNF nurse staffing despite an increase in the nursing component of Medicare's PPS payment (Dummit, 2002).

Overall, the national panel and cross-sectional studies show a positive relationship between average state Medicare rates and nursing home nurse staffing. However, these studies did not explicitly examine Medicaid rate changes as a result of a policy change. Rather, they compared state Medicaid rates, over time for panel studies and at a single point in time for cross-sectional studies, to ascertain their relationship with nurse staffing.

There have also been a few cross-sectional, single-state studies that have examined the relationship between Medicaid reimbursement rates and nursing home staffing. These studies have the advantage of examining facility specific rates because they use state cost reports whereas the national studies do not. Kash, Castle et al. (2007), in a Texas nursing home cross-sectional study found that higher Medicaid reimbursement rates were positively associated with RN, LPN, and CNA HPRD (Kash, Castle et al., 2007). Similarly, Kash et al. (2006) in another Texas nursing home cross-sectional study found that higher Medicaid reimbursement rates were again positively associated with

RN, LPN, and CNA HPRD. A cross-sectional investigation of nursing homes in New York found that higher facility-specific Medicaid rates were associated with a higher number of RNs (Grabowski, 2001b).

The cross-sectional, state studies also generally showed that higher Medicaid rates were positively related to higher nursing home nurse staffing. The strength of these studies is that they used state cost reports and were able to examine facility-specific reimbursement rates. The weakness of these studies is that they were cross-sectional and therefore unable to investigate whether rate changes over time were associated with higher nurse staffing.

Summary of Empirical Literature

The empirical literature reviewed examined the relationship between nursing home nurse staff and Medicare and/or Medicaid reimbursement methods and rates using national, multi-state, and single-state data. These studies have also used panel, pooled independent cross-sections, and cross-sectional data. Opportunities lie in examination of flat-rate and cost-based reimbursement methodologies as they have rarely been studied. Also, the national studies suffer from using OSCAR data for staffing measures, while all of these studies share weaknesses in how nursing home markets are defined and competitors identified.

Flat-rate and cost-based reimbursement methodologies for nursing homes have rarely been examined, in part, because they are rare. After the passage of AB 1629, California was only one of three states that used a cost-based strategy for Medicaid reimbursement (Harrington et al., 2008). Thus, California presents a unique opportunity

to examine nursing home staffing levels following a significant Medi-Cal reimbursement method change that was also designed to provide higher reimbursement levels and improve staffing levels.

All of the national nursing home studies reviewed used OSCAR data to operationalize the staffing measures. However, the reliability and validity of OSCAR staffing data has been a concern since each facility is required to report the number of staffing hours, by category, worked in the 14 days before their periodic survey (Feng et al., 2005). These periodic inspections are relatively predictable and facilities may increase staffing just before them to make staffing numbers appear more favorable (Kash, Hawes et al., 2007). Feng et al. (2005) further maintain that state Medicaid cost reports hold greater reliability and consistency than the OSCAR data because of this concern. There is some support for this as Kash, Hawes et al. (2007) found that average staffing levels were higher in OSCAR than the Texas Medicaid cost report. The present study uses desk-audited California annual financial data which may more accurately indicate relationships between reimbursement method and nursing home staffing.

The three previously mentioned AB 1629 reports used California cost report information for staffing and also examined staffing levels following the reimbursement method change. However, these studies only had data available up through 2006, lacked a lucid theoretical framework/conceptual model, and the analyses could be improved by using a more comprehensive multivariable analysis accounting for organizational characteristics and environmental factors that may be related to nursing home nurse staffing.

Another limitation in the literature is how nursing home competitors have been defined. The county has been the overwhelming choice used to define markets and identify competitors usually using a Hirschmann-Herfindahl Index (HHI) of market concentration (Cawley et al., 2006; Grabowski, 2001b; Grabowski, 2004; Harrington & Swan, 2003; Intrator et al., 2005; Kash, Castle et al., 2007; Konetzka et al., 2006). Using this method, Los Angeles County, which is over 4,000 square miles (Wikipedia, 2010), would overestimate the level of competition because each nursing home would be viewed as a competitor despite potentially being over a hundred miles apart. Conversely, the amount of competition facing a nursing home is underestimated when a nursing home in one county competes with a nursing home located just outside its county boundary (Grabowski, 2008). An alternative method is to determine a fixed geographic radius around each facility and use that to identify each nursing home's market and define the level of competition accordingly (Baker, 2001). This method has been used in the study of nursing home arena using a 25 km radius (Grabowski & Stevenson, 2008) and improves on the prevalent method of using counties as markets to determine competition. However, this method will not account for nursing homes that are across state lines and within 15 or 25 miles of a California nursing home, but neither would the standard county calculation. This study will use both a 15 mile and 25 mile radius to determine a nursing home's competition with other nursing homes, distinct-part facilities, ICFs, subacute nursing facilities, MLRCs, and CCRCs.

The final gap in the literature entails identifying competitors. It has been postulated that increased ALF and HHA use has lessened both nursing home occupancy

rates and excess demand in markets because they are substitutable for low acuity patients (Allen, 2005; Grabowski, Feng et al., 2004; Grabowski, Gruber et al., 2008). However, these are rarely included in analyses as nursing home competitors, with a few exceptions (Amirkhanyan, 2007). Excluding these types of facilities may underestimate the level of competition that nursing homes face.

This study will improve upon previous research in three ways. First, California's desk-audited cost reports are used to construct the dependent staffing variables. Second, this study will take advantage of a unique opportunity to examine the change to a relatively rare reimbursement methodology. Preliminary studies have also taken advantage of this reimbursement change. However, this study will contribute to the literature by improving on their efforts by using a more comprehensive statistical analysis and creating a robust theoretical framework. Third, this study will define competition more appropriately by using a fixed radius measure of nursing home market competition, and including HHA and ALF facilities as competitors in the analysis.

Chapter Summary

The elderly population is projected to grow rapidly in the United States over the next 40 years. This population growth, when combined with less informal support for them, will more than likely increase the need for nursing home care. This is despite a healthier elderly population in terms of ADLs and alternatives such as home health care and ALFs which may alleviate some of the demand. This is troubling for many legislatures, policymakers, and other stakeholders since nursing home care is expensive and predominantly paid for by the federal and state governments. Also worrisome is

potentially limited access for Medicaid patients and inadequate nurse staffing levels needed to provide the quality of care in many nursing homes. Federal and government intervention has sought to address these various concerns through policies such as CON and bed moratoria, case-mix reimbursement, enactment of different reimbursement methods, and higher Medicaid rates. Market mechanisms such as publication of quality information and use of pay-for-performance have also begun.

Reports of poor nursing home care in California in concert with four legislative bills designed to increase nurse staffing, change Medi-Cal reimbursement method, and increase Medi-Cal rates culminated in the passage of AB 1629 in 2004. In intent, AB 1629 was California's attempt to improve Medi-Cal nurse staffing in order to provide the quality of care California nursing home residents deserve. The Act contained therein also sought to increase access to appropriate long-term care services, improve wages and benefits for nursing home workers, support compliance with state and federal requirements, and encourage administrative efficiency. The focus of this study is on whether AB 1629 achieved staffing increases, particularly for those nursing homes highly dependent on Medi-Cal, because the empirical literature shows that both reimbursement method and rate are related to nurse staffing.

CHAPTER THREE: THEORETICAL FRAMEWORK

The purpose of this chapter is to develop a conceptual model using resource dependence theory (RDT) and it is organized into four main sections. The first section defines quality for the purpose of this study and briefly introduces some of the ways quality has been examined in nursing homes. The second section describes Donabedian's (1980) quality framework while focusing on the importance of the structure element. The third section provides an overview of RDT and its most important constructs. The final section introduces this study's conceptual model, formulates hypotheses, and briefly discusses other factors that need to be accounted for when examining nurse staffing. The chapter culminates with a brief summary.

Quality Defined

Defining nursing home quality of care is an important first step before introducing the theoretical framework and conceptual model. Quality essentially encompasses two components: quality of care (QOC) and quality of life (QOL). The IOM defines the QOC component as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (IOM, 2001, p. 30). On the other hand, the IOM defines QOL as "subjective or objective judgment concerning all aspects of an individual's existence including health, economic, political, cultural, environmental, aesthetic, and spiritual

aspects" (2001, p. 29). The QOC construct has dominated empirical studies over the QOL construct in large part because the former has more measures available. This is especially true when considering the large, administrative databases such as CMS' OSCAR database and state cost reports that researchers frequently use.

Nursing home QOC has been described as a "multidimensional" construct (Davis, 1991). As such, nurse staffing (Castle & Engberg, 2005, 2007, 2008; Castle, Engberg et al., 2008; Kim, Harrington et al., 2009; Kim, Kovner, Harrington, Greene, & Mezey, 2009; Schnelle et al., 2004); QMs (Castle, Engberg, & Liu, 2007; Werner et al., 2009; Zinn et al., 2005); and inspection deficiencies (Amirkhanyan et al., 2008; Castle, 2002; Castle & Longest, 2006; Konetzka et al., 2004) have all been examined. These examinations commonly use Donabedian's Structure, Process, and Outcome (SPO) quality framework alone (Castle & Longest, 2006; Chen & Shea, 2002; Grabowski, 2001a; Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005; Munroe, 1990; Zinn, 1994) and/or in concert with an organizational or economic theory (Aaronson, Zinn, & Rosko, 1994; Decker, 2008; Harrington et al., 2007; Kim, Kovner et al., 2009; Starkey et al., 2005; Weech-Maldonado et al., 2003; Weech-Maldonado et al., 2004).

Donabedian's Quality Framework

Donabedian (1980) introduced SPO as the three important elements of QOC. Structure is a blunt measure of QOC and it encompasses the human, physical, and financial resources needed to produce care (Donabedian, 1980). It also includes the number, distribution, and qualifications of professional personnel. Many studies have used this framework to examine nursing home staffing (Aaronson et al., 1994; Decker,

2008; Grabowski, 2001a; Zinn, 1994). Donabedian further stated that structure was relevant to quality because it increased or decreased the probability of good performance and "is probably the most important means of protecting and promoting the quality of care" (1980, p. 82). Facility specific nursing home staffing was made available on CMS' NHC website in 1999 and California nursing home staffing information has been available on California's Nursing Home Search website since October 2002 (Harrington, O'Meara, Collier, & Schnelle, 2003).

Processes of care are sets of activities that occur within and between staff and patients according to Donabedian (1980). He further stated that these processes of care were normative behaviors derived from either the science of medicine or society's ethics and values. CMS began publishing 10 QMs, a combination of process and outcome measures, nationally on its NHC website beginning in November 2002 as part of its NHQI (Fermazin et al., 2003; Mukamel, Weimer, Spector, Ladd, & Zinn, 2008). These measures were based on resident-level data obtained from the MDS and they have subsequently been studied by researchers. For instance, process QMs such as restraint use (Castle & Engberg, 2005; Grabowski, Angelelli et al., 2004; Grabowski, Gruber et al., 2008; Mukamel et al., 2008) and catheter use (Castle & Engberg, 2005; Grabowski, Angelelli et al., 2004; Grabowski, Gruber et al., 2008) have commonly been examined.

Patient outcomes were the last element in Donabedian's QOC framework. Outcomes were described as "a change in a patient's current and future health status that can be attributed to antecedent health care" (1980, p. 82). CMS NHC outcome measures such as residents with moderate to severe pain (Castle & Engberg, 2008; Castle, Engberg,

et al., 2008; Grabowski, Angelelli et al., 2004) or residents whose ability to move about in and around their room got worse (Castle & Longest, 2006; Castle, Engberg et al., 2008; Castle, Liu, & Engberg, 2008) have been studied.

Examination of structures, processes, and outcomes are the three major approaches to quality assessment and there is functional relationship between these three elements (Donabedian, 1980). For instance, structural characteristics influence processes of care thereby enhancing or diminishing QOC. Moreover, process of care changes influence the effect of care on health status (i.e., outcomes). Donabedian offers a simple schematic shown in Figure 3. Thus, single elements of this framework can be studied alone or the relationships between them studied.

Figure 3. Donabedian's relationship between quality elements.

The focus of this study is on the structure element of Donabedian's framework. More specifically nurse staffing as the dependent variable, because AB 1629 set out to specifically improve nursing home staffing and because staffing is critical to the protection and promotion of QOC as described by Donabedian. Moreover, staffing is considered a structural element of quality in of itself. RDT will be used to construct hypotheses based on organizational characteristics and environmental factors that may be related to nurse staffing in California nursing homes.

Resource Dependence Theory

Resource dependence theory has commonly been used in health care research including studies of nursing homes (Banaszak-Holl, Zinn, & Mor, 1996; Davis, Brannon, & Whitman, 2009; Decker, 2008; Harrington et al., 2007; Intrator et al., 2005; Starkey et al., 2005; Zinn, Proenca, & Rosko, 1997; Zinn, Weech, & Brannon, 1998; Zinn, Mor, Castle, Intrator, & Brannon, 1999); hospitals (Alexander & Morrisey, 1989; Hsieh, Clement, & Bazzoli, 2010; Kazley & Ozcan, 2007; Nayar, 2008; Proenca, Rosko, & Zinn, 2000; Proenca, Rosko, & Zinn, 2003; Zinn et al., 1997); and outpatient facilities (Alexander & Wells, 2008; Campbell & Alexander, 2005). It remains a useful organizational theory over three decades after being introduced. This is mainly because it considers both organizational characteristics and environmental factors in an organization's response to resource dependencies, environmental changes and pressures, and uncertainty--conditions all organizations face to varying degrees. The passage of AB 1629 is a prime example of an environmental change. Thus, RDT is particularly applicable to this study because California nursing homes may respond differently to AB 1629 based on their level of Medi-Cal dependence, other organizational characteristics, and environmental factors.

Overview

Resource dependence theory operates in the open system, natural model realm. The open system portion acknowledges the vital importance of the environment, while the natural perspective stresses that organizations are social groups attempting to adapt to their particular circumstances and environment in order to survive (Scott & Davis, 2007).

The passage of AB 1629 in this case is an environmental change that may require adaptation depending on an organization's characteristics and environment. Pfeffer and Salancik (1978) outlined RDT in their seminal work, *The External Control of Organizations: A Resource Dependence Perspective* (later republished in 2003 with a new introduction). The central theme of this work is that organizational activities and outcomes are determined by the environment or social context. Organizations do not control all the resources they need to operate, and as a consequence must exchange resources with others in order to survive. This drives organizational decisions.

In response, organizations use various means available to them to try to avoid or manage dependence in an attempt to maintain as much autonomy as possible (Aldrich, 1979; Astley & Van de Ven, 1983; Pfeffer & Salancik, 2003). However, organizational actions are never completely successful and new patterns of dependence and interdependence emerge (Pfeffer, 1997). Therefore, it is important that managers not only manage their structures, but also their environments to reduce or manage dependencies (Pfeffer & Salancik, 2003; Scott, 2004). Figure 4 illustrates the important RDT constructs of interdependence, uncertainty, dependence, competition, and munificence as well as a few organizational response options when resource dependence and uncertainty are both high.

Interdependence

Pfeffer and Salancik (2003) state that organizational exchanges and transactions may entail monetary or physical resources, information, or social legitimacy with other groups and organizations and these exchanges and transactions create interdependencies.

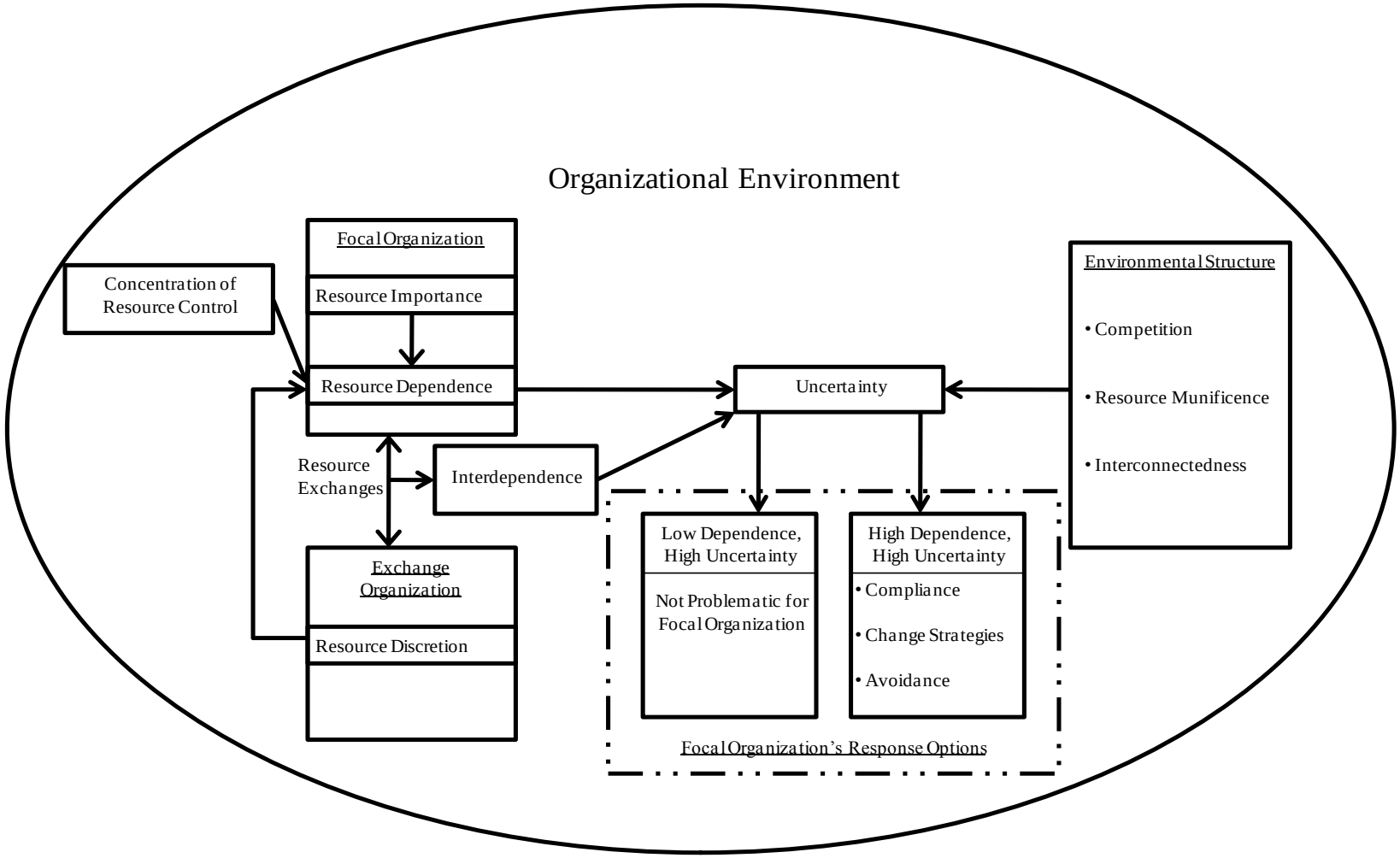

Figure 4. Resource dependence theory model.

These interdependencies exist between organizations whenever one organization does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the desired outcome from that action. They also maintain that when these exchanges are asymmetrical, some power accrues to the less dependent organization which may be used to influence or compel the weaker one. Thus, organizational behavior is constrained and shaped by the demands and pressures of organizations in its environment—a consequence of the open-systems nature of organizations. Moreover, these interdependencies can create problems of uncertainty. The resulting interdependence, when coupled with the ambiguity of the exchange organization's actions, leads to a situation in which survival and continued success are uncertain (Pfeffer & Salancik, 1978).

Uncertainty

Pffefer and Salancik (2003) describe uncertainty as the degree that future conditions cannot be anticipated and accurately predicted. Furthermore, it is the predicated on the structural characteristics of the environment in which an organization resides. As such, it may be partially looked upon as an outcome of an environment's structural elements. Additionally, competition plays an important role in environmental uncertainty especially when resources are scarce. In response to environmental uncertainty, organizations may comply with environmental demands, use organizational change strategies, or attempt to avoid resource dependence and control.

Dependence

According to Pfeffer & Salancik (1987) uncertainty is only problematic when it involves critical elements on which an organization depends. They further state that this dependence is based on three factors. The first factor is internal and it is resource importance or how much the focal organization requires it for continued operation and survival. The second factor is external to the focal organization and it is the extent to which the exchange organization has discretion of the resource's allocation and its use. The final factor is also external and it is the concentration of resource control. Resource importance is essentially the extent to which the focal organization has come to depend on certain types of exchanges for resources in order to operate and survive. There are two factors that determine resource importance: magnitude of the exchange and how critical the resource is to focal organization. The magnitude of an exchange can be thought of as the proportion of total inputs or outputs accounted for by the exchange (Pfeffer & Salancik, 2003). Conversely, the criticality of the resource is the ability of the focal organization to operate in the absence of a given resource and this factor is more difficult to determine than magnitude of the exchange.

The exchange group's discretion over resource allocation and use is the second factor determining resource dependence. The discretion over resources provides the exchange group power especially when the resource is scarce. Resource control can be based on: (a) possession of resource; (b) access to resource; and (c) the ability to make rules, regulate the possession, allocation, and use of resources and have the ability to enforce these regulations (Pfeffer & Salancik, 2003). Concentration of resource control

is the final factor determining the focal organization's dependence on a resource. This concentration of resource control is the extent to which input or output exchanges are made by a relatively few, or only one for that matter, significant organizations. Pfeffer and Salancik (2003) point out that the number of suppliers or purchasers is not as critical as whether or not the focal organization has access to resources from additional sources. Thus, the essence of concentration of resource control is the ability of the focal organization to substitute sources for the same resource. These three factors combined determine an organization's dependence on another. More specifically, Pfeffer and Salancik state that "dependence can then be defined as the product of the importance of a given input or output to the organization and the extent to which it is controlled by a relatively few organizations" (2003, p. 51). Dependence then ultimately boils down to the importance of the external organizations in the focal organization's environment and how much they must be accounted for and considered in decision-making (Pfeffer & Salancik, 2003).

Structural Characteristics of the Environment

Pfeffer and Salancik (2003) discussed three main structural characteristics of an organization's environment: (a) concentration; (b) munificence, and (c) interconnectedness. Environmental concentration was described as the degree in which power and authority in the environment was distributed (i.e., competition), while munificence was the availability of critical resources in the environment. Interconnectedness was expressed as the number and patterns of linkages between organizations within an environment (i.e., network of relationships). Concentration and

munificence alter the intensity of conflict between organizations. In essence, there is less organizational conflict when there is a higher concentration of organizations (i.e., less competition) and more resource munificence in the environment. On the other hand, munificence and interconnectedness cause varying levels of interdependence. Higher levels of munificence result in less interdependence, but higher degrees of interconnectedness produce more interdependence. Higher levels of conflict and interdependence consequently result in a higher amount of uncertainty that an organization faces in its environment. In response, organizations seek to avoid or manage dependence by adapting to the environment or altering the environment so it fits the organization's capabilities.

Managing Environmental Demands

Organizations have many options available to them when trying to manage environmental demands. These responses include compliance, avoiding influence, managing the conditions of social control, and managing and avoiding dependence (Pfeffer & Salancik, 2003). Compliance with external demands is avoided when possible because it results in lost autonomy; however, it is not always possible to avoid compliance especially when dealing with powerful organizations in one's environment. Avoiding influence and managing the conditions of social control are more successful when dealing with less powerful groups in the environment, but are not effective when dealing with powerful organizations that control critical resources (Pfeffer & Salancik, 2003). In these circumstances, organizations seek to manage and avoid dependence.

Organizational change strategies and resource dependence avoidance are a couple of ways that organizations can manage and avoid dependence when dealing with powerful organizations. Pfeffer and Salancik (2003) list many change strategies that organizations may employ in attempts to fit its environment. These strategies include adapting its (a) structure; (b) information system; (c) patterns of management and human relations; (d) technology; (e) product; or (f) definition of the environment. Conversely, the organization may attempt to use strategies to affect the environment. These include diversification, mergers, cooptation, and government lobby.

Organizations may also choose to try to avoid resource dependence through buffering, controlling rules of trade, pursuit of substitutable exchanges, and diversification (Pfeffer & Salancik, 2003). Buffering is building up an inventory of resources large enough to continue operations even when resources are scare. Moreover, the development of substitutable exchanges is an attempt to lessen the importance of an exchange. Diversification is movement into different business lines.

Aldrich (1979) agreed with Pfeffer and Salancik (2003) that maintaining as much autonomy as possible and avoiding unnecessary dependence on others was of the utmost importance. He outlined a hierarchy of preferred organization relation strategies going for most preferred to least preferred: (a) proprietary strategies, such as product differentiation, in which an organization maintains possession and control over resources and protects organizational boundaries; (b) strategies which require cooperation or negotiation with other organizations on a dyadic basis (e.g., cooptation, joint ventures,

and mergers); and (3) the development of action sets (e.g., joint lobbying group) as the least preferred strategies (Aldrich, 1979).

Although popular, RDT does have some detractors. Some critics of RDT point to its lack of attention to the spatial character of social action and structure, that it ignores social class when considering ties, and that the ability of managers to manage environmental dependencies is more limited because of a shift to investor capitalism (Pfeffer & Salancik, 2003). Additionally, others point out four sources of ambiguity in RDT: (a) constraint absorption does not discriminate between power imbalance and mutual dependence, (b) RDT is both a normative and positive theory leading to prescriptions that are often confounded with predictions, (c) the scope conditions of the RDT model are ambiguous, and (d) although RDT is based on dyadic relationships, empirical tests tend to focus on only one organization without considering the other's reciprocal dependence (Casciaro & Piskorski, 2005). Despite these critiques RDT remains a powerful theory. This may in part lie in part by it offering a unifying theory of power (Casciaro & Piskorski, 2005). However, perhaps its greatest strength is giving credence to organizational adaptability versus a natural selection approach like population ecology.

