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**A QUANTITATIVE ANALYSIS OF OWNERSHIP-INDUCED QUALITY GAPS  
IN THE LONG-TERM CARE SECTOR: INFLUENCES OF OWNERSHIP  
CONVERSIONS, SELF-REPORTING, REGULATORY REFORMS, AND THE  
COVID-19 PANDEMIC**

A Dissertation  
Presented to  
The Academic Faculty

by

Muhammet Emre Coskun

In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy in  
Public Policy

Georgia State University and  
Georgia Institute of Technology  
August 2022

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## LIST OF ABBREVIATIONS

ADL: Activities of daily living  
AJC: Atlanta Journal-Constitution  
CASPER: the Certification and Survey Provider Enhanced Reporting  
CMS: the Center for Medicare and Medicaid Services  
DCH: Georgia Department of Community Health  
DID: difference-in-differences  
GAO: Government Accountability Office  
HCBS: home and community-based services  
IOM: Institute of Medicine  
IPCP: Infection prevention and control program  
LPN: licensed practical nursing  
LTC: long-term care  
LTC: Focus: the Long-term Care Facts on Care in the U.S.  
LTSS: long-term service and support  
MDS: the Minimum Data Set  
NH: Nursing home  
NHRA: the Nursing Home Reform Act  
OBRA: the Omnibus Reconciliation Act  
PBJ: Payroll-based Journal  
QAPI: Quality Assurance and Performance Improvement  
RN: registered nurse  
RUG-IV: Resource Utilization Group  
SNF: Skilled nursing facilities  
TWFE: two-way fixed effects

## SUMMARY

The growing population aged 65 and older in the United States has led to increased demand and government funding for long-term care services over the last decades, which has attracted a growing supply of primarily for-profit companies into the long-term care (LTC) sector. The increasing share of for-profit providers in the sector has raised concerns about service quality because the profit-making motive may put pressure on providers to cut costs, which might adversely affect service quality. On the other hand, nonprofit providers are not subject to such pressures due to their non-distribution constraint; thus, nonprofits are considered to offer better quality. Among factors related to LTC service quality, the ownership types of nursing homes have been studied in the context of for-profit providers' actions that were detrimental to quality, which has resulted in stricter regulations in the nursing home sector. Moreover, over the last few decades, the assisted living and community-based services sector has been subject to an inflow of private capital similar to the nursing home sector. Scandals and quality issues have followed this, yet the assisted living sector remains loosely regulated. More recently, the drastic impact of the COVID-19 pandemic on LTC residents and news reports of scandals involving resident abuse cases have brought issues about the quality of long-term care services to the forefront of attention of the public and policymakers. The current situation begs investigation into whether the ownership-related quality gaps persist among nursing homes despite stricter regulations and whether similar ownership-related differences in quality exist among assisted living facilities, given the loose regulatory environment of the assisted living sector.

The previous studies that examined the ownership-quality relationship in nursing homes are at least a decade old, and their results are mainly based on cross-sectional models, which do not allow causal identification of the effects of ownership. Moreover, studies about ownership type-related quality variances among assisted living facilities are rare, and the existing ones are mostly based on small sample cases. This dissertation contributes to the literature by presenting new evidence based on quantitative analyses of the association between ownership types and quality of services in the LTC sector in the United States. The study investigates nursing homes at the national level and assisted living facilities in Georgia by applying quantitative research methods to the most current data sources available. The introduction chapter presents an overview of the study and provides background information about the LTC sector in the U.S. The analyses are organized into four essays after the introductory chapter as follows.

Chapter 2 analyzes the effects of for-profit ownership conversions on nursing home quality indicators using a quasi-experimental methodology that provide strong identification of the effects. Accordingly, dynamic difference-in-differences models are employed to investigate ownership-induced quality differences among nursing homes by drawing on national-level panel data for the years between 2013 and 2021 provided by the Center for Medicare and Medicaid Services (CMS). Moreover, this chapter examines the adverse effects of information asymmetries by comparing changes in government-inspected quality measures with changes in quality measures self-reported by nursing homes following a for-profit conversion of a nursing home. This comparison analysis allows assessing the usefulness of self-reported quality indicators to capture quality changes and their reliability in contrast to measures inspected by the government.

Chapter 3 analyzes the effects of the recent regulatory changes on the quality of care concerning the ownership type of facilities in the nursing home sector. In 2016, the federal-level nursing home regulations were comprehensively updated for the first time since 1991 to address quality problems in the sector. Until the present study, no single analysis had been conducted to investigate the effects of the recent regulatory changes on nursing home quality. Hence, this dissertation provides the first examination of the impact of the recent regulatory changes implemented at the end of 2016 in the nursing home sector with respect to the quality trends and differences in quality by ownership type among nursing homes.

Examining factors that hurt long-term care quality is especially critical given the current unprecedented times brought on by the COVID-19 pandemic. Therefore, as a timely contribution, chapter 4 in this dissertation examines the facility-level factors associated with the pandemic outcomes in nursing homes, focusing on ownership types and regional characteristics. Compared to the previous studies conducted during the early period of the pandemic, the analysis provided here presents a complete picture of the pandemic outcomes in long-term care facilities by drawing on more recently collected data. In addition, the chapter makes a unique contribution to the literature by investigating the effects of hospital-based facilities and area socioeconomic need levels on the pandemic outcomes in nursing homes.

Lastly, chapter 5 explores the relationship between ownership and quality in assisted living facilities in the State of Georgia by using a unique dataset of State-level inspection records. Previous studies of assisted living quality were mainly based on surveys and a small sample of facilities. Moreover, studies about the effects of ownership

types on assisted living quality are rare. This chapter provides a unique analysis of ownership-related quality gaps among assisted living facilities by drawing on a recent dataset of inspection records collected for all assisted living communities and personal care homes with more than 25 beds in Georgia. Moreover, this chapter makes a unique contribution by investigating the differences between COVID-19 outcomes in for-profit vs. nonprofit assisted living facilities using the COVID-19 data released by the Georgia Department of Community Health.

Overall, the results of this study contribute to the previous scholarship about the factors that influence service quality in long-term care facilities, specifically regarding the effect of ownership. This dissertation finds that ownership-induced quality gaps persist in the long-term care sector. Specifically, for-profit ownership status is found to be associated with worse quality outcomes among nursing homes and assisted living facilities, including adverse outcomes of the COVID-19 pandemic. Among nursing homes, results for the government-inspected quality indicators show apparent declines following the for-profit conversion event, whereas results for self-reported quality measures are mixed. Moreover, the analyses show that the recent regulatory reforms had little to no effect on improving the quality of nursing homes over time. The results show that the quality gaps between for-profit and nonprofit nursing homes have widened after the implementation of recent regulations. The findings are discussed in the conclusion chapter to help policymakers formulate new policies and effective regulations to improve the quality of long-term care for current and future residents.



## CHAPTER 1: INTRODUCTION

### 1.1 Overview

Long-term care provision has become an increasingly important public policy issue in the United States as the growing older adult population has led to increasing demand for care. Nationally, according to one estimation by the U.S. Census Bureau, the number of individuals aged 65 and over is expected to nearly double from 49.2 million in 2016 to over 94.6 million in 2060, which will correspond to about 23 percent of the population (Vespa, Armstrong, & Medina, 2018). In parallel with that, the U.S. Department of Health and Human Services (HHS) estimated that demand for long-term care services at nursing homes or home and community-based facilities was projected to rise from 15 million in 2000 to 27 million in 2050 (HSS, 2003). This growing need for care puts a heavyweight on government-funded health care programs, as Medicare and Medicaid funding cover about two-thirds of formal long-term care service expenditures (Hagen, 2013). In the fiscal year 2016, Medicaid funding spent \$167 billion on long-term care services, accounting for around 30 percent of total Medicaid expenditures (Eiken, Sredl, Burwell, & Amos, 2018). Moreover, even though only 8 percent of Medicare beneficiaries used long-term care or skilled nursing facility care in 2018, the total health care expenditures on these services for Medicare beneficiaries came to around \$140 billion (CMS, 2020).

The increasing demand and government funding for LTC services have led to a growing number and variety of providers entering the market. These various suppliers with different organizational characteristics and motivations have resulted in a

heterogeneous long-term care market concerning the type and quality of services offered. The inflow of public funding into the market has contributed to the growing supply of senior care services, especially for-profit companies. As for-profit companies started to dominate the market, their profit-making motives have raised concerns about service quality. The profit motives may pressure for-profit providers' management to cut costs, which might adversely affect service quality, leading to lower quality of services than nonprofit providers that are not subject to such pressures thanks to their non-distribution constraint. Concerns about increasing profits at the expense of service quality have been shown to be valid by previous studies (Comondore et al., 2009; Hillmer, Wodchis, Gill, Anderson, & Rochon, 2005). Following a series of scandal cases involving for-profit nursing homes at the national level, questions were raised about the lack of regulation in the senior care sector which had public health consequences for the well-being of senior citizens (Institute of Medicine, 1986, 2001). The result was stricter regulation of the nursing home sector by federal and state governments, aiming to address practices detrimental to service quality.

Issues about how organizational structure and environmental factors influence the quality of LTC services are imperative subjects of academic research and important with regard to policymaking. Previous studies have researched the for-profit vs. nonprofit quality gap issue in the nursing home sector (Comondore et al., 2009; Hillmer et al., 2005). While most of these studies found that for-profit nursing homes provide lower levels of quality in various aspects compared to nonprofit providers, many other studies presented mixed or inconclusive findings (Comondore et al., 2009). Moreover, most of these studies are at least a decade old, and their findings are based on cross-sectional

methods that provide weak identification of the effects of ownership on quality. Therefore, the overall picture of the ownership-quality relationship looks inconclusive, which leaves the question open for further research. In Chapter 2, this dissertation identifies ownership types' effects on quality differences in the nursing home sector by applying quasi-experimental methods to the most recent national-level data available.

Moreover, previous studies examined adverse influences of asymmetric information in service provision in nursing homes using subjectively defined criteria of the observability of service quality. The present study differs from the predecessors by comparing ownership effects on the government inspected versus self-reported quality outcomes to examine the asymmetric information problem. Results reveal strong identification of ownership-induced quality deficiencies among nursing homes that converted from nonprofit or government ownership to for-profit ownership.

The strict regulatory rules in the nursing home sector are intended to lessen quality gaps between for-profit and nonprofit operators by curbing maleficent incentives to profit at the expense of high-quality care for residents. Previous studies have examined the influences of a stricter regulatory environment on nursing home quality in the context of the Nursing Home Reform Act (NHRA) of 1987, which brought more stringent rules. These studies generally found that the quality of services improved after stricter regulations (Harrington, Swan, Nyman, & Carrillo, 1997; Zhang & Grabowski, 2004). More recently, the Centers for Medicare and Medicaid Services (CMS) imposed regulatory reformations in the nursing home sector at the federal level. These reforms were set to be implemented starting at the end of 2016. No study has examined the effectiveness of these 2016 regulatory changes until the present study. Therefore, this

dissertation is the first to investigate the effects of the 2016 sector-wide regulations on overall quality trends and ownership-related quality gaps in the nursing home sector. Chapter 3 describes the contents of the changes implemented in the 2016 regulatory reforms. Then, the effects of these changes on overall quality trends are examined using locally estimated smoothing curves and polynomial estimation fits. Additionally, I use interrupted time-series models to investigate whether these regulation reforms narrowed quality gaps between for-profit and other ownership-type nursing homes.

As the LTC sector evolved due to the growing need and diversity of service demand, a secondary domain of service providers has become prevalent. These providers, often referred to as assisted living facilities and personal care homes, have become popular by offering care services to seniors whose health conditions do not require nursing home care but still need assistance, such as with daily activities. These providers provide care services in home-like environments that are not as strictly regulated as nursing homes. Yet, the assisted living sector is subject to the same issues related to the inflow of private investors and practices detrimental to the quality of services as in the case of the nursing home sector. Moreover, the loose regulation of the assisted living sector renders it more susceptible to quality deficiencies due to the profit motives of the increasing number of corporate investors in the sector. Indeed, recent investigative reporting revealed scandals involving neglect and abuse cases in assisted living facilities similar to those in the nursing home industry (Teegardin et al., 2019; Teegardin & Schrade, 2019, November 23). The investigation has prompted the State legislators to implement tighter regulations for assisted living communities and personal care homes in Georgia (20 HB 987, Ga. 2020).

Previous literature about assisted living care discusses definitions and types of services within contexts of a single or few states by mostly using surveys (Grabowski, 2014; Hawes, Phillips, Rose, Holan, & Sherman, 2003; Zimmerman & Sloane, 2007). A reason behind this fragmentation is the variation in states' definitions and regulations of assisted living facilities. Only a few studies have examined the relationship between ownership type and quality of assisted living facilities, mostly based on resident surveys in a small number of facilities. A significant hindrance before studying assisted living facilities is the lack of data. To this end, Chapter 5 in this dissertation investigates quality differences related to the ownership type of assisted living care providers in Georgia by drawing on a unique dataset of state government inspections collected by the Atlanta Journal-Constitution. In addition, the analysis includes area socioeconomic need levels to examine the spatial dimension of quality variations among assisted living facilities.

Moreover, another timely contribution of this dissertation is the analysis of COVID-19 outcomes in long-term care facilities. Specifically, in Chapter 4, the factors behind the effects of the pandemic in the nursing home sector have been examined with a focus on differences by ownership types of nursing homes. The COVID-19 pandemic has drastically affected older adults and long-term care residents. Most studies that examined the outcomes of the pandemic in nursing homes have been conducted in the early phase of the pandemic before the situation has fully evolved. This dissertation examines a more current picture of the pandemic outcomes in nursing homes using more recent data collected by CMS. This dataset covers the whole period from the beginning of the pandemic until March 2022, after the major waves have led to surges in cases in facilities. Negative binomial regression models are used to examine the effects of the

ownership type with and without including staffing variables, which is a potential mediator of the ownership effect. Moreover, the analysis contributes to the literature by analyzing two factors that were not included in the previous studies: the effects of being a hospital-based facility and area socio-economic need levels. In addition, this dissertation also examines differences between the pandemic outcomes in for-profit and nonprofit assisted living facilities, an issue that only a few previous studies have examined. Chapter 5 presents the analyses of COVID-19 effects on assisted living facilities.

## **1.2 Definitions and Types of Long-Term Care Services**

Long-term care refers to services provided, usually continually, to assist older adults and people with disabilities who need assistance with activities of daily living and might also have healthcare needs (Grabowski, 2014). Long-term care services can be provided by institutions such as nursing homes or noninstitutional settings such as home and community-based services (HCBS), including assisted living communities and personal care homes. The majority of long-term care services are delivered to seniors. Long-term care has become critical with the growing older adult population in the United States. According to a recent National Center for Health Statistics (NCHS) report, in 2016, five major long-term care sectors served over 8.3 million individuals in the United States through 65,600 providers (Harris-Kojetin et al., 2019). These included 15,600 nursing homes serving 1,347,600 residents and 28,900 assisted living and similar residential facilities serving 811,500 residents in 2016 (Harris-Kojetin et al., 2019).

### **1.2.1 Nursing homes**

Nursing homes are institutional long-term care facilities that provide constant skilled nursing care to older adults whose health conditions require intense health care

and assistance with daily living activities. Over the years, various types of nursing homes emerged, as some specialized in certain areas. Skilled nursing facilities (SNF), for instance, provide short-term post-acute care and rehabilitation services for older adults after hospital discharges. Similarly, some hospitals have an integrated wing of hospital-based nursing facilities. Both types of facilities focus on patients' restoration and rehabilitative care after a hospital stay.

### **1.2.2 Home and community-based services: assisted living communities and personal care homes**

Home and community-based services (HCBS) generally refer to noninstitutional alternatives to nursing homes to provide long-term care services for older adults with lower acuity. HCBS includes a variety of settings such as home-based care services, personal care homes, and residential care facilities. Assisted living facilities and personal care homes are generally understood as community-based long-term care providers that assist residents with daily living with limited access to nursing oversight. However, there is no standard definition as assisted living facilities vary by practices and philosophy across states, and each state has its regulatory definitions (Brown Wilson, 2007; Hawes et al., 2003; Mollica, Houser, & Ujvari, 2012; Stevenson & Grabowski, 2010; Zimmerman et al., 2003; Zimmerman & Sloane, 2007). Given the situation, terms such as residential care communities, assisted living facilities, and community-based care are used interchangeably and broadly refer to noninstitutional residential facilities that provide long-term care (Brown Wilson, 2007; Hawes et al., 2003; Kane & Wilson, 1993; Zimmerman & Sloane, 2007). In alignment with the federal and state policy guidelines,

assisted living facilities and personal care homes are also referred to as home and community-based services or settings (HCBS).

### **1.2.3 Nursing homes vs. home and community-based services (HCBS)**

Compared to nursing homes, HCBS are cost-effective alternatives to long-term care and are more desirable to residents who prefer a more independent lifestyle. The average nursing home resident population is higher than the average number of residents served in non-institutional settings. In 2016, 63.7 percent of nursing homes served between 26 and 100 residents, and 30.6 percent of nursing facilities served above 100 residents (Harris-Kojetin et al., 2019). HCBS are comparatively smaller long-term care settings, such that an average facility serves 28 residents daily, and 65 percent of HCBS serve 25 or fewer residents daily (Harris-Kojetin et al., 2019).

Monthly median costs for nursing home residents are, on average, \$7,756 for a shared room and \$8,821 for a private room in 2020, substantially higher than monthly costs for home and community-based settings, which stand at on average \$4,300 for a private room in an assisted living facility (Genworth Financial, 2020). In Georgia, the median monthly costs for a private room are \$7,173 in a nursing home and \$3,500 in an assisted living facility, respectively (Genworth Financial, 2020). Despite cost advantages, states have been reluctant to finance HCBS due to moral hazard problems associated with individuals who could get free care from family members or friends to start using government-funded HCBS services (Grabowski, 2014).



### **1.3 Resident characteristics in nursing homes and assisted living communities:**

Residents of nursing homes and assisted living facilities share a lot of commonalities but also differ from each other in meaningful ways. Among common aspects, both types of residents need assistance with essential and instrumental activities of daily living. Activities of daily living (ADL) are essential functions that need to be carried out daily, such as bathing, dressing, eating, toilet use, continence, and ambulation (moving from place to place). Instrumental activities play supportive roles in one's daily life, including cooking, cleaning, doing house chores, shopping, planning a day, money management, and medication management. The severity of a resident's conditions determines the level of assistance and appropriate long-term care setting to provide for such needs accordingly. Along with age and disability characteristics, these factors also decide which type of funding can cover a resident's long-term care expenses. On average, nursing home residents are younger in comparison to residents of noninstitutional community-based providers (Harris-Kojetin et al., 2019). Still, they have higher acuity, requiring more intensive and costly care (Kaye, Harrington, & LaPlante, 2010).

There are two categories of nursing home residents that differ according to the lengths of stay. Nursing home residents are called short stay if they stay in a nursing home shorter than 100 days, and long stay otherwise. Usually, short-stay nursing home residents are Medicare coverage recipients in rehabilitative condition following a hospitalization who stay until their recovery is complete. Long-term residents are the main occupants of a nursing home whose health conditions require constant nursing care. Not surprisingly, long-stay nursing home residents are more likely to have chronic health conditions than short-stay residents. Indeed, long-stay nursing home residents reportedly

had higher needs for assistance with ADL and higher rates of Alzheimer's disease or other dementias, depression, diabetes, heart disease, and hypertension than short-stay residents in 2016 (Harris-Kojetin et al., 2019). Accordingly, CMS defines quality measures for short- and long-term nursing home residents.

Demographically, nursing home and HCBS long-term care residents are more often female and non-Hispanic white (Harris-Kojetin et al., 2019). Regarding the racial composition, African Americans constitute 14.3 percent of nursing home residents and 75.1 percent non-Hispanic white residents. In comparison, 4.1 percent of HCBS residents are African Americans, and 81.4 percent are non-Hispanic white (Harris-Kojetin et al., 2019). This racial disparity between a nursing home and HCBS residents has raised questions about equality of access by racial minority groups.

#### **1.4 Ownership types: for-profit, nonprofit, and government-owned**

Long-term care providers can take one of three main ownership structures: for-profit, nonprofit, and publicly owned. The ownership structure of an organization directly influences primary organizational goals and incentives and the legal framework that governs its activities. The dominant ownership type for both nursing homes and HCBS is for-profit ownership. For-profit organizations are owned by investors or shareholders who have a claim on the residual value produced. For-profit long-term care providers can take various forms ranging from individually owned small residential care communities to private equity-owned large nursing home chains. These organizational structures primarily aim to produce additional wealth for owners or shareholders by allocating some share of profits resulting from their operation. Therefore, the managerial structure of for-profit organizations incentivizes its managers and employees to maximize profits. It is

argued that working to increase shareholder wealth and provide the best care for service recipients constitutes an inherent ethical conflict that is almost impossible to solve for for-profit organizations (Lawrence, 1997). Thus, the main concern about for-profit ownership of long-term care providers is that their profit-making incentives might lead to service cuts to reduce costs which have detrimental effects on the quality of services (Davis, 1993; Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001; Herrera, Rada, Kuhn-Barrientos, & Barrios, 2014; Hillmer et al., 2005).

The nonprofit organization is the second most common organizational ownership type in long-term care. The nonprofit status is commonly defined by the non-distribution constraint, which refers to the legal restriction that prohibits a nonprofit organization from distributing residual earnings (profits) to its members or employees (Hansmann, 1980). In doing so, nonprofit founders forego personal earnings in return for tax privileges for the organization. Nonprofit organizations can still earn money through services, investments, sales, etc. Some of these earnings are tax-free if the business activity that generated them is related to the organization's nonprofit mission. But more importantly, all income generated by nonprofits, regardless of being tax-free, must be put back into the nonprofit organization by being reinvested in service provision or expansion.

Moreover, a nonprofit organization's primary purpose is to achieve its foundational mission. Nonprofits are expected to install strong incentives on their members and employees to prioritize serving their constituents, given the organization's mission-oriented nature and non-distribution constraint. These service-oriented incentives are expected to lead to better outcomes that consumers prefer, especially in markets with

asymmetric information where quality assessment is challenging for consumers, such as long-term care (Weisbrod, 1989; Weisbrod & Schlesinger, 1986). Nonprofit providers are also thought to have cost advantages due to their tax exemption (Schlesinger & Gray, 2006).

Publicly owned long-term care providers constitute a small minority of the sector. These are generally nursing homes owned by government-run hospitals, other public institutional long-term care settings, and a small number of government-owned residential centers. Their organizational incentives are similar to nonprofits because they are publicly funded and operated to improve social welfare (Herrera et al., 2014; Weech-Maldonado et al., 2012). However, in the context of hospitals effectiveness of public ownership is questioned due to possible hurdles of administrative bureaucracy and political influences (Eggleston, Shen, Lau, Schmid, & Chan, 2008; Shen, Eggleston, Lau, & Schmid, 2007).

According to a recent National Center for Health Statistics report, in 2016, U.S. nursing home providers were 69.3% for-profit companies, 23.5% nonprofit organizations, and 7.2% publicly owned; whereas assisted living and other residential care communities consisted of 81% for-profits, 17.7% nonprofits and 1.3% government-owned facilities (Harris-Kojetin et al., 2019).

### **1.5 Funding: Payment systems, payer mix issues**

Long-term care services in the U.S. are paid mainly by three types of funding sources: government funding, private out-of-pocket pay, and private insurance. Nursing home and community-based long-term care sectors differ by the distribution of these

funding sources. The largest payer of nursing home services is Medicaid, whereas services provided by assisted living and residential care communities are paid mainly out of their residents' pockets (Harris-Kojetin et al., 2019). In 2019, the total national health expenditures for services provided at nursing homes and continuing care retirement communities, which does not include home and community-based service providers, was \$172.7 billion, of which Medicaid paid for approximately \$50.8 billion (29.4%), Medicare paid for around \$38.2 billion (22.1%), out-of-pocket payments covered \$45.6 billion (26.4%), and \$18 billion (10.4%) was paid by private health insurance funds (Centers for Medicare & Medicaid Services, 2019). In 2015, the primary payer for nursing home expenses was Medicaid for 61.6 percent of all residents, followed by Medicare for 14.2 percent of all residents. The remaining 24.2 percent of nursing home residents used out-of-pocket and other sources to cover the majority of their care expenses (Harrington, Carrillo, Garfield, Musumeci, & Squires, 2018).

### **1.5.1 Medicaid and Medicare funding**

Medicaid and Medicare are two government-funded national health care coverage programs signed into law in 1965. These programs play significant roles in long-term care coverage for seniors, with Medicaid as the primary payer. The Centers for Medicare & Medicaid Services (CMS), previously known as the Health Care Financing Administration until 2001, is responsible for running these programs at the federal level under the U.S. Department of Health and Human Services. Medicare is a federally run program that provides health care benefits for individuals over 65 and some younger people with disabilities. On the other hand, Medicaid is a federal and state-funded program administered primarily by states which provides coverage for low-income

individuals, pregnant women, individuals with disabilities, and seniors. Even though federal law mandates states to cover certain eligibility groups, Medicaid coverage somewhat differs across states. Each state has the freedom to add its eligibility groups following federal guidelines.

States are allowed to use Medicaid funds to cover HCBS residents who are otherwise eligible to stay in a nursing home under 1915(c) home and community-based service waivers or 1915(i) state plan HCBS programs according to the Social Security Act (42 CFR § 441.301, 42 CFR § 441.710). In 2014, the Affordable Care Act brought further program and funding improvements to expand Medicaid availability to HCBS residents. However, unlike nursing homes, Medicaid funding cannot cover board and room expenses in HCBS. According to the National Study of Long-Term Care Providers (NSLTCP) data, 61.8 percent of nursing home residents and 16.5 percent of HCBS residents used some Medicaid funding to cover long-term care expenses in 2016 (Harris-Kojetin et al., 2019). Medicare covers short-term skilled nursing facility (SNF) care for a hospital-related medical condition for hundred days after hospital discharges, which pays total costs for the first 20 days and requires coinsurance payment until the 100<sup>th</sup> day. A 2010 study reports that Medicare covers 17.7 percent of nursing home expenses, though its share is larger for the first three months of stay (Kaye et al., 2010). Medicare covers only a small percentage of home and community-based services (HCBS).

### **1.5.2 Private self-payment out of pocket and Private Insurance**

Individuals who do not qualify for Medicaid or Medicare coverage have to pay for long-term care through private funding sources. Private sources include out-of-pocket spending, private insurance, and other funding such as charitable contributions. Among

these sources, out-of-pocket payments have the largest weight. In 2019, out-of-pocket payments covered \$63.4 billion of total long-term care services and support (LTSS) expenditures, corresponding to 14.9% of total spending on LTSS (Colello, 2021). Around one-quarter of long-term care recipients in a nursing home and HCBS were reported to pay out-of-pocket for some of the service charges, including 18.6 percent who paid all the expenses (Kaye et al., 2010). Private insurance coverage, on the other hand, plays a minor role in long-term care spending. In 2006, private insurance paid about 12 percent of all long-term care spending (Catlin, Cowan, Hartman, & Heffler, 2008). As of 2019, the share of private insurance coverage of LTSS expenditures has decreased. Personal insurance payments for LTSS added to \$38.5 billion, corresponding to 9% of the total U.S. spending on LTSS in 2019 (Colello, 2021).

### **1.6 The State of Georgia's long-term care service statistics**

According to most recent state data estimates from the National Study of Long-Term Care Providers, around 360 nursing homes cared for 33,000 residents. In contrast, about 870 residential care communities served 22,600 residents in Georgia in 2016 (Lendon et al., 2019). Georgia nursing homes were, on average, more likely to be chain-affiliated (76.3%) than HCBS providers (59.9%). Moreover, Georgia nursing homes, on average, served 93 residents in each facility, compared to 26 residents served by an average community-based provider (Lendon et al., 2019). The same data source shows that in 2016, 64.5 percent of Georgia nursing homes were for-profit, 35.5 percent were nonprofit or government-owned, and 82.7 percent of community-based providers were for-profit. The remaining 17.3 percent were nonprofit or publicly owned. These numbers

indicate a high profit-driven activity in the assisted living sector in Georgia, which is concerning given the minimal government oversight of the sector.

The primary funding source for Georgia's nursing home services was Medicaid which covered 72.4 percent of residents, while 11.5 percent used Medicare, and 16.1 percent used private and other payments (Harrington et al., 2018). In Georgia, the total Medicaid LTSS expenditures on seniors and people with physical disabilities were \$1.87 billion in 2016. Out of this amount, nursing homes received \$1.33 billion (71%), \$491 million (26%) million went to 1915(c) waivers for older adults and people with physical disabilities, and \$52 million (3%) was spent on home health services (Eiken et al., 2018). Thus, HCBS accounts for 29% percent of total Medicaid LTSS expenditures spent on older people and people with physical disabilities in Georgia.



## **CHAPTER 2: NURSING HOME QUALITY AND OWNERSHIP TYPES**

### **2.1 Introduction**

The long-term care sector is shaped by the distinct characteristics of care recipients and service providers operating under diverse market conditions. Overall, long-term care recipients are fragile, physically or mentally disabled, and may also have severe health care needs. In the nursing home sector, for-profit and nonprofit providers serve to meet the needs of their residents. These various provider types differ in organizational characteristics and goals, which might influence the outcomes of their services. This chapter investigates quality differences among nursing homes with respect to ownership status. Previous work assessing ownership's effect on nursing home quality is mostly a decade old (Comondore et al., 2009).

Moreover, most of the earlier studies applied relatively straightforward methodologies such as multivariate linear estimation models, which provide weak identification of the effect of ownership on quality. The present study supports and improves the previous literature by employing a quasi-experimental identification strategy to analyze ownership-related quality gaps. Additionally, this study differs from previous studies that use subjective criteria of observability of quality measures to investigate adverse effects of asymmetric information in service provision. Instead, this chapter compares ownership-induced quality changes for more concretely defined government inspected versus self-reported quality measures to examine the role of asymmetric information in truthful reporting and the reliability of self-reported quality indicators.

The analysis applies recently developed and improved dynamic difference-in-differences models with heterogeneity-bias corrected estimation techniques on a panel dataset of all Medicare and Medicaid certified U.S. nursing homes between 2013 and 2021. The primary data sources include the CMS's Provider Data Catalog and the LTCFocus project at the School of Public Health at Brown University (LTC, 2021). Below, I first review the nursing home sector's history, followed by a description of the conceptual framework that encapsulates the relationship between ownership types and the quality of services. Then I present a summary of the related literature, the data, and the methodology used in the analysis. Finally, I discuss the analysis results and conclusions.

## **2.2 History: From the almshouse and boarding homes to nursing homes**

Before the nineteenth century, the care for older adults was provided by individuals or informally arranged social groups. Family care was the most common, and community initiatives helped when immediate family care was unavailable. At the beginning of the nineteenth century, as the population grew, public institutional settings such as the almshouse started to provide services for the poor and sick older adults and other disadvantaged groups in the community (Kaffenberger, 2001). In the late nineteenth century, almshouses outgrew their capacity to provide for older adults due to the increasing population of poor immigrants. The demise of almshouses was seen as the failure of the public sector to care for older adults, which gave way to privately operated boarding homes and homes for the aged as alternatives. These homes were primarily private, nonprofit organizations (Kaffenberger, 2001).