Conceptual Model

The use of RDT to hypothesize nurse staffing in nursing homes is suitable for this study's research questions for a few reasons. First, a nursing home's response to AB 1629 surely varied based on the environmental factors that it faced. RDT is therefore an appropriate theory because it outlines potential responses to exogenous changes in the

environment including organizational change strategies, resource dependence avoidance, resource control avoidance, or even no change when organizations are not dependent on a particular resource for survival.

Nursing homes also have unique organizational characteristics that may have affected how it reacted to the legislation. For instance, it is quite possible the amount of dependence on Medi-Cal revenues may be the best predictor of how these nursing homes reacted in terms of nurse staffing changes. Thus, RDT remains the proper theory since it effectively frames important organizational characteristics such as resource dependence, size, and slack resources and accounts for environmental factors like competition, resource control concentration, and resource munificence which may impact organizational responses.

Nursing homes may have also had different reasons for increasing nurse staffing following AB 1629. For instance, there was pressure to increase nurse staffing in nursing homes as witnessed by the legislation leading up to AB 1629, but the problem may have been inadequate Medi-Cal reimbursement rates that were not high enough to permit additional nurse staffing investments. Thus, higher Medi-Cal reimbursement rates post AB 1629 may have allowed nursing homes to meet nurse staffing level pressures. Nursing homes may have also increased nurse staffing in an attempt to differentiate their products and services, particularly in competitive markets.

Nursing homes can differentiate their products in many ways, but one way is through quality improvements. Thus, higher staffing levels are a structural measure of quality and are readily available on NHC. RDT again appropriately accounts for these

different circumstances. Figure 5 is the RDT-based conceptual model with the control variables thought to influence staffing.

Research Hypotheses

There are three RDT-based organizational characteristics of interest for this study. The first two are nursing home size and slack resources which may affect a nursing home's response to external pressures. The third one is resource dependence which is the product of resource importance (organizational characteristic) and resource concentration (environmental factor). These two constructs were shown externally in Figure 5 for the sake of clarity. Additionally, resource munificence and competition are important environmental factors as they may also shape nursing home responses such as structural quality changes through changes in nurse staffing. Other pertinent control variables are included which may impact nurse staffing levels according to the empirical literature.

Organizational Characteristics

Compliance with external demands is more likely in organizations that depend on external organizations for scarce resources or for resources needed for survival (Pfeffer & Salancik, 2003). Although these demands vary based on the actors involved and their sometimes competing interests, a few examples of external demands include minimum nurse staffing standards, profit maximization, and providing high quality care. For instance, a study of community orientation found that hospitals with a higher dependence on managed care had a positive relationship with community orientation thereby illustrating compliance with external demands (Proenca et al., 2000). A nursing home's dependence on Medi-Cal revenue is determined by the magnitude of the exchange

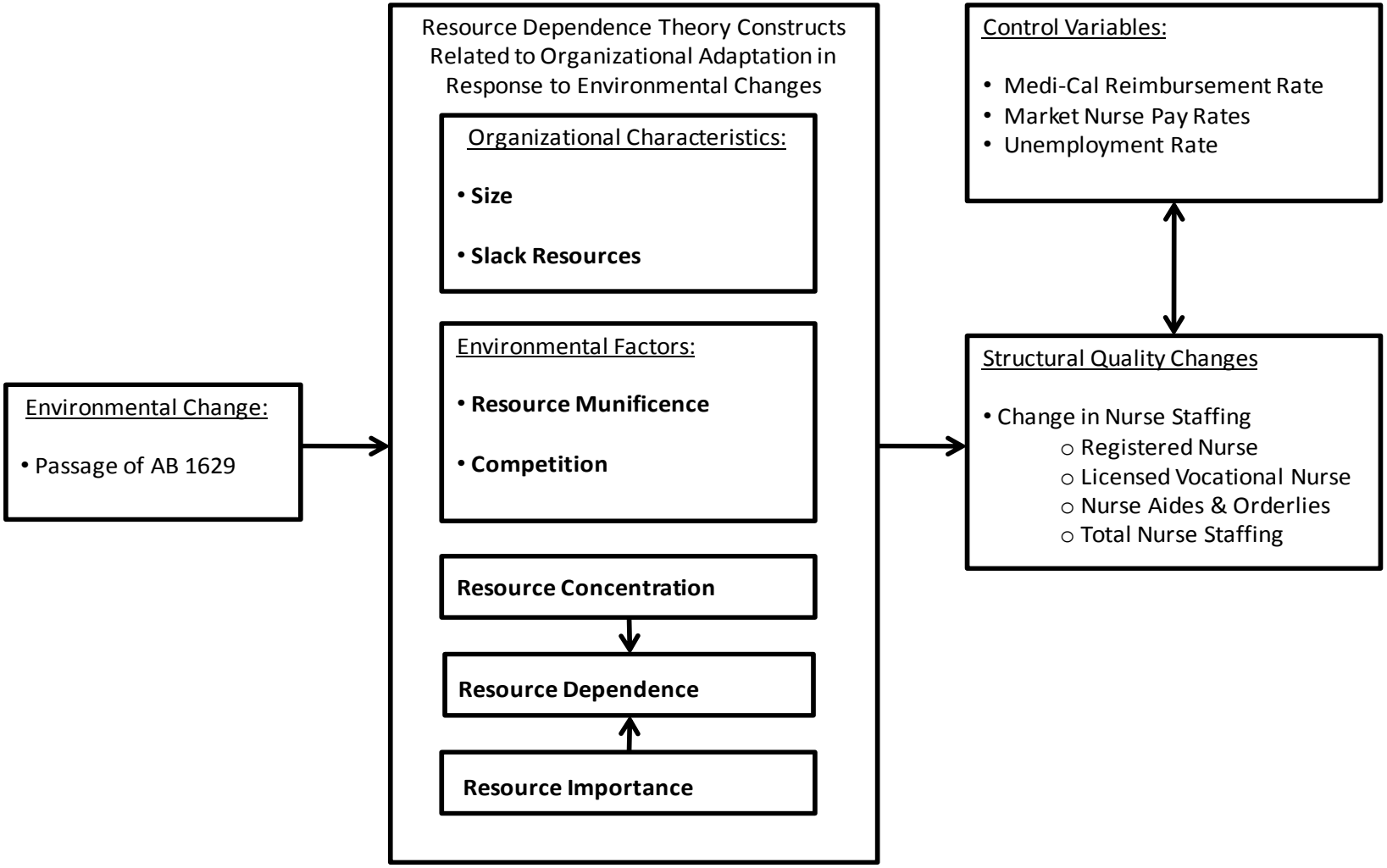

Figure 5. Conceptual model derived from resource dependence theory.

(resource importance) multiplied by how concentrated the control of the resource in the nursing home's environment (resource concentration). Hence, nursing homes are more dependent on Medi-Cal, the higher the product value of the interaction term (resource importance × resource concentration). Higher resource dependence increases pressure on the nursing homes to meet external demands such as providing higher nurse staffing. However, California was in the bottom 10% of Medicaid (Medi-Cal) nursing home reimbursement rates prior to the implementation of the AB 1629 (California Health Policy and Data Advisory Committee, 2005). This meant that nursing homes highly dependent on Medi-Cal may not have had the financial resources means necessary to hire additional nurse staff. For instance, Harrington et al. (2007) found that a higher dependence on Medicaid patients resulted in lower RN and total nurse staffing.

Nursing homes with high Medi-Cal dependence benefitted the most from AB 1629. These facilities saw their Medi-Cal revenues increase via higher Medi-Cal reimbursement rates. They also had a lower quality assurance fee (QAF) burden since the QAF (essentially a provider tax on the number of resident days) was returned to them through a pass-through for each Medi-Cal patient. This may have provided them the ability to meet the external demands of increasing their nurse staffing. Changing their nurse staffing may have also been a strategic response. This is because additional staffing would later lead to higher reimbursement rates due to higher staff costs and the labor driven operating allocation (LDOA) which was a bonus reimbursement percentage above and beyond the cost of nurse staffing. Conversely, facilities with low Medi-Cal dependence did not see their Medi-Cal revenue increase much and they also had a higher

QAF burden. Low Medi-Cal resource dependence for these nursing homes meant they were less likely to react to these changes by altering their staffing structure. Therefore:

H1: Nursing homes with the highest Medi-Cal dependence increased nurse staffing relative to nursing homes with lower Medi-Cal dependence post AB 1629, other things constant.

Pfeffer and Salancik (2003) state that larger organizations have more control over critical activities which reduces problematic dependence, provides stability, and reduces uncertainty. They also maintain that larger organizations are better equipped to resist immediate pressures for change (e.g., increase nurse staffing, improve quality of care, or expand access to care) from policymakers, stakeholders, and legislators. Therefore, larger organizations have more time to recognize threats in the environment and adapt to them accordingly. Hence, larger facilities may not have felt enough pressure to increase nurse staffing after the passage of AB 1629. This is supported by Harrington et al. (2007) who found that larger facilities had fewer RN HPRD and total nurse HPRD in a national study of nursing home staffing and Medicaid reimbursement rates (Harrington et al., 2007). Conversely, smaller facilities may have felt much greater pressure to adapt their nurse staffing in response to environmental demands associated with AB 1629. Therefore:

H2: Smaller nursing homes increased nurse staffing relative to large nursing homes post AB 1629, other things constant.

Pfeffer and Salancik (2003) stated that organizational slack, extra profits or other

resources, enable organizations to manage competing environmental demands. Many demands can at least be partially satisfied when slack resources are available. This means that California nursing homes may have been able to meet pressures to increase nurse staffing when slack resources were available. Slack resources were also probably needed because hiring new or replacing lost staff is an expensive process. For example, a conservative rule-of-thumb for employee turnover is that the cost of hiring a new employee is 25% of his or her annual compensation amount (Seavey, 2004). Thus, a RN with an annual compensation of $50,000 would cost about $12,500 to replace. Hence:

H3: Nursing homes with more slack resources, (e.g., higher cash flow) increased nurse staffing post AB 1629, other things constant.

Environmental Factors

California nursing homes in competitive markets compete for scarce resources (i.e., potential residents). One way to attract residents is through product differentiation (Aldrich, 1979). Nurse staffing level information had been available to potential California residents and their families on CMS' NHC website since 1999 and California's Nursing Home Search since October 2002 (Harrington et al., 2003). This permitted potential residents and/or their families the ability to distinguish between nursing homes based on the structure element of quality. In addition, staffing is perhaps an easier quality measure to understand because generally more staffing indicates a higher quality of care. Empirical nursing home studies by and large support this positive association between higher competition and nurse staffing (Feng et al., 2008; Grabowski, 2001a,

2002, 2004). This may have meant that California nursing homes, in competitive markets before AB 1629, sought to distinguish themselves from others with better nurse staffing. Additionally, AB 1629 gave each nursing home even greater incentive to compete for Medi-Cal residents due to the higher reimbursement rates based in large part on staffing costs. This may have provided these facilities the resources necessary to increase staffing particularly since the increased staffing costs would be a part of future reimbursement rates. Thus:

H4: Nursing homes in more competitive markets had higher nurse staffing, other things constant.

Higher munificence or availability of resources is associated with lower environmental conflict and interdependence (Pfeffer & Salancik, 2003; Scott & Davis, 2007). As such there is less uncertainty and greater access to resources. Nursing homes must take into account the resources available from the environment, such as per capita income or percentage of the population age 85 and older, when making hiring and staffing decisions. A higher per capita income and a greater percentage of the population over age 85 both indicate more favorable environments for nursing homes. A higher per capita income is an indicator of a more affluent environment that could more readily afford higher private-pay nursing home charges. This would result in higher patient revenue thereby providing a means to increase nurse staffing. Similarly, a higher percentage of the population over age 85 indicates a higher demand for nursing home services which may translate into less competition and also higher charges. This may again provide the means necessary for nursing homes to hire additional nurse staffing.

Conversely, nursing homes may employ cost-cutting strategies such as lowering nurse staff or using contract nurse staff to meet minimum staffing standards (Bourbonniere et al., 2006) in less munificent markets. This is supported by empirical research that confirms a positive link between higher resource munificence and nursing home nurse staffing (Cohen & Spector, 1996; Grabowski, 2001a, 2002, 2004; Harrington et al., 2007; Kash et al., 2006). Hence:

> **H5:** Nursing homes in markets with higher resource munificence (e.g., higher per capita income and greater % of population over 85) were positively associated with nurse staffing, other things constant.

Other Factors Related to Nurse Staffing

There are other organizational characteristics and environmental factors which lie outside the RDT theoretical framework that may also impact California nursing homes' nurse staffing decisions. Organizational characteristics include Medi-Cal reimbursement rate, resident case-mix, ownership type, and chain membership. Similarly, environmental factors such as market nurse staff pay rates and the unemployment rate have shown an association with nurse staffing.

Cross-sectional, single-state studies have shown a relationship between Medicaid reimbursement rates and nursing home staffing. These studies have the advantage of examining facility specific rates because they use state cost reports whereas the national studies use average rate for each state. A Texas nursing home cross-sectional study found that higher Medicaid reimbursement rates were positively associated with RN, LPN, and CNA HPRD (Kash, Castle et al., 2007). Similarly, a cross-sectional

investigation of nursing homes in New York State found that higher facility-specific Medicaid rates were associated with a higher number of RNs (Grabowski, 2001b). A cross-sectional study of California nursing homes also revealed that Medi-Cal reimbursement rates were positively associated with RN staffing hours (Harrington & Swan, 2003).

Resident case-mix has been shown to be related to nurse staffing in that increased patient acuity customarily requires additional nurse staffing. Nursing homes studies by Grabowski (2001, 2002, 2004) and Swan and Harrington (2003), all show a positive relationship between higher ADL requirements and nurse staffing. Further, other case-mix measures such as the acuity index (Feng et al., 2008; Mueller et al., 2006), intravenous therapy availability (Bourbonniere et al., 2006), tracheotomy care availability (Bourbonniere et al., 2006), and high rehabilitation intensity (Bourbonniere et al., 2006) have all also been positively associated with nurse staffing in nursing homes.

Ownership type may have also affected staffing levels in California nursing homes. In essence, for-profit (FP) owned nursing homes are thought to maximize profits by setting output, quality, and patient mix at levels necessary to achieve this objective for shareholders (Grabowski & Stevenson, 2008). Thus, they may reduce nurse staffing in the pursuit of profits. Not-for-profit (NFP) and government owned nursing homes on the other hand have a "non-distribution constraint" which prohibits them from distributing residual earnings to individuals who exercise control over the nursing home, such as officers, directors, or members (Hansmann, 1987). Thus, given that government and NFP owned nursing homes do not have defined shareholders, there is less incentive for

them to maximize profit and even greater incentive to maximize other objectives such as increasing quality or access (Grabowski & Stevenson, 2008). Empirical research supports that NFP ownership indeed has higher staffing levels when compared to FP ownership (Harrington & Swan, 2003; Harrington et al., 2007; Kash et al., 2006; Kash, Castle et al., 2007; Mueller et al., 2006).

Chain membership may reduce the cost of capital, facilitate the transfer of knowledge between facilities, and allow for greater economies of scale (Davis et al., 2009). It may also provide additional access to capital and administrative expertise (Shah, Fennell, & Mor, 2001). As such, members of chains may benefit from shared experience and hiring practices (Intrator et al., 2005) that would ease the hiring of nurse staff. Empirical evidence in general shows a positive relationship between chain membership and higher RN and LPN staffing (Grabowski, 2001b). Of note, ownership type and chain membership are not included in the first difference, fixed effects estimation analyses because these constant variables would be "washed away."

Nurse wages may also impact the amount of nursing home nurse staffing. In essence, the higher the market wages the lower the ability of nursing home's to hire additional nurse staff (Harrington et al., 2007; Zinn, 1993). On the other hand, higher nurse staff wages may increase their supply in the market perhaps enhancing the ability of nursing homes to hire them. This effect may be tempered somewhat because nursing homes have historically been viewed as the least desirable employers in terms of working conditions (Bourbonniere et al., 2006). Research has shown a negative relationship between wages and nursing home nurse staffing (Harrington et al., 2007; Zinn, 1993).

The unemployment rate is expected to be related to nurse staffing particularly for RNs. High unemployment rates may mean that spouses of married RNs lost jobs or worried they may lose them shortly. This actual or potential loss of household income may compel RNs to make up for the lost income by increasing their nursing activities or re-entering the nurse workforce (Buerhaus, Auerbach, & Staiger, 2007). This would increase their supply in the market. A cross-sectional study of California nursing homes indeed found higher RN HPRD in markets with higher unemployment rates (Harrington & Swan, 2003).

Chapter Summary

Nursing homes do not control all of the resources necessary to survive and continue operations. Hence, they depend on a combination of public, private, and insurance payers to pay for supplies and services rendered for their patients and residents. The Medicaid and Medicare programs, respectively, make the bulk of the payments to these facilities making them a force to be reckoned with for most nursing homes. The more dependent nursing homes are on this revenue, the more likely they are to succumb to the various pressures put on them by these programs. The desire for increased nurse staffing in California nursing homes was one such pressure, but prior to AB 1629 the Medi-Cal reimbursement level was low which made it difficult for some nursing homes to hire additional staff. AB 1629 was passed in part to provide the means necessary for California nursing homes to increase staffing. This provided California nursing homes an opportunity to adapt their nurse staffing structures to match the changed external environment.

Nursing home reaction to AB 1629 undoubtedly varied based on unique organizational characteristics and the environment in which the nursing home operated. This makes RDT an appropriate theoretical framework as it takes into account various organizational characteristics such as resource dependence, size, and slack that may be related to nurse staffing changes after the passage of AB 1629. The theory also outlines various tactics in response to exogenous changes in the environment as well as environmental factors like competition and munificence that may affect a nursing homes response. Table 3 summarizes this study's hypotheses derived from RDT.

Table 3

Summary of Hypotheses With Expected Sign

Hypothesis	Expected Sign
H1: Nursing homes with the highest Medi-Cal dependence increased nurse staffing relative to nursing homes with lower Medi-Cal dependence post AB 1629, other things constant.	+
H2: Smaller nursing homes increased nurse staffing relative to large nursing homes post AB 1629, other things constant.	+
H3: Nursing homes with more slack resources (e.g., higher cash flow) increased nurse staffing post AB 1629, other things constant.	+
H4: Nursing homes in more competitive markets had higher nurse staffing, other things constant.	+
H5: Nursing homes in markets with higher resource munificence (e.g., higher per capita income and greater percentage of population over 85) were positively associated with nurse staffing, other things constant.	+

CHAPTER FOUR: METHODOLOGY

This chapter presents the study's methodologies used to ascertain whether California nursing home nurse staffing increased following implementation of AB 1629. The research design is introduced first along with a short discussion on threats to design validity. This is followed by a description of the data sources, study sample, and the variables with their accompanying measures. The analytical procedures are then detailed and the chapter closes with a brief summary.

Research Design

The research design for this study is based on the natural experiment concept (similar to a quasi-experimental design) found in the economics literature. A natural experiment occurs when an exogenous event, such as a change in government policy, alters the environment in which firms operate (Wooldridge, 2006). A natural experiment has a control group, which is not typically affected by the policy change, but there is a treatment group which is expected to be affected by the change (Polit & Beck, 2004). Wooldridge (2006) asserts that the difference between a true experiment and a natural experiment lies in the fact that true experiments have treatment and control groups that are randomly chosen. Conversely, the treatment and control groups in a natural experiment are the result of a policy change.

California's AB 1629 may be viewed as a natural experiment, although most California nursing homes were affected by AB 1629 because only a very small percentage of the nursing homes do not have Medi-Cal residents. However, there are varying levels of Medi-Cal dependence meaning that there would be a stronger AB 1629 impact for some nursing homes. This is straightforward as nursing homes with high Medi-Cal dependence gained the most from AB 1629, while those with low Medi-Cal dependence gained the least. The treatment group of most interest is nursing homes with high Medi-Cal dependence, while the control group is nursing homes with low Medi-Cal dependence. A control group with zero exposure to AB 1629 was not available because only about 5%-7% of California's nursing home population do not treat Medi-Cal residents and the non-CMS certified nursing homes do not have case-mix information.

Quartiles are used in this study to create four groups based on a nursing home's baseline measure of Medi-Cal dependence in 2002. The top quartile had the highest degree of Medi-Cal dependence and the lowest quartile had the least. The second and third quartiles are also appealing because there may have been a dose effect (Konetzka et al., 2004). This dose effect occurs when larger effects are observed as each subsequent quartile is compared to the control group. Meyer (1995) also stated that multiple groups have an advantage in that it may allow further checks of hypotheses and the elimination of alternative explanations. It is noteworthy that the low Medi-Cal dependence control group in this study was exposed to AB 1629 because the nursing homes in the group received Medi-Cal payments, albeit a much smaller amount when compared to the high Medi-Cal dependence quartile.

Specifically, this is a difference-in-difference panel data study design that can separate the AB 1629 effects from macro-effects that may cause changes in the dependent variable over the study period (Konetzka et al., 2004). The unit of analysis is free-standing California nursing homes and the pre-AB 1629 period is 2002-2004 and the post-AB 1629 period is 2006-2007. Two periods (pre-AB 1629 and post-AB 1629) with multiple years in each period are used because it permits the examination of various validity threats and allows researchers to examine if the treatment and control groups moved in parallel (Meyer, 1995). The 2005 data are excluded from the main analyses because this is a transitional phase between the time when the legislation was passed and the initial effects of AB 1629 were felt. The research design is graphically depicted in Figure 6 below where "O" represents a yearly observation for each nursing home and "X" represents the introduction of AB 1629 for the two main study groups of interest (i.e., high and low Medi-Cal dependence).

O_{2002}	**O_{2003}**	**O_{2004}**	**X**	**O_{2006}**	**O_{2007}**	**High Medi-Cal Dependence**
O_{2002}	**O_{2003}**	**O_{2004}**		**O_{2006}**	**O_{2007}**	**Low Medi-Cal Dependence**

Figure 6. Research design

This design is similar to a quasi-experimental, time series nonequivalent control group design. However, the groups were not randomly assigned in this study. The groups were created based on their level of Medi-Cal dependence in 2002 to determine the effect of the exogenous AB 1629 legislation on nursing home staffing changes. This means that the groups may not have been initially equivalent. Therefore, statistical

procedures are required to control for the differences in organizational characteristics and environmental factors. Also, the study uses panel data instead of time series. Panel data allows for the control of time-invariant fixed effects that may have been omitted variables and confounded the results.

Design Validity

The overarching consideration when choosing a study design is whether or not the design provides trustworthy answers to the research questions by addressing threats to design validity (Polit & Beck, 2004). The types of design validity include internal, external, statistical conclusion, and construct. All four types are important, but internal and external validity are of greater concern.

Internal Validity

Internal design validity is the ability to make inferences that the independent variables are truly causing or are associated with the dependent variable after controlling for confounding or extraneous factors (Polit & Beck, 2004). Thus, the key question is whether observed changes in nurse staffing can be attributed to AB 1629 and not to other causes. A good research design addresses the major threats to internal validity. Table 4 summarizes how this study's design tackles the various threats to internal validity.

External Validity

External validity seeks to ensure the study is generalizable to other settings and samples (Polit & Beck, 2004). In other words, it is the degree to which the conclusions found in this study would hold for other nursing homes in other states and at other times (Trochim, 2006). This is a single state study that may limit generalizability to other

Table 4

Threats to Internal Design Validity

Threat	Source	Solution
History	California nursing homes may have been exposed to extraneous events that influenced nurse staffing, but that were not related to AB 1629.	A control group is included which would have also been exposed to these potential events.
Maturation	Nursing home staffing changed during study period.	A control group is included and there are also a series of pre and post measures.
Selection bias	Nursing homes with varying levels of Medi-Cal dependence may have been fundamentally different.	Measures Medi-Cal dependence before implementation of AB 1629 and other differences are controlled for via independent and control variables in the estimation procedures.
Mortality	Some nursing homes changed ownership or closed during study period.	Nursing homes that changed ownership or closed during the study period are removed from analyses.
Statistical regression	Nursing homes' Medi-Cal dependence grouped on extreme scores.	Nursing homes were grouped based at a point in time before AB 1629 and level of Medi-Cal dependence should have been stable prior to AB 1629. Thus, this
Interaction of selection and maturation	Nursing home nurse staffing changes over time and due to pre-existing differences.	The series of pre and post measures can identify interaction effects.

Table 4 - continued

Threat	Source	Solution
Testing	Pretest sensitivity to performance on posttest measures.	Study uses secondary data and a baseline measure of Medi-Cal dependence. Thus, it does not apply.
Instrumentation	Changes in the instrument used to collect the data. For instance, changing the wording on California's nursing home financial disclosure forms.	A control group is used that is exposed to the same instrument.

states. However, California is thought to be the largest and most diverse state in the continental United States (Phibbs & Robinson, 1993). California also has the largest number of nursing home beds of any state and its nursing homes are similar to national averages in terms of total average staffing levels, nurse turnover rates, resident characteristics, resident payer sources, and occupancy rates (Harrington & Swan, 2003). Hence, positive results that show a relationship between the new reimbursement method and increased nurse staffing in California may be generalizable to other states.