Following the Great Depression in 1932, escalating unemployment and poverty led the federal government to enact social security reforms to help the poor and

disadvantaged. The Social Security Act of 1935 proposed direct cash payments to older adults, which played an essential role in the growth of boarding and nursing homes as more seniors could pay for their services. Opportunities provided by the inflow of government funding into the senior care sector primarily benefited for-profit nursing home companies whose numbers significantly increased, surpassing nonprofit and public nursing home counts. While there were 360 for-profit, 622 nonprofit nursing, and 55 public homes according to the Bureau of Labor Statistics in 1925, the American Nursing Home Association reported 15,530 for-profits, 1,429 nonprofits, and 496 publicly owned nursing homes in 1957 (Kaffenberger, 2001).

In 1959, Section 232 of the National Housing Act authorized the Department of Housing and Urban Development's Federal Housing Administration to provide loan guarantees to nursing homes, which reduced real estate financing costs (U.S. Government Accountability Office (GAO), 2006). These loan guarantees also disproportionately benefited the for-profit nursing homes as they increased profit margins. Afterward, for-profit companies started nationwide nursing home chains by binding facilities to increase profits, while nonprofit providers remained local standalone facilities. Furthermore, these loan guarantees have been expanded to assisted living facilities through regulations issued by Housing and Urban Development in 1994 (GAO, 2006).

Congress passed Medicaid and Medicare policies in 1965 to provide older adults and people with disabilities with better health services, including coverage for long-term care (Berkowitz, 2005). These policies, particularly Medicaid, provided significant funding to nursing homes, which further caused the expansion of the nursing home. The side effect of this process was that a large inflow of government money lured many for-

profit investors into the sector without any experience or genuine interest in serving older adults. This expansion created quality problems and abuse cases due to inexperienced and inadequate providers (Hawes & Phillips, 1986). In some cases, as supply started to exceed demand, facilities failed to realize profit goals, and their practices to cut costs harmed service quality. Cases of patient neglect, abuse, and problems with facilities and regulations were revealed in the U.S. Senate hearings (U.S. Senate, Trussel, 1965).

Finally, an investigation study by the Institution of Medicine in 1986 concluded a need for better regulation of the senior care sector (Institute of Medicine, 1986). This report proposed strict nursing home regulations in the United States, which were included in the Nursing Home Reform amendments passed with the Omnibus Reconciliation Act (OBRA) of 1987 (Institute of Medicine, 2001). These regulations mandated new inspection procedures, nursing staffing ratios, minimum care standards, improved resident rights, intermediate sanctions for violations of regulatory standards, and periodic comprehensive evaluations of all nursing homes. OBRA set the standards for nursing homes to get certified to be eligible for Medicaid and Medicare coverage.

The life cycle theory explains the nursing home sector's evolution, which postulates that the phase of technological change and diffusion of services influence the role and share of nonprofit and for-profit providers (Marmor, Schlesinger, & Smithey, 1987). In the first stage, nonprofit organizations innovatively addressed societal needs that the public sector did not meet, as almshouses failed the capacity to care for the older adult population. As the demand for services increased, for-profit companies saw the opportunity to enter the market in the second stage. The third stage witnessed external influences on the sector, such as new legislations and inflow of public funding, which

have led to a substantial increase in the for-profit market share. The fourth stage, which the U.S. nursing home sector is currently in, is called the mature phase and is characterized by market stabilization after strict regulations and high competition between providers, which might cause nonprofit and for-profit providers to become similar.

### **2.3 Theory-Based Conceptual Framework**

The nature of long-term care recipients is an essential factor that affects the nature of services they receive, along with the quality of services being provided. The majority of long-term care residents are older adults with physical or mental disabilities that may inhibit their ability to make sound judgments and raise their voices. These incapacitations potentially make LTC residents prone to being abused or taken advantage of by ill-motivated service providers, especially when regulatory oversight is weak (Castle & Beach, 2013; Pillemer, 1988). It is argued that senior residents usually make long-term care purchases only once in their lifetime, which leaves them less bargaining power when choosing care providers (Huang & Bowblis, 2018). Moreover, in most cases, long-term care recipients do not decide where to receive the services, nor are they the payers. Instead, residents' families or government agencies usually choose and pay for their care (Grabowski, 2014). The disconnect between service recipients and payers creates an informational gap between consumers and providers of long-term care services. The information asymmetry in the long-term care market is exacerbated by high rates of cognitive impairments among residents, limited relocation of residents among providers, and difficulty in monitoring services (Chou, 2002; Spector, Selden, & Cohen, 1998).

Ownership types of long-term care providers might influence the service quality. Long-term care services are provided by both for-profit and nonprofit organizations, which differ in organizational characteristics and goals. Theories about organizational ownership and control are often invoked to broadly explain the differences between for-profit and nonprofit organizations (Allison, 1980; Glaeser & Shleifer, 2001; Rainey, Backoff, & Levine, 1976; Weisbrod & Schlesinger, 1986). According to these theories, distinct characteristics of these two organizational types result in differences between their operations, goals, and services. For-profit organizations can retain the residual income and aim to maximize profits to create value for their owners/shareholders. Nonprofit organizations, on the other hand, are defined by the non-distribution constraint such that they are not allowed to distribute net earnings to their members and can only invest it towards improving their services.

Moreover, nonprofits are primarily mission-oriented and expected to aim for furthering their services as their *raison d'être*. These organizational differences led researchers to argue that underlying incentive mechanisms in each organizational setting results in different service outcomes. Profit motives of for-profit organizations might put pressure on their management to cut costs which might affect service quality adversely, leading to lower quality of services. Nonprofit service providers are not subject to such pressures because of the non-distribution constraint. Their mission-oriented nature is also expected to result in superior service quality (Hansmann, 1980, 1987; Newhouse, 1970).

Information asymmetry has long been argued to be an influential factor in the emergence and prevalence of nonprofit providers not only in the general healthcare market (Arrow, 1963) but also specifically in the long-term care industry (Hirth, 1993,

1999; Weisbrod, 1997; Weisbrod & Schlesinger, 1986). This line of argumentation states, in relation to the theory of ownership, that the primarily profit-motivated organizations are susceptible to taking advantage of the consumers' information disadvantages by undercutting the quality of services they provide to raise profits. Consequently, an organization's behavior is more susceptible to being guided by perverse incentives, which have detrimental effects on service quality in the presence of asymmetric information. Nonprofit providers, on the other hand, are primarily service-oriented and expected to keep quality high even when hidden from outside eyes. The service quality is nearly impossible to be included in the formal contracts in the presence of information asymmetries. Therefore, the contract failure theory asserts that nonprofit organizations prevail in such markets where consumers who lack information about the quality of the services turn to nonprofits as reliable providers in the sense that nonprofits provide trust to consumers, which is intrinsic to their organizational characteristics (Easley & O'Hara, 1983; Hansmann, 1980; Weisbrod & Schlesinger, 1986).

## **2.4 Literature review**

Ownership-related variances among nursing homes have led researchers to study the relationship between ownership types and quality indicators. Research about the relationship between ownership and quality of nursing homes has spanned over the last five decades and produced mixed findings. Though most studies found nonprofits to perform better than for-profit nursing homes in terms of quality, inconsistencies and insignificant findings are also common (Comondore et al., 2009; Hillmer et al., 2005). These mixed findings and inconsistencies can be attributed to three sources of variations among previous studies: difference in quality measures used in the analysis, dissimilar

adjustments included in the analysis, and variation in the data source, which usually dictates variable measurements and unit of analysis.

#### **2.4.1 Measuring the quality of care**

A key reason behind mixed results obtained in the literature is the multi-dimensional nature of the quality of long-term care (Castle & Ferguson, 2010). Among various approaches used to assess health care quality, a widely accepted paradigm is the Donabedian framework (Donabedian, 1966, 1988) which focuses on three aspects of care: structures, processes, and outcomes. The structural aspect refers to organizational factors such as facility size, resources, amenities provided, staff numbers, ownership structure, and administration. The processes aspect relates to practices and use of resources during the provision of care, which include staff training, daily practices of care staff, daily schedule of residents, planning, and coordination of care. Previous studies used the Donabedian framework to examine the effects of organizational structure and process measures on long-term care outcomes (Aaronson, Zinn, & Rosko, 1994; Castle & Ferguson, 2010; Comondore et al., 2009; Hillmer et al., 2005; L. Unruh & Wan, 2004; Winblad, Blomqvist, & Karlsson, 2017). The outcomes aspect is the most common approach to assess the quality of care, encompassing all sorts of end products resulting from care provisions, such as improvements in health conditions, negative health outcomes, and resident retention rates.

Frequently employed outcome measures include pressure ulcers prevalence, mortality rates, hospitalizations, falls, bladder/bowel incontinence, urinary tract infections, depression, dementia, behavioral symptoms, and the number of health deficiencies cited by inspectors (Castle & Ferguson, 2010; Comondore et al., 2009;



Hillmer et al., 2005). For example, pressure ulcers, also called pressure sores or bedsores, are skin and tissue injuries resulting from immobility, which lowers a resident's quality of life (Berlowitz, Bezerra, Brandeis, Kader, & Anderson, 2000). Accordingly, the prevalence of pressure ulcers is a relevant outcome quality indicator because residents should rarely develop these conditions as long as they receive proper care (Hillmer et al., 2005).

Process measures constitute a second major aspect of quality used by previous studies to evaluate nursing home care. Some widely assessed process measures are physical or chemical restraint use, proper administration of medication, and proper use of urethral catheterization and feeding tubes (Castle & Ferguson, 2010; Comondore et al., 2009; L. Unruh & Wan, 2004). Physical restraints are devices that limit mobility and movement as a preventive mechanism to protect residents from potential harm (Castle & Mor, 1998; Institute of Medicine, 1986). Inappropriate use of physical restraints has also been associated with mortality, morbidity, and deficiencies in nursing homes (Castle & Mor, 1998; Graber & Sloane, 1995; Phillips, Hawes, & Fries, 1993). Chemical restraints or psychoactive drugs are similarly used to control or alleviate, especially residents with cognitive impairments. Improper use of psychoactive drugs is associated with a higher risk of falls, lowered quality of life, and increased mortality rates (Bernabei & Carbonin, 1997; Rubenstein, Powers, & MacLean, 2001). Excessive use of restraints can limit a resident's independence, diminish dignity, and cause harm rather than preventing it, such as causing pressure ulcers (Castle & Ferguson, 2010; Comondore et al., 2009). Use of urinary catheters (or urethral catheterization) and feeding tubes are also essential to assess quality; their excessive use indicates poor quality of care (Castle & Ferguson, 2010;

Hillmer et al., 2005; L. Unruh & Wan, 2004). Increasing use of urinary catheters, for instance, has been linked with urinary tract infections (Ouslander & Kane, 1984).

#### **2.4.2 Factors behind the quality of care**

Another reason behind inconsistencies between the findings of previous studies is their focus on different factors to explain variation in the quality of services. Specifically, researchers interested in the relationship between ownership and quality include a variety of adjustments in their analysis to control for the influences of other factors. In a multiple regression analysis, including factors affecting the quality of care unrelated to ownership allows to partially isolate the actual effect of ownership status on quality of care without confounders. The factors influencing long-term care quality can be classified into three groups: facility features, resident characteristics, and environmental factors (Amirkhanyan, Meier, O'Toole, Dakhwe, & Janzen, 2017; Chou, 2002; Grabowski, 2008; Grabowski, Feng, Hirth, Rahman, & Mor, 2013). The facility features include organizational characteristics such as ownership status, size, occupancy rate, hospital affiliation, chain affiliation, staffing measures, and amenities. Resident characteristics include age, race, length of stay, payer mix, and health condition assignments at the time of admission (such as cognition scores, ADL index, physical function, dementia, urinary and fecal incontinence). Lastly, environmental conditions that can affect the quality of care include competition, market share, and location characteristics such as median or per capita income, rural-urban status, and poverty rate.

Staffing is a significant input factor influencing quality outcomes and takes up the largest share of operating expenses in long-term care settings. Previous studies have repeatedly shown that improved staffing resources in terms of numbers or training were

linked with better quality outcomes (Bostick, Rantz, Flesner, & Riggs, 2006; Castle & Engberg, 2007). Specifically, higher staffing levels in nursing homes were found to be positively associated with lower restraint use (Castle & Fogel, 1998; Graber & Sloane, 1995), lower rates of pressure sores, lower catheterization (Castle & Engberg, 2008; Cherry, 1991), lower death rates (Bliesmer, Smayling, Kane, & Shannon, 1998; Cohen & Spector, 1996), and fewer deficiencies (Harrington, Zimmerman, Karon, Robinson, & Beutel, 2000; Munroe, 1990). In two different literature reviews of studies about staffing and quality in nursing homes, Castle (2008) and Collier and Harrington (2008) summarized previous findings that consistently show staffing measures were positively related to quality in nursing homes.

Given that staffing resources constitute a large expense item in nursing home budgets, it is expected that profit-making incentives by for-profit organizations lead to reduce staffing to cut costs, which in turn affects quality negatively (Aaronson et al., 1994; Hillmer et al., 2005; O'Neill, Harrington, Kitchener, & Saliba, 2003). In support of this nonprofit nursing homes were discovered to have higher staff levels and better quality post-acute care (care provided following a hospitalization) compared to for-profit facilities, even after controlling for residents' health conditions (Grabowski et al., 2013). Indeed, for-profit facilities have been frequently reported to have lower staffing levels than nonprofits in many studies (Comondore et al., 2009; Grabowski, 2001; Grabowski & Hirth, 2003; Harrington & Swan, 2003; Harrington et al., 2001; Hughes, Lapane, & Mor, 2000; Konetzka, Yi, Norton, & Kilpatrick, 2004; Lu & Lu, 2021; O'Neill et al., 2003). On the other hand, a few other studies reported mixed results, such as non-significant staffing

differences between nonprofit and for-profit facilities (Cohen & Dubay, 1990; McGregor et al., 2005; Weech-Maldonado, Neff, & Mor, 2003).

Although staffing resources are structural factors that influence quality outcomes, researchers are rightfully wary about its inclusion as a control variable while analyzing the effect of ownership on nursing home quality outcomes (Comondore et al., 2009; O'Neill et al., 2003; Spector et al., 1998; L. Unruh & Wan, 2004). These studies explain that staffing is endogenous to ownership status because staffing is an intermediary variable through which ownership influences quality outcomes. In this case, including staffing as a factor of analysis along with ownership would take away the indirect effect of ownership on quality, resulting in underestimated effect size. Thus, it is more appropriate to treat staffing as a structural quality measure and estimate the effect of ownership status on it separately.

#### **2.4.3 Nonprofit vs. for-profit nursing homes quality comparisons**

Comprehensive literature reviews of studies about the relationship between ownership status and quality of care in nursing homes are at least a decade old (Comondore et al., 2009; Davis, 1991; Hillmer et al., 2005; Schlesinger & Gray, 2006; L. Unruh & Wan, 2004). Comondore and colleagues (2009) conducted a systematic review of 82 studies using various data sources from 1965 to 2003. They found that 40 studies concluded that nonprofit nursing homes offer better service quality than for-profits, and the remaining studies offered mixed or inconclusive findings (Comondore et al., 2009). The authors of this review also conducted a meta-analysis and found that nonprofit facilities had more or better-quality staffing and a lower prevalence of pressure ulcers, two commonly used quality measures. The meta-analysis also showed that nonprofits

perform better on two other widely used quality measures: less prevalent physical restraint use and a lower number of government-cited deficiencies, yet these latter results were non-significant.

In a comprehensive review of the literature published until 2002, Schlesinger and Gray (2006) assessed the findings of fifty previous studies comparing nonprofit and for-profit nursing-care providers' financial and quality performances. They revealed that eight of the nine studies comparing the occurrence of adverse outcomes and six out of seven studies on process measures found nonprofit facilities provided better quality as opposed to only one study that favored for-profit nursing homes (Schlesinger & Gray, 2006). Similarly, another review of studies published between 1990 and 2002 reported that for-profit nursing homes more frequently offer lower service quality in terms of various process and outcome measures used in previous studies (Hillmer et al., 2005). Findings of the reviewed studies show that for-profit nursing homes got cited more frequently for inappropriate restraint use, a process measure. As for the outcome quality indicators, nonprofits had lower rates of pressure ulcers, lower rates of infections, lower deficiency citations, and higher overall quality scores. However, in 38 studies included in this review, 48 of the 81 results on the ownership-quality relationship either concluded no significant nonprofit vs. for-profit difference or found superior for-profit nursing homes quality (Hillmer et al., 2005)

Many previous studies found nonprofit nursing homes had significantly lower rates of pressure ulcers (Castle, 2001a; Grabowski, 2001; Grabowski & Angelelli, 2004; Grabowski, Angelelli, & Mor, 2004; Grabowski & Hirth, 2003; Zhang & Grabowski, 2004; Zinn, Spector, Hsieh, & Mukamel, 2005), whereas others found insignificant

results favoring nonprofit facilities for the same measure (Chou, 2002; Spector et al., 1998). Only a few studies thus far found for-profit facilities were associated with lower rates of pressure ulcers, significantly only at a 10% level (Aaronson et al., 1994) or with an insignificantly negligible difference (Zinn, Aaronson, & Rosko, 1993). However, insignificant results by some of these latter studies can be related to inappropriately controlled staffing or restraint use measures, which took away from the effect of ownership on the outcome measure.

Another commonly used quality indicator is the number of deficiency citations during regulatory inspections, which is an outcome measure. An overwhelming majority of previous studies support the conclusion that nonprofit nursing homes had fewer deficiencies cited compared to for-profits (Castle, 2001b; Comondore et al., 2009; Harrington et al., 2001; Hughes et al., 2000; Konetzka, Yi, et al., 2004; C. White, 2005). Conversely, O'Neill et al. (2003) studied California nursing homes in 1998, adjusting for resident, facility, and market characteristics while explicitly excluding staffing in their analysis. They concluded that for-profit nursing homes had significantly higher total and severe deficiencies, especially those at the highest end of the profit distribution among proprietary homes (O'Neill et al., 2003). Amirkhanyan et al. (2017) used a combination of regulatory CMS data and survey data to analyze the effects of ownership and management on nursing home quality performance, measured by the number of health deficiencies cited and the Five-Star overall quality ratings. They found that nonprofit and public nursing homes offered better quality than for-profit facilities, controlling for various other organizational and environmental factors.

Mortality, hospitalization rates, and complaints are other outcome quality measures used in the literature. Spector and colleagues analyzed national resident level data prior to the 1987 Nursing Home Reform act and discovered that nonprofit facilities were associated with lower mortality rates even when authors controlled for the sorting of sicker residents into nonprofit homes (Spector et al., 1998). Their results contrast with those of Zinn et al. (1993) and Spector and Takada (1991), who concluded for-profit facilities had lower mortality rates. The inconsistency between these results might be explained by the inclusion of staffing which is consequential to ownership status by Zinn et al. (1993), or by the small sample of nursing homes in a small region analyzed by Spector and Takada (1991). A higher hospitalization rate is usually interpreted as lower quality because it indicates poor or inadequate care in a nursing facility which necessitates hospital service. Analysis of hospitalization rates usually reveals nonprofits offer better quality (Grabowski, Stewart, Broderick, & Coots, 2008; Intrator, Castle, & Mor, 1999; Konetzka, Spector, & Shaffer, 2004; McGrail, McGregor, Cohen, Tate, & Ronald, 2006). More recent studies on hospital admission incidence show lower rates of hospitalization by nonprofit nursing homes (Grabowski et al., 2013; Hirth, Grabowski, Feng, Rahman, & Mor, 2014). Moreover, a few studies analyzed number of complaints filed by residents to assess quality, which can be considered a product of care process, and reported higher quality in nonprofit facilities indicated by fewer complaints made by residents (Allen, 2001; Troyer & Thompson, 2004; Weisbrod & Schlesinger, 1986).

Most studies focusing on process measures to compare nursing homes analyzed physical and chemical restraint prevalence in nonprofit vs. for-profit facilities. Previous research has argued that inadequate staffing due to cost-cutting incentives at for-profit

facilities might lead to excessive use of restraints and catheters (Weisbrod, 1996). Indeed, for-profit nursing homes were more likely to use physical restraints (Castle, 2000, 2001a; Castle & Fogel, 1998; Graber & Sloane, 1995; Grabowski et al., 2004; Mukamel, 1997; Zhang & Grabowski, 2004), even while controlling for staffing (Aaronson et al., 1994; Castle & Engberg, 2005; Zinn, 1993; Zinn et al., 1993). On the other hand, other studies reported lower restraint use prevalence in for-profit nursing facilities, though estimation results were insignificant (Anderson, Issel, & McDaniel Jr, 2003; Starkey, Weech-Maldonado, & Mor, 2005). Castle (2002) discovered that for-profit facilities were cited less for consecutive years of deficiencies due to improper use of physical restraints. A different study by Castle (1999) found for-profit nursing homes had an insignificantly lower prevalence of psychoactive restraint use. Regarding the rate of catheterization and feeding tube use, research results have also been mostly in favor of nonprofit nursing homes (Castle, 2001a; Castle & Engberg, 2005; Moseley, 1994; Zhang & Grabowski, 2004; Zinn, 1993). Grabowski and Hirth (2003) analyzed the prevalence of restraint use, feeding tubes, and catheterization using a national sample of nursing homes and discovered that nonprofit facilities had lower rates of catheter and feeding tube usage but higher physical restrained use than for-profits. They also found spillover effects that increasing nonprofit market share is associated with higher average nursing home quality measured by lower rates of catheterization, feeding tube use, and pressure ulcers (Grabowski & Hirth, 2003).

Regarding asymmetric information in long-term care, Chou (2002) found that quality differences between nonprofit and for-profit homes were more pronounced when residents did not have family members visiting to check their conditions, whereas



differences became insignificant when family members frequently monitored residents. By drawing on the OSCAR and government regulatory data, Ben-Ner, Karaca-Mandic, and Ren (2012) analyzed quality separately for observable and unobservable aspects. Their analysis used outcome measures, including the prevalence of falls and infections, number of deficiencies, resident satisfaction ratings, and adjustments to control for residential demographic characteristics and health conditions, resident case mix, and market-level factors. Study results showed that non-profit nursing homes deliver better quality on aspects of service that are less observable, either by residents or their family, and the same level of quality on observable outcomes compared to for-profit homes.

#### **2.4.4 Estimation methods used in previous studies**

Discovering the potential influences of the ownership type of a nursing home on the quality of care is not an easy task, especially with observational data. To that end, most of the previous studies used cross-sectional data analysis with linear models to estimate the relationship between ownership and quality (Castle, 2000, 2002; Grabowski, 2001; Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2002; Hughes et al., 2000; Konetzka, Spector, et al., 2004; Zinn et al., 2005). Typically, these estimation models include time-varying nursing home characteristics and location-based characteristics. Potential challenges to estimating true effects through a cross-sectional model include unobserved heterogeneity that might confound the estimates. A fundamental issue is the potential selection problem caused by sorting residents with specific characteristics into certain types of nursing homes. As discussed by some researchers, not controlling for the selection of residents into nursing homes may introduce bias in the analysis results (Grabowski et al., 2013; Huang & Bowlblis, 2018,

2019; Rahman et al. 2013). As such, a quality outcome disparity between for-profit and nonprofit providers might be caused by different characteristics of the residents admitted into these facilities rather than the quality of care provided. If individuals with more acute health conditions choose to receive long-term care in nonprofit nursing homes, as argued by previous researchers (Grabowski et al., 2013), the effect of nonprofit ownership on quality would be underestimated.

Some previous studies attempted to address the selection-bias issue by using instrumental variable estimation techniques in their analysis (Grabowski et al., 2013; Grabowski & Hirth, 2003; Hirth et al., 2014; Huang & Bowblis, 2018, 2019; Rahman et al., 2013). However, devising a workable instrumental variable is challenging without access to resident-level data. Other methodological attempts to resolve the effects of underserved cross-sectional confounders were through fixed effects regressions (Stevenson & Grabowski, 2008) or difference-in-difference (DID) methods (Braun, Jung, Casalino, Myslinski, & Unruh, 2021; Grabowski & Stevenson, 2008; Lu & Lu, 2021). Grabowski and Stevenson (2008) were the first to use DID models to examine the effect of nursing home ownership conversions on quality. Their analysis showed quality declines along with staffing hours in facilities that converted from nonprofit to for-profit status. However, they could not claim causal effects due to the presence of pre-trends in their estimations. More recently, Lu and Lu (2021) implemented simple DID models to examine changes in operating costs, staffing levels, and the number of deficiencies in nursing homes converting from nonprofit to for-profit status. They found that nonprofit to for-profit ownership conversions decreased operating costs by lowering total nurse wage and overhead wage costs and significantly cutting registered nurse staffing, eventually

leading to higher deficiencies in NP-to-FP converted nursing homes (Lu & Lu, 2021). However, their simple DID models implemented only before-after conversion comparison without considering dynamic effects, and their estimations were based on standard two-way fixed effects regressions. Even though the DID approach prevents the selection bias caused by residents sorting into certain nursing homes, it still leads to another type of bias if the standard two-way fixed effects method is used in estimating the average treatment effects as explained in the methodology section below (2.6.2). In addition, Lu and Lu (2021) do not differentiate between self-reported and non-self-reported quality measures in their analysis. Therefore, the present study provides an important contribution to the literature by examining how ownership conversions affect this aspect of quality measures.

## **2.5 Research questions and hypotheses**

Research has revealed that superior quality of long-term care services was more often provided by nonprofit nursing homes than for-profit nursing homes, but overall findings were mixed (Comondore et al., 2009; Rosenau & Linder, 2003). Inconclusive findings and the fact that most studies are at least a decade old begs further inquiry. This chapter's primary research question pertains to the relationship between ownership and quality in nursing homes. Previous studies mostly examine this relation using multivariate analysis to compare for-profit and nonprofit nursing homes. However, these techniques suffer from various biases. Instead of making a comparative analysis, I use event study models that strongly identify ownership's effect on quality. Specifically, I ask whether for-profit ownership conversion of a nursing home is associated with changes in the quality of services.

Researchers have noted that nonprofit and for-profit nursing homes provide similar outcomes on more easily observable aspects of service quality. In contrast, nonprofits deliver better outcomes, especially on aspects of service quality that are hard to measure, where the information asymmetry problem is more severe (Ben-Ner et al., 2012; Hirth, 1993; Spector et al., 1998; Weisbrod & Schlesinger, 1986). Previous studies define observability of quality indicators subjectively and base their results on the assumption that the reported data is correct. However, it is questioned whether nursing homes correctly report less observable quality measures, especially if doing so hurts their reputation (Han, Yaraghi, & Gopal, 2018; Integra Med Analytics, 2020; Sanghavi, Pan, & Caudry, 2020).

A more concrete way to examine the adverse effects of asymmetric information would be comparing self-reported quality measures with those inspected by the government, which are expected to differ in reliability. As such, for-profit nursing homes are expected to manipulate self-reported quality indicators by underreporting negative measures that are damaging to their reputation and overreporting positive measures that benefit them. Doing so would help them as increasing consumer demand brought by a high-quality score results in higher profits. In support of that, a recent New York Times investigation found many nursing homes owned by for-profit companies misrepresented information to the Centers for Medicare and Medicaid (CMS) to manipulate their Five-Star ratings posted on the CMS website (Silver-Greenberg & Gebeloff, 2021). The investigation revealed, for instance, that some nursing homes underreported or hid harm made to residents and inflated their staffing numbers until they were required to report payroll data. On the other hand, the quality measures inspected by the government or

derived from Medicare claims-based data are harder to manipulate and, therefore, more likely to reveal quality problems caused by perverse incentives in the presence of information asymmetries. This study differs from previous studies in analyzing the role of asymmetric information. Accordingly, instead of looking at subjectively determined observability of quality measures, the present study inquires whether more concretely defined self-reported vs. inspected quality measures change in different ways following a for-profit ownership conversion of a nursing home.

In parallel with the discussion above, I expect nursing homes that have converted into for-profit ownership to have lower ratings of government-inspected or Medicare claims-based quality measures compared to unconverted nursing homes because these measures are almost impossible to be manipulated by the service provider and, therefore more likely to reveal quality problems. I include staffing variables among these inspected measures. Although some nursing homes were discovered to have misreported their staff hours to authorities (Silver-Greenberg & Gebeloff, 2021), the CMS conducts audits to verify the reported staff data and imposes penalties for significant discrepancies. Moreover, since 2016, nursing homes have been mandated by CMS to report payroll-based staffing information to the Payroll Based Journal (PBJ) system (CMS, 2018). Thus, I hypothesize staff hour measures to be reliable even though they are initially self-reported and then inspected later. Hence, I offer the following hypotheses:

**Hypothesis 2.1:** For-profit converted nursing homes (NH) are expected to offer lower quality of care compared to nonprofit and government-owned nursing homes that did not convert in terms of the following government-inspected quality measures. Compared to unconverted NHs, for-profit converted NHs are predicted to have:

H2.1(a): higher number of deficiency citations issued in the most recent periodic government inspection,

H2.1(b): higher number of complaint deficiencies,

H2.1(c): lower number of total nursing staff hours per resident day (resident case-mix adjusted),

H2.1(d): lower numbers of total registered nurse (RN) hours per resident day (resident case-mix adjusted).

Another reliable source of quality measure is the Medicare claims data. CMS obtains these measures from Medicare claims made by residents in cases of hospitalization or emergency department visits. As such, it is implausible that a facility may prevent such events from being reported in a resident's Medicare records. Thus, I consider Medicare claims-based quality measures reliable and offer the following hypotheses.

**Hypothesis 2.2:** For-profit converted nursing homes perform worse than unconverted nonprofit and government-owned nursing homes concerning Medicare claims-based quality measures. As such, compared to unconverted NHs, for-profit converted NHs are predicted to have:

H2.2(a): higher rates of re-hospitalization among short-stay residents,

H2.2(b): higher rates of outpatient emergency department visits among short-stay residents,

Regarding the self-reported MDS-based quality measures, I do not expect to find any significant differences between for-profit converted and unconverted nonprofit and government-owned nursing homes because these measures can be manipulated, and for-profit nursing homes have incentives to do so. Hence, I offer the following hypothesis:

**Hypothesis 2.3:** I expect to find no significant differences between self-reported (non-inspected) MDS-based quality measures reported by for-profit converted nursing homes and unconverted nonprofit and government-owned homes. As such, compared to unconverted NHs, for-profit converted NHs are predicted to have similar:

H2.3(a): percentage of long-stay residents whose need for assistance with daily activities increased,

H2.3(b): percentage of long-stay residents whose mobility worsened,

H2.3(c): percentage of long-stay residents with urinary catheter usage,

H2.3(d): percentage of long-stay residents with urinary tract infection,

H2.3(e): percentage of long-stay residents with pressure ulcers,

H2.3(f): percentage of short-stay residents with new or worsened pressure ulcers,

H2.3(g): percentage of long-stay residents who got chemical restraints (antipsychotics),

H2.3(h): percentage of short-stay residents who got chemical restraints (antipsychotics) for the first time.