Statistical Conclusion Validity

Polit and Beck (2004) note that the first criterion for establishing causality is demonstrating that there is an empirical relationship between the independent and dependent variable. As such, appropriate statistical methods are needed to ensure statistical conclusion validity. A couple of threats to statistical construct validity are low statistical power and inadequate precision. Basically, small sample sizes limit statistical power and the resulting analyses may fail to show a relationship between the independent and dependent variables (Polit & Beck, 2004). Low statistical power is not an issue in this study because the population of free-standing nursing homes in California is used (with some exclusions) instead of random sampling.

Inadequate precision can result when inaccurate measurement tools are used, there is poor control over extraneous variables, and inappropriate or weak statistical methods are utilized (Polit & Beck, 2004). This study uses audited financial data and other widely accepted and used data for measures. Additionally, the study controls for extraneous variables that may affect the dependent variables and strong statistical

procedures, based on panel data, are used to control for fixed-effects that may be omitted variables. Thus, inadequate precision should not be present in this study especially when considering that the measures used in this study are commonly found in the empirical literature.

Construct Validity

Construct validity is essentially the degree to which a given instrument properly measures the construct being investigated (Polit & Beck, 2004). There are multiple threats to construct validity including demand traits, expectancy effects, compensatory rivalry effects, compensatory equalization effects, and novelty effects. However, these threats are based on the reaction of people or organizations to an experiment and/or instrument used to collect data for the experiment. However, these should not be a factor because this study is based on a natural experiment without the use of a researcher-contrived intervention or instrument.

Data Sources

California state agencies provide the bulk of the data for this study. These state agencies include the California Office of Statewide Health Planning and Development (COSHPD), California Department of Finance, California Department of Social Services, California Department of Health Care Services, and the California Department of Public Health. Other data sources include the University of Southern California, Brown University, U.S. Bureau of Economic Analysis, and the U.S. Bureau of Labor Statistics. All nursing homes are required to submit an Integrated Disclosure and Medi-Cal Cost Report within 4 months of the nursing home's fiscal year end (Office of Statewide Health

Planning and Development - Healthcare Information Division, 2008). The report contains detailed financial and utilization information about each nursing home to include nurse staffing information. The COSHPD offers this data as "submitted" by each facility or upon completion of their desk-audit. The desk-audit encompasses a COSHPD algorithm that is run on the facility submitted disclosure reports (Mr. Ty Christensen, personal communications, March 5, 2010). The process flags values that are outside of a predetermined threshold and COSHPD sends questions to the facility in a back-and-forth process until the issue is resolved. Approximately 98% of the facilities receive questions on their submitted reports and COSHPD spends an average of 4 hours on each long-term care submitted report according to Mr. Christensen. This gives COSHPD an advantage over other data sources including CMS OSCAR data. OSCAR data have been deemed less reliable, particularly for staffing variables, because there are concerns that nursing homes may "staff up" before state inspections (Institute of Medicine, 2001; Kash, Hawes et al., 2007). COSHPD staffing measures do not suffer from this problem because they are based on a facility's entire fiscal year. The COSHPD also provides the nurse wage and HHA data needed to calculate the HHA competition measure.

Nursing homes in California choose their own fiscal year and report the data for this period to COSHPD accordingly. However, Mr. Ty Christensen stated that approximately 80% of them have a fiscal year end date of December 31 (personal communications, April 30, 2010) which is easy to assign to study years because the calendar year matches the fiscal year. On the other hand, a data rule is necessary for the remaining 20% of nursing homes whose fiscal year straddles 2 calendar years. A nursing

home's COSHPD data will be assigned to the appropriate study year based on which calendar year exceeded 182 days in the fiscal year reporting period. For instance, a nursing home with a fiscal year begin date of July 1, 2007 had 184 calendar days in 2007 and 182 calendar days in 2008 (2008 was a leap year resulting in an extra day). Thus, this nursing home's reporting period data would be assigned to the 2007 study year.

The California Department of Finance provides the data for the percentage of the population over age 85 in each county. The benchmark population for the projections is based on the 2000 U.S. Census counts and modified using fertility, mortality and migration assumptions (State of California, Department of Finance, July, 2007). The department then uses a baseline cohort-component method to project the population by age, gender and race/ethnicity for each year. Cohorts change as specified in the mortality and migration assumptions as each year passes and new cohorts are formed by applying the fertility assumptions (State of California, Department of Finance, July, 2007).

The California Department of Social Services is the source for the ALF (i.e., residential care for the elderly) data for all licensed facilities. The department is charged with inspections and licensing of all RCFEs and as such maintains a listing of all licensed facilities. Only licensed RCFEs that were in continuous operation for the entire calendar year will be considered for that particular study year and included as competitors.

The California Department of Health Care Services (formerly the California Department of Health Services until 2007) provides the Medi-Cal daily per diem reimbursement rates. The Med-Cal reimbursement rates were based on two bed categories and three geographic regions before AB 1629. Post AB 1629 these

reimbursement rates became facility-specific based on costs. These rates were released after August 1st of each year with a different release date depending on the year. However, the rates were retroactive to August 1st each year regardless of when they were released. These rates could be considered a pseudo-FY Medi-Cal reimbursement rate even though it does not match California's state fiscal year of July 1 - June 30. Thus, Medi-Cal reimbursement rates straddle two calendar years (e.g., 2006-2007). In this study, the Medi-Cal rates will be applied to the later study year since the rates apply to the majority of the days in the later calendar year. For instance, the 2006-2007 Medi-Cal rates will be applied to the 2007 study year because the rates applied to more days in calendar year 2007 (January 1 - July 31) than calendar year 2006 (August 1 - December 31). This data rule also aligns for the most part with the majority of California nursing homes which use a January 1, 20XX - December 31, 20XX fiscal year.

The California Department of Public Health is the supplier for the nursing home change in ownership (CHOW) and closure listing. These listings are important because nursing homes that have changed ownership or closed will be removed from the final sample of nursing homes, although they will still be used in the competition and nurse wage rate measures. The COSHPD financial data also has a variable that indicates whether or not the report is generated as a result of a CHOW. However, this information is not reliable according to Mr. Ty Christensen because some nursing homes fail to annotate that a disclosure report is the result of a change in ownership (personal communication, April 30, 2010). Alternatively, Mr. Christensen suggests looking for

reports that are less than 365 days and/or with an unusual fiscal year end date (e.g., May 23, 2007) if COSHPD data is used to determine CHOWs.

The University of Southern California Geographical Information System (GIS) Lab (also known as WebGIS) provides the majority of the geocoding for the study. Geocoding is the name of the process for converting nonspatial location data into a corresponding spatial representation, usually converting postal addresses into latitude and longitude geographic coordinates (University of Southern California, College of Letters, Arts, and Sciences, 2010). The WebGIS platform performed well in a recent comparison to seven other commercial geocoders by tying with three of them for the best in terms of address matches (Swift, Goldberg, & Wilson, 2008). The longitude and latitude information is necessary to create the 15 mile and 25 mile radii market measures from each nursing home.

The Brown University Long-Term Care Focus website provides the case-mix data used to adjust the hours per resident day dependent variables. The website is an important nursing home data source and includes elements from the Minimum Data Set (MDS), OSCAR, Area Resource File, Residential History File, and Brown University collected Medicaid state policy data (Brown University, Alpert Medical School, 2010). The acuity index (ACUINDEX) is used as the case-mix adjustment for this study and is generated from OSCAR information obtained during the periodic (i.e., every 9-15 months) nursing home inspections. Noncertified CMS nursing homes are excluded from this study because the ACUINDEX variable is not available. The Brown University

website also provides the total number of beds for each hospital-based facility. This information is necessary in order to compute the nursing home HHI.

The median per capita personal income is provided by the U.S. BEA. The median per capita personal income is based upon estimates of the personal income of residents divided by the Census Bureau's annual midyear population estimates (U.S. Department of Commerce Bureau of Economic Analysis, 2010b). The BEA released new median per capita estimates for 2008 and revisions for 1969-2007 on April 22, 2010 (U.S. Department of Commerce Bureau of Economic Analysis, 2010a).

The U.S. BLS is the last data source for this study and furnishes the unemployment information for each county in California. The individual states collect monthly data and create estimates for local area and state level unemployment data using BLS developed concepts, definitions, and technical procedures (U.S. Bureau of Labor Statistics, 2010). The BLS Handbook of Methods further explains that monthly data is based on a time series approach to sample survey data with the intent to reduce high variability in monthly Current Population Survey estimates for geographic areas with small sample sizes. The BLS also is this study's source for the Consumer Price Index (CPI) All Urban Consumers (Current Series) used to convert the wage, income, and Medi-Cal rate variables into December 2007 real dollars.

Sample

The study sample consists of approximately 1,000 CMS certified, free-standing California nursing homes in continuous operation from 2002 to 2007. Approximately 25 nursing homes were not certified by Medicare or Medi-Cal and they are excluded from

this study because they do not have available case-mix data. Facilities which have changed ownership or closed during the study period are only included in the competition and nurse wage rate measures. This is because they were competitors for a given study year, but either information is not available for the entire study period (closures) or they are expected to operate differently after changes in ownership. Hospital-based facilities are only included in the nursing home competition measure because they compete for some of the same patients as nursing homes. However, AB 1629 did not affect them due to the fact they fall under a different reimbursement methodology. Subacute care facilities were subject to the QAF and a new reimbursement methodology because of AB 1629. However, these facilities care for some residents that have much more intensive needs than residents in a typical nursing home. For instance, California's subacute residents require breathing assistance and are on ventilators (Mr. Nixon, personal communications, February 9, 2010). Hence, subacute care facilities will only be included in the construction of the HHI competition and nurse wage rate measures. Similarly, ICFs, CCRCs, and MLRCs are included in the construction of the HHI competition measure because they compete for a segment of the residents who may receive care in a nursing home, but they offer a range of services much different from the typical nursing home. These facilities are also used to determine market nurse wages.

Variables and Measures

This study's conceptual model, constructs and an empirical literature review provide the basis for the dependent, independent, and control variables. These constructs were outlined in Figure 5 and include competition, resource munificence, resource

concentration, size, slack resources, resource importance, and resource dependence. Table 5 summarizes the variable names, operational measures, and data sources. Additionally, the variable operationalizations in this study are commonly used and found in the nursing home or hospital empirical literature.

Dependent Variables

Nurse staffing standards or recommended nursing home nurse staffing are usually expressed as HPRD. For example, CMS' minimum recommended total nursing home nurse staffing HPRD is 2.75 (Harrington, 2002). Likewise, California's current minimum total nursing home nurse staffing is 3.2 HPRD as established by AB 1107 in 1999 (A.B. 1107, 1999). A panel of experts convened at the John A. Hartford Institute for Geriatric Nursing in 1998 recommended a 4.4 HPRD standard for total nursing home nurse staff (Harrington, 2002). This recommendation consisted of 1.04 RN HPRD, .7 LVN HPRD, and 2.7 nurse assistant HPRD. Empirical nursing home studies also commonly use nurse staffing HPRD as the dependent variable (Bostick, Rantz, Flesner, & Riggs, 2006; Feng et al., 2008; Kash, Hawes et al., 2007; Mueller et al., 2006). The typical HRPD calculation is based upon the number of total productive nurse hours for each dependent variable (i.e., RN, LVN, NA, and total HPRD) divided by the number of resident days. COSHPD productive hours include regular time, overtime and in-service and out-service education hours, but do not include vacation, sick, on-call, holiday or any other paid time off (California Healthcare Information Division, 1998). The COSHPD productive hours also do not differentiate between skilled and intermediate nursing care.

Table 5

Variable Type, Name, Measure, and Data Source

Type of Variable/Construct	Variable Name	Variable Measure	Data Source
Dependent Variables			
Structural quality changes	Registered Nurse (RN) hours per Resident Day (HRPD) RN_HPRD	Total RN productive hours for nursing services during the period (including temporary staffing) divided by (number of resident days [DAYS] multiplied by the acuity index (ACUINDEX).	California (CA) Office of Statewide Health Planning and Development (COSHPD) and Brown University.
	Licensed Vocational Nurse (LVN) HPRD LVN_HPRD	Total LVN productive hours for nursing services during the period (including temporary staffing) divided by (number of resident days [DAYS] multiplied by ACUINDEX).	COSHPD and Brown University.
	Nurse Assistant (NA) HRPD NA_HPRD	Total NA productive hours for nursing services during the period (including temporary staffing) divided by (number of resident days [DAYS] multiplied by ACUINDEX).	COSHPD and Brown University.
	Total Nursing HPRD TOTAL_HPRD	Total RN, LVN, and CNA productive hours for nursing services during the period (including temporary staffing) divided by (number of resident days [DAYS] multiplied by ACUINDEX).	COSHPD and Brown University.

Table 5 - continued

Type of Variable/Construct	Variable Name	Variable Measure	Data Source
Independent Variables			
Environmental Change: Passage of AB 1629	POST	Indicator variable for pre and post periods with the pre period as the reference category	N/A
Organizational Characteristics:			
Size	BEDS	Average number of licensed beds for the year broken into quartiles and assigned indicator variables. Highest bed quartile is base group.	COSHPD
	POST_BEDS	Interaction term of POST indicator variable multiplied by BEDS quartiles.	COSHPD
Slack Resources	SLACK	Ratio of cash flow (net income plus depreciation) to total assets.	COSHPD
	POST_SLACK	Interaction term of POST indicator variable multiplied by SLACK variable.	COSHPD
Resource Importance	MCAL_REVENUE	Gross Medi-Cal facility revenue for skilled nursing care/gross revenue for routine and ancillary services for inpatient and outpatient care.	COSHPD

Table 5 - continued

Type of Variable/Construct	Variable Name	Variable Measure	Data Source
Independent Variables-continued			
Resource Dependence	DEPENDENCE	Interaction term of MCAL REVENUE and MCAL_CONCENTRATION. Broken into quartiles with low dependence as bottom quartile while high dependence is top quartile. Indicator variables created with fourth quartile as base group.	COSHPD
	POST_DEPENDENCE	Interaction term of POST indicator variable multiplied by Medi-Cal DEPENDENCE quartiles.	COSHPD
Environmental Factors:			
Competition	NH_HHI	Sum of the squares of the market shares in terms of licensed beds with 15 and 25 miles of each free-standing nursing home. Includes distinct-part, subacute facilities, ICFs, MLRCs, and CCRCs as they provide some skilled nursing care.	COSHPD
	ALF_BEDS	The number of assisted living beds within 15 and 25 miles of each free-standing nursing home scaled by 10,000.	CA Department of Social Services and COSHPD

Table 5 - continued

Type of Variable/Construct	Variable Name	Variable Measure	Data Source
Independent Variables-continued			
	HHA_VISITS	The number of home health agency unique patient visits within 15 and 25 miles of each free-standing nursing home scaled by 10,000.	COSHPD
Resource Concentration	MCAL_ CONCENTRATION	Total number of skilled nursing Medi-Cal days in each market/total number of skilled nursing days in the market. Uses a 15 and 25 mile radius from each free-standing nursing home to determine total days in the environment.	COSHPD
Resource Munificence	INCOME	Median per capital income in the county converted to December 2007 real dollars using Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) for All-Urban Consumers (Current Series).	U.S. Bureau of Economic Analysis and BLS
	POPULATION	Percentage of the county population over age 85.	CA Department of Finance

Table 5 - continued

Type of Variable/Construct	Variable Name	Variable Measure	Data Source
Control Variables			
	MCAL_RATE	Annual Medi-Cal reimbursement rate for each nursing home converted to December 2007 real dollars using BLS CPI for All-Urban Consumers (Current Series).	California Department of Health Care Services and BLS
	WAGES	Weighted average of RN, LPN, and NA market wage rates using 15 and 25 mile radii from each free-standing nursing home, ICF, CCRC, MLRC, and subacute care facility converted to December 2007 real dollars using BLS CPI for All-Urban Consumers (Current Series).	COSHPD and BLS
	UNEMPLOYMENT	Unemployment rate for the civilian labor force in each county.	BLS

This study uses a modified version of the typical HPRD by incorporating a case-mix adjustment. Case-mix should be considered when examining nurse staffing levels because higher staffing levels are generally needed for residents with higher nursing care needs (Harrington, 2002). Using a case-mix adjusted HPRD has the added benefit of not having to control for case-mix in the estimation procedures which may cause simultaneity with the nurse staffing dependent variables. Case-mix and nurse staffing may suffer from simultaneity in that a higher case-mix may require higher nurse staffing levels, but higher nurse staffing levels may also permit a higher case-mix. Seblega et al. (2010) used a similar approach in their nursing home nurse staffing study. Specifically, they divided nurse staffing HPRD by an acuity index (ACUINDEX) to arrive at a case-mix adjusted HPRD (Seblega et al., 2010). The ACUINDEX has also been frequently used in other nursing home studies to account for case-mix (Feng et al., 2006; Mueller et al., 2006; Seblega et al., 2010; Stevenson, 2006).

The average acuity index is used as the case-mix adjustment for this study. It is a measure of care needed by each nursing home's residents and calculated based on the number of residents needing various levels of ADL assistance, the number of residents receiving special treatments (i.e., respiratory therapy or intravenous treatments), and the number of residents with certain diagnoses such as dementia (http://ltcfocus.org/Downloads.aspx, row 164, column 3). More specifically, The Brown University Center for Gerontology & Healthcare Research's LTCFocUS.org Data Dictionary describes its calculation in detail:

Average Acuity Index = Adlindex + Stindex + Addindex

(i) **Adlindex** = (number of eating-dependent residents × 3) + (number of eating-assisted residents × 2) + (number of eating-independent residents) + (number of toileting-dependent residents × 5) + (# toileting-assisted residents × 3) + (number of toileting-independent residents) + (number of transfer-dependent residents × 5) + (number of transfer-assisted residents × 3) + (number of transfer-independent residents) + (number of bedfast residents ×5) + (number of chairbound residents × 3) + (number of ambulatory residents) divided by (total number of residents).

(ii) **Stindex** = (number of residents receiving respiratory care) + (number of residents receiving suctioning) + (number of residents receiving IV therapy) + (number of residents receiving tracheostomy care) divided by (total number of residents).

(iii) **Addindex** = (number of residents with dementia) + (number of residents with psychiatric diagnosis) + (number of residents with retardation) + (number of residents receiving PT, OT or speech therapy) + (number of residents receiving tube feedings) divided by (total number of residents) (http://ltcfocus.org/Downloads.aspx, row 164, column 4).

This study will use 2002 as the base year to create an index of the acuity index measure. The mean of the average acuity index, for each nursing home in 2002, is first calculated. Next, the average acuity index for each facility, and for each study year, is divided by the 2002 overall mean of the average acuity index. The value of the new index would be one if the average acuity index equaled the 2002 overall mean of the

average acuity index. A value greater than one would indicate that a nursing home had a higher case-mix than the average nursing home in 2002 (i.e., residents with higher patient acuity). Similar procedures have been in the empirical literature. For example, one study created an index using the procedures outlined above. They then divided the number of hours of nursing care per inpatient-day by the case-mix index to calculate the adjusted number of hours of nursing care per day (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002).

Independent Variables

The independent variables consist of an environmental change variable (passage of AB 1629 [POST]) as well as three environmental factors: competition (NH_HHI, ALF_BEDS and HHA_VISITS), resource munificence (INCOME and POPULATION) and resource concentration (MCAL_CONCENTRATION). There are also three organizational characteristics: size (BEDS), slack resources (SLACK), and resource importance (MCAL_REVENUE). The Medi-Cal dependence variable (DEPENDENCE) is the product of the resource concentration environmental factor (MCAL_ CONCENTRATION) and the resource importance organizational characteristic (MCAL_REVENUE). This interaction term was expressed outside of the environmental factors and organizational characteristics boxes in Figure 5 for the sake of clarity.

Environmental Change

The POST indicator variable delineates the environmental change caused by the passage of AB 1629 and divides the pre-AB 1629 and post-AB 1629 study periods. The AB 1629 indicator variable is assigned a zero for the study years 2002-2004 and a one for

the years 2006-2007. It is further used with the BEDS, SLACK, and DEPENDENCE variables to create interaction terms. These interaction terms are in effect the policy effect variables. Similarly, one may view them as the difference-in-difference estimators. For instance, the POST_DEPENDENCE_Q1 parameter is the post period multiplied by the lowest Medi-Cal DEPENDENCE quartile. This parameter represents the difference between pre and post period as well the difference between the highest Medi-Cal dependence group and the lowest. Hence, the term difference-in-difference.

Environmental Factors

Competition is a key consideration especially when using a RDT-based framework because it is the competition for scarce resources that drives many organizational actions. Nursing homes may engage in price competition or product differentiation to gain a competitive advantage over others with the need for these actions based on the level of market concentration (Starkey et al., 2005). The HHI is the prevalent measure of market concentration in nursing homes studies. The index ranges from zero to one and is constructed by summing the squared market shares, typically beds (Bourbonniere et al., 2006; Castle & Engberg, 2008; Harrington et al., 2007; Mukamel & Spector, 2002; Zinn et al., 1999) or patient days (Mukamel & Spector, 2002; O'Neill, Harrington, Kitchener, & Saliba, 2003), in the defined market area. Higher values indicate more concentration and therefore less market competition. The market area is usually defined geopolitically through the use of counties, but this study instead uses both a 15 mile and 25 mile radii from each nursing home.

The nursing home HHI includes all free-standing nursing homes, distinct-part facilities (hospital-based), MLRCs, CCRCs, ICFs, CLHFs, and subacute facilities that were in operation for each individual study year. Each of these facilities is included in the competition measure because they provide some measure of skilled nursing care thereby making them competitors. The NH_HHI is based on the number of beds for all of these facilities within a 15 and 25 mile radii of each free-standing nursing home. Grabowski & Stevenson (2008) used a 25 km radius around each nursing home in their national study of nursing home ownership conversions. Similarly, Phibbs and Robinson (1993) used multiple measures including a 15 mile radius to determine hospital market structure.

The ALF competition measure includes all licensed California RCFE facilities that were in operation for each individual study year. The ALF_BEDS variable is based on the total number of licensed ALF beds within both a 15 and 25 radius from each free-standing nursing home. ALFs have rarely been included as competitors in empirical studies despite general acknowledgement that they compete with nursing homes for residents with lower acuity (Castle et al., 2009; Gruneir et al., 2007). This may be due to a lack of national data or limited availability in some state nursing home studies. A cross-sectional, Texas study of nursing home dementia special care units included ALFs as competitors (Gruneir et al., 2007). This study incorporated both the number of ALFs in each county and the number of ALF beds per 1,000 people age 65 and over as nursing home competitors.

The HHA competition measure includes all licensed HHAs that were in operation in each individual study year. The HHA_VISITS variable is based on the number of unique HHA patient visits and within both a 15 and 25 mile radius from each free-standing nursing home. Unique patient visits were chosen instead of total visits because an individual patient can have multiple visits per year. For instance, it was estimated that the number of HHA visits per user was 80 in 1995 (Bishop, 1999). The number of HHAs per county (Amirkhanyan, 2007), the number of HHAs per 1,000 people age 65 and over (Gruneir et al., 2007; Starkey et al., 2005), and the number of HHAs per 10,000 people age 65 and over in each county (Gulley & Santerre, 2007) have been used as HHA measures of nursing home competition.

Resource munificence is represented by the two variables of median per capita income and proportion of the population age 85 and older. The median per capita income is calculated as the median value of the personal income of residents in each county divided by the resident population in each county (U.S. Bureau of Economic Analysis, 2010). The BEA calculates personal income as the sum of net earnings by place of residence, rental income of persons, personal dividend income, personal interest income, and personal current transfer receipts. Additionally, the BEA uses the Census Bureau's annual midyear population estimates to compute the resident population in each county. The median per capita income has been commonly used in nursing home studies to represent resource munificence or more favorable markets (Grabowski, 2001a, 2001b, 2004; Swan et al., 2009). The median per capita income is converted to December 2007

real dollars using Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) for All Urban Consumers (Current Series).

The proportion of the population age 85 and older in each county is calculated using the California Department of Finance's population projections for each study year. This data source has projections for each age group (0 to 100) broken down by gender and county. The male and female age groups are combined and then totaled to obtain each county's estimated population. The age groups 85 and older are then totaled for each county and divided by the total estimated county population. Health care studies have used the proportion of the population age 65 and older (Decker, 2008; Harrington et al., 2007; McCue, Mark, & Harless, 2003; Swan et al., 2009), 75 and older (Intrator et al., 2005; Zinn et al., 2003), and 85 and older (Kim, Harrington et al., 2009; Kim, Kovner et al., 2009; Swan et al., 2009) in each market. This study uses the proportion of the population 85 and older because this group is more likely to require long-term care (Hagen, 2004).

Pfeffer and Salancik (1978) describe resource concentration as the extent to which inputs or outputs are made by relatively few significant resources. Therefore, this is an environmental factor, but it is shown separately in Figure 5 for the sake of clarity. Thus, a measure is needed that reflects the resource concentration (i.e., purchasing power) in each market. Starkey et al. (2005), in a study of nursing home market competition, created such a measure by dividing the total number of Medicaid nursing home residents in the county by the total number of nursing home residents in the county. This study takes a similar tack, but uses the number of Medicaid skilled nursing days divided by the

total number of days. Days were chosen instead of residents because private-pay patients commonly "spend down" until they become Medicaid eligible meaning they may have been both private-pay and Medicaid eligible in a given study year. Thus, using days may be a more accurate measure. Both a 15 and 25 mile radius from each free-standing nursing home is again used to represent nursing home markets.

Organizational Characteristics

The number of licensed beds is commonly used in the empirical literature to represent a nursing home's size (Cohen & Spector, 1996; Harrington & Swan, 2003; Intrator et al., 2005; Konetzka et al., 2004). The number of licensed beds in this study will be broken into quartiles with an indicator variable assigned to each group. The highest quartile (i.e., nursing homes with the most beds) will act as the base group in the analysis. The use of categorical variables helps to ease interpretation, reduce noise (Intrator et al., 2005), and capture the possible curvilinear effect of facility size on nurse staffing (Zinn, Mor, Feng, & Intrator, 2007).

Slack resources are those that an organization has in excess of the minimum necessary to produce a given level of organizational output (Zinn et al., 2007). Slack resources are sometimes represented by chain membership (Castle & Fogel, 1998; Zinn, Feng, Mor, Intrator, & Grabowski, 2008; Zinn, Mor, Feng, & Intrator, 2007) and/or size (Zinn et al., 2008; Zinn et al., 1998; Zinn et al., 2007) in part because financial data may not be available. This is would be the case for national nursing home studies. However, Pfeffer and Salancik (1978) note that slack is frequently apparent in the form of extra profits or resources. Thus, chain membership and/or size may instead be proxy variables

for slack resources. COSHPD collected financial data are available for this study and the ratio of cash flow (net income plus depreciation) to total assets is used to represent slack resources. This measure was used to represent slack resources in a study of hospitals offering long-term care (Muramatsu et al., 2000) reasoning that cash flow per asset represents more financial resources to invest in skilled nursing and long-term care.

Resource importance is the extent to which a nursing home has come to depend on certain types of exchanges for resources in order to operate and survive. Hence, it is an organizational characteristic, but is shown separately in Figure 5 for the sake of clarity. Pfeffer and Salancik (1978) assert that resource importance can be measured by assessing the proportion of total inputs accounted for by the exchange. In support of this measure, Harrington et al. (2007), in a national study of nursing homes, state that nursing facilities depend on revenues from Medicaid and Medicare, which in turn may impact nurse staffing levels. As such, the proportion of total gross Medi-Cal nursing home revenue for skilled and intermediate nursing care is divided by total gross revenue for routine and ancillary services for inpatient and outpatient care is used to operationalize resource importance. Skilled nursing care net revenue figures by payer (i.e., Medi-Cal) would be preferred, but they are not broken down by payer on the COSHPD financial disclosure forms.

Pfeffer and Salancik (1978) stated that resource dependence is an interaction of resource concentration (environmental factor) and resource importance (organizational characteristic). However, health care studies generally either use resource concentration (Banaszak-Holl et al., 1996; Intrator et al., 2005; Starkey et al., 2005) or resource

importance (Decker, 2008; Harrington et al., 2007; Thompson & McCue, 2004) alone to represent the resource dependence construct. This study follows Pfeffer and Salancik's (1978) guidance by operationalizing resource dependence by multiplying resource concentration and resource importance to create the interaction term. The resulting measure is then broken into quartiles with an indicator variable created for each quartile. The highest quartile (i.e., high Medi-Cal dependence) serves as the base category. Furthermore, this study uses a 2002 baseline measure of resource dependence for each free-standing nursing home.

Control Variables

There are three control variables for this study: each nursing home's Medi-Cal reimbursement rate (MCAL_RATE), the nurse wage rates using both a 15 and 25 mile radius (WAGES), and the unemployment rate in each county (UNEMPLOYMENT). The Medi-Cal reimbursement rate is the daily per diem rate, in each study year, paid to each nursing home for providing skilled nursing care to Medi-Cal residents. This was a flat rate prior to AB 1629 based on two bed categories and three geographic regions. The rate became facility specific post-AB 1629 based on the aforementioned reimbursement cost categories (i.e., labor, indirect care and nonlabor, administrative, capital, and direct pass-through). State level nursing home studies have the ability to use facility specific Medicaid reimbursement rates (Kash et al., 2006; Kash, Castle et al., 2007; Mukamel & Spector, 2002) while national studies use the average state Medicaid rates (Castle, 2005; Castle et al., 2009; Grabowski & Castle, 2004). The Medi-Cal rate is converted to

December 2007 real dollars using Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) for All Urban Consumers (Current Series).

The nurse wage rates are included in the analysis because Harrington et al. (2007) note that nursing homes are expected to hire fewer RNs (and with fewer hours) when RN wage rates are high. The same may be said for other nurse staffing categories. The nurse wage rates for each staffing category (i.e., RN, LVN, and NA) are created using weighted averages. This is calculated by first totaling the productive hours (skilled nursing and intermediate care) of all free-standing nursing homes, ICFs, CCRCs, MLRCs, and subacute facilities within both a 15 and 25 mile radius of each free-standing nursing home. This number is then divided by the total salary and wages (skilled nursing and intermediate care) of all free-standing nursing homes, ICFs, CCRCs, MLRCs, and subacute facilities within both a 15 and 25 mile radius of each individual freestanding nursing home. The resulting measure is the weighted average wage for each nurse category. The wage rates are also converted to December 2007 real dollars using Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) for All Urban Consumers (Current Series).

The regression analyses for the total HPRD will include the pay rates for RNs, LVNs, and NAs. The regression analyses for the RN, LVN, and NA will only include the wage rate which matches the dependent variable (e.g., the RN HPRD will have RN wages included in the regression analysis). Other nursing homes studies have followed this convention by only including the wage rate for the dependent staffing variable being examined (Harrington & Swan, 2003; Kash et al., 2006; Kash, Castle et al., 2007).

The final control variable is the unemployment rate in each county. According to the BLS a person must be without work, be available for work, and have actively searched for work to be classified as unemployed (Cohany, 2008). The BLS calculates the official unemployment rate as the total number of unemployed persons divided by the civilian labor force and multiplied by 100. Nursing home research has used county unemployment rates because high unemployment means fewer vacant positions and less likelihood of voluntary turnover (Castle & Engberg, 2005; Castle & Engberg, 2008).

Analytical Approach

Descriptive Statistics

The first step of the analytical approach is to examine the univariate descriptive statistics. The minimum values, maximum values, mean, and standard deviation are all examined and presented, as well as a correlation matrix. The frequency for all nominal variables will be presented as well. The descriptive statistics are used to ascertain if there are problems of multicollinearity, outliers, and missing data. Not many outliers and/or missing data are expected since the majority of this study's data comes from audited COSHPD financial data.

Model Specifications

The second step is to specify the models. There are two different model specifications for this study. The first model is a simple interaction model using ordinary least squares (OLS), without conditioning on any other variables, to get at the root of the policy effect of AB 1629 on staffing. This model is meant to provide a simple, yet revealing indication if nursing homes with high Medi-Cal dependence did indeed

increase nurse staffing post-AB 1629. The first model for each dependent variable is:

$$Staffing_{it} = \beta_0 + \beta_1 POST + \beta_2 DEPENDENCE\_Q1 + \beta_3 DEPENDENCE\_Q2 + \beta_4 DEPENDENCE\_Q3 + \beta_5 POST\_DEPENDENCE\_Q1 + \beta_6 POST\_DEPENDENCE\_Q2 + \beta_7 POST\_DEPENDENCE\_Q3 + u_{it}$$

where β_0 is the average staffing for nursing homes with the highest Medi-Cal dependence before AB 1629, POST represents the study years 2006-2007 following passage of AB 1629; DEPENDENCE denotes the indicator variables for each quartile of Medi-Cal dependence in 2002; POST_DEPENDENCE is an interaction term of the post AB 1629 period multiplied by Medi-Cal dependence quartiles; u_{it} signifies the error term; i indexes nursing homes and t indexes time. The parameter of primary concern is β_1 since it is the estimator of pre and post periods of nursing homes with the highest Medi-Cal dependence. These regressions will also be run using the first, second, and third Medi-Cal dependence quartile as the base to ascertain if nurse staffing increased (indicated by the POST variable in each regression) after AB 1629. The coefficients and standard error are not reported, but the results will be discussed.

The second model includes all of the organizational characteristics, environmental factors, and control variables. The model is the same for all of the dependent variable regressions except for the nurse pay rate as previously outlined. The total nurse staff HPRD will include all three nurse pay rates while the other three dependent variables (i.e., RN, LVN, and NA) will only include the corresponding nurse pay rate. For example, the RN dependent variable regression will only include the RN pay rate in the estimation procedure. Of note, these regressions will be run twice, once with a 15-mile

market radius and the other with a 25-mile market radius around each nursing home. The second model for each dependent variables is:

$$Staffing_{it} = \alpha_i + \beta_1 POST + \beta_2 POST\_DEPENDENCE\_Q1_{it} + \beta_3 POST\_DEPENDENCE\_Q2_{it} + \beta_4 POST\_DEPENDENCE\_Q3_{it} + \beta_5 BEDS\_Q1_{it} + \beta_6 BEDS\_Q2_{it} + \beta_7 BEDS\_Q3_{it} + \beta_8 POST\_BEDS\_Q1_{it} + \beta_9 POST\_BEDS\_Q2_{it} + \beta_{10} POST\_BEDS\_Q3_{it} + \beta_{11} SLACK_{it} + \beta_{12} POST\_SLACK_{it} + \beta_{13} NH\_HHI_{it} + \beta_{14} ALF\_BEDS_{it} + \beta_{15} HHA\_VISITS_{it} + \beta_{16} INCOME_{it} + \beta_{17} POPULATION_{it} + \beta_{18} MCAL\_RATES_{it} + \beta_{19} WAGES_{it} + \beta_{20} UNEMPLOYMENT_{it} + u_{it}$$

where POST represents the study years 2006-2007 following passage of AB 1629; DEPENDENCE denotes the indicator variables for each quartile of Medi-Cal dependence in 2002; POST_DEPENDENCE parameters are interaction terms of the post AB 1629 period multiplied by Medi-Cal dependence quartiles; BEDS represents the indicator variables for each of the nursing home bed size quartiles; POST_BEDS parameters are interaction terms of the post AB 1629 period multiplied by the bed size quartiles; SLACK represents the amount of slack resources available to each nursing home; the POST_SLACK parameter is an interaction term of the post AB 1629 period multiplied by slack resources available to each nursing home; NH_HHI, ALF_BEDS, and HHA_VISITS are the competition measures from each free-standing nursing home during the entire study period each using a 15 and 25 mile radius; INCOME and POPULATION represent per capita media income and proportion of the population age 85 and older in each county, both signifying resource munificence; MCAL_RATE denotes each nursing homes Medi-Cal rate; WAGES are the weighted average of nurse

wages using both a 15 mile and a 25 mile radius around each nursing home; UNEMPLOYMENT reflects the unemployment rate in each county; α_i is the fixed-effect; u_{it} signifies the error term; i indexes nursing homes and t indexes time. Table 6 provides a breakdown of this study's hypotheses, matching parameters, and expected sign of the results.

Table 6

Study Hypotheses, Associated Parameter, and Expected Sign

	Parameter	Expected Sign
H1: Nursing homes with the highest Medi-Cal dependence increased nurse staffing relative to nursing homes with lower Medi-Cal dependence post AB 1629, other things constant.	$ß_1$	+
H2: Smaller nursing homes increased nurse staffing relative to large nursing homes post AB 1629, other things constant.	$ß_8$ $ß_9$ $ß_{10}$	+ + +
H3: Nursing homes with more slack resources (e.g., higher cash flow) increased nurse staffing post AB 1629, other things constant.	$ß_{12}$	+
H4: Nursing homes in more competitive markets had higher nurse staffing, other things constant.	$ß_{13}$ $ß_{14}$ $ß_{15}$	+ + +
H5: Nursing homes in markets with higher resource munificence (e.g., higher per capita income and greater percentage of population over 85) were positively associated with nurse staffing, other things constant.	$ß_{16}$ $ß_{17}$	+ +

Econometric Approach

Wooldridge (2006) states "panel data sets are very useful for policy analysis" (p. 467). He further explains that panel data consists of unobserved factors that are both constant and vary over time. The intercept α_i in the aforementioned model specification represent all unobserved, time-constant factors that affect the dependent variables. Conversely, the u_{it} is the time-varying error that characterizes the unobserved factors that change over time and impact the dependent variables (Wooldridge, 2006). The α_i may be considered an omitted variable and could bias results if not accounted for properly. This study uses panel data to account and control for the unobserved fixed-effects that may impact the dependent variables of interest. More specifically, first-differencing (FD) estimation procedures are used to eliminate the unobserved, fixed-effects.

The FD estimator will produce an unbiased, or consistent estimator, if several assumptions hold true as outlined by Wooldridge (2006). First, strict exogeneity must be satisfied where the change in u_{it} is uncorrelated with the changes in the independent variables. This should be true for all of the independent variables except for the Medi-Cal reimbursement rate which will require an instrumental variable (IV) and IV estimation procedures as described below. Second, there must be some variation for each independent variable across the nursing homes. This is the reason why chain membership and ownership type could not be included as independent variables as they are both static for the most part and would be "washed away" under the first-differencing procedure.

Homoskedasticity (i.e., constant error variance) is also required for all of the observations in order to ensure that the standard errors and test statistics are valid (Wooldridge, 2006). Thus, the standards errors must be corrected if heteroskedasticity is present. This study will cluster by nursing homes in the estimation procedures to account for heteroskedasticity and the possibility of correlated errors within each individual nursing home.

First differencing procedures require strict exogeneity where the error term is not correlated with any of the independent variables and in any period. However, this is not the case for Medi-Cal rates at the end of the study period (i.e., 2007). The nursing homes were unable to affect their Medi-Cal rates in the years prior to AB 1629 because it was a flat rate based on two bed categories and three geographic regions. Thus, strict exogeneity holds in this time period. Strict exogeneity also held true the first couple of years after AB 1629 because the rates were based on past financial data (18 to 24 month lag). This means that the Medi-Cal rates for 2005 and 2006 were based on fiscal years that ended in 2003 and 2004, respectively. Again the nursing homes did not have the ability to impact their future Medi-Cal rates. However, a feedback effect is present in the 2007 year. This is because nursing homes had the ability to increase their future Medi-Cal rates by increasing nurse staffing in the years 2005 and beyond. Nursing homes that increased their nurse staffing in 2005, in response to AB 1629, would see higher Medi-Cal rates in 2007 due to the 18-24 month lag; however, this ability may have been tempered somewhat because of cost category percentile limits as well as the overall aggregate Medi-Cal rate cap. Regardless, a feedback effect is obvious and must be

accounted for using the concept of sequential exogeneity and IV estimation procedures. Wooldridge (2006) notes that in the presence of endogeneity all estimators will be biased and inconsistent when using ordinary least squares (OLS). He further states that IV estimation can be combined with panel data methods such as FD. This permits consistent parameter estimates in the presence of unobserved effects and endogeneity in one or more time-varying independent variables. Importantly, Wooldridge (2002) relaxed the strict exogeneity assumption and discussed the sequential exogeneity concept where the error term u_{it} is allowed to be correlated with future values of the explanatory variables. This is particularly applicable to this study, and Medi-Cal rates because a large u_{it} may feed into future Medi-Cal rates for the 2007 study year. A lagged value of the endogenous independent variable can be used as an IV in these circumstances since it is uncorrelated with the change in the error term u_{it} (Wooldridge, 2002). Thus, this study will use IV estimation procedures with the lagged values of Medi-Cal rates acting as IVs.

The FDs for the study variables need to be calculated and then IV estimation performed on the calculated differences. This procedure is necessary since excluding the 2005 year data leaves a gap in the panel study. All FDs for year 2006 are then necessarily missing if 2005 data is excluded entirely. Further, in this circumstance the FD of a variable such as POST would be missing in 2006 and zero in all other years. Hence, 2005 data is used for constructing first differences for 2006, but excluded otherwise (i.e., first differences between 2005 and 2004 are excluded).

Ethical Issues

All of the datasets for this study are publicly available. They also do not contain any patient-level data, nor does the study involve any human subjects. Hence, this study is exempt from the Virginia Commonwealth University Internal Review Board process outlined in Title 45, Part 46, of the Code of Federal Regulations (45 CFR 46).

Chapter Summary

This chapter presented the research design along with the threats to design validity. The data sources were explained in detail and the sample population was described as well. The dependent, independent, and control variables and their operationalizations were outlined as was the analytical approach that included a depiction of the study's hypotheses, corresponding parameters in the model specifications, and the expected signs of the parameters. A short explanation of ethical issues closed the chapter.

CHAPTER FIVE: RESULTS

This chapter presents the study's empirical analyses results. The first section describes how the study's sample of free-standing nursing homes was derived. In the second section, the dependent, independent, and control variables of free-standing California nursing homes in the study sample are compared to the excluded free-standing nursing homes. The third section briefly presents the other facility types used to compute the nursing home competition measures (e.g., HHI in terms of beds, HHA unique patient visits, and ALF beds). Next, descriptive statistics for the study variables are presented. The final section presents the results from the regression analyses as well as a sensitivity analyses. The chapter closes with a summary.

Study Sample Derivation of Free-Standing Skilled Nursing Facilities

The purpose of this study was to determine the policy effect of AB 1629 on California nursing home staffing (i.e., RN, LVN, NA, and total nurse staffing). The study also looked to ascertain the impact of Medi-Cal dependence on nurse staffing as well as organizational characteristics and environmental factors that may have affected nurse staffing during the study period. The unit of analysis is free-standing California nursing homes that may or may not have been members of a chain. Other facilities such as hospital-based facilities, CLHFs, ICFs, MLRCs, CCRCs, ALFs, and HHAs are used in the competition measures.

The population of all free-standing nursing homes in California was: 1,026 in 2002, 1,020 in 2003, 1,016 in 2004, 1,010 in 2005, 1,002 in 2006, and 995 in 2007 for a total of 6,069 free-standing SNF observations during the study period. The number of SNFs in 2005 is in the sample derivation description because a CHOW or closure in 2005 removes the nursing home from the sample. The 2005 data is also used to compute first-differences (i.e., 2006-2005). The entire panel for a free-standing SNF is excluded if it provided sub-acute care or care for the mentally or developmentally disabled, had a study year that did not have COSHPD data, changed license type from/to a skilled nursing license, did not have case-mix information for any given year, did not provide skilled nursing care to Medicare and Medi-Cal patients, or was missing Medi-Cal revenue or Medi-Cal rates for any given study year. Additionally, the entire panel for a free-standing SNF was removed if it changed ownership or closed from 2002-2007. Table 7 illustrates the number of nursing home exclusions by reason. A couple of trends can also be identified from Table 7. First, the number of free-standing nursing homes providing sub-acute care increased from 32 in 2002 to 56 in 2007. This is not too surprising since AB 1629 also created a new, more generous reimbursement methodology for sub-acute care. Second, there were a large number of CHOWs during the study period. In fact, 313 CHOWs occurred between 2002-2007, and of those, 21 facilities changed ownership twice during this period.

The exclusion criteria resulted in a balanced panel of 567 SNFs and 2,835 observations for the years 2002-2004 and 2006-2007 as shown Table 8.

Table 7

Free-Standing Skilled Nursing Facility (SNF) Exclusions by Year

	2002	2003	2004	2005	2006	2007	Total
Adult subacute facilities	32	35	43	-	52	56	218
Pediatric subacute facilities	3	3	5	-	5	5	21
Developmental disabled facilities	2	1	1	-	2	2	8
Mentally disabled facilities	32	31	31	-	29	29	152
Missing year of data (incomplete panel)	0	2	2	-	23	26	53
No Medicare and Medicaid skilled nursing facility (SNF) days	53	58	56	-	47	45	259
Changed license type to/from skilled nursing license	18	13	15	-	19	19	84
Missing Medi-Cal rates	-	-	-	-	21	18	39
Change of ownership	37	104	22	33	32	85	313
Closure	0	8	8	2	9	3	30
Total Exclusions	185	268	194	35	248	296	1,226

Of note, the excluded facility totals in Table 8 for each year do not match the excluded criterion totals shown in Table 7. There are a couple of reasons for this imbalance. First, a free-standing SNF panel is removed if it meets one of the exclusion criteria in any study year. This also holds true for CHOWs and closures except that the

Table 8

Free-Standing Skilled Nursing Facility (SNF) Final Sample and Population

	2002	2003	2004	2005	2006	2007	Total
SNFs - final sample	567	567	567	0	567	567	2,835
Excluded SNFs	459	453	449	1,010	435	428	3,234
SNF population	1,026	1,020	1,016	1,010	1,002	995	6,069

panel is also excluded if a CHOW or closure occurred in 2005 as well as the study period. Second, individual facilities may meet more than one exclusion criterion for a given year. For example, three nursing homes in 2003 had a CHOW and did not provide skilled nursing care to Medi-Cal nor Medicare patients. Therefore, although there were 185 exclusions in 2002, 459 facilities were actually excluded because of meeting one or more criteria in the same or another year.

Comparison of Sample and Excluded Free-Standing Skilled Nursing Facilities

The sample and excluded facility means are compared to assess differences between the two groups. More specifically, the final sample is compared to the excluded free-standing nursing homes to discover if there are differences across the dependent, independent, and control variables. This is first accomplished by examining only the year 2002 using two-group mean-comparison tests (i.e., t-tests). Table 9 provides the 2002 study year comparisons between the final sample and excluded observations, across the dependent variables. In a supplementary analysis, the final sample across all years is compared to the excluded free-standing nursing homes. The standard errors (and hence

Table 9

Dependent Variable Comparison of Final Sample and Excluded Facilities, Study Year 2002

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Registered Nurse hours per Resident Day HPRD, case-mix adjusted.	567	0.27	0.16	400	0.34	0.35	-4.17	0.00003
Licensed Vocational Nurse HRPD, case-mix adjusted.	567	0.62	0.22	400	0.68	0.54	-2.44	0.0145
Nurse Aide HPRD, case-mix adjusted.	567	2.39	0.45	400	2.49	1.82	-1.34	0.1803
Total Nurse HPRD, case-mix adjusted.	567	3.27	0.58	400	3.51	2.47	-2.21	.0271
Acuity Index, 2000 base year.	567	1.00	0.13	435	0.99	0.20	0.93	.3509
Total skilled nursing and intermediate care days.*****	567	32.23	14.47	452	28.71	17.33	3.53	0.00040

*****Note. Variable is scaled by 1,000.

the resulting t-statistics) for this comparison are adjusted for dependence of observations within facilities. The results of this analysis are located in Table A1 in Appendix A.

The t-tests in Table 9 show a statistically significant difference between the sample and excluded observations across three of the four dependent variables. The final sample had lower staffing than the excluded observations except for nurse aide staffing. For example, the case-mix adjusted RN HPRD averaged .27 HPRD for the final sample of free-standing nursing homes versus the excluded observations' .34 average.

The acuity index and total skilled nursing and intermediate care days variables are included with the dependent variables in Table 9 since both are used in the denominator for the case-mix adjusted HPRD. The 2002 indexed average acuity in the final sample is not statistically different than for the excluded sample. However, there is a statistically significant difference between the total skilled nursing and intermediate care days for the final sample (32.23 annual average scaled by 1,000) versus the excluded observations (28.71). This is expected as the focus of the final sample is on facilities that provide total skilled nursing days as opposed to others that may focus more on other patients and services.

The differences between the sample and excluded observations carry over to the organizational characteristics. For example, Table 10 shows there was a statistically significant difference between organizational slack in the final sample (.06) and the excluded facilities (-.07). There were also statistically significant differences in terms of the proportion of patient revenue derived from Medi-Cal and Medi-Cal dependence

Table 10

Organizational Characteristics Comparison of Final Sample and Excluded Facilities, Study Year 2002

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Beds	567	99.33	44.62	459	103.59	52.02	-1.41	0.15813
Slack	567	0.06	0.47	451	-0.07	0.85	3.13	0.00177
Medi-Cal Revenue	567	0.62	0.20	451	0.47	0.28	9.81	8.82E-22
Dependence - 15 Mile Market (MM)	567	0.42	0.15	451	0.32	0.20	9.65	3.81E-21
Dependence - 25 MM	567	0.42	0.15	451	0.32	0.20	9.52	1.17E-20

using a 15 and 25 mile radius to delineate markets. However, there were not statistically significant differences in terms of beds.

The two groups were much more similar across environmental factors, but there were statistically significant differences in terms of Medi-Cal concentration using a 15 mile market and median per capita income. For instance, the final sample had a Medi-Cal concentration in 15 mile markets of 68%, which was a statistically significant difference from excluded facilities which had a 66% Medi-Cal concentration. Also, the median per capita income for the final sample ($38.68 scaled by 1,000) was statistically different from the excluded facilities ($39.94). The details of the t-tests can be found in Table 11.

The control variable comparisons are illustrated in Table 12. This table shows the groups were similar for the most part except for RN and NA wage differences in 15 mile markets. The 15 mile market wages for RNs in the final sample were $.50 lower than the excluded facilities ($31.39 versus $31.89). Similarly, the NA wages in the final sample were $.21 lower than the excluded facilities ($12.16 versus $12.37).