H2.3(i): percentage of long-stay residents experiencing one or more falls with injuries,

In the Nursing Home Five-Star Quality Rating System, each nursing home is assigned four overall ratings: the health inspection rating, the staffing rating, the quality measure (QM) rating, and an overall Five-Star (5-Star) rating of one to five stars (CMS, 2021a). The health inspection rating is calculated based on a nursing home's government health inspection records during the most recent inspections. The staffing rating is based on two quarterly submitted case-mix adjusted measures: total nursing hours per resident day and registered nurse (RN) hours per resident day. The total nursing hours are the sum of RN, licensed practical nurse (LPN), and nurse aide hours (CMS, 2021a). Each nursing home is assigned a staffing rate of one to five stars based on staffing thresholds calculated by CMS. The overall QM rating is based on ten self-reported MDS-based QMs and five Medicare claims-based measures. To control for variation between states, the health inspection ratings and QM ratings are assigned to each nursing home based on its performance within the state relative to a state-level threshold calculated (CMS, 2021a).

The overall Five-Star (5-Star) rating is assigned based on the three-domain ratings. The health inspection rating constitutes the base rate for the overall Five-Star rating, and the staffing and QM ratings can only be used to improve the base health inspection rate. CMS uses this system to put more weight on the most recent findings of onsite inspections compared to staffing and self-reported quality measures. For example, if the health inspection rating is one star, then the staffing and QM ratings can only improve the overall Five-Star rating to two stars. The overall rating is not assigned if a nursing home is missing a health inspection rating. Yet, a nursing home with only three stars health inspection rating can receive a top five-star rating with the help of its staffing and other self-reported quality measures. Indeed, the CMS guidelines state, “The health



inspection rating is the most important dimension in determining the overall rating but, depending on the performance on the staffing and QM domains, the overall rating for a nursing home may be increased or decreased by up to two stars.” (CMS, 2021a).

Indeed, the Five-Star quality rating is a widely used quality measure in the literature (Abrams, Loomer, Gandhi, & Grabowski, 2020; Amirkhanyan et al., 2017; Konetzka, Grabowski, Perrailon, & Werner, 2015). Research has shown that the star-based rating system has led to a significant increase in the market share for nursing homes with 5-star ratings and a significant decrease in the demand for 1-star facilities (Werner, Konetzka, & Polsky, 2016). Therefore, nursing homes are expected to have strong incentives to influence star ratings to attract new residents. Indeed, some nursing homes were reported to be able to inflate their overall Five-Star ratings by misreporting self-reported quality indicators (Silver-Greenberg & Gebeloff, 2021). However, not all the four overall ratings are manipulable. For instance, it is much harder for a facility to manipulate the staffing rating, especially after the PBJ system was implemented in 2016. It is also almost impossible to manipulate the health inspection rating because it is based on government inspection records. So, I consider the health inspection and staffing ratings reliable overall ratings. On the other hand, the QM rating is mainly based on self-reported MDS-based quality measures, so it is easier to manipulate. As mentioned above, the overall Five-Star rating is open to manipulation as well. Therefore, I offer different hypotheses for these four ratings. I consider the overall Five-Star rating and the QM rating unreliable quality measures in the sense that they are manipulable and establish my hypothesis as such:

**Hypothesis 2.4:** I expect to find no significant differences between the average Five-Star and QM ratings assigned to for-profit converted nursing homes and unconverted nonprofit and government-owned homes. As such, compared to unconverted NHs, for-profit converted NHs are predicted to have:

H2.4(a): similar overall Five-Star ratings,

H2.4(b): similar overall QM ratings,

**Hypothesis 2.5:** For-profit converted nursing homes perform worse than unconverted nonprofit and government-owned nursing homes with respect to the reliable overall quality ratings. As such, compared to unconverted NHs, for-profit converted NHs are predicted to have:

H2.5(a): lower health inspection ratings,

H2.5(b): lower overall staffing ratings,

## **2.6 Methodology and data**

The analysis in this chapter primarily draws on the Certification and Survey Provider Enhanced Reporting (CASPER) (previously known as Online Survey, Certification, and Reporting - OSCAR) data provided by the Centers for Medicare and Medicaid Services (CMS) from 2013 through 2021. This data is publicly available on Care Compare<sup>1</sup> (also known as the Nursing Home Compare before December 2020). The most recent data, as well as the archived data, is available to download at the Provider Data Catalog located at <https://data.cms.gov/provider-data/>. The CASPER data consists

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<sup>1</sup> Care Compare can be accessed at: <https://www.medicare.gov/care-compare/>.

of facility-level information reported monthly for around 15000 Medicare and Medicaid certified nursing homes registered with the CMS, which is about 95 percent of all nursing homes nationwide. Information in this data includes quality measures collected through survey data self-reported by facilities and data collected through government inspections which occur at least once every 15 months (every 12 months on average). These quality measures are used as dependent variables to analyze quality gaps. The CMS data also include facility characteristics such as size, age, ownership status, and staffing levels.

The CASPER data are merged with national historical data of nursing homes provided by the Long-term Care Facts on Care in the U.S. (LTCFocus) project run by the Brown University Center for Gerontology and Healthcare Research and sponsored by the National Institute on Aging (LTCFocus, 2021). Researchers at Brown University have drawn from the CMS's CASPER and the Minimum Data Set (MDS) to create the LTCFocus data. This dataset provides detailed information about nursing home residents' average health and functional status, including the average case-mix index and facility characteristics such as chain affiliation, hospital affiliation, occupancy rate, and payer mix.

### **2.6.1 Dependent Variables: Quality Measures**

The analysis has several dependent variables to measure the quality of service since there is no single standard measure to assess senior care quality. The CASPER data provides a variety of facility-level quality measures, including the Five-Star nursing home ratings and the number of deficiencies reported. The Centers for Medicare and Medicaid Services (CMS) oversees comprehensive inspections of nursing homes participating in the Medicare and Medicaid programs annually on average. These

inspections assess the nursing home's compliance with federal regulations by evaluating facility policies and practices regarding resident wellbeing, administration, environment, and quality of services. Results are used in the Nursing Home Five-Star Quality Rating System to assign a variety of quality ratings to the nursing home, including deficiency citations, complaint deficiencies, abuse citations, and health inspection ratings. Centers for Medicare and Medicaid outline definitions and details calculations for these quality ratings in the Technical User's Guide (CMS, 2021a). Accordingly, the quality measures are defined as follows.

*Deficiency citations:* number of deficiencies cited on health inspections during the most recent three-year period,

*Complaint deficiencies:* deficiency citations on complaint inspections during the most recent three years,

The second category of quality measures relates to staffing levels at facilities. The CMS collects staffing data from nursing homes through the Payroll-based Journal (PBJ) system every quarter (CMS, 2021a). These data were then adjusted for resident case-mix by the CMS using the Resource Utilization Group (RUG-IV) case-mix system. The RUG-IV system is used by the CMS to calculate the case severity level of residents in each facility. Therefore, staffing quality measures already reflect the care need levels of residents. Two staffing quality measures are total nursing hours per resident day and registered nursing hours per resident day.

*Total nursing staff hours per resident day:* summation of registered nursing (RN), licensed practical nursing (LPN), and nurse aide hours divided by total resident census and case-mix adjusted using the Resource Utilization Group (RUG-IV) case-mix system,

*Registered nursing (RNs) hours per resident day:* total RN hours divided by total resident census and case-mix adjusted using the RUG-IV system,

Finally, the third category of quality measures consists of outcome and process-related quality indicators. These quality measures (QMs) have been provided in the CASPER data and are based on two sources. CMS obtains MDS-based QM from Minimum Data Set (MDS) self-reported by facilities. The second source is the Medicare claims data. These include quality measures for both long-stay residents (who are in the nursing home longer than 100 days) and short-stay residents.

QMs obtained from self-reported MDS-based data are the following (CMS, 2021a):

- Percentage of long-stay residents whose need for assistance with daily activities increased: measures percent of long-stay residents with increased needs for help with Activities of Daily Living (ADL) than before. A higher percentage indicates lower quality of care as increasing ADL dependency indicates insufficient care.
- Percentage of long-stay residents whose mobility worsened: measures percent of long-stay residents who experienced a decline in locomotion independence compared to their previous assessment. Similar to above, a higher percentage indicates lower quality.
- Percentage of high-risk long-stay residents with pressure ulcers: measures rate of high-risk residents who have Stage II-IV or unstageable pressure ulcers. Those

include residents who are impaired in bed mobility or transfer. A higher percentage indicates lower quality of care.

- Percentage of long-stay residents with urinary catheter usage: urinary catheterization may lead to health complications such as urinary infections, so a higher percentage indicates a lower quality of care.
- Percentage of long-stay residents with a urinary tract infection: an outcome measure of residents who have had a urinary tract infection during the past 30 days. These infections are preventable with proper care. Thus, a higher percentage indicates lower quality of care.
- Percentage of long-stay residents experiencing one or more falls with injuries: an outcome measure of falls indicates a lower quality of care provided.
- Percentage of long-stay residents who use chemical restraints (antipsychotics): Understaffed facilities might be prone to use chemical controls in unnecessary circumstances to pacify some residents. So, a higher percentage implies lower quality.
- Percentage of short-stay residents with new or worsened pressure ulcers: forming of new pressure ulcers or worsening of existing ones indicate a lower quality of care in an SNF.
- Percentage of short-stay residents who got chemical restraints (antipsychotics) for the first time: start of using chemical restraints indicates a lower quality of care.

Along with the measures obtained from self-reported MDS data, other quality measures are derived from Medicare claims data (CMS, 2021a). This latter source includes healthcare claims made by residents to Medicare, so it is harder to be

manipulated by the facility. Due to lack of data, two out of five Medicare claims-based QMs are included in the analysis, which are:

- Rate of re-hospitalization among short-stay residents: measures the percentage of short-stay residents who were re-admitted to a hospital within 30 days of entry into the nursing home. A higher rate implies a lower quality of care.
- Rates of outpatient emergency department visits among short-stay residents: measures the percentage of short-stay residents who had an outpatient ED visit within 30 days of entry into the nursing home. A higher rate implies a lower quality of care.

Finally, the CMS combines all the above quality indicators to calculate four comprehensive quality ratings for each facility (CMS, 2021a). These are the health inspections rating, the staffing rating, the quality measures (QM) rating, and an overall Five-Star rating. Explanations of each of these ratings are provided in section 2.3.

### **2.6.2 Estimation methodology: Event study analysis**

In this study, I employ a difference-in-differences analysis to estimate the effect of ownership on nursing home quality outcomes. Compared to the cross-sectional approach, which compares quality in for-profit and nonprofit facilities while controlling for various facility and location-based variables, the difference-in-differences (DID) approach uses ownership conversions within nursing homes to identify the effects of ownership on quality. The classical approach to the difference-in-differences model is a two-way fixed effects estimation where both unit and time fixed effects are included in the model along with the treatment variable and time-varying controls. This modeling technique allows researchers to control for unit and time-invariant factors, removing any between-unit and

time-invariant unobserved heterogeneity from the estimated effects. Therefore, using this methodology allows us to estimate the effect of ownership on quality without any potential confounding effects of selection biases at the facility level.

The identification strategy in DID models relies on exploiting variation in the timing of ownership conversions across nursing homes. The effect of ownership conversion on quality is estimated by comparing quality differences before and after conversion in facilities that converted with the quality differences in facilities that did not convert over the same period. The facilities that did not convert are used as control groups to estimate the effects. The main underlying assumptions of this method are the parallel trends and no anticipation assumptions. According to the parallel trends assumption, quality trends in facilities that eventually converted are assumed to be parallel with the quality trends in facilities that did not convert until the time of conversion. In other words, this assumption maintains that had the treated facilities not been converted, their quality would have followed similar trends with the facilities that did not convert. Similar to the parallel trends, the no-anticipation assumption assures that outcome trends before treatment cannot substantially differ (no treatment effects before treatment period), as units are assumed not to take any anticipatory behavior to change their outcome before the treatment. In a typical DID, model units receive the treatment condition at common times. However, there are also cases when the treatment time varies across the units, usually referred to as staggered adoption (Athey & Imbens, 2022). The situation for ownership conversions analyzed here is a staggered adoption setting, so the analysis in this chapter uses a staggered adoption design, also called an event study.



An event study is a dynamic difference-in-differences method including lead and lag effects to evaluate outcome differences between treated and control observations before and after the treatment. In this model, before-treatment differences (leads) are used to assess the parallel trends assumption, which presumes no significant differences exist between outcomes of treated and untreated units before the treatment application. At the same time, after-treatment differences (lags) are used to assess the dynamic effects of treatment for each year following its application. The dynamic DID model is essentially an expanded version of the two-way fixed-effects model with dummy variables included for lead and lag effects of the treatment period. These models are most appropriate for estimating treatment effects when treatment is applied simultaneously for all treated units or when treatment effects are constant over time and across units. However, in a staggered adoption setting, treatment condition is applied at different time periods across the treated units, which may not necessarily be constant across time or units. This latter situation is called treatment effect heterogeneity in the literature (Sun & Abraham, 2021).

Recent research has shown that when treatment effect heterogeneity exists, the classic DID estimates might lead to biased estimates of the average treatment effect (Callaway & Sant'Anna, 2021; Chapman & Brooks, 2016; de Chaisemartin & D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun & Abraham, 2021). For instance, treatment effect heterogeneity might emerge as contextual differences across different periods cause treatment effects to differ across cohorts (Goodman-Bacon, 2021). An event study model is insufficient to address the bias in the estimated treatment effects if heterogeneity exists in lag and lead effects across cohorts (Sun & Abraham, 2021). In such cases, researchers produced alternative estimation methods to correct potential biases in an event study

design (Borusyak, Jaravel, & Spiess, 2021; Callaway & Sant'Anna, 2021; Gardner, 2021; Roth & Sant'Anna, 2021; Sun & Abraham, 2021). These alternative methods either use an imputation of the control group outcome or an aggregation method to estimate average treatment effects. The analysis below includes corrected estimates for average treatment effects by using two different alternative estimation methods proposed by Gardner (2021) and Sun and Abraham (2021).

An event study equation used to estimate dynamic treatment effects is given in the below equation (1). Here  $Y_{it}$  is the quality outcome measure for facility  $i$  at time  $t$ ,  $\alpha_i$  and  $\lambda_t$  represent the facility and time fixed effects,  $E_i$  is the event time for facility  $i$ , which marks the time when facility  $i$  gets treated (converts ownership),  $X_{it}$  represent time-varying controls, and  $v_{it}$  is an unobserved error term capturing the remaining variation in outcome. In this equation, the lead and lag effects of the treatment are denoted by indicators of relative periods. Specifically, the indicator  $\mathbb{1}\{t - E_i = l\}$  denotes that unit  $i$  is  $l$  periods away from receiving the treatment ( $E_i$ ), which represents a lead period when  $l$  is negative and a lag period when  $l$  is positive. This equation specification includes  $K$  lead effects and  $L$  lag effects of the treatment. The lead period prior to treatment is excluded as the reference period. The corresponding coefficients  $\mu_j$  and  $\mu_l$  give estimates for dynamic treatment effects in lead and lag periods, respectively.

$$Y_{it} = \alpha_i + \lambda_t + \sum_{j=-K}^{-2} \mu_j \mathbb{1}\{t - E_i = j\} + \sum_{l=0}^L \mu_l \mathbb{1}\{t - E_i = l\} + \Gamma X_{it} + v_{it} \quad (1)$$

Sun and Abraham's (2021) method decomposes the relative period coefficient estimates ( $\mu_j$  and  $\mu_l$ ) by averaging unit-level treatment effects in each relative period

across units treated at the same time  $E_i = e$  (cohort  $e$ ), and they call these the cohort-specific average treatment effects on the treated ( $CATT_{e,l}$ ). Subsequently, the authors show that under the assumptions of parallel trends and no anticipations, the regression coefficients  $\mu_j$  and  $\mu_l$  are linear combinations of not only  $CATT_{e,l}$  from own periods but also  $CATT_{e,l}$  from other periods in the presence of treatment effect heterogeneity across cohorts. Therefore, coefficient estimates of relative period effects from the dynamic difference-in-difference method are contaminated by treatment effects from other periods, leading to biased results. Moreover, this contamination makes it problematic to use pre-treatment effect estimates to test the parallel trends assumption (Sun & Abraham, 2021). They devised an estimation method to address this contamination problem arising from the treatment effect heterogeneity. Sun and Abraham's (2021) method estimates an aggregation of  $CATT_{e,l}$  across cohorts for each relative period  $l$ , where shares of cohorts in relative periods are used as weights and the weighted average  $CATT_{e,l}$  is also normalized by the number of relative periods included in the equation. They call their estimator an 'interaction-weighted' (IW) estimator and show that under parallel trends and no anticipation assumptions, IW estimators can estimate dynamic treatment effects without biases caused by the presence of heterogeneous treatment effects.