Table A1 in the Appendix compares the final sample and excluded facilities across all study years by regressing the variable of interest on a group indicator variable and clustering by facility. The t-tests from these regressions indicate whether or not the final sample is in fact statistically significant and different from the excluded facilities. This supplementary analysis confirms the 2002 t-tests results. Hence, the final sample and excluded facilities are very similar in terms of both environmental factors and control variables, but they are much different in terms of the dependent staffing variables (i.e.,

Table 11

Environmental Factor Comparisons of Final Sample and Excluded Facilities, Study Year 2002

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Nursing Home Competition 15 Mile Market (MM)	567	0.07	0.13	459	0.07	0.15	-0.54	0.58775
Nursing Home Competition 25 MM	567	0.04	0.08	459	0.04	0.10	-0.86	0.38851
Assisted Living Facility (ALF) Bed Competition - 15 MM*****	567	.7326	.5493	459	.7184	.5191	0.42	0.67373
ALF Bed Competition 25 MM*****	567	1.4961	1.1332	459	1.4839	1.0756	0.17	0.86194
Home Health Agency (HHA) Unique Visit Competition 15 MM*****	567	3.4628	3.1205	459	3.2355	2.8273	1.21	0.22664
HHA Unique Visit Competition 25 MM*****	567	665.27	583.02	459	648.72	547.07	0.46	0.64209
MCAL Concentration - 15 MM	567	0.68	0.08	456	0.66	0.09	3.17	0.00159
MCAL Concentration - 25 MM	567	0.67	0.06	456	0.67	0.07	1.35	0.17888

Table 11 - continued

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Income**, ***	567	38.68	8.55	459	39.94	10.01	-2.16	0.03089
Population	567	1.32	0.25	459	1.34	0.27	-1.25	0.21142

*****Variable scaled by 10,000; ******Variable scaled by 1,000; *******Variable is converted to December 2007 real dollars.

Table 12

Control Variable Comparisons of Final Sample and Excluded Observations

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Medi-Cal Rate	567	130.75	10.47	459	131.41	10.46	-1.00	0.31574
Registered Nurse (RN) Wages - 15 Mile Market (MM)*****	567	31.39	3.33	452	31.89	3.29	-2.39	0.01714
RN Wages - 25 MM*****	567	31.58	3.06	452	31.82	3.19	-1.22	0.22307
Licensed Vocational Nurse (LVN) Wages - 15 MM*****	567	24.32	3.34	452	24.61	3.34	-1.35	0.17736
LVN Wages - 25 MM*****	567	24.38	3.18	452	24.6	3.23	-1.08	0.2787
Nurse Aide (NA) Wages 15 MM*****	567	12.16	1.86	452	12.37	1.86	-1.86	0.06374
NA Wages - 25 MM*****	567	12.21	1.80	452	12.34	1.79	-1.11	0.26937
Unemployment Rate	567	6.91	1.70	459	6.83	1.62	0.80	0.42313

*****Variable is converted to December 2007 real dollars.

RN, LVN, and total nurse staffing) and organizational characteristics. Thus, the results of this analysis should only be generalized to free-standing California nursing homes that were in continuous operation, without a CHOW between 2002 - 2007, that did not provide subacute care, and that treated Medi-Cal patients.

Other Facilities Used for Competition Measures

There were total of 2,248 observations from distinct-part facilities, SNF residential facilities, ICFs, ICF residential facilities, and CLHFs that were used in tandem with the 6,059 free-standing skilled nursing facility observations to compute the nursing home HHI bed competition measure. This is shown in Table 13 (8,317 total observations - 6,069 free-standing nursing home observations = 2,248). Of these, 1,196 (2,248 other facility observations - 1,052 distinct-part facilities = 1,196) were also used in concert with the free-standing nursing facilities to compute the RN, LVN, and NA market nursing wage rates as well as the Medi-Cal SNF day concentration measure. The 1,052 distinct-part facilities were excluded from these latter variables because the information was not provided in the OSCAR data.

Table 13 also shows a couple of trends. First, there is a steady decline of distinct-part facilities from a high of 200 in 2002 to 149 in 2007. Second, there is an increase in the number of CLHFs from only 25 in 2002 to 40 by 2007. The increased CLHF numbers may be the result of AB 1629 because it also changed the reimbursement method for sub-acute care and increased the Medi-Cal rates.

The number of ALF beds and HHA unique patient visits around each nursing home, both using a 15 and 25 mile radius, are also used as competition measures.

Table 13

Facility Types Used for Nursing Home Bed Competition Measure

	2002	2003	2004	2005	2006	2007	Total
Distinct-Part Facilities	200	195	179	169	160	149	1,052
Residential Skilled Nursing Facility	147	151	149	146	146	143	882
Intermediate Care Facility (ICF)	18	20	18	19	18	17	110
Residential ICF	1	1	2	1	1	2	8
Congregate Living Health Facility (CLHF)	25	27	33	33	38	40	196
Free-standing Nursing Home	1,026	1,020	1,016	1,010	1,002	995	6,069
All Facilities	1,417	1,414	1,397	1,378	1,365	1,346	8,317

Table 14 shows an increasing trend for the number of ALFs during the study period. The number of ALFs increased from 5,506 in 2002 to 6,504 by 2007, but the average number of beds fell during this time period indicating the trend was increasingly more ALFs, but smaller in size. Also, the number of ALF beds is customarily set at a minimum of 6, but it may be as low as one (Mr. Blount, personal communications, February 9, 2011).

The same held true for HHAs, but it was much more pronounced, as illustrated in Table 15. The number of HHAs increased from 713 in 2002 to 997 by 2007; however, the average number of unique patient visits decreased. Some HHAs also lacked a single unique patient visit. This is because some HHAs are considered operating despite not having certification or serving patients (Mr. Uy, personal communications, Feb. 7, 2011).

Table 14

Assisted Living Facility (ALF) Descriptive Statistics by Year

Year	Number of ALFs	Mean Number of Beds	Standard Deviation	Minimum	Maximum
2002	5,506	24.40	56.83	1	783
2003	5,555	24.77	57.20	1	783
2004	5,603	24.77	59.18	1	1,233
2005	5,812	24.63	58.81	1	1,233
2006	6,073	23.98	58.65	1	1,233
2007	6,504	23.21	57.46	1	1,233

Table 15

Home Health Agency (HHA) Descriptive Statistics by Year

Year	Number of HHAs	Mean Number of Unique Visits	Standard Deviation	Minimum	Maximum
2002	713	733.36	1149.16	0	11,452
2003	837	649.37	1031.12	0	10,689
2004	834	629.95	989.08	0	10,053
2005	876	606.40	966.31	0	9,677
2006	895	609.40	963.45	0	9,699
2007	997	562.92	943.52	0	10,038

Descriptive Statistics

The means and standard deviations for the study variables, across the 567 panels and 6 study years, are displayed on Table 16. A cursory review shows there are some trends over the study period. First, adjusted LVN HPRD increased from .62 in 2002 to .73 by 2007 and adjusted total HPRD increased from 3.28 to 3.43. Second, the amount of slack (i.e. cash flow ratio) went from .06 in 2002 to .13 in 2007. Other trends include higher median per capita income, a higher percentage of the population over the age of 85, increased ALF bed and HHA unique patient visit competition, a higher Medi-Cal rate, and higher wages for RNs and LVNs. However, NA wages actually decreased over the study period in terms of real dollars and the unemployment rate in each nursing home's market decreased as well. Additionally, Table 16 lists the cutpoints for the variables broken down into quartiles for potential comparisons to future studies.

A correlation matrix was used to determine multicollinearity amongst the independent variables. Correlations above .90 are an indication of substantial multicollinearity that may need to be addressed (Hair, Black, Babin, Anderson, & Tatham, 2006). There were some highly correlated variables above .90 as illustrated in Table A2 located in the Appendix. Most of these entailed correlations between a variable with a 15 mile and 25 mile market radius. For instance, RN wages using a 15 mile radius was highly correlated with RN wages using a 25 mile radius ($r = .91$). This does not cause a problem because these variables will be in separate regressions. However, the ALF beds and HHA visits competition measures were highly correlated for both the 15 (.94) and 25 (.98) mile markets when examining the correlation of these variables in

Table 16

Nursing Home Descriptive Statistics 2002-2007

Variable Name/Cut Points for Quartiles if Applicable	2002 mean/(s/d)	2003 mean/(s/d)	2004 mean/(s/d)	2005 mean/(s/d)	2006 mean/(s/d)	2007 mean/(s/d)
Registered Nurse (RN) Hours per Resident Day (HPRD), case-mix adjusted.	0.27 (0.16)	0.26 (0.16)	0.26 (0.16)	0.26 (0.16)	0.27 (0.17)	0.27 (0.17)
Licensed Vocational Nurse (LVN), HPRD, case-mix adjusted.	0.62 (0.22)	0.63 (0.21)	0.65 (0.21)	0.67 (0.21)	0.69 (0.22)	0.73 (0.22)
Nurse Aide (NA) HPRD, case-mix adjusted.	2.39 (0.45)	237 (0.44)	2.40 (0.48)	2.39 (0.46)	2.43 (0.49)	2.43 (0.47)
Total Nurse HPRD, case-mix adjusted.	3.28 (0.58)	3.26 (0.55)	3.31 (0.60)	3.32 (0.57)	3.39 (0.61)	3.43 (0.59)
Acuity Index, 2002 base year.	1.00 (0.13)	1.01 (0.13)	1.01 (0.13)	1.01 (0.13)	1.02 (0.13)	1.02 (0.13)
Total Skilled Nursing and Intermediate Care Days *****	32.23 (14.47)	32.47 (14.56)	31.99 (15.11)	32.67 (14.92)	32.51 (14.65)	32.14 (14.42)
Beds/ (Quartile 1 = 65, Quartile 2 = 99, Quartile 3 = 120)	99.33 (44.62)	99.25 (44.61)	99.39 (44.62)	99.43 (45.21)	99.52 (45.38)	99.49 (45.25)
Slack	0.06 (0.47)	0.05 (0.48)	0.05 (0.42)	0.12 (0.34)	0.13 (0.49)	0.13 (0.50)

Table 16-continued

Variable Name/Cut Points for Quartiles if Applicable	2002 mean/(s/d)	2003 mean/(s/d)	2004 mean/(s/d)	2005 mean/(s/d)	2006 mean/(s/d)	2007 mean/(s/d)
Medi-Cal Revenue.	0.62 (0.20)	0.62 (0.20)	0.61 (0.20)	0.60 (0.20)	0.60 (0.20)	0.60 (0.21)
Dependence - 15 Mile Market (MM)/ (Quartile 1 = .31, Quartile 2 = .42, Quartile 3 = 53).	0.42 (0.15)	0.42 (0.15)	0.41 (0.15)	0.41 (0.15)	0.41 (0.15)	0.40 (0.15)
Dependence - 25 MM/ (Quartile 1 = .31, Quartile 2 = .42, Quartile 3 = .53).	0.42 (0.15)	0.42 (0.15)	0.41 (0.15)	0.41 (0.15)	0.40 (0.15)	0.40 (0.15)
Nursing Home Competition - 15 MM	0.07 (0.13)	0.07 (0.14)	0.07 (0.14)	0.07 (0.13)	0.07 (0.13)	0.07 (0.13)
Nursing Home Competition - 25 MM	0.04 (0.08)	0.04 (0.08)	0.04 (0.08)	0.04 (0.08)	0.04 (0.08)	0.04 (0.08)
Assisted Living Facility (ALF) Bed Competition - 15 MM**	.7326 (.5493)	.7381 (.5445)	.7573 (.5675)	.7594 (.5521)	.7713 (.5649)	.7957 (.5749)
AFL Bed Competition - 25 MM**	1.4961 (1.1333)	1.5124 (1.1253)	1.5390 (1.1512)	1.5626 (1.1490)	1.5981 (1.844)	1.6508 (1.2130)
Home Health Agency (HHA) Visit Competition - 15 MM**	3.4629 (3.1206)	3.6312 (3.2993)	3.4314 (3.0837)	3.5572 (3.2639)	3.6188 (3.2947)	3.8413 (3.5583)

Table 16-continued

Variable Name/Cut Points for Quartiles if Applicable	2002 mean/(s/d)	2003 mean/(s/d)	2004 mean/(s/d)	2005 mean/(s/d)	2006 mean/(s/d)	2007 mean/(s/d)
HHA Visit Competition - 25 MM**	6.6528 (5.8302)	7.0201 (6.1903)	6.6733 (5.8234)	6.8827 (6.0761)	7.0121 (6.1612)	7.4455 (6.7075)
MCAL Concentration - 15 MM	0.68 (0.08)	0.68 (0.07)	0.68 (0.07)	0.67 (0.07)	0.67 (0.07)	0.67 (0.07)
MCAL Concentration - 25 MM	0.67 (0.06)	0.68 (0.06)	0.67 (0.06)	0.67 (0.06)	0.67 (0.06)	0.67 (0.06)
Income,* ***	38.68 (8.55)	39.06 (83.53)	39.89 (88.34)	40.50 (93.81)	42.43 (10.18)	42.63 (10.36)
Population	1.32 (0.25)	1.35 (0.26)	1.39 (0.28)	1.43)0.28)	1.47 (0.28)	1.51 (0.28)
Medi-Cal Rate*	130.75 (10.47)	130.15 (10.89)	130.71 (11.92)	137.43 (12.04)	148.80 (18.15)	150.16 (20.05)
RN Wages - 15 MM*	31.39 (3.33)	31.95 (3.00)	32.59 (2.70)	33.24 (2.65)	33.46 (2.45)	33.60 (2.20)
RN Wages - 25 MM*	31.58 (3.06)	32.09 (2.70)	32.79 (2.31)	33.34 (2.17)	33.54 (2.17)	33.65 (1.86)
LVN Wages - 15 MM*	24.32 (3.34)	24.63 (3.08)	25.00 (2.91)	25.31 (3.01)	25.27 (2.91)	25.26 (2.88)

Table 16-continued

Variable Name/Cut Points for Quartiles if Applicable	2002 mean/(s/d)	2003 mean/(s/d)	2004 mean/(s/d)	2005 mean/(s/d)	2006 mean/(s/d)	2007 mean/(s/d)
LVN Wages - 25 MM*	24.38	24.66	25.04	25.34	25.28	25.23
	(3.18)	(2.90)	(2.74)	(2.83)	(2.69)	(2.62)
NA Wages - 15 MM*	12.16	12.06	11.87	11.79	11.85	11.93
	(1.86)	(1.72)	(1.65)	(1.61)	(1.62)	(1.65)
NA Wages - 25 MM*	12.21	12.11	11.92	11.83	11.88	11.96
	(1.80)	(1.65)	(1.58)	(1.52)	(1.51)	(1.51)
Unemployment rate	6.91	7.09	6.48	5.62	5.06	5.51
	(1.70)	(1.76)	(1.72)	(1.51)	(1.44)	(1.59)
N	567	567	567	567	567	567

*Variable converted to December 2007 real dollars; **Scaled by 10,000; ***Scaled by 1,000.

levels. It is anticipated that the correlation between these variables will be much less when examining them using first-differences. These variables will be included regardless because the empirical literature shows that they are important measures of competition. Additionally, high degrees of multicollinearity do not violate the first difference assumption of no perfect collinearity. The ramifications of including these two highly correlated variables are larger variances for their slope estimators making their statistical significance more difficult to discern. However, high multicollinearity between these two variables does not have a direct effect the variances for the other variables of interest (Wooldridge, 2002).

Multiple Regression Results

Simple OLS Interaction Models

The simple OLS interaction models were run using both a 15 and 25 mile radius to delineate nursing home markets and determine a nursing home's dependence on Medi-Cal revenue (resource importance × resource concentration). The purpose of these regressions was to provide a simple, yet straightforward, view of AB1629's impact on nurse staffing. Additionally, chain membership and post × chain membership variables were included in a couple other sets of regressions. These variables were included to investigate if nurse staffing was different in nursing homes that were part of a chain, versus those that were not, before and after AB 1629. Tables 17-20 show the results of these regressions broken down by nurse categories (i.e., RN, LVN, NA, and Total Nurse HPRD).

Table 17

Ordinary Least Squares Results for Registered Nurses (RNs)

Variables	RN 15 Mile Market (MM)	RN 25 MM	RN 15 MM With Chain	RN 25 MM With Chain
Post AB 1629	0.006	0.004	0.016	0.015
	(0.012)	(0.012)	(0.015)	(0.015)
Medi-Cal Dependence Quartile 1[a]	0.1388***	0.132***	0.137***	0.131***
	(0.011)	(0.011)	(0.011)	(0.011)
Medi-Cal Dependence Quartile 2	0.082***	0.087***	0.080***	0.085***
	(0.011)	(0.011)	(0.011)	(0.011)
Medi-Cal Dependence Quartile 3	0.034***	0.033***	0.033***	0.033***
	(0.011)	(0.011)	(0.011)	(0.011)
Post AB 1629 Medi-Cal Dependence Quartile 1[a]	0.012	0.017	0.013	0.018
	(0.017)	(0.017)	(0.017)	(0.017)
Post AB 1629 Medi-Cal Dependence Quartile 2	-0.002	-0.007	-0.001	-0.006
	(0.017)	(0.017)	(0.017)	(0.017)
Post AB 1629 Medi-Cal Dependence Quartile 3	-0.019	-0.013	-0.018	-0.013
	(0.017)	(0.017)	(0.017)	(0.017)
Chain Member	-	-	0.016*	0.016*
	-	-	(0.009)	(0.009)
Post AB 1629 Chain Member	-	-	-0.014	-0.014
	-	-	(0.014)	(0.014)
Constant	0.200***	0.201***	0.189***	0.189***
	(0.007)	(0.007)	(0.010)	(0.010)
Observations	2,835	2,835	2,835	2,835
R-squared	0.113	0.107	0.114	0.108

Standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.

[a]Quartile 1 represents the lowest Medi-Cal dependence quartile in the table.

Table 18

Ordinary Least Squares Results for Licensed Vocational Nurses (LVNs)

Variables	LVN 15 Mile Market (MM)	LVN 25 MM	LVN 15 MM With Chain	LVN 25 MM With Chain
Post AB 1629	0.046***	0.046***	0.056***	0.056***
	(0.016)	(0.016)	(0.021)	(0.021)
Medi-Cal Dependence Quartile 1[a]	0.033**	0.037**	0.032**	0.036**
	(0.015)	(0.015)	(0.015)	(0.015)
Medi-Cal Dependence Quartile 2	-0.048***	-0.058***	-0.050***	-0.060***
	(0.015)	(0.015)	(0.015)	(0.015)
Medi-Cal Dependence Quartile 3	-0.050***	-0.060***	-0.050***	-0.060***
	(0.015)	(0.015)	(0.015)	(0.015)
Post AB 1629 Medi-Cal Dependence Quartile 1[a]	0.043*	0.035	0.044*	0.035
	(0.023)	(0.023)	(0.023)	(0.023)
Post AB 1629 Medi-Cal Dependence Quartile 2	0.047**	0.051**	0.049**	0.052**
	(0.023)	(0.023)	(0.023)	(0.023)
Post AB 1629 Medi-Cal Dependence Quartile 3	0.041*	0.046**	0.041*	0.046*
	(0.023)	(0.023)	(0.023)	(0.023)
Chain Member	-	-	0.018	0.02
			(0.013)	(0.013)
Post AB 1629 Chain Member	-	-	-0.013	-0.014
			(0.019)	(0.019)
Constant	0.647***	0.651***	0.634***	0.636***
	(0.010)	(0.010)	(0.014)	(0.014)
Observations	2,835	2,835	2,835	2,835
R-squared	0.055	0.061	0.056	0.062

Standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.

[a]Quartile 1 represents the lowest Medi-Cal dependence quartile in the table.

Table 19

Ordinary Least Squares Results for Nurse Aides (NAs)

Variables	NA 15 Mile Market (MM)	NA 25 MM	NA 15 MM With Chain	NA 25 MM With Chain
	(0.034)	(0.034)	(0.044)	(0.044)
Medi-Cal Dependence Quartile 1[a]	-0.249*** (0.031)	0.046 (0.034)	-0.246*** (0.031)	-0.255*** (0.031)
Medi-Cal Dependence Quartile 2	-0.308*** (0.031)	-0.257*** (0.031)	-0.304*** (0.031)	-0.324*** (0.031)
Medi-Cal Dependence Quartile 3	-0.223*** -0.031	-0.329*** -0.031	-0.221*** -0.031	-0.243*** -0.031
Post AB 1629 Medi-Cal Dependence Quartile 1[a]	-0.02 (0.049)	0.008 (0.031)	-0.018 (0.049)	-0.016 (0.049)
Post AB 1629 Medi-Cal Dependence Quartile 2	-0.02 (0.049)	0.008 (0.049)	-0.018 (0.049)	-0.016 (0.049)
Post AB 1629 Medi-Cal Dependence Quartile 3	-0.008 (0.049)	-0.019 (0.049)	-0.002 (0.049)	0.016 (0.048)
Chain Member	-	-	-0.049* (0.026)	-0.048* (0.026)
Post AB 1629 Chain Member	-	-	-0.073* (0.040)	-0.070* (0.040)
Constant	2.582*** (0.022)	2.594*** (0.022)	2.618*** (0.029)	2.630*** (0.029)
Observations	2,835	2,835	2,835	2,835
R-squared	0.068	0.075	0.075	0.082

Standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.

Table 20

Ordinary Least Squares Results for Total Nurse Hours Per Resident Day

Variables	Total 15 Mile Market (MM)	Total 25 MM	Total 15 MM With Chain	Total 25 MM With Chain
Post AB 1629	0.106**	0.097**	0.175***	0.163***
	(0.044)	(0.044)	(0.057)	(0.057)
Medi-Cal Dependence Quartile 1[a]	-0.079**	-0.088**	-0.078**	-0.088**
	(0.040)	(0.039)	(0.040)	(0.039)
Medi-Cal Dependence Quartile 2	-0.274***	-0.301***	-0.273***	-0.300***
	(0.040)	(0.039)	(0.040)	(0.039)
Medi-Cal Dependence Quartile 3	-0.239***	-0.271***	-0.238***	-0.270***
	(0.040)	(0.039)	(0.040)	(0.039)
Post AB 1629 Medi-Cal Dependence Quartile 1[a]	0.047	0.06	0.049	0.062
	(0.063)	(0.062)	(0.063)	(0.062)
Post AB 1629 Medi-Cal Dependence Quartile 2	0.026	0.024	0.03	0.03
	(0.063)	(0.062)	(0.063)	(0.062)
Post AB 1629 Medi-Cal Dependence Quartile 3	0.014	0.041	0.021	0.048
	(0.063)	(0.062)	(0.063)	(0.062)
Chain Member	-	-	-0.015	-0.012
	-	-	(0.034)	(0.034)
Post AB 1629 Chain Member	-	-	-0.100*	-0.098*
			(0.051)	(0.051)
Constant	3.429***	3.446***	3.440***	3.455***
	(0.028)	(0.028)	(0.037)	(0.037)
Observations	2,835	2,835	2,835	2,835
R-squared	0.047	0.055	0.050	0.058

Standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.

[a]Quartile 1 represents the lowest Medi-Cal dependence quartile in the table.

A few of the RN regression results bear mentioning. First, there was a statistically significant difference between the first three Medi-Cal dependence quartiles and the highest Medi-Cal dependence quartile (pre-AB 1629) for all four regressions. Second, there may have been a "dose effect" present wherein RN staffing increased as each subsequent dependence quartile was compared to the highest dependence quartile. For instance, there were .138 more case-mix adjusted RN HPRD in the first quartile over the fourth quartile (pre-AB 1629) for the RN regression using a 15-mile market. The coefficients for the second and third quartiles where .082 and .034, respectively, thereby potentially showing an increase in adjusted RN HPRD as Medi-Cal dependence decreased. Third, RN staffing increased for the highest Medi-Cal dependence quartile between the pre and post AB 1629 periods, but the results were not statistically significant (i.e., POST coefficients). Fourth, chain membership displayed a marginally statistically significant difference pre AB 1629 indicating that nursing homes that were part of a chain had higher RN staffing before the legislation was passed.

The results for the LVN regressions again showed statistically significant differences between the first three Medi-Cal dependence quartiles and the highest Medi-Cal dependence quartile pre-AB 1629. Specifically, the lowest Medi-Cal dependence quartile had higher LVN staffing than the highest dependence quartile, but the second and third dependence quartiles had lower LVN staffing than the highest dependence quartile. Moreover, LVN staffing was significantly higher across all four regressions when comparing the fourth quartile's post AB 1629 period to the pre AB 1629 period. In the post AB 1629 period, estimates indicate that the first three Medi-Cal dependence

quartiles increased LVN staffing more than the highest Medi-Cal dependence quartile though estimates were not significantly different from zero at conventional levels in dependence quartile 1 in the specifications involving a 25 mile market. The staffing results for chain members in the pre and post periods were not statistically significant.

The NA regression results were different from the LVN results. There was statistically significant and lower NA staffing when the first three dependence quartiles were compared to the highest Medi-Cal dependence quartile pre-AB 1629 in 15 mile markets. Parallel results were found in 25 mile markets, but the estimate for the first Medi-Cal dependence quartile was positive but not statistically different from the highest dependence quartile. Moreover, the highest dependence quartile did not display statistically significant NA staffing increases between the pre and post-AB 1629 periods except in the specifications that included the chain member variables. The lowest Medi-Cal dependence quartile post AB 1629 showed statistically significant and lower NA staffing than the highest Medi-Cal dependence quartile in 25 mile markets. Additionally, chain members pre and post AB 1629 had less NA staffing than their non-chain counterparts.

The first three dependence quartiles of the total staffing regressions had less total nurse staffing than the fourth Medi-Cal dependence quartile pre-AB 1629. Total nurse staffing increased for the highest dependence quartile between the pre and post-AB 1629 time periods for all four regressions. The lower three post dependence quartiles had positive coefficients in relation to the highest dependence quartile, but the coefficients

were not statistically significant. Chain members had less total nurse staffing than nonchain members post AB 1629 with a marginal statistical difference.

In summary, there were statistically significant nurse staffing differences (i.e., RN, LVN, NA, and total nurse) between the first three Medi-Cal dependence quartiles and the fourth quartile pre-AB 1629 (except for NA staffing in the first Medi-Cal dependence quartile using 25 mile markets). There may have also been a dose effect present (not tested) for the coefficients in the RN staffing regressions pre-AB 1629 in both 15 and 25 mile markets. The highest Medi-Cal dependence quartile increased NA staffing more than the first dependence quartile in 25 mile markets post AB 1629. On the other hand, the highest Medi-Cal dependence quartile increased LVN staffing less the first three quartiles using both 15 and 25 mile markets (except for the first quartile using a 25 mile market). Chain membership was positively related to RN staffing pre AB 1629, but negatively related to NA and total nurse staffing post AB 1629. Finally, the highest dependence quartile had statistically significant increases in LVN and total nurse staffing between the pre and post AB 1629 periods.

First-Differenced Estimation Using Instrumental Variables

Tables 21 and 22, respectively, display the FD IV regressions using both 15 and 25 mile markets. Regarding the 15 mile market regressions, smaller nursing homes in general had higher LVN, NA, and total nurse HPRD when compared to the larger nursing homes pre AB 1629. For example, the third bed quartile in the LVN regression had .055 more LVN HPRD than the fourth bed quartile, the second bed quartile had .080 more LVN HPRD than the fourth bed quartile, and the lowest bed quartile had .112 more LVN

Table 21

Instrumental Variable First-Differenced Results Using 15 Mile Markets

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Medi-Cal Rate	0.006	-0.004	-0.004	-0.005
	(0.005)	(0.006)	(0.012)	(0.018)
Post AB 1629	-0.012	0.009	0.047	0.054
	(0.023)	(0.027)	(0.061)	(0.089)
Beds - Quartile (Q) 1	-0.036	0.112***	0.127	0.206
	(0.088)	(0.037)	(0.175)	(0.268)
Beds - Q2	0.023	0.080***	0.206***	0.306***
	(0.042)	(0.024)	(0.096)	(0.117)
Beds - Q3	0.032	0.055***	0.122	0.215***
	(0.043)	(0.017)	(0.082)	(0.100)
Post AB 1629 Beds-Q1	0.006	-0.014	0.029	0.024
	(0.015)	(0.018)	(0.040)	(0.054)
Post AB 1629 Beds-Q2	0.008	-0.025	-0.023	-0.046
	(0.013)	(0.017)	(0.043)	(0.059)
Post AB 1629 Beds-Q3	01010	-0.010	-0.004	-0.006
	(0.012)	(0.014)	(0.033)	(0.044)
Slack	-0.026**	-0.005	-0.071***	-0.101***
	(0.011)	(0.012)	(0.021)	(0.029)
Post AB 1629 Slack	0.002	0.009	0.054**	0.065**
	(0.014)	(0.013)	(0.024)	(0.030)
Post AB 1629 Dependence Q1[a]	-0.107	0.114	0.073	0.131
	(0.094)	(0.112)	(0.229)	(0.357)
Post AB 1629 Dependence Q2	-0.046	0.050	-0.008	0.018
	(0.038)	(0.045)	(0.096)	(0.145)

Table 21 - continued

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Post AB 1629	-0.024*	0.030*	-0.020	-0.011
Dependence Q3	(0.012)	(0.016)	(0.040)	(0.051)
Nursing Home	-0.067	0.162	0.422	0.689
Competition	(0.258)	(0.184)	(0.381)	(0.645)
Assisted Living	-0.045	0.100	0.065	0.088
Facility Bed Competition	(0.064)	(0.074)	(0.174)	(0.230)
Home Health Agency	0.002	0.015*	0.015	0.030
Competition	(0.007)	(0.008)	(0.022)	(0.029)
Median Per Capita	0.001	0.001	0.008	0.012
Income	(0.004)	(0.004)	(0.014)	(0.018)
Percent Population > 85	-0.038	-0.024	0.594*	0.552
	(0.121)	(0.147)	(0.351)	(0.462)
Registered Nurse (RN)	-0.004	-	-	0.003
Wages	(0.003)	-	-	(0.011)
Unemployment Rate	0.004	0.004	-0.015	-0.005
	(0.005)	(0.007)	(0.019)	(0.024)
Licensed Vocational	-	-0.009	-	-0.025
Nurse (LVN) Wages	-	(0.005)	-	(0.016)
Nurse Aides (NA) Wages	-	-	-0.058*	-0.064
			(0.033)	(0.040)
Constant	-0.004	0.023***	-0.027*	-0.008
	(0.004)	(0.006)	(0.015)	(0.019)
Observations	2,268	2,268	2,268	2,268

Robust standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.
[a]Q1 represents the lowest Medi-Cal dependence quartile in the table.

Table 22

Instrumental Variable First-Differenced Results Using 25 Mile Markets

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Medi-Cal Rate	0.009	-0.003	-0.004	0.001
	(0.007)	(0.007)	(0.012)	(0.020)
Post AB 1629	-0.028	0.005	0.046	0.022
	(0.032)	(0.032)	(0.069)	(0.101)
Beds - Quartile (Q) 1	-0.025	0.109***	0.118	0.196
	(0.083)	(0.040)	(0.178)	(0.267)
Beds - Q2	0.038	0.080***	0.204**	0.313**
	(0.043)	(0.028)	(0.098)	(0.127)
Beds - Q3	0.042	0.053***	0.118	0.209*
	(0.040)	(0.018)	(0.084)	(0.107)
Post AB 1629 Beds-Q1	0.006	-0.017	0.025	0.011
	(0.017)	(0.017)	(0.039)	(0.052)
Post AB 1629 Beds-Q2	0.014	-0.025	-0.024	-0.037
	(0.017)	(0.018)	(0.045)	(0.060)
Post AB 1629 Beds-Q3	0.017	-0.013	-0.005	-0.004
	(0.016)	(0.015)	(0.035)	(0.047)
Slack	-0.030**	-0.006	-0.070***	-0.106***
	(0.013)	(0.012)	(0.022)	(0.031)
Post AB 1629 Slack	0.004	0.009	0.053**	0.066**
	(0.016)	(0.013)	(0.024)	(0.031)
Post AB 1629 Dependence Q1[a]	-0.173	0.102	0.110	0.044
	(0.134)	(0.134)	(0.245)	(0.385)
Post AB 1629 Dependence Q2	-0.069	0.045	-0.020	-0.041
	(0.050)	(0.050)	(0.094)	(0.143)

Table 22 - continued

Variables	Resident Day	Resident Day	Resident Day	Total Nurse Resident Day
Post AB 1629	-0.027*	0.036**	0.006	0.015
Dependence Q3	(0.016)	(0.017)	(0.041)	(0.054)
Nursing Home	-0.010	0.766**	0.277	1.184
Competition	(0.784)	(0.370)	(1.265)	(1.726)
Assisted Living	-0.031	0.030	-0.096	-0.112
Facility Bed Competition	(0.051)	(0.060)	(0.128)	(0.173)
Home Health Agency	0.002	0.005	0.003	0.009
Competition	(0.005)	(0.006)	(0.014)	(0.019)
Median Per Capita	0.000	0.001	0.006	0.007
Income	(0.004)	(0.005)	(0.014)	(0.018)
Percent Population > 85	-0.076	-0.019	0.685*	0.623
	(0.147)	(0.163)	(0.365)	(0.485)
Registered Nurse (RN)	0.001	-	-	0.021
Wages	(0.004)	-	-	(0.016)
Unemployment Rate	0.003	0.004	-0.012	-0.006
	(0.006)	(0.008)	(0.021)	(0.028)
Licensed Vocational	-	-0.007	-	-0.038*
Nurse (LVN) Wages	-	(0.007)	-	(0.022)
Nurse Aides (NA) Wages	-	-	-0.062	-0.053
	-	-	(0.048)	(0.060)
Constant	-0.006	0.023***	-0.025	-0.011
	(0.005)	(0.006)	(0.016)	(0.021)
Observations	2,268	2,268	2,268	2,268

Robust standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.
[a]Q1 represents the lowest Medi-Cal dependence quartile in the table.

HPRD than the fourth bed quartile (all were statistically significant at the .01 level). Similar results held true for the NA (only the second bed quartile displayed a statistically significant difference from the fourth bed quartile) and the total nurse (second and third bed quartiles displayed statistically significant differences from the fourth bed quartile) staffing regressions. Increased slack (e.g., cash flow) was statistically significant and negatively related to RN, NA, and total nurse staffing pre AB 1629. However, slack was statistically significant and positively related to NA and total nurse staffing post AB 1629. The third Medi-Cal dependence quartile coefficient was statistically significant and negative in the RN regressions indicating that this quartile had a larger RN staffing decrease than the highest Medi-Cal dependence quartile post AB 1629. On the other hand, the third Medi-Cal dependence quartile was statistically significant and positive in the LVN regression indicating that this quartile had a higher LVN staffing increase than the highest Medi-Cal dependence quartile post AB 1629. Increased HHA competition and a higher percentage of the population over the age of 85 also resulted in higher LVN staffing with a marginal statistically significant differences. LVN and NA wages showed negative and marginal statistically significant differences in their respective regressions thereby illustrating that a higher wage rate was negatively related to each of these staffing categories. Finally, the constant for the LVN regression was statistically significant and positive indicating that the highest Medi-Cal dependence quartile showed LVN staffing increases during the pre-AB 1629 period. Conversely, the constant for the NA regression was marginally statistically significant and negative illustrating that the highest Medi-Cal dependence quartile showed NA staffing decreases during the pre AB 1629 period.

The 25-mile market regression results were similar to the 15-mile market results overall. Again smaller nursing homes in general had higher LVN, NA, and total nurse HPRD when compared to the larger nursing homes pre AB 1629. Coefficients for the three lowest bed quartiles pre AB 1629 were statistically significant and higher than the fourth bed quartile in the LVN regression. Similarly, the coefficients for the second bed quartile in the NA regression and the second and third bed quartiles in the total nurse staffing regression were statistically significant and higher than the fourth bed quartile. Slack resources in terms of cash flow were negatively related to RN, NA, and total nurse staffing pre AB 1629, but slack resources were positively related to NA and total nurse staffing post AB 1629. The third Medi-Cal dependence quartile was statistically significant and negative in the RN regression indicating that this quartile had a decrease in RN staffing larger than the decrease in staffing for the highest dependence quartile post AB 1629. On the other hand, the third Medi-Cal dependence quartile was statistically significant and positive in the LVN regression indicating that this quartile had a larger change relative to the increase for the highest dependence quartile post AB 1629. Decreased nursing home bed competition was statistically significant and positively related to additional LVN staffing. Similarly, a higher percentage of the population over age 85 was positively related to NA staffing with a marginal statistically significant difference. Higher LVN wages was also marginally statistically significant and negatively related to total nurse staffing. Finally, the constant for the LVN regression was statistically significant and positive indicating that the highest Medi-Cal dependence quartile showed staffing increases during the pre-AB 1629 period.

Sensitivity Analyses

The inclusion of the CHAIN_MEMBER variable in the first set of OLS regressions was a portion of this study's sensitivity analyses. It was proposed that chain membership may have affected nurse staffing. A review of tables 17-20 shows a slightly higher R^2 indicating more variation in the DVs was accounted for in the models that included chain membership. Chain membership pre AB 1629 was further associated with increased RN HPRD in both the 15 and 25 mile markets and decreased NA HPRD in 15 mile markets. Additionally, NA and total nurse staffing was statistically significant and lower for chain members post AB 1629. However, the DEPENDENCE, POST, and POST DEPENDENCE variables all had the same sign and statistical significance when the CHAIN_MEMBER variable was included versus when it was not.

The use of a 25 mile market was also a part of the sensitivity analyses. Grabowski and Stevenson (2008) used a 25 km (approximately 15.5 miles) radius around each nursing home in their national study of nursing home ownership conversions while Phibbs and Robinson (1993) used multiple measures including a 15 mile radius to determine hospital market structure. This study incorporated a 25 mile radius as part of a sensitivity analyses because a 15 mile radius may have been too small and the use of counties to delineate markets may have been too large. The OLS regression results for the 15 and 25 mile markets were nearly identical when the chain member variables were excluded. The coefficient values were about the same, the signs were in the same direction, and the statistical significance was the same except in two cases. First, the LVN regression had a marginal statistically significant and positive POST

DEPENDENCE coefficient for the first quartile using a 15 mile market, but not when a 25 mile market was used. Second, the NA regression had a statistically significant and negative POST DEPENDENCE variable for the first quartile using a 25 mile market, but not when a 15 mile market was used.

The FD results using IV estimation procedures were very similar using a 15 and 25 mile market. The only differences were in terms of LVN HHA competition, nursing home bed competition, LVN wages, NA wages, and the constant in the NA regression. Basically, the HHA competition, LVN wages (for the LVN regression), and NA wages showed marginal statistically significant differences in the 15 mile market, but not the 25 mile market. Conversely, nursing home bed competition and LVN wages (for the total nurse staffing regression) displayed marginal statistically significant differences in the 25 mile market, but not the 15 mile market.

The FD IV regressions were also performed using counties to define markets, located in Table 23 as part of the sensitivity analyses. The coefficients and statistical significance for the regressions using the county as the market were similar to those obtained using 15 and 25 mile markets. The biggest difference lies in the nursing home bed HHI. For instance, the county RN HHI was 1.569 (significant at .01 level) versus -0.067 (not significant) for the 15 mile market and .010 for the 25 mile market (not significant). Similar results were found in the total nurse hours regressions.

The final part of the sensitivity analyses entailed running the nurse staffing regressions using FDs, but without the lagged IV. These regression results are shown in Tables A3-A5 located in the Appendix. It is important to note that these estimates are biased

Table 23

First-Differenced Instrumental Variable Results Using County as Market

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Medi-Cal Rate	0.008	-0.003	-0.009	0.012
	(0.007)	(0.007)	(0.015)	(0.019)
Post AB 1629	-0.024	0.007	0.071	0.085
	(0.032)	(0.032)	(0.078)	(0.099)
Beds - Quartile (Q) 1	-0.028	0.112***	0.093	0.158
	(0.084)	(0.042)	(0.185)	(0.280)
Beds - Q2	0.033	0.086***	0.180*	0.274**
	(0.042)	(0.027)	(0.099)	(0.117)
Beds - Q3	0.045	0.052***	0.105	0.190*
	(0.040)	(0.018)	(0.085)	(0.104)
Post AB 1629 Beds-Q1	0.004	-0.016	0.028	0.022
	(0.017)	(0.018)	(0.042)	(0.056)
Post AB 1629 Beds-Q2	0.009	-0.021	-0.025	-0.044
	(0.015)	(0.016)	(0.044)	(0.057)
Post AB 1629 Beds-Q3	0.012	-0.009	-0.008	-0.011
	(0.014)	(0.014)	(0.035)	(0.046)
Slack	-0.028**	-0.006	-0.065***	-0.094***
	(0.012)	(0.012)	(0.022)	(0.029)
Post AB 1629 Slack	0.005	0.009	0.052**	0.064**
	(0.015)	(0.012)	(0.025)	(0.031)
Post AB 1629 Dependence Q1[a]	-0.149	0.082	0.187	0.277
	(0.131)	(0.133)	(0.299)	(0.362)
Post AB 1629 Dependence Q2	-0.072	0.044	-0.017	-0.052
	(0.051)	(0.052)	(0.120)	(0.143)

Table 23 - continued

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Post AB 1629	-0.012	0.031**	0.028	0.056
Dependence Q3	(0.014)	(0.015)	(0.040)	(0.048)
Nursing Home	1.569***	0.497**	1.250	3.281**
Competition	(0.455)	(0.230)	(1.033)	(1.286)
Assisted Living	-0.040	0.028	-0.155	-0.213
Facility Bed Competition	(0.102)	(0.119)	(0.270)	(0.336)
Home Health Agency	0.004	-0.003	0.019	0.022
Competition	(0.004)	(0.005)	(0.013)	(0.016)
Median Per Capita	0.001	0.000	0.009	0.012
Income	(0.004)	(0.004)	(0.014)	(0.018)
Percent Population > 85	-0.137	-0.005	0.845*	0.881
	(0.191)	(0.209)	(0.505)	(0.603)
Registered Nurse (RN)	0.002	-	-	0.000
Wages	(0.003)	-	-	(0.014)
Unemployment Rate	0.002	0.007	-0.003	-0.006
	(0.006)	(0.008)	(0.020)	(0.026)
Licensed Vocational	-	-0.006	-	-0.030
Nurse (LVN) Wages	-	(0.006)	-	(0.020)
Nurse Aides (NA) Wages	-	-	-0.058*	-0.046
	-	-	(0.035)	(0.045)
Constant	-0.004	0.027***	-0.008	-0.030
	(0.005)	(0.007)	(0.014)	(0.026)
Observations	2,268	2,268	2,268	2,268

Robust standard errors in parentheses, ***p < 0.01; **p < 0.05; *p < 0.1.
[a]Q1 represents the lowest Medi-Cal dependence quartile in the table.

and inconsistent because endogeneity is present based upon how Medi-Cal rates were constructed post AB-1629 (i.e., past staffing costs help in part determine future Medi-Cal rates). The results are simply presented as part of a sensitivity analyses. There were a couple of notable differences. First, RN wages were also negative and statistically significant using 15 mile markets whereas they were not statistically significant before. Second, ALF competition was positive and marginally statistically significant in the 15 mile markets without IVs whereas it was not statistically significant before. Again, these results are neither unbiased or consistent due to endogeneity.

Chapter Summary

This chapter described the sample derivation procedures, compared the California nursing home sample versus the California nursing home population across the dependent, independent, and control variables, and presented the descriptive statistics as well as the regression results. Sensitivity analyses using alternate market definitions (25 mile and county), chain membership, and FDs without IV estimation were presented.

Statistically significant differences between the population and sample were found across the variables indicating that the study should only be generalized to free-standing California nursing homes that were in continuous operation, without a CHOW between 2002-2007, that did not provide subacute care, and that treated Medi-Cal patients. The OLS results showed that LVN and total nurse HPRD increased for the highest Medi-Cal dependence quartile post-AB 1629. The FD IV regressions showed that facilities with fewer beds in general had less LVN, NA, and total nurse HPRD in the pre-AB 1629 period. Furthermore, HHA competition was related to higher LVN staffing

in 15 mile markets while LVN staffing was positive in the pre AB 1629 period. The alternate regressions used in the sensitivity analyses returned similar results to the FD IV results except for ALF competition and RN wage variables.

CHAPTER SIX: DISCUSSION

Introduction

This study's primary purpose was to examine AB 1629's effect on California nursing home staffing. More specifically, the study sought to determine if RN, LVN, NA, and total nurse staffing HPRD (adjusted for case-mix) increased in free-standing nursing homes following passage of the legislation. It was expected that nurse staffing would improve because Medi-Cal reimbursement rates generally increased after the legislation was passed. The new reimbursement rate was also based on each individual nursing home's lagged costs (18-24 months) which provided incentive to hire more nurse staff. This was especially true considering the LDOA which potentially rewarded facilities up to 8% more than employee labor costs, not to exceed 5% of the total Medi-Cal reimbursement rate. Thus, higher staffing cost in the present would generally lead to a higher Medi-Cal reimbursement rate in the future. However, this incentive may not have been great enough for some nursing homes given that each faced varying degrees of resource dependencies, environmental changes and pressures, and uncertainty.

A RDT conceptual framework was chosen to examine nurse staffing increases post AB 1629 because it effectively accounts for resource dependencies, environmental factors, and organizational characteristics. It also outlines potential responses to exogenous changes in the environment including organizational change strategies,

resource dependence avoidance, resource control avoidance, or even no change when organizations are not dependent on a particular resource for survival. The passage of AB 1629 certainly qualified as an exogenous event.

Four research questions were posed in this study based in part on AB 1629's legislative intent (i.e., increase nurse staffing) as well as organizational and environmental considerations framed by RDT:

1. Did California nursing home nurse staffing increase following the passage of AB 1629?

2. Did nursing homes with the highest levels of Medi-Cal dependence increase staffing more than those nursing homes with lower dependence?

3. What were the organizational characteristics and environmental factors associated with nurse staffing?

4. Did ALF and HHA competition effect nursing home staffing?

The first research question entails the basic policy impact of AB 1629, but it is not derived from the conceptual framework and therefore does not have a hypothesis. It was however anticipated that nurse staffing HPRD would increase post AB 1629 because that was the Assembly Bill's legislative intent. On the other hand, five hypotheses were built upon the last three research questions and the RDT derived conceptual model:

H1: Nursing homes with the highest Medi-Cal dependence increased nurse staffing relative to nursing homes with lower Medi-Cal dependence post AB 1629, other things constant.

H2: Smaller nursing homes increased nurse staffing relative to large

nursing homes post AB 1629, other things constant.

H3: Nursing homes with more slack resources, (e.g. higher cash flow) increased nurse staffing post AB 1629, other things constant.

H4: Nursing homes in more competitive markets had higher nurse staffing, other things constant.

H5: Nursing homes in markets with higher resource munificence (e.g. higher per capita income and greater percentage of population over 85) were positively associated with nurse staffing, other things constant.

The data for this study came from administrative sources with most of them being California state agencies. The COSHPD provided the bulk of the data (including HHA information), but the California Departments of Finance (population over age 85), Social Services (ALF), Health Care Services (Medi-Cal reimbursement rates), and Public Health (CHOW and closure listings) also contributed. Other data sources included the University of Southern California (geocoding), Brown University (distinct-part beds and case-mix), U.S. Bureau of Economic Analysis (median per capita income), and the U.S. Bureau of Labor Statistics (unemployment rates and CPI).

Summary and Interpretation of the Descriptive Analysis

Descriptive analyses of the nursing home study sample and excluded observations were conducted to ascertain if there were differences between them. This was initially done using two-group mean comparison tests (i.e., t-tests) for the year 2002. An additional analysis of the final sample and excluded nursing homes compared all study years (2002-2004 and 2006-2007) with the standard errors adjusted for the dependence of

the observations within facilities. The 2002 analysis and the 2002-2004 and 2006-2007 analysis returned very similar results except that the 2002 analysis did not find a statistically significant difference in terms of beds while the latter analysis did.

The final study sample generally had lower nurse staffing and more total SNF and ICF days than the excluded observations. Additionally, the final sample by and large had a higher ratio of cash flow to total assets (i.e., slack), a higher proportion of Medi-Cal revenue, and a higher Medi-Cal resource dependence. The remaining final sample differences involved a higher Medi-Cal concentration in 15-mile markets, a lower median per capita income, and lower RN wages in 15-mile markets than the excluded observations.

The dependent variable related differences between the final sample and excluded nursing homes were predictable. For instance, the final sample did not include CLHFs and sub-acute facilities that generally treat patients and residents with a higher acuity. A higher patient/resident acuity would ostensibly require both a more professional staff as well as more staff in general. Also, the final sample had a higher number of total skilled nursing and intermediate care days which was anticipated because this study specifically examined skilled nursing care whereas some of the excluded facilities may have focused on other care such as sub-acute or intermediate care.

In terms of the organizational characteristics, it was also expected that the final sample would have had a higher proportion of Medi-Cal revenue and greater Medi-Cal resource dependence (i.e., interaction term of Medi-Cal revenue and Medi-Cal SNF day concentration in each market) using both a 15 and 25 mile market radius. This was

anticipated since the excluded facilities such as MLRCs, CCRCs, and CLHF provided additional services that generate non-Medi-Cal revenue.

The Medi-Cal concentration (15 mile radius) difference is intuitive since the final sample included nursing homes that predominantly treated Medi-Cal patients while the excluded group also included nursing homes that focused on private pay patients (i.e., zero Medi-Cal SNF days). The 15 mile markets may have also picked up on urban versus rural area differences which were not explicitly studied (these would be "washed away" in the fixed effects models). If this were true, it would help explain why 15 mile markets showed significant differences, but 25 mile markets did not. It may been the case that 15 mile markets captured urban areas which typically have people with a lower socioeconomic status and therefore were more likely to have Medi-Cal as a payer. Conversely, the 25 mile markets may have captured more suburban and rural areas in which people may have had a higher socioeconomic status and less likelihood of having Medi-Cal as a payer. This is further supported in both analyses because the excluded group had a statistically significant and higher median per capita income when compared to the final sample.

RN wages was the only control variable that was significantly different when comparing the final sample (lower average RN wage) to the excluded group. The excluded group included facilities that served a higher patient/resident acuity; thus, RNs may have been paid more on average in these facilities to provide this more intensive care. Also, facilities in the excluded group may have had newer and better facilities or

provided a higher quality of care. This may have potentially lowered RN turnover resulting in a higher average wage (i.e., longevity raises) if true.

Summary and Interpretation of the Hypotheses Tested

The dependent variables (i.e., RN, LVN, NA, and total nurse staffing HPRD) used OLS to answer research question one, OLS and FD IV to answer research question two, and FD IV to answer research questions three and four. All of the estimation procedures used both a 15 and 25 mile radii to delineate markets. There were two main purposes for the OLS regressions. First, the OLS regressions were used to examine the first research question, if nurse staffing increased post AB-1629. In addition to using the fourth quartile as the omitted reference group, the OLS regressions were run (15 and 25 mile markets) using the other dependence quartiles (i.e., first, second, and third quartiles) as the reference group to ascertain if staffing increased post AB 1629 in each quartile. For instance, the POST variable for the RN OLS regression, using the first dependence quartile, would indicate if RN staffing changed for the first quartile after AB 1629. The specific coefficient values and standard errors for these latter OLS regressions are not presented herein, but are available upon request. Second, these regressions were used as a straightforward method to see if nursing homes with the highest levels of Medi-Cal dependence increased nurse staffing more than those nursing homes with lower dependence post AB 1629. Thus, the results displayed in Tables 17-20 helped address the second research question and the first hypothesis.