Sun and Abraham's (2021) method combines the treated units by cohorts according to their treatment periods. They provide estimates of the periodic treatment effects by taking weighted averages of effects across cohorts, as explained above. Accordingly, their proposed estimator is an aggregation of treatment effects where control groups are units that have not yet been treated at a given relative period and never-treated units. This method is an aggregation-based approach to dealing with problems caused by

heterogeneous treatment effects. Another approach uses imputation-based estimators to address these issues using imputed counterfactual outcomes (Borusyak et al., 2021; Gardner, 2021). Gardner (2021) proposed an imputation-based estimator using a two-stage approach to identify average treatment effects. In the first stage, outcomes are regressed on unit and time fixed effects from the sample of untreated observations to estimate group and period effects. In the second stage, these estimated group and period effects are removed from outcomes, and the remaining outcomes are compared across treated and untreated units to identify average treatment effects. He shows that his proposed estimator, which is called the two-stage difference-in-differences (2sDiD) estimator, is robust to heterogeneous treatment effects under staggered adaptation (Gardner, 2021). His identification strategy relies on parallel trends and no anticipation assumptions along with the assumption of correct model specification of outcome model in the first stage. Therefore, Gardner's method relies on stronger assumptions than Sun and Abraham's. Nevertheless, Gardner's two-stage estimations are included in this study as an important alternative estimation method to make findings robust to method choice.

I apply three estimation methods separately to estimate the dynamic effects of ownership conversions on quality indicators. These are the classic two-way fixed effects estimates, Sun and Abraham estimates, and Gardner's estimates. Analyses are conducted using the R software packages `fixest`, `sunab`, and `did2s` (Bergé, 2018; Butts & Gardner, 2021). In the below section, the first event study method is described in the context of analyzing the effects of ownership conversion on nursing home quality. A description of data processing steps follows this. Then, event-study estimation results are presented for each of the three methods on the same graphs for each outcome variable.

### 2.6.3 Data pre-processing

Estimating a difference-in-differences model requires having panel data.

Therefore, panel data is constructed from the Center of Medicare and Medicaid Services' (CMS) CASPER data for the years between 2013 and 2021. This data is then merged with long-term care data provided by the LTCFocus project at the School of Public Health at Brown University. The combined data included an unbalanced panel of 16655 nursing homes across nine years. Since our panel data extends over nine years, I consider dynamic effects of ownership conversion up to five lead and five lag periods, such that  $J = K = 5$ . For-profit ownership status is marked as the treatment condition, and a nursing home is considered treated as the ownership type of the nursing home changes to a for-profit ownership category. Moreover, a nursing home is considered untreated if its ownership is of nonprofit or government type. Nonprofit and government-owned nursing homes are grouped together in this analysis of quality because overall trends revealed that quality outcomes for these ownership types are relatively close. Furthermore, from a theoretical perspective, government facilities are expected to operate with similar incentives to nonprofit facilities because both types of facilities are free from profit-driven incentives. So, nonprofit and government-owned nursing homes are grouped together to be compared with for-profit nursing homes. The event study equation in this context becomes equation (2) given below:

$$Y_{it} = \alpha_i + \lambda_t + \sum_{j=-5}^{-2} \mu_j \mathbb{1}\{t - E_i^{FP} = j\} + \sum_{l=0}^5 \mu_l \mathbb{1}\{t - E_i^{FP} = l\} + \Gamma X_{it} + v_{it} \quad (2)$$

In this context, for the parallel trends assumption to hold, nursing home quality trends should follow similar trajectories between the converted facilities and those that

did not convert prior to the period of for-profit conversion. Similarly, no anticipation assumption indicates that nursing homes have no prior knowledge of ownership conversion to change their quality outcomes before the conversion occurs. To test these two assumptions, corrected pre-treatment period effects are used to compare the outcome trends between treatment and control groups before treatment periods.

The CMS data proposed a challenge to run a simple ownership conversion analysis because there were cases in which a nursing home switched ownership back and forth between different types over a period of just a few years. It was unclear if some nursing homes switched ownership multiple times over nine years or if those cases were data entry errors. Therefore, for the reliability of the estimates, I had to eliminate these cases of multiple ownership conversions within the same facility over the study period. This process resulted in dropping 1182 nursing homes from the analysis. As a robustness check, I also ran analysis models by keeping these nursing homes with multiple conversions and assumed absorbing treatment effects, meaning that a facility is considered treated if it has ever been converted into for-profit ownership status. Analyses results stayed mostly the same. Furthermore, as explained above, for-profit ownership conversion is used as the treatment condition compared to nonprofit and government ownership. This process resulted in 629 cases of for-profit conversions from either nonprofit or government types from 2013 to 2021 in the final data used in the analysis. As a robustness check, I excluded government-owned nursing homes from the analysis, and the results did not change substantially. The following section presents analysis results where multiple conversion cases were eliminated and nonprofit and government facilities are grouped together.

## **2.7 Results**

Three groups of quality indicators from the CMS data are used to evaluate the effects of for-profit ownership conversions on nursing home quality: government-inspected deficiency and staffing measures, Medicare claims-based measures, and self-reported quality measures. In addition to individual quality indicators, I also examined the four overall quality summary ratings calculated by CMS: the Five-Star ratings, the overall quality measure (QM) ratings, the health inspection ratings, and the overall staffing ratings. In total, 19 different quality indicators are analyzed. Event study estimations are conducted to estimate the dynamic effects of for-profit ownership conversions on each quality measure separately by following the procedures described in the previous section. Results are provided for the overall ratings first, followed by estimation results for individual measures within the three groups of quality indicators.

### **2.7.1 Average summary ratings**

The first model below presents dynamic event study estimates to assess the effects of for-profit conversion on nursing homes' overall Five-Star quality ratings assigned by CMS. First, an empty model is estimated for the Five-Star ratings, meaning that no other covariates are included in the model. Then the model is estimated with covariates by including the number of beds and occupancy rate to control for possible time-varying effects of these variables. Estimation results for both models are shown in Figure 2.1 and Figure 2.2. The vertical dashed line on the graphs shows the reference period, which is set to the year immediately before the for-profit ownership takeover. Results stay almost identical when the covariates are included in the model. In both cases, we observe significant decreases in the Five-Star ratings in converted nursing homes after for-profit

conversion compared to nonprofit or government-owned nursing homes that did not convert. The standard two-way fixed effects (TWFE) estimations and both corrected estimates support this finding. However, we also observe differences between Five-Star ratings when we examine estimated effects in pre-treatment periods, which means that the parallel trends assumption is violated. As explained by Sun and Abraham (2021), the classic TWFE pre-treatment effect estimates might pick up effects from other periods, so it is not appropriate to use them to test the parallel trends assumption. But even the estimates corrected by their method show differences in pre-treatment effects. Only Gardner’s corrected estimates support the parallel trends assumption for up to four years before the conversion event.

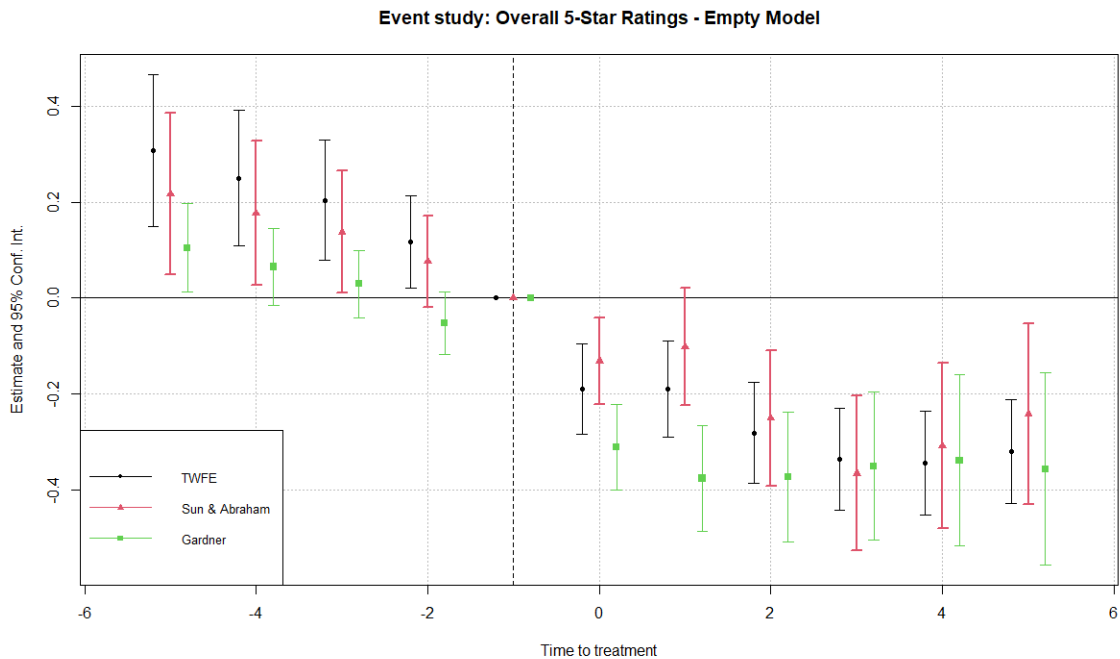


Figure 2.1: Event study model estimations for the overall Five-Star ratings (empty model)



The existence of pre-treatment trends might mean that the difference in quality trends between converted and unconverted nursing homes have existed even before the conversion occurs, which makes it questionable to attribute the after-treatment differences to the conversion event. According to the Sun-Abraham corrected estimation, the apparent decreases in the Five-Star ratings after the conversion cannot be attributed to the for-profit conversion, but according to Gardner's estimations, they can be. Since the existence of pre-trends differs between the two corrected estimation methods, the results about the relationship between the for-profit conversion event and the overall 5-Star ratings are inconclusive. Therefore, I cannot reject hypothesis 2.4(a).

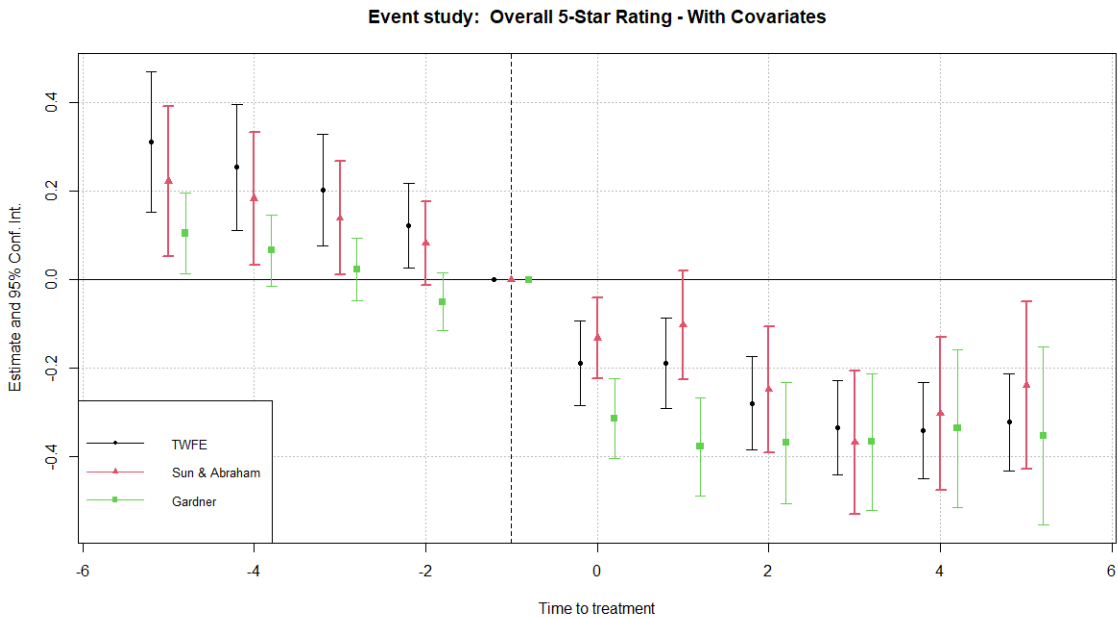


Figure 2.2: Event study model estimations for the overall Five-Star ratings with covariates

For all the rest of the estimations, results are presented without covariates, as the effect estimations change only minimally when covariates are included. Empty models are preferred to prevent losing observations due to missing values of covariates. The following three figures (2.3, 2.4, and 2.5) present event study estimations for the overall QM, health inspection, and staffing ratings. The QM rating plot presented in Figure 2.3 clearly shows that according to all estimation methods, overall QM ratings gradually worsen after a nursing home converts into for-profit ownership. Moreover, we observe no significant differences between the QM ratings before the ownership conversion, supporting the parallel trends assumption. So, hypothesis 2.4(b) is rejected. We observe a significant decrease in the QM ratings up to 3 years after the for-profit conversion; the effect fades at the 4<sup>th</sup> lag period according to corrected estimates. However, as we go towards the further periods, the number of conversion cases to estimate lag effects decreases. Therefore, the insignificant effects for the later periods might be an artifact of the low number of conversions remaining to estimate further lag effects in the nine years of data.

Figure 2.4 presents estimations for health inspection ratings, which show a similar picture to the overall QM ratings. Health inspection ratings are significantly lower in converted facilities after the for-profit conversion. Moreover, the parallel trends assumption holds, supporting that after-treatment effects can be attributed to the treatment condition. These findings support hypothesis 2.5(a) that for-profit conversion is associated with decreasing health inspection ratings. The overall staffing rating plot (Figure 2.5) displays a picture similar to that of Five-Star ratings. The staffing ratings are significantly lower in converted facilities after the conversion. However, pre-treatment

effects differ significantly between treated and untreated facilities, so the parallel trends assumption is violated. The plot shows a decreasing trend in quality differences between for-profit converted and unconverted nursing homes over the years. As a result, the effect of for-profit conversion on staffing ratings is unclear, and I can neither reject nor support hypothesis 2.5(b). At the same time, this finding raises suspicion about the reliability of the staffing rating, given that it is the only overall rating that shows pre-treatment variation compared to the health inspection and QM ratings. On the other hand, these findings also explain the above results for the overall Five-Star ratings because Five-Star ratings are calculated based on the combination of the health inspection, overall staffing, and overall QM ratings.

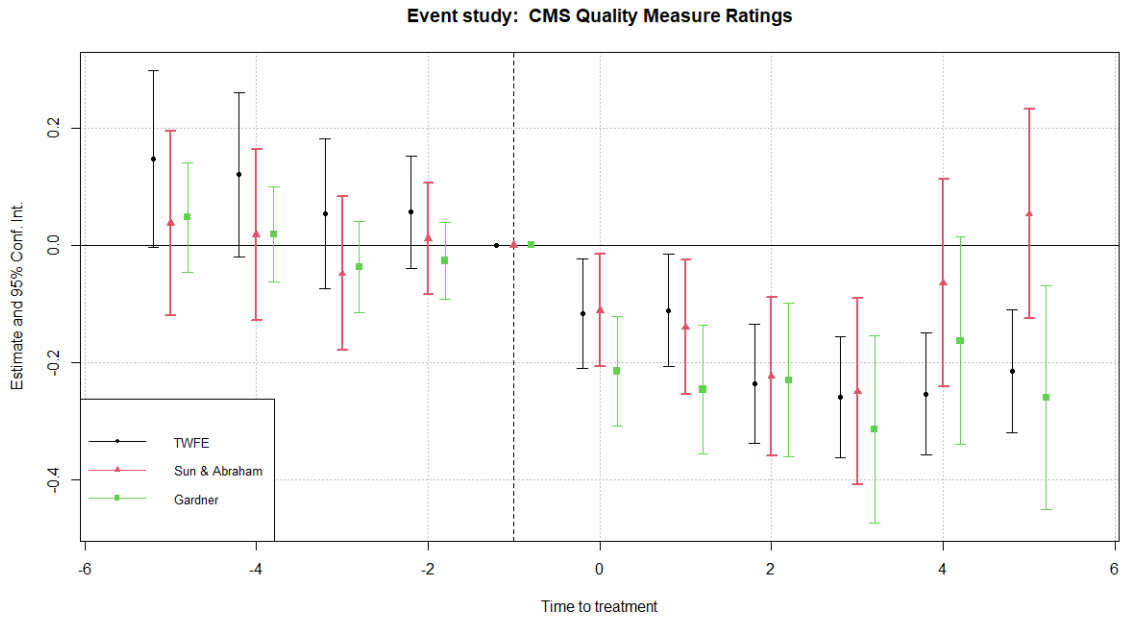


Figure 2.3: Event study model estimations for the overall quality measure (QM) ratings

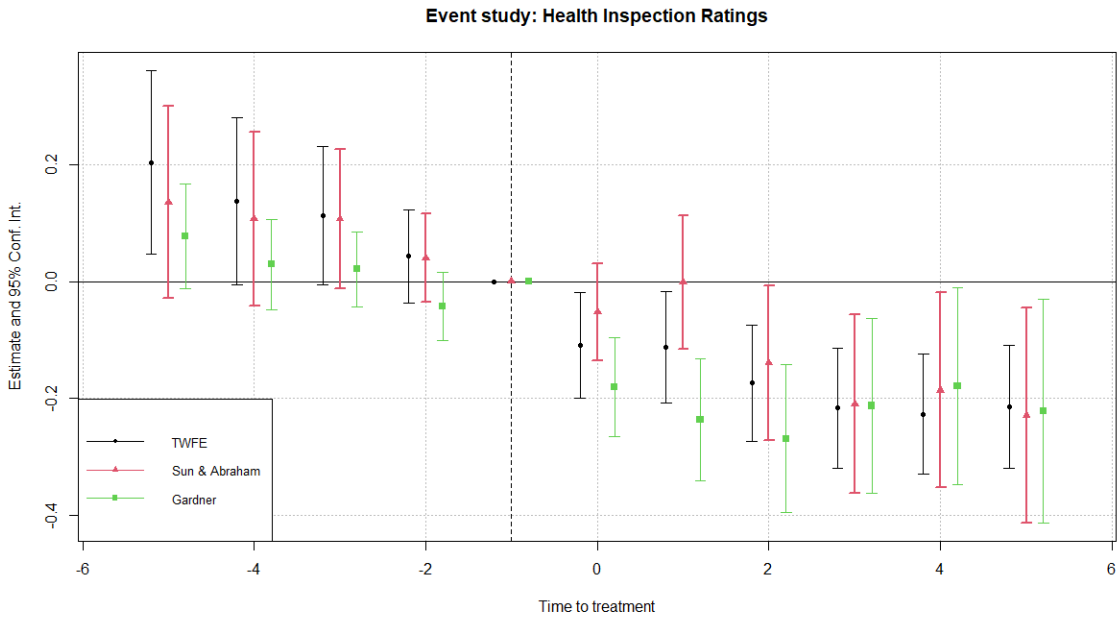


Figure 2.4: Event study model estimations for the health inspection ratings

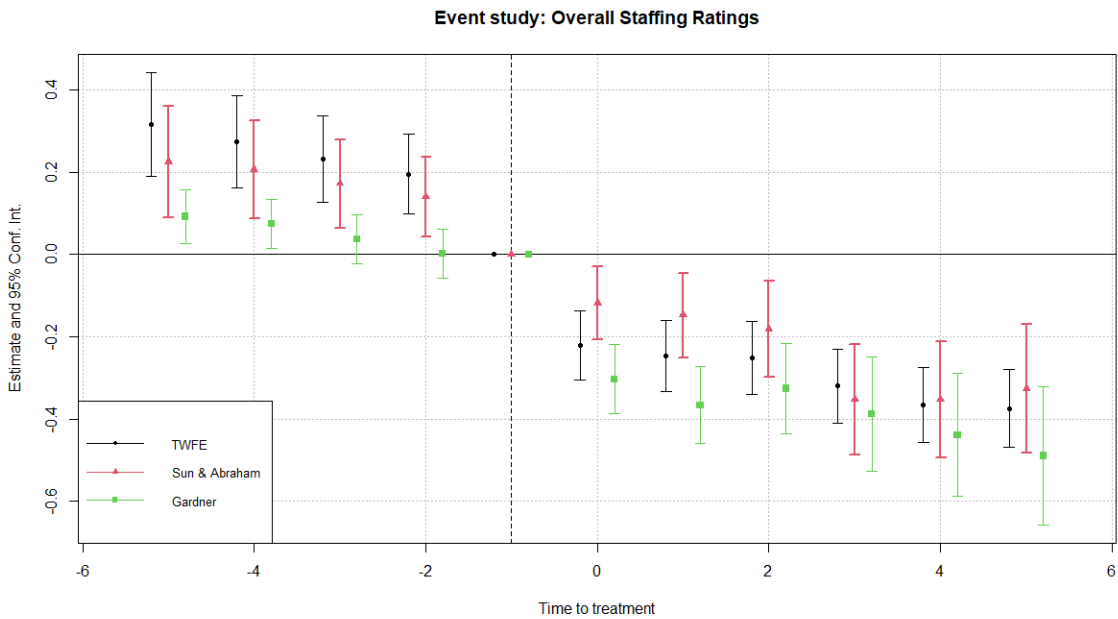


Figure 2.5: Event study model estimations for the overall staffing ratings

### **2.7.2 Results for government inspected quality measures:**

The results above present a general picture by providing estimated effects on the overall quality ratings. Next, I ran event study models for individual quality measures to analyze the effects of the for-profit conversion on each indicator separately. First, results are presented for government-inspected quality measures: health deficiencies, complaint-based deficiencies, resident case-mix adjusted total nursing staff hours per resident day, and case-mix adjusted registered nurse (RN) hours per resident day. Figure 2.6 and Figure 2.7, respectively, show event study estimations for the total number of deficiency citations and total complaint-based deficiencies cited through health inspections. In these plots, effect estimations for after-treatment periods clearly show that the total number of health deficiencies and number of complaint-based deficiencies significantly increase after the for-profit conversion of a nursing home in comparison to nonprofit and government-owned nursing homes that did not convert. Moreover, in both cases, lead effects before the treatment are all insignificant, indicating the absence of pre-trends in these deficiency outcomes before the for-profit ownership conversion. Therefore, the results support hypotheses 2.1(a) and 2.1(b) that the for-profit ownership conversion is strongly associated with significant increases in total numbers of health deficiency citations and complaint-based deficiencies that flow from government inspections.

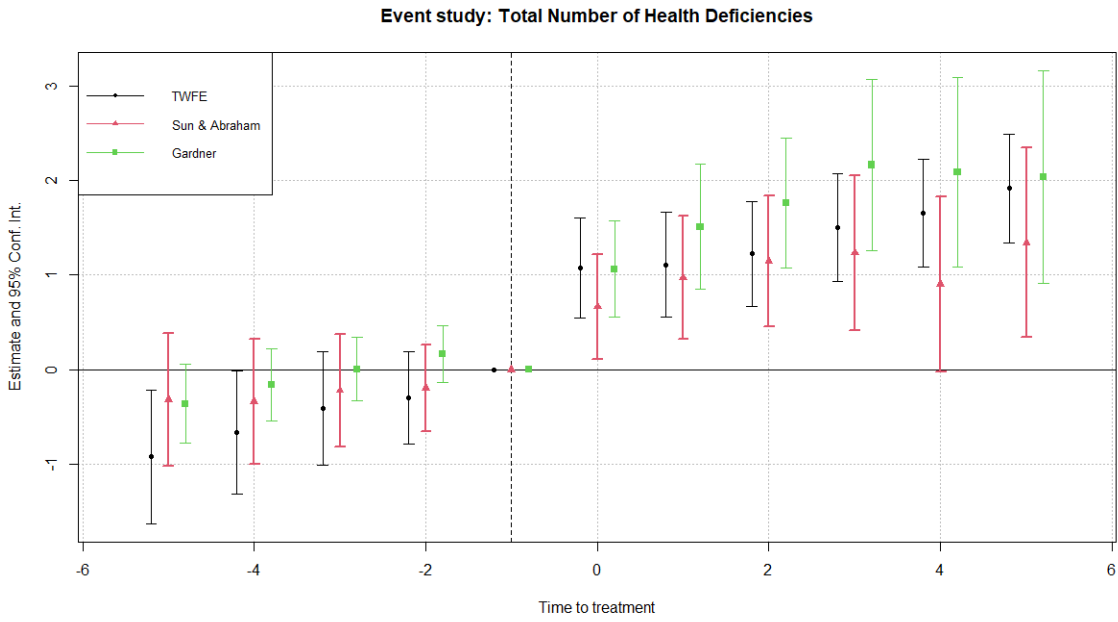


Figure 2.6: Event study model estimations for the total number of health deficiencies

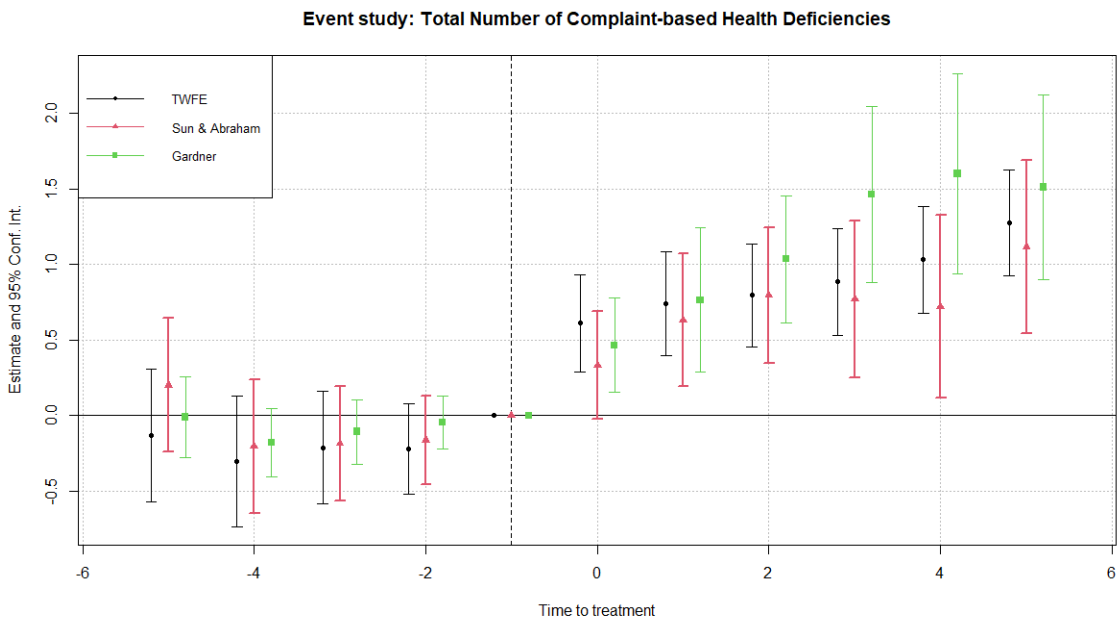


Figure 2.7: Event study model estimations for the total complaint-based deficiencies

Estimation results for case-mix adjusted total nurse staffing hours and registered nursing hours per staffing day are shown in Figures 2.8 and 2.9. Dynamic after-treatment effect estimations are significantly negative in both plots, indicating that resident case-mix adjusted total nurse staffing and registered nursing hours per resident day significantly went down following the for-profit ownership conversion in a nursing home. When we look at pre-treatment effect estimates, we observe what Sun and Abraham (2021) have warned us about, that two-way fixed effects estimations of pre-treatment effects might be non-zero in the absence of pre-trends. Indeed, corrected pre-treatment estimates in both plots support the parallel trends assumption. Overall, these estimates show that case-mix adjusted total and registered nurse staffing hours are similar across nursing homes before conversion. The staffing hours gradually worsen among converted nursing homes starting right after the for-profit conversion. Therefore, for-profit ownership conversion is strongly associated with decreases in total staffing and RN hours per resident day, which support hypotheses 2.1(c) and 2.1(d). Higher staffing levels are positively associated with better quality in previous studies (Backhaus, Verbeek, van Rossum, Capezuti, & Hamers, 2014; Castle, 2008; Harrington et al., 2018; Harrington, Olney, Carrillo, & Kang, 2012; Harrington, Schnelle, McGregor, & Simmons, 2016b). Therefore, this finding of lower staffing hours followed by for-profit conversion is one of the essential results presented here because it might explain the underlying factor behind other decreasing quality measures following a for-profit conversion of a nursing home. On the other hand, these findings are inconsistent with the overall staffing rating analysis results, indicating that using summary ratings of 1-5 stars might overshadow the actual content of the individual quality measures, undermining overall ratings' reliability.