The FD IV regressions were performed to test the RDT developed hypotheses. The results of these tests (Tables 21 and 22) address the five hypotheses, but also the last

three research questions. The FD IV regressions were a more comprehensive statistical analysis which accounted for endogeneity in the Medi-Cal reimbursement rate as well as facility-specific constants (e.g., ownership). Clustering by nursing home in these regressions also overcame heteroskedasticity and serial correlated errors. Hence, these results provided consistent parameter estimates.

First Research Question: Post AB 1629 Nurse Staffing

The first research question entailed an examination of nurse staffing after the AB 1629 legislation was passed. A hypothesis was not specified for this research question, but it was expected that nurse staffing would increase because the new reimbursement methodology was facility-specific, cost-based and the reimbursement rate was higher for the most part. Table 24 illustrates the OLS results and includes the coefficient sign and statistical significance using each of the dependence quartiles as the reference group.

The results show that RN HPRD only had a marginal statistically significant increase in the first Medi-Cal dependence quartile using a 25 mile market. There are also a couple of reasons why RN staffing may not have increased in the other Medi-Cal dependence quartiles. First, RNs are expensive as shown by the hourly wages in Tables 12 and A1. Thus, AB 1629's Medi-Cal reimbursement rate increase may not have been enough to spur most nursing homes to hire more RN staff. Second, there was uncertainty surrounding the legislation given that it originally had a 2008 sunset date. This meant that nursing homes had to make the initial investment to hire RNs, they would not see the returns until 18-24 months later given the lagged costs used to compute the rates, and there was no guarantee that a nursing home's investment in RN staffing would keep

Table 24

Ordinary Least Squares Results With Different Reference Group Quartiles

Dependent Variable	Reference Quartile	15 Mile Market Coefficient Sign/ Statistical Significance**	25 Mile Market Coefficient Sign/ Statistical Significance**
Registered Nurse (RN) Hours Per Resident Day (HPRD)*	Quartile 1	Positive, Not Significant (NS)	Positive Marginal Significance (MS)
RN HPRD*	Quartile 2	Positive, NS	Negative, NS
RN HPRD*	Quartile 3	Negative, NS	Negative, NS
RN HPRD	Quartile 4	Positive, NS	Positive, NS
Licensed Vocational Nurse (LVN) HPRD*	Quartile 1	Positive, Statistically Significant (SS)	Positive, SS
LVN HPRD*	Quartile 2	Positive, SS	Positive, SS
LVN HPRD*	Quartile 3	Positive, SS	Positive, SS
LVN HPRD	Quartile 4	Positive, SS	Positive, SS
Nurse Aide (NA) HPRD*	Quartile 1	Positive, NS	Positive, NS
NA HPRD*	Quartile 2	Positive, NS	Positive, NS
NA HPRD*	Quartile 3	Positive, NS	Positive, NS
NA HPRD	Quartile 4	Positive, NS	Positive, NS
Total Nurse HPRD*	Quartile 1	Positive, SS	Positive, SS
Total Nurse HPRD*	Quartile 2	Positive, SS	Positive, SS
Total Nurse HPRD*	Quartile 3	Positive, SS	Positive, SS
Total Nurse HPRD	Quartile 4	Positive, MS	Positive, MS

Note. *Coefficients and standard errors not presented, but available upon request. ** Statistical significance is a p value < .05 or lower and marginal statistical significance is a p value > .05 and < .10.

paying off given that the legislation and higher associated Medi-Cal rates could end in 2008. Third, a country- wide shortage of RNs and the notion that nursing homes are generally not the preferred work place for RNs also needs to be considered. All of these may have contributed to a lack of statistically significant RN staffing increases post AB 1629.

LVN staffing increased in the post AB 1629 period across all of the dependence quartiles. This partially affirms that nurse staffing increased post AB 1629. A nursing home's decision to increase LVN staffing over RN staffing is understandable for a few reasons. First, LVNs are less expensive than RNs as shown in Tables 12 and A1. Thus, nursing homes may have been more willing to take advantage of the more generous Medi-Cal reimbursement rate and make the investment in LVNs despite the risk involved in AB 1629's sunset date. Second, more LVNs may have also been available, and therefore easier to recruit, due to a shorter training pipeline than RNs. Third, LVNs may have been preferred to RNs because the average nursing home's patient acuity in the sample did not warrant more RNs. Fourth, it would have behooved nursing homes to hire more professional staff and get reimbursed for associated Medi-Cal labor costs, assuming they stay under their peer group's labor percentile. This was because up to 100% of the costs could potentially be reimbursed. Furthermore, the LDOA would enable them to receive an additional 8% above and beyond these costs. This may have been very appealing to some nursing homes.

Nursing homes did not increase NA staffing post AB 1629 and this may have occurred for a couple of reasons. First, they are the least skilled direct care provider.

Thus, nursing homes wishing to treat higher acuity patients or provide a higher level of quality of care needed to hire more RNs and LVNs. Second, NAs already were the dominant nurse staffing category pre AB 1629 so other nurse categories (e.g., RNs and LVNs) were more than likely needed. Case in point, NAs make up the bulk of these hours as witnessed by the constants in the OLS regressions (Tables 17-20).

Nursing homes increased total nurse HPRD overall in the post AB 1629 period thereby providing the strongest support yet that nurse staffing increased post AB 1629 because total nurse staffing encompasses RN, LVN, and NA staffing. Moreover, the driving force behind the total nurse staffing increase appeared to be LVN staffing. However, the highest Medi-Cal dependence quartile also appeared to increase NA staffing although it was not statistically significant due to it being measured with poor precision.

In summary, there was statistically significant support that LVN and total nurse staffing increased post AB 1629 thereby answering research question one. The LVN and total nurse staffing HPRD increased across all four Medi-Cal dependence quartiles. Additionally, RN staffing for the first quartile showed a marginal statistically significant increase post AB 1629 in 25 mile markets.

Research Question Two: Nurse Staffing and High Medi-Cal Dependence

The second research question involved an examination of nurse staffing in nursing homes which had the highest Medi-Cal dependence. Hypothesis one predicted that nursing homes in the highest Medi-Cal dependence quartile increased nurse staffing more than nursing homes with the lowest Medi-Cal dependence since they gained the

most from the new reimbursement methodology. The OLS results in Tables 17-20 show that positive coefficients for the POST variable indicating that the highest Medi-Cal dependence quartile increased RN, LVN, NA and total nurse staffing post AB 1629, but the RN and NA results were not statistically significant. The FD IV results failed to provide any statistically significant nurse staffing increased for the highest Medi-Cal dependence quartile post AB 1629.

There was marginal statistically significant evidence that the highest Medi-Cal dependence quartile increased NA staffing relative to the lowest Medi-Cal dependence quartile post AB 1629. There was not any statistically significant evidence that the highest Medi-Cal dependence quartile increased RN and total nurse staffing relative to the lower Medi-Cal dependence quartiles post AB 1629. Unexpectedly, the lowest three Medi-Cal dependence quartile coefficients (15 mile markets) and second and third Medi-Cal dependence quartile coefficients (25 mile markets) for the LVN regressions were positive and at least marginally significant. This indicates that nursing homes with lower Medi-Cal dependence increased LVN staffing more than facilities with the highest Medi-Cal dependence.

Two additional results pertaining to hypothesis one bear mentioning. First, the third POST DEPENDENCE quartile in the RN FD IV regression was negative and had a marginal statistically significant difference indicating that RN staffing for nursing homes in this quartile fell even further than nursing homes with the highest Medi-Cal dependence. Second, the third POST DEPENDENCE quartile in the LVN FD IV regression was positive with a marginal statistically significant difference. This indicates

that LVN staffing for nursing homes in this quartile increased even more than nursing homes with the highest Medi-Cal dependence.

In review, support for hypothesis one is mixed. The OLS regressions provide support that LVN and total nurse staffing HPRD increased in nursing homes with the highest Medi-Cal dependence post AB 1629. The FD IV regressions failed to substantiate these OLS results. Additionally, LVN HPRD increased in nursing homes with lower Medi-Cal dependence post AB 1629 relative to nursing homes with the highest level of Medi-Cal dependence.

Research Question Three: Organizational Characteristics and Environmental Factors

The third research question comprised an assessment of organizational characteristics and environmental factors, using a RDT conceptual framework, related to nurse staffing in nursing homes. Hypothesis two predicted that nursing homes with smaller beds would increase nurse staffing relative to larger bedded facilities, but this was not supported. Hypothesis three expected that nursing homes with more slack resources post AB 1629 would increase nurse staffing. This hypothesis was supported for the NA and total nurse staffing regressions. The fourth hypothesis that pertained to this research question predicted that higher nursing home bed competition would lead to increased nurse staffing. There was not any statistically significant support for this hypothesis. On the contrary, the opposite was found for the LVN regression using a 25 mile market. The fifth hypothesis expected increased nurse staffing in more munificent markets (e.g., higher per capita income and greater % of the population over age 85). There was some support for this in the NA staffing regressions using both a 15 and 25 mile market.

Hypothesis two stated that smaller facilities (in terms of beds) would increase nurse staffing more in relation to larger facilities. This hypothesis was not supported, but there were some interesting results nonetheless involving the bed quartiles pre AB 1629. Specifically, the LVN regression first, second, and third BED quartiles pre-AB 1629 were positive and statistically significant thereby indicating that LVN staffing was higher in smaller facilities before AB 1629. Similarly, the NA (second quartile) and total nurse staffing (second and third quartiles) coefficients for the pre AB 1629 period were positive and had at least a marginal statistical significance. This also indicated that NA and total nurse staffing was higher in smaller facilities before AB 1629.

Hypothesis three concerning higher cash flow (i.e., slack resources) and higher nurse staffing was supported in the NA and total nurse staffing regressions as the coefficients were positive and statistically significant. This is an encouraging result because it means that nursing homes with slack resources were investing in more NA staffing and more total nurse staffing overall. The coefficients for RN and LVN were also positive, but not statistically significant.

Hypothesis four concerning nursing home bed competition was not supported. In contrast, a lower concentration of nursing homes in 25 mile markets resulted in more LVN staffing which was unexpected. Furthermore, this result was amplified when counties were used as markets. For instance, the coefficients for RN HPRD was 1.569 and total nurse staffing was 3.281 both statistically significant when counties were used as the market. This statistically significant result using counties as markets lends some

support to the cited problems of using these large geographical areas to delineate nursing home markets.

Hypothesis five, which entailed median per capita income and percentage of the population over 85 being positively related to nurse staffing, had some statistical support in the NA regressions. Specifically, a higher percentage of the population over age 85 in the market resulted in increased NA staffing. The coefficient for the total nurse staffing was also about the same, but it was not statistically significant. The median per capita income coefficients were positive for all the regressions as expected, but they were not statistically significant.

In summary, the FD IV regressions provided some evidence supporting research question number three and hypotheses three and five. However, there was not statistical evidence that smaller nursing homes (in terms of beds) increased nurse staffing post AB 1629 or that facilities with more nursing home bed competition increased staffing. There was statistically significant support though that nursing homes with slack resources post AB 1629 increased NA and total nurse staffing. Additionally, NA staffing was higher in markets with a higher percentage of the population over the age of 85.

Research Question Four: Assisted Living Facility and Home Health Agency Competition

The final hypothesis for the fourth and final research question postulated that increased ALF and HHA competition would result in more nursing home nurse staffing. Only the FD IV LVN regression using a 15 mile market provided marginal statistically significant support for this hypothesis. In essence, for every 10,000 HHA unique patient

visits, LVN HPRD increased by .015 in 15 mile markets. Thus, there is mixed support for hypothesis number four.

Summary of the Findings

The OLS regression results illustrated that LVN and total nurse staffing increased in nursing homes with the highest Medi-Cal dependence post AB 1629. However, nursing homes with the highest Medi-Cal dependence only increased NA HPRD more than facilities with lower Medi-Cal dependence in 25 mile markets. Unexpectedly, LVN regression results showed that nursing homes with lower Medi-Cal dependence increased LVN staffing more than nursing homes with the highest Medi-Cal dependence (except for the lowest Medi-Cal dependence quartile in 25 mile markets).

The FD IV analyses also did not support the hypothesis that smaller facilities would increase nurse staffing more than larger one post AB 1629. The rationale behind this was that smaller facilities more than likely had lower nurse staffing HPRD when compared to larger ones. However, this did not turn out to be the case as the lower bed quartiles, in general pre AB 1629, had more nurse staffing than the highest bed quartile. Regardless, bed size post AB 1629 size did not matter in terms of nurse staffing increases.

It was also expected that a higher ratio of net income and depreciation to total assets (i.e., slack) would be related to higher nurse HRPD post AB 1629. This turned out to be true for the NA and total nurse staffing regressions. Thus, it appears that nursing homes with slack resources post AB 1629 concentrated on NA staffing which would have also helped increase total nurse staffing.

Resource munificence was also anticipated to be positively related to increased nurse staffing. There was some statistical evidence to support this hypothesis. Specifically, NA staffing was found to be higher in markets with a higher percentage of the population over the age of 85.

Competition was also expected to be related to increased nursing home nurse staffing HPRD. Only the LVN HPRD using 15 mile markets supported this hypothesis that higher HHA competition resulted in higher nursing home LVN HPRD. A lack of results here may have been due to different types of competition that each nursing home faced. Nursing homes faced competition for patients that may have required additional staff to differentiate their services. On the other hand, nursing homes also faced competition for nursing staff, particularly RNs which were in a short supply nationally. It may have very well been the case that nursing homes were unable to attract professional nurse staffing, despite well intentioned efforts, because of competition from other health care providers such as hospitals, ALFs, and HHAs. This is especially true considering that California has minimum nurse staffing requirements for hospitals (Dr. McCue, personal communications, April 1, 2011) which would obviously shrink the available pool of RNs.

Implication for Theory – Based Research

The findings support a couple of the resource dependence theory (RDT) framed hypotheses. A lack of more statistically significant results may be due to the design of AB 1629. In some cases, the increased resources may have been distributed to shareholders or retained rather than used to increase nurse staffing. Another potential

explanation is that nurse staffing changes were not detected because only two years of data post AB 1629 were studied. There was an 18-24 month lag used to compute the new reimbursement rates meaning that increased nurse staffing in 2005, in response to AB 1629, would not show up in higher Medi-Cal reimbursement rates until at least 2007. Hence, this study that only runs through 2007 may only have touched upon the start of increased nurse staffing in California nursing homes. Moreover, there was a sunset date for the reimbursement methodology which caused some uncertainty as to whether past investments in nurse staffing would continue to lead to higher Medi-Cal reimbursement rates in the future.

The use of the resource dependence interaction term (resource concentration × resource importance) was noteworthy. Frequently researchers have used only resource concentration or resource importance in isolation to represent the resource dependence construct. However, Pfeffer and Salancik (1978) stated that it was the interaction of resource concentration and resource importance that determined resource dependence. Using one of these in isolation to represent resource dependence did not present the entire picture of an organization's characteristics and environmental factors. The use of Medi-Cal dependence provided statistically significant results for LVN and total nurse staffing post AB 1629 when using OLS. However, the FD IV regressions in general were not statistically significant perhaps due to the two reasons outlined in the previous paragraph.

Implication for Methodology

A key consideration in RDT is the competition for scarce resources. Thus, the use of alternative markets was also an important contribution of this study. Nursing home

studies overwhelmingly use counties to delineate nursing home markets and therefore competitors. Much of this is due to a lack of data, particularly for national nursing home studies. This study's results show the problem with this approach particularly when one examines the nursing home competition results in Tables 21-23. For example, RN staffing was negative and statistically insignificant in the 15 and 25 mile markets; however, it has positive and showed great statistical significance ($p < .01$) using counties as the market. This is because counties overstate competition. The 15 and 25 mile markets may have more closely resembled the markets that each nursing home operated in during this study period.

Defining competitors is equally important as defining the markets in which they compete and operate. ALF and HHA competitors are predominantly excluded as competitors in nursing home studies because the data is generally not available particularly for national studies. This study was able to contribute to the empirical literature by including ALFs and HHAs as competitors. LVN staffing increased in response to greater HHA competition using 15 mile markets. The remaining ALF and HHA results were not statistically significant, but this may be due to using fixed 15 and 25 mile market radii. The use of fixed radii is an improvement over using counties to delineate markets, but surely not every facility operates solely in either a 15 or 25 mile market. For instance, rural nursing homes may have a larger geographical market while urban ones may have a smaller one. An examination of variable market radii based on patient origin at time of admission would be a more precise measure of market competition.

A lack of more statistically significant results in this study may be related to the data and analytical procedures used. Only two years of post AB 1629 data were available for this study. This is because the case-mix data necessary to for 2008 remains unavailable (last checked on April 10, 2011) on the Brown University Long-Term Care Focus website. The use of the FD IV regressions may not have been able to pick up staffing changes in this short amount of time.

The use of the 2005 data to compute first differences could be improved upon in two ways. First, find a strictly exogenous instrument and apply the within-transformation. This would subtract out the average value of the panel making the use of 2005 data unnecessary in the analysis. The difficulty was finding a strictly exogenous instrument that was related to the Medi-Cal rate, but not the nurse staffing dependent variables. One was not found, but perhaps such an instrument is out there. Another option would be to use forward orthogonal deviations to transform and then subtract out the average of all available future observations.

The OLS regressions also did not explain much of the variation in the dependent variables; however, the intent was never to explain this variation. Rather, the OLS regressions were meant to give a straightforward answer as to whether nursing homes with higher Medi-Cal dependence increased nurse staffing post AB 1629. This proved to be the case for the LVN and total nurse staffing regressions. There are many other variables that help explain this variation such as ownership type, chain membership, use of a management company, and geographical location (i.e., rural versus urban).

However, these are all "constant" variables or fixed effects for the most part and could not be included in the IV FD regressions.

Implications for Policymakers and Legislators

The study provides some evidence in the OLS regressions that California nursing homes increased LVN and total nurse staffing post AB 1629. This is an important contribution because studies of Medicaid prospective payment based on facility-specific costs and its relationship with nursing home nurse staffing are rare. This is mainly because only two other states had employed a Medicaid prospective payment method based on facility-specific costs before California passed AB 1629 (Harrington, et al., 2008).

This study's results are contrary to some of the findings in the Harrington et al. (2008) and Schnelle et al. (2007) AB 1629 reports. For instance, the Harrington et al. (2008) report found that RN HPRD had increased by 1.5% between 2004 and 2006 while the Schnelle et al. (2007) report found that CNA staffing had decreased from 2001-2006. However, there were similarities between this study's results and the two aforementioned reports. Most notably Harrington et al. (2008) found that total nurse staffing HRPD increased between 2004 and 2006 and Schnelle et al. (2007) found that licensed nurse staffing increased, of which LVNs are a major part. This study's results also confirmed Feng et al. (2008) national panel study of nursing homes that found that higher state Medicaid rates were positively associated with LPN and total nurse HPRD.

It must be noted that this study's OLS results showing LVN and total nurse staffing HPRD increases is not particularly strong evidence. This is especially the case

since the more robust IV FD regressions did not support these nurse staffing increases. It may be that AB 1629 did not increase staffing as intended due to multiple reasons.

First, the sunset date was originally 2008 leaving nursing homes with uncertainty as to whether the higher reimbursement rates would continue. It is expensive to hire and train additional staff only to have to potentially release them later because the new reimbursement methodology would be halted. This may have quelled some of the nurse staffing hiring. It may be best to stop the practice of establishing sunset dates for this legislation. This would reduce uncertainty and give nursing homes more confidence to make the investment in additional nurse staffing.

Second, the reimbursement rates were based on cost reports that were 18-24 months old. Therefore, it would take nursing homes this long before they saw any returns on their nurse staffing increases. This time period may have been too long especially considering the uncertainty outlined above. It may behoove policymakers to use more recent cost data if possible. This would enable nursing homes to see a return on their staffing investments much quicker thereby potentially prodding them to invest in more nurse staffing.

The LDOA was designed as an incentive to reward nursing homes for hiring additional staff (excluding contract and temporary agency) above and beyond their costs. Nursing homes could earn up to 8% more than these costs, but the LDOA component could not exceed 5% of the total reimbursement rate. These caps may have been too prohibitive and complicated for nursing homes to hire additional nursing staff. One

potential solution is to consider retaining the 8% of costs cap, but remove the 5% cap on the total reimbursement rate. This may provide more incentive for nursing homes to hire more nursing staff.

Nursing homes with the highest Medi-Cal dependence increased their total nurse HPRD to approximately 3.5 HPRD (case-mix adjusted) which exceeded state's minimum nursing home nurse staffing requirement. Therefore, it appears that nursing homes highly dependent on Medi-Cal took advantage of the more generous rates to increase nurse staffing above and beyond the state's minimum staffing requirements. It further appears that they did this predominantly by hiring more LVN staff. These nursing homes may not have previously been able to hire additional and more expensive profession nurse staff considering that California was in the bottom 10% of Medicaid (Medi-Cal) nursing home reimbursement rates prior to the implementation of the AB 1629 (California Health Policy and Data Advisory Committee, 2005). It may also be the case that more specific staffing goals needed to be established with the reimbursement rates tied to attainment. For instance, maybe it is more desirable to hire RNs instead of LVNs meaning that future Medi-Cal rates could potentially be tied to also having the appropriate nurse staffing mix.

Limitations of the Study

There were some important limitations in this study that need to be recognized. First, this was a single state study thereby limiting generalizability to California. The results are also only generalizable to the nursing homes that did not: provide sub-acute care or care for the mentally or developmentally disabled; have a study year without COSHPD data; change license type from/to a skilled nursing license; have missing case-

mix information for any given year; fail to provide skilled nursing care to Medi-Cal patients; have missing Medi-Cal revenue or Medi-Cal rates for any given study year; or changed ownership or closed between 2002-2007. The final sample was also different from the nursing home population in terms of nurse staffing, Medi-Cal days, case-mix, slack, Medi-Cal dependence, and median per capita income. Second, only 2 years of data were available post AB 1629 meaning that enough time may not have elapsed to observe positive staffing increases. Third, gross Medi-Cal revenue was used to compute the resource importance variable instead of net Medi-Cal revenue. Fourth, the COSHPD data did not segregate skilled nursing care and intermediate care nursing hours. Fifth, there was not a true comparison group in this study because the lowest dependence quartile had exposure to AB 1629. Facilities without exposure to AB 1629 were not included in the lowest dependence quartile because their case-mix variable was not available.

Suggestions for Future Research

An obvious extension to this study is to incorporate more post AB 1629 data and potentially use forward orthogonal deviations instead of FD. Additional data years may provide more opportunity to discern nurse staffing changes in response to AB 1629. The forward orthogonal deviations procedure may also be an improvement versus this study's reliance on FD using the 2005 data.

AB 1629 had many other goals besides increasing SNF nurse staffing. More specifically, the legislative intent was meant to effectively ensure individual access to appropriate long-term care services, promote quality care, support provider compliance with all applicable state and federal requirements, and encourage administrative

efficiency. Each of these presents an opportunity to see if AB 1629 was positively related to any of these goals. For instance, one study could examine if access for Medi-Cal residents improved post AB 1629 due to higher Medi-Cal rates. Another potential study could investigate if any of the NHC quality measures changed post AB 1629. A different study could probe if OSCAR nursing home deficiencies decreased after AB 1629. All of these are potential studies could test whether a portion of AB 1629's legislative intent was met. AB 1629 also increased the reimbursement rate for sub-acute care facilities. Therefore, staffing and quality studies examining subacute facilities is another potential research avenue.

Examining nursing home competition using a variable radius, instead of a fixed radius, for market competition is also intriguing. This type of research has been conducted in the hospital empirical literature, but has yet to be studied in the nursing home literature. There is opportunity here since the MDS lists the zip code of the nursing home resident immediately before admission. This data could be used to determine each nursing home's individual market with competition measures calculated accordingly. Research on what administrators and patients consider as their markets would be important as well.

A study pertaining to staffing mix may also shed light on staffing changes spurred by AB 1629. Perhaps nursing homes changed their professional staff mix or staff mix in general in response to AB 1629. For instance, nursing homes may have decided to hire more LVNs, but less NAs in an attempt to increase the quality of care. This topic would make an interesting follow-up study.

Surprisingly, there were over 313 CHOWs and 30 nursing home closures during the study period. Future studies could examine these facilities in terms of quality of care and access provided to Medi-Cal residents before and after a nursing home was sold or closed. It would also be appealing to examine the CHOW trend to see if AB 1629 decreased these CHOWs and closures.

Conclusion

AB 1629 was an ambitious piece of legislature. It sought to improve nurse staffing as a means of improving the quality of care among other honorable pursuits. The first research question sought answers to whether or not nursing home nurse staffing improved post AB 1629. In general, LVN and total nurse staffing HPRD increased post AB 1629 as shown by the OLS regressions using different Medi-Cal quartiles as the reference group.

The second research question specifically pertained to the highest Medi-Cal dependence nursing homes. It was hypothesized that these nursing homes would increase nurse staffing because the legislation benefited them the most. The results showed a glimmer of evidence that nursing homes with the highest Medi-Cal dependence increased LVN, NA, and total nurse staffing post AB 1629 thereby answering the second research question and first hypothesis. However, since the support was provided by OLS regression models, it is not particularly strong as the IV FD results failed to offer statistically significant support for this question.

The third research question entailed an examination of organizational characteristics and environmental factors that were thought to be related to nurse staffing.

The second hypothesis which postulated that smaller bedded nursing homes would increase nurse staffing greater than larger facilities post AB 1629 was not supported. The third hypothesis, which speculated that increased slack resources would be positively related to nurse staffing post AB 1629, was substantiated for NA and total nurse staffing. The fourth hypothesis which involved nursing home bed competition was not supported, but the fifth hypothesis illustrated that higher resource munificence in terms of a higher percentage of the population over the age of 85 was related to more NA staffing.

The final research question involved ALF and HHA competition expecting it to be positively related to increased nurse staffing. Increased HHA competition was positively related to greater LVN HPRD in 15 mile markets thereby showing some support for hypothesis four. However, ALF and HHA competition was not statistically significant for the remaining regressions.

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APPENDIX A

CORRELATION AND REGRESSION TABLES FOR SENSITIVITY ANALYSES

Table A1

Variable Comparison of Final Sample and Excluded Facilities, 2002-2004, 2006-2007

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Registered Nurse hours per Resident Day HPRD, case-mix adjusted.	2,835	0.27	0.16	1,935	0.32	0.30	3.68	.0002
Licensed Vocational Nurse HRPD, case-mix adjusted.	2,835	0.74	0.22	1,935	0.73	0.70	2.32	0.0204
Nurse Aide HPRD, case-mix adjusted.	2,835	2.41	0.47	1,935	2.49	2.02	0.91	0.3603
Total Nurse HPRD, case-mix adjusted.	2,835	3.33	0.59	1,935	3.54	2.80	1.70	.0893
Acuity Index, 2002 base year.	2,835	1.01	0.17	2,121	1.05	0.33	-0.61	0.541
Total skilled nursing and intermediate care days.*	2,835	32.27	14.63	2,180	29.05	17.35	-3.24	0.0012

Table A1 - continued

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
Beds	2,835	99.40	44.87	2,224	104.63	52.10	1.72	0.0859
Slack	2,835	0.08	0.47	2,171	-0.06	1.51	-3.53	0.0004
Medi-Cal Revenue	2,835	0.61	0.20	2,175	0.46	0.27	-10.24	1.61800E-23
Dependence - 15 Mile Market (MM)	2,835	0.41	0.15	2,175	0.31	0.19	-10.04	1.06200E-22
Dependence - 25 MM	2,835	0.41	0.15	2,175	0.31	0.19	9.92	3.31400E-22
Nursing Home Competition - 15 MM	2,835	0.07	0.13	2,224	0.07	0.15	0.64	0.5204
Nursing Home Competition - 25 MM	2,835	0.04	0.08	2,224	0.04	0.11	0.93	0.3532
Assisted Living Facility (ALF) Bed Competition - 15 MM**	2,835	.76	.56	2,224	.75	.53	-.34	0.7314
ALF Bed Competition - 25 MM**	2,835	1.56	1.16	2,224	1.55	1.11	-.10	0.9218
Home Health Agency (HHA) Visit Competition - 15 MM**	2,835	3.59	3.28	2,224	3.36	2.92	-1.24	0.2152

Table A1-continued

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
HHA Visit Competition - 25 MM**	2,835	6.96	6.15	2,224	6.79	5.77	-.44	0.6618
MCAL Concentration 15 MM	2,835	0.67	0.07	2,210	0.66	0.08	2.38	0.0175
MCAL Concentration 25 MM	2,835	0.67	0.06	2,211	0.67	0.06	0.71	0.4748
Income*, ***	2,835	40.54	9.44	2,224	41.63	10.82	1.73	0.0835
Population	2,835	1.41	0.28	2,224	1.43	0.30	0.92	0.3556
Medi-Cal Rate	2,835	138.11	17.50	2,066	138.01	17.00	0.13	0.8975
RN Wages - 15 MM	2,835	32.60	2.89	2,179	32.96	2.85	2.30	0.0214
RN Wages - 25 MM*	2,835	32.73	2.58	2,179	32.86	2.65	0.90	0.3678
LVN Wages - 15 MM*	2,835	24.90	3.05	2,180	24.99	2.94	0.49	0.6232
LVN Wages - 25 MM*	2,835	24.92	2.85	2,180	24.98	2.80	0.35	0.7246
NA Wages - 15 MM*	2,835	11.97	1.70	2,180	12.13	1.65	1.47	0.1415

Table A1-continued

	Sample N	Sample Mean	Sample St. Dev.	Excluded N	Excluded Mean	Excluded St. Dev.	*t* Statistics	P Values
NA Wages - 25 MM*	2,835	12.01	1.61	2,180	12.09	1.59	0.74	0.4607
Unemployment Rate	2,835	6.21	1.82	2,224	6.16	1.74	0.46	0.6432

Note. *Variable is converted to December 2007 real dollars; **Variable scaled by 10,000; ***Variable scaled by 1,000.

Table A2. Correlation Matrix of Independent and Control Variables

	post	de~15_q1	de~15_q2	de~15_q3	de~25_q1	de~25_q2	de~25_q3	po~15_q1	po~15_q2	po~15_q3	po~25_q1	po~25_q2	po~25_q3
post	1.00												
depend~15_q1	.00	1.00											
depend~15_q2	.00	-.33	1.00										
depend~15_q3	.00	-.33	-.33	1.00									
depend~25_q1	.00	.93	-.27	-.33	1.00								
depend~25_q2	.00	-.27	.82	-.22	-.33	1.00							
depend~25_q3	.00	-.33	-.22	.80	-.33	-.33	1.00						
post_d~15_q1	.41	.58	-.19	-.19	.54	-.15	-.19	1.00					
post_d~15_q2	.41	-.19	.58	-.19	-.15	.47	-.13	-.11	1.00				
post_d~15_q3	.41	-.19	-.19	.58	-.19	-.13	.46	-.11	-.11	1.00			
post_d~25_q1	.41	.54	-.15	-.19	.58	-.19	-.19	.94	-.06	-.11	1.00		
post_d~25_q2	.41	-.15	.47	-.13	-.19	.58	-.19	-.06	.85	-.02	-.11	1.00	
post_d~25_q3	.41	-.19	-.13	.46	-.19	-.19	.58	-.11	-.02	.84	-.11	-.11	1.00
beds_q1	.00	-.03	-.12	-.02	-.03	-.12	.00	-.01	-.07	-.01	-.01	-.07	.00
beds_q2	-.01	-.04	.09	.02	-.03	.06	.02	-.03	.05	.01	-.02	.03	.01
beds_q3	.01	-.01	.03	-.01	.01	.04	-.02	.00	.02	.00	.01	.03	-.01
post_beds_q1	.41	-.02	-.07	-.01	-.02	-.07	.00	.14	.06	.15	.14	.06	.17
post_beds_q2	.39	-.02	.05	.02	-.02	.03	.01	.13	.23	.18	.14	.21	.18
post_beds_q3	.42	-.01	.02	-.01	.01	.02	-.01	.16	.20	.16	.18	.21	.15
slack	.08	.07	.03	.00	.06	.06	-.02	.10	.06	.01	.11	.07	-.01
post_slack	.20	.07	.03	-.03	.08	.04	-.05	.19	.12	.04	.19	.14	.01
nh_hhi15	.00	.00	-.02	.01	.01	-.01	-.02	.00	-.01	.00	.01	.00	-.01
nh_hhi25	.00	-.02	-.03	-.01	-.02	-.03	-.03	-.01	-.02	.00	-.01	-.02	-.02
alf_beds15	.04	-.08	.01	-.01	-.10	.01	.02	-.03	.02	.01	-.04	.02	.03
alf_beds25	.05	-.13	.02	.02	-.14	.02	.04	-.05	.03	.03	-.06	.03	.04
hha_visits15	.03	-.14	.00	.00	-.15	.00	.02	-.08	.01	.01	-.08	.01	.03
hha_visits25	0.04	-0.16	0.02	0.03	-0.17	0.03	0.04	-0.08	0.03	0.03	-0.09	0.03	0.04
income	0.17	0.20	0.06	-0.07	0.21	0.01	-0.03	0.20	0.11	0.03	0.20	0.08	0.05
population	0.24	0.11	0.09	-0.03	0.13	0.03	0.00	0.16	0.15	0.08	0.18	0.12	0.10
mcal_rate	0.53	0.28	0.04	-0.10	0.30	0.00	-0.09	0.52	0.25	0.09	0.54	0.22	0.10
wages_rn_15	0.26	0.16	0.07	-0.06	0.17	0.02	-0.02	0.19	0.14	0.09	0.20	0.11	0.11
wages_lvn_15	0.10	0.15	0.07	-0.06	0.18	0.02	-0.04	0.13	0.08	0.01	0.14	0.05	0.01
wages_aid~15	-0.04	0.25	0.06	-0.06	0.27	0.01	-0.03	0.12	0.02	-0.05	0.13	-0.01	-0.03
wages_rn_25	0.27	0.14	0.07	-0.04	0.16	0.04	-0.03	0.18	0.14	0.10	0.19	0.14	0.10
wages_lvn_25	0.10	0.14	0.07	-0.05	0.18	0.03	-0.04	0.13	0.08	0.01	0.14	0.06	0.02
wages_aid~25	-0.05	0.23	0.06	-0.06	0.25	0.03	-0.05	0.11	0.02	-0.05	0.12	0.00	-0.04
unemploy_r~e	-0.41	-0.20	-0.08	0.01	-0.18	-0.09	0.01	-0.26	-0.21	-0.17	-0.25	-0.21	-0.17

	beds_q1	beds_q2	beds_q3	post_b~1	post_b~2	post_b~3	slack	post_s~k	nh_hhi15	nh_hhi25	alf_h~15	alf_h~25
post												
depend~15_q1												
depend~15_q2												
depend~15_q3												
depend~25_q1												
depend~25_q2												
depend~25_q3												
post_d~15_q1												
post_d~15_q2												
post_d~15_q3												
post_d~25_q1												
post_d~25_q2												
post_d~25_q3												
beds_q1	1.00											
beds_q2	-0.32	1.00										
beds_q3	-0.34	-0.33	1.00									
post_beds_q1	0.58	-0.19	-0.20	1.00								
post_beds_q2	-0.18	0.57	-0.19	-0.11	1.00							
post_beds_q3	-0.20	-0.19	0.58	-0.11	-0.11	1.00						
slack	-0.02	0.07	-0.01	0.01	0.08	0.04	1.00					
post_slack	-0.03	0.05	0.01	0.04	0.16	0.10	0.66	1.00				
nh_hhi15	0.03	-0.02	0.05	0.02	-0.02	0.03	-0.03	-0.01	1.00			
nh_hhi25	0.00	-0.06	0.08	0.00	-0.03	0.05	-0.02	-0.01	0.82	1.00		
alf_beds15	-0.03	0.06	-0.04	0.00	0.05	-0.01	0.09	0.03	-0.51	-0.44	1.00	
alf_beds25	-0.02	0.09	-0.05	0.01	0.07	-0.01	0.09	0.04	-0.50	-0.45	0.95	1.00
hha_visits15	-0.05	0.07	0.00	-0.02	0.06	0.02	0.10	0.04	-0.44	-0.37	0.94	0.92
hha_visits25	-.03	.09	-.03	.00	.07	.00	.10	.03	-.44	-.39	.93	.98
income	0.04	0.02	-0.12	0.10	0.09	-0.01	0.00	0.06	-0.20	-0.23	0.20	0.20
population	0.03	0.02	-0.07	0.11	0.11	0.06	0.00	0.06	0.21	0.14	-0.11	-0.10
mcal_rate	-0.02	-0.02	-0.02	0.20	0.19	0.20	0.03	0.15	0.08	0.04	-0.30	-0.33
wages_rn_15	0.03	0.00	-0.08	0.11	0.11	0.08	-0.05	0.03	-0.19	-0.21	-0.02	-0.03
wages_lvn_15	0.06	-0.01	-0.09	0.07	0.04	-0.01	-0.07	0.01	0.04	-0.03	-0.20	-0.22
wages_aid~15	0.06	-0.02	-0.09	0.02	-0.03	-0.07	-0.10	-0.03	0.00	-0.06	-0.31	-0.34
wages_rn_25	0.06	-0.01	-0.08	0.12	0.11	0.09	-0.05	0.04	-0.13	-0.20	-0.07	-0.07
wages_lvn_25	0.07	-0.01	-0.09	0.07	0.04	-0.01	-0.06	0.02	0.05	-0.02	-0.22	-0.23
wages_aid~25	0.07	-0.02	-0.09	0.02	-0.03	-0.07	-0.10	-0.02	0.04	-0.05	-0.34	-0.36
unemploy_r~e	0.03	-0.06	0.05	-0.16	-0.20	-0.13	-0.03	-0.10	0.24	0.30	-0.30	-0.30

	hha_h~15	hha_h~25	income	popula~n	mcal_~te	wa~rn_15	wa~vn_15	wag~s_15	wa~rn_25	wa~vn_25	wag~s_25	unempl~e
post												
depend~15_q1												
depend~15_q2												
depend~15_q3												
depend~25_q1												
depend~25_q2												
depend~25_q3												
post_d~15_q1												
post_d~15_q2												
post_d~15_q3												
post_d~25_q1												
post_d~25_q2												
post_d~25_q3												
beds_q1												
beds_q2												
beds_q3												
post_beds_q1												
post_beds_q2												
post_beds_q3												
slack												
post_slack												
nh_hhi15												
nh_hhi25												
alf_beds15												
alf_beds25												
hha_visits15	1.00											
hha_visits25	0.72	1.00										
income	-0.22	-0.32	1.00									
population	0.20	0.15	0.51	1.00								
mcal_rate	0.13	0.11	0.51	0.38	1.00							
wages_rn_15	-0.16	-0.18	0.61	0.35	0.58	1.00						
wages_lvn_15	0.10	0.04	0.65	0.46	0.58	0.81	1.00					
wages_aid~15	0.08	0.05	0.64	0.42	0.60	0.75	0.86	1.00				
wages_rn_25	-0.05	-0.15	0.61	0.39	0.59	0.91	0.81	0.75	1.00			
wages_lvn_25	0.12	0.05	0.63	0.48	0.58	0.80	0.97	0.86	0.85	1.00		
wages_aid~25	0.15	0.06	0.61	0.44	0.58	0.71	0.85	0.96	0.78	0.88	1.00	
unemploy_r~e	0.26	0.34	-0.52	-0.41	-0.31	-0.36	-0.19	-0.26	-0.39	-0.18	-0.25	1.00

Table A3

First-Differenced Results Using 15 Mile Markets

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Post AB 1629	0.013	-0.009	0.033	0.037
	(0.097)	(0.014)	(0.038)	(0.049)
Beds - Quartile (Q) 1	-0.052	0.122***	0.135	0.216
	(0.097)	(0.036)	(0.173)	(0.264)
Beds - Q2	0.006	0.091***	0.214**	0.317***
	(0.037)	(0.021)	(0.096)	(0.114)
Beds - Q2	0.027	0.057***	0.123	0.218**
	(0.041)	(0.016)	(0.083)	(0.101)
Post AB 1629 Beds Q 1	0.012	-0.018	0.025	0.02
	(0.011)	(0.015)	(0.039)	(0.051)
Post AB 1629 Beds Q2	0.000	-0.02	-0.019	-0.04
	(0.011)	(0.014)	(0.038)	(0.050)
Post AB 1629 Beds Q3	0.006	-0.007	-0.001	-0.004
	(0.010)	(0.012)	(0.031)	(0.042)
Slack	-0.021**	-0.009	-0.074***	-0.104***
	(0.010)	(0.011)	(0.021)	(0.028)
Post AB 1629 Slack	0.001	0.01	0.055**	0.066**
	(0.012)	(0.012)	(0.024)	(0.030)
Post AB 1629 Dependence Q1	0.012	0.029*	0.011	0.052
	(0.012)	(0.018)	(0.045)	(0.060)
Post AB 1629 Dependence Q2	0.002	0.016	-0.033	-0.015
	(0.010)	(0.014)	(0.039)	(0.050)
Post AB 1629 Dependence Q3	0.016*	0.024*	-0.024	-0.016
	(0.010)	(0.014)	(0.037)	(0.046)

Table A3 - continued

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Nursing Home Competition	0.107 (0.202)	0.033 (0.080)	0.334* (0.202)	0.571 (0.380)
Assisted Living Facility Competition	-0.068 (0.058)	0.118* (0.069)	0.077 (0.170)	0.104 (0.223)
Home Health Agency Competition	-0.002 (0.006)	0.017** (0.008)	0.017 (0.022)	0.032 (0.029)
Median Per Capita Income	0.003 (0.003)	0.000 (0.004)	0.007 (0.013)	0.010 (0.017)
Percentage Population > 85	0.068 (0.084)	-0.101 (0.111)	0.535** (0.268)	0.483 (0.352)
Registered Nurse (RN) Wages	-0.005** (0.002)	- -	- -	0.004 (0.011)
Unemployment Rate	0.006 (0.005)	0.002 (0.007)	-0.016 (0.018)	-0.007 (0.023)
Medi-Cal Rate	0.000 0.000	0.000 0.000	0.000 (0.001)	-0.001 (0.001)
Licensed Vocational Nurse (LVN) Wages	- -	-0.008* (0.004)	- -	-0.024 (0.016)
Nurse Aides (NA) Wages	- -	- -	-0.056* (0.032)	-0.063 (0.039)
Constant	-0.005 (0.004)	0.024*** (0.006)	-0.026* (0.013)	-0.007 (0.019)
Observations	2,268	2,268	2,268	2,268
R-squared	0.022	0.010	0.011	0.012

Robust standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

Table A4

First-Differenced Results Using 25 Mile Markets

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Post AB 1629	0.013	-0.010	0.03o	0.032
	(0.010)	(0.014)	(0.038)	(0.049)
Beds - Quartile (Q) 1	-0.051	0.119***	0.127	0.190
	(0.094)	(0.037)	(0.174)	(0.268)
Beds - Q2	0.011	0.090***	0.213**	0.307***
	(0.035)	(0.021)	(0.096)	(0.118)
Beds - Q2	0.035	0.056***	0.12	0.208*
	(0.038)	(0.016)	(0.084)	(0.108)
Post AB 1629 Beds Q 1	0.013	-0.019	0.022	0.013
	(0.011)	(0.015)	(0.039)	(0.050)
Post AB 1629 Beds Q2	0.000	-0.019	-0.019	-0.04
	(0.010)	(0.014)	(0.038)	(0.050)
Post AB 1629 Beds Q3	0.006	-0.008	-0.001	-0.007
	(0.009)	(0.012)	(0.031)	(0.041)
Slack	-0.022**	-0.009	-0.073***	-0.104***
	(0.010)	(0.011)	(0.021)	(0.028)
Post AB 1629 Slack	0.001	0.010	0.054**	0.066**
	(0.012)	(0.012)	(0.024)	(0.031)
Post AB 1629 Dependence Q1	0.015	0.031*	0.043	0.086
	(0.011)	(0.018)	(0.045)	(0.059)
Post AB 1629 Dependence Q2	0.001	0.018	-0.045	-0.026
	(0.010)	(0.015)	(0.039)	(0.049)
Post AB 1629 Dependence Q3	0.013	0.030**	0.001	-0.019
	(0.010)	(0.014)	(0.037)	(0.045)

Table A4 - continued

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Nursing Home Competition	0.203 (0.530)	0.681** (0.322)	0.179 (1.188)	1.237 (1.668)
Assisted Living Facility Competition	-0.054 (0.037)	0.038 (0.054)	-0.091 (0.126)	-0.116 (0.168)
Home Health Agency Competition	-0.002 (0.004)	0.007 (0.005)	0.004 (0.014)	0.008 (0.019)
Median Per Capita Income	0.003 (0.003)	-0.001 (0.004)	0.005 (0.013)	0.007 (0.016)
Percentage Population > 85	0.086 (0.084)	-0.084 (0.115)	0.625** (0.278)	0.658** (0.364)
Registered Nurse (RN) Wages	-0.003 (0.002)	- -	- -	0.021 (0.015)
Unemployment Rate	0.007 (0.005)	0.003 (0.007)	-0.015 (0.019)	-0.005 (0.025)
Medi-Cal Rate	0.000 0.000	0.000 0.000	-0.001 (0.001)	-0.001 (0.001)
Licensed Vocational Nurse (LVN) Wages	- -	-0.005 (0.006)	- -	0.037* (0.022)
Nurse Aides (NA) Wages	- -	- -	-0.056 (0.040)	-0.056 (0.049)
Constant	-0.006 (0.004)	0.024*** (0.006)	-0.024* (0.014)	-0.011 (0.020)
Observations	2,268	2,268	2,268	2,268
R-squared	0.020	0.009	0.011	0.013

Robust standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

Table A5

First-Differenced Results Using County as the Market

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Post AB 1629	0.012	-0.006	0.033	0.033
	(0.010)	(0.014)	(0.038)	(0.048)
Beds - Quartile (Q) 1	-0.051	0.121***	0.116	0.19
	(0.093)	(0.037)	(0.173)	(0.265)
Beds - Q2	0.01	0.094***	0.204**	0.305***
	(0.034)	(0.021)	(0.095)	(0.114)
Beds - Q2	0.038	0.054***	0.111	0.198*
	(0.036)	(0.017)	(0.083)	(0.103)
Post AB 1629 Beds Q 1	0.011	-0.018	0.02	0.012
	(0.011)	(0.016)	(0.040)	(0.052)
Post AB 1629 Beds Q2	0.001	-0.018	-0.017	-0.033
	(0.011)	(0.014)	(0.038)	(0.049)
Post AB 1629 Beds Q3	0.006	-0.007	-0.002	-0.002
	(0.009)	(0.012)	(0.031)	(0.041)
Slack	-0.022**	-0.008	-0.071***	-0.102***
	(0.010)	(0.011)	(0.021)	(0.028)
Post AB 1629 Slack	0.003	0.01	0.053**	0.066**
	(0.012)	(0.012)	(0.024)	(0.031)
Post AB 1629 Dependence Q1[a]	0.015	0.023	0.024	0.06
	(0.012)	(0.017)	(0.046)	(0.060)
Post AB 1629 Dependence Q2	-0.007	0.021	-0.048	-0.034
	(0.010)	(0.016)	(0.039)	(0.050)
Post AB 1629 Dependence Q3	0.003	0.028**	0.019	-0.043
	(0.009)	(0.014)	(0.036)	(0.044)

Table A5 - continued

Variables	RN Hrs. Per Resident Day	LVN Hrs. Per Resident Day	NA Hrs. Per Resident Day	Total Nurse Hrs. Per Resident Day
Nursing Home Competition	1.550***	0.502*	1.293*	3.335***
	(0.240)	(0.263)	(0.779)	(0.955)
Assisted Living Facility Competition	-0.067	0.066	-0.052	-0.082
	(0.046)	(0.073)	(0.175)	(0.237)
Home Health Agency Competition	0.000	-0.001	0.016	-0.018
	(0.003)	(0.005)	(0.012)	(0.015)
Median Per Capita Income	0.002	0.000	0.007	0.01
	(0.003)	(0.004)	(0.014)	(0.017)
Percentage Population > 85	0.073	-0.083	0.639**	0.604
	(0.083)	(0.117)	(0.294)	(0.387)
Registered Nurse (RN) Wages	-0.002	-	-	0.001
	(0.003)	-	-	(0.014)
Unemployment Rate	0.006	0.006	-0.007	0.000
	(0.005)	(0.007)	(0.018)	(0.024)
Medi-Cal Rate	0.000	0.001	0.000	0.000
	0.000	0.000	(0.001)	(0.001)
Licensed Vocational Nurse (LVN) Wages	-	-0.007	-	0.036*
	-	(0.006)	-	(0.019)
Nurse Aides (NA) Wages	-	-	-0.052	-0.035
	-	-	(0.033)	(0.039)
Constant	-0.004	0.028***	-0.008	-0.032
	(0.005)	(0.007)	(0.014)	(0.025)
Observations	2,268	2,268	2,268	2,268
R-squared	0.023	0.01	0.013	0.015

Robust standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

[a]Quartile 1 represents the lowest Medi-Cal dependence quartile in the table.

VITA

Matthew Krauchunas was born in Blue Island, Illinois on July 25, 1971. He graduated from John Hersey High School a year early in 1988 and joined the United States Air Force as Telephone and Data Circuitry Specialist in 1989. He rose to the rank of Staff Sergeant until being commissioned as a Medical Service Corps First Lieutenant in July 2000. He has been part of many military operations throughout his career including DESERT SHIELD, DESERT STORM, PROVIDE COMFORT, and ENDURING FREEDOM. He has received an Associate in Applied Science, Electronic Systems Technology from the Community College of the Air Force in 1996, a Bachelor of Science in Health Care Management in 1996 from the University of Maryland University College, and a Master of Science, Health Services Administration in 1999 from Central Michigan University. He was selected by the Air Force to obtain a Ph.D. in Health Services Organization and Research in 2006 and began classes at VCU in 2007. He is currently an instructor at the United States' Army Baylor MHA program. He is married to Melanie Krauchunas and has six children: Tanner, Caleb, Adeline, Alexia, William, and Evie.