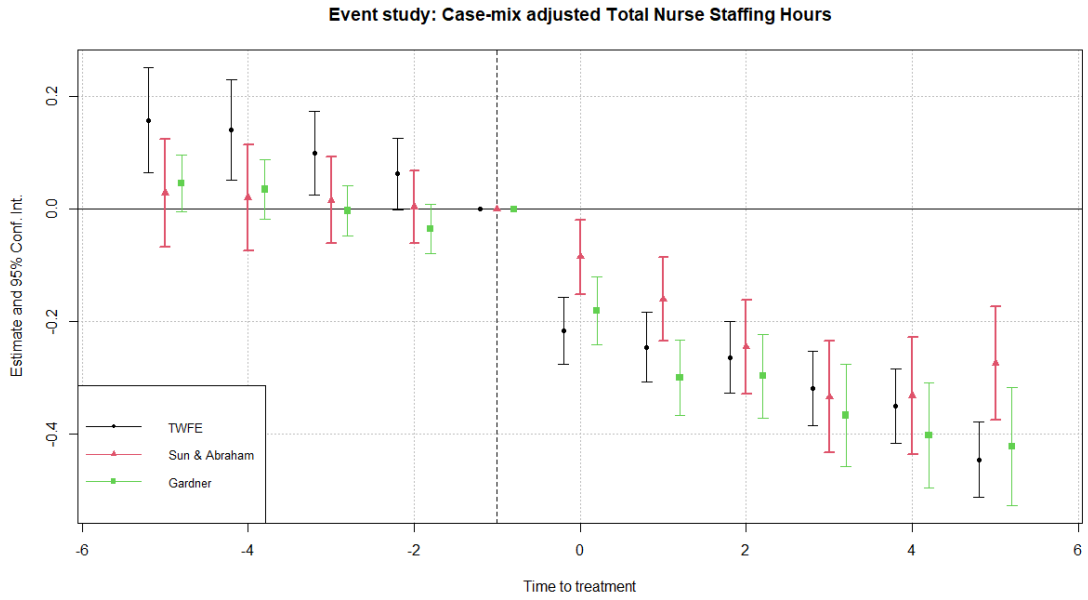


Figure 2.8: Event study model estimations for case-mix adjusted total nurse staffing hours per resident day

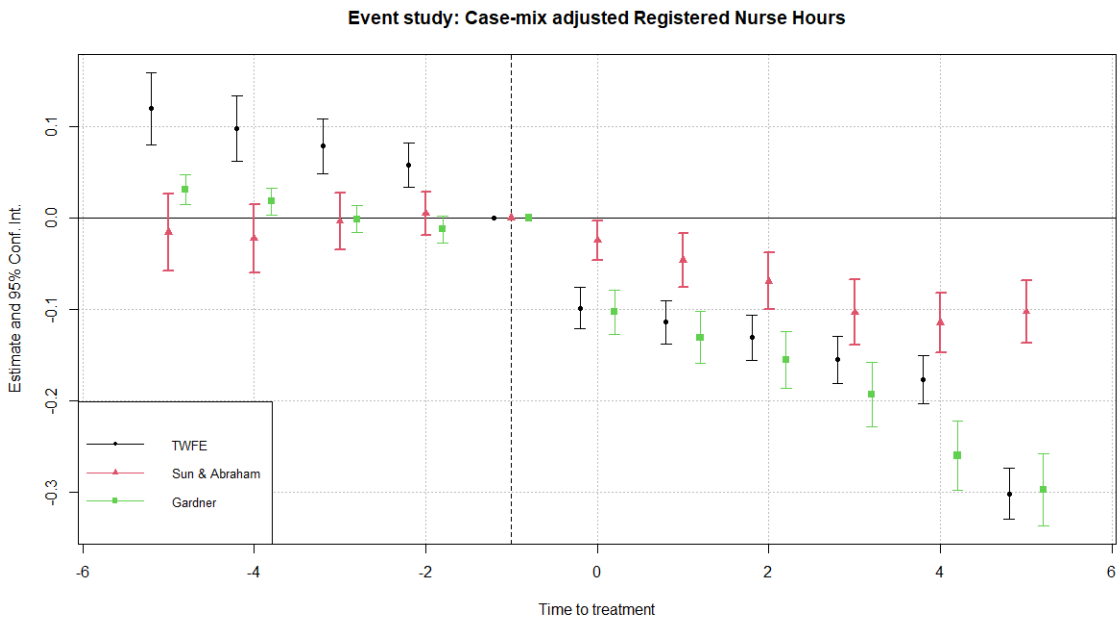


Figure 2.9: Event study model estimations for case-mix adjusted registered nurse staffing hours per resident day



### **2.7.3 Results for Medicare claims-based quality measures**

In Figure 2.10 and Figure 2.11, estimations for Medicare claims-based quality measures listed in hypothesis 2.2 are presented. These are the percentage of short-stay residents re-hospitalized after a nursing home admission and the percentage of short-stay residents who had an outpatient emergency department visit. Although CMS collects data for other Medicare-based quality indicators such as hospitalizations and emergency department visits for long-stay residents, the data was available for only a few years for these variables. So, the analysis is restricted to the two short-stay Medicare claims-based measures. Overall, we don't see much difference between these Medicare claims-based measures for treated and untreated nursing homes. Pre-treatment difference estimations indicate no significant differences before the conversion. The only differences are a significantly higher percentage of re-hospitalizations among short-stay residents in converted nursing homes in the 1<sup>st</sup> and 4<sup>th</sup> lag periods after the for-profit conversion. This finding indicates that short-stay resident rehospitalization rates increased in converted facilities some years after conversion. This result implies that the for-profit conversion is associated with some increase in re-hospitalization rates, partially supporting hypothesis 2.2(a). On the other hand, results show no significant difference in the percentage of short-stay residents who had an outpatient emergency department visit in nursing homes converted into for-profit ownership following the conversion compared to other nursing homes, which refutes hypothesis 2.2(b).

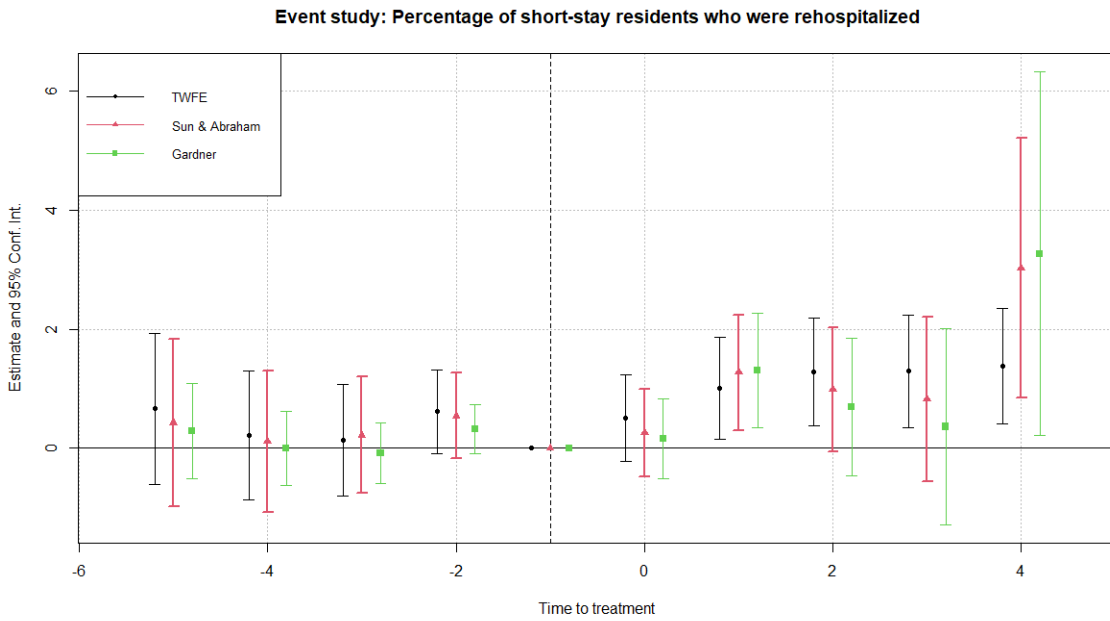


Figure 2.10: Event study model estimations for the percentage of short-stay residents who were re-hospitalized after a nursing home admission

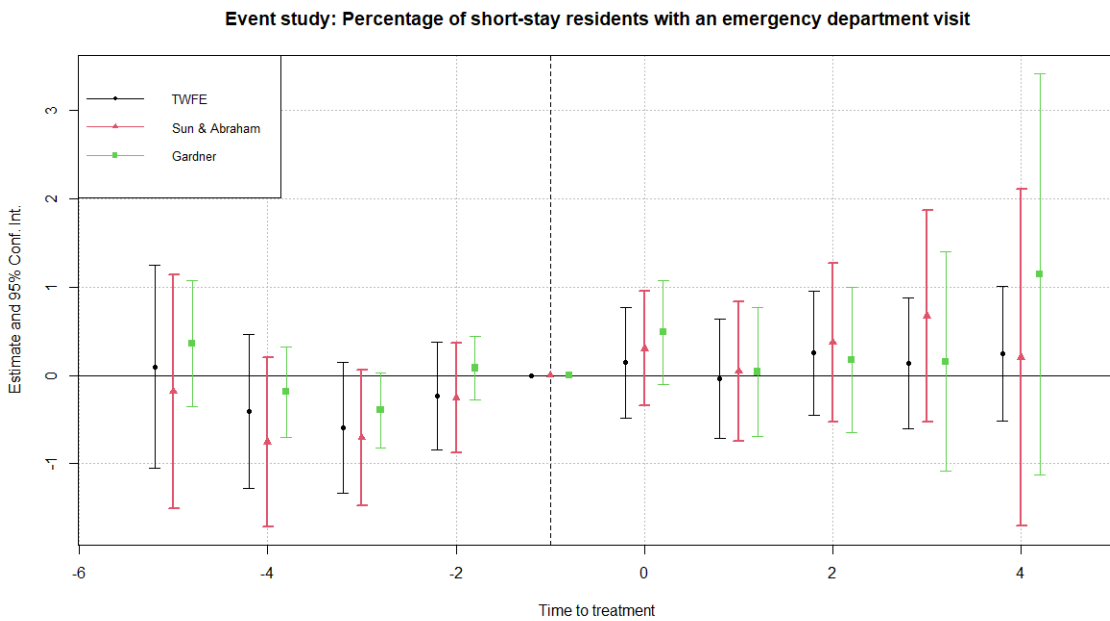


Figure 2.11: Event study model estimations for the percentage of short-stay residents who had an outpatient emergency department visit

#### **2.7.4 Results for MDS-based self-reported quality measures**

The third group of quality indicators analyzed is the Minimum Data Set (MDS) based self-reported measures. These quality measures are directly reported by nursing homes in the Minimum Data Set (MDS) data to the CMS periodically and included in the Five-Star Quality Ratings System. There have been reports that some nursing homes try to game the quality rating system by misreporting some of these self-reported quality measures (Han et al., 2018; Integra Med Analytics, 2020; Sanghavi et al., 2020).

Accordingly, I argue in hypothesis 2.3 that no significant differences are expected to be found between the converted and unconverted nursing homes in terms of the self-reported quality measures. The estimation results below show that this hypothesis is partially supported. While there are no significant differences between treated and untreated nursing homes for most of the self-reported MDS-based quality measures, a few indicators significantly change following the for-profit conversion event. Results for each of these quality measures are provided below.

Estimation results for the percentage of long-stay residents whose need for help with activities of daily living (ADL) and whose mobility worsened are presented below in Figure 2.12 and Figure 2.13. For these quality measures, we observe about 1-2 percentage point jumps in the rates at the year of the for-profit conversion and the year after, and the increase fades away in the following years. But methods agree only on the first-year effect. Moreover, we do not observe any pre-trends from pre-treatment effect estimates. Therefore, the for-profit conversion is associated with only short-term increases in the percentages of long-stay residents with ADL help needs and whose mobility worsened.

Event study: Percentage of LS residents with increased need for help with ADL

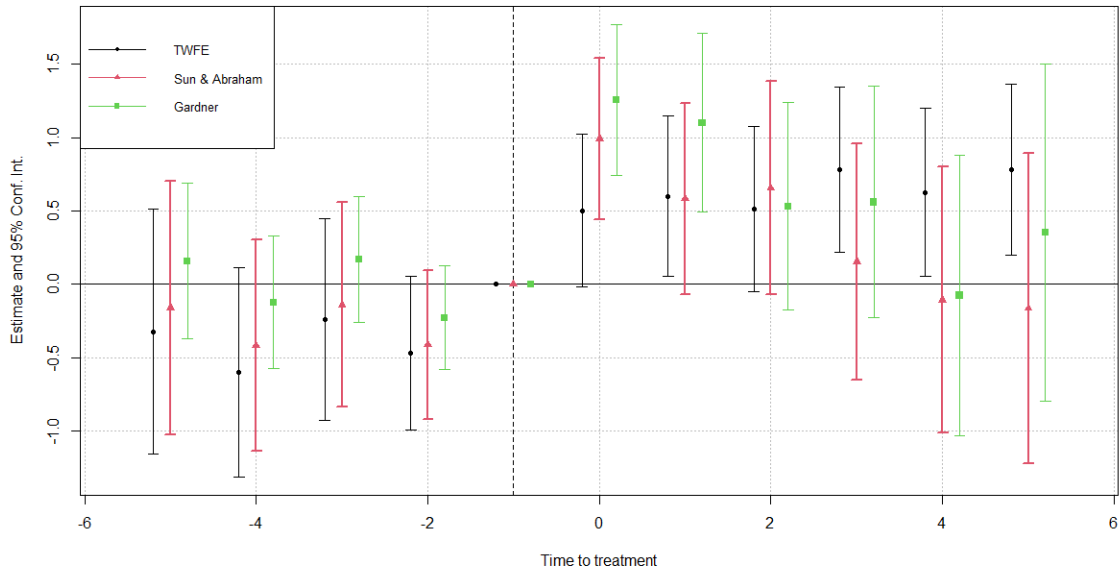


Figure 2.12: Event study model estimations for the percentage of long-stay residents whose need for assistance with daily activities increased

Event study: Percentage of long-stay residents whose mobility worsened

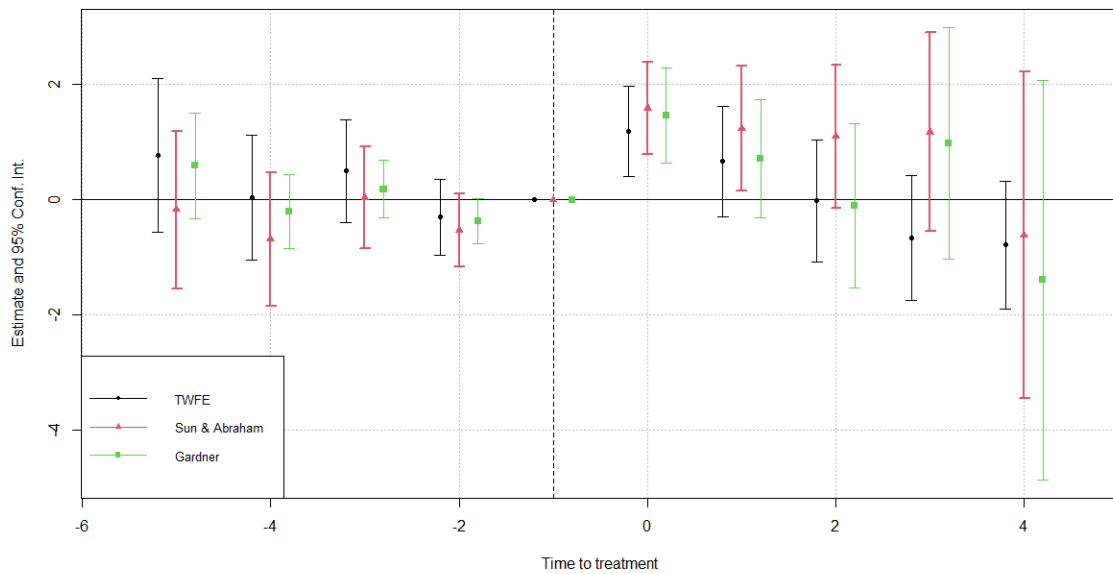


Figure 2.13: Event study model estimations for the percentage of long-stay residents whose mobility worsened

In the next two plots, estimation results show decreasing percentage of long-stay residents with urinary catheter usage (Figure 2.14) and decreasing urinary tract infections among long-term residents (Figure 2.15) after the for-profit conversion compared to unconverted nursing homes. However, effects are only significant for Gardner’s corrected estimates in the case of urinary catheter usage, meaning that it is method sensitive. So, hypothesis 2.3(c) is inconclusive. As for the urinary tract infections, however, estimated effects for lag periods show significantly lower rates between 0.5 to 1.5 percentage points in converted nursing homes after the for-profit conversion, refuting hypothesis 2.3(d). This result is interesting because it is the only quality measure that shows an association between for-profit ownership and better quality in nursing homes.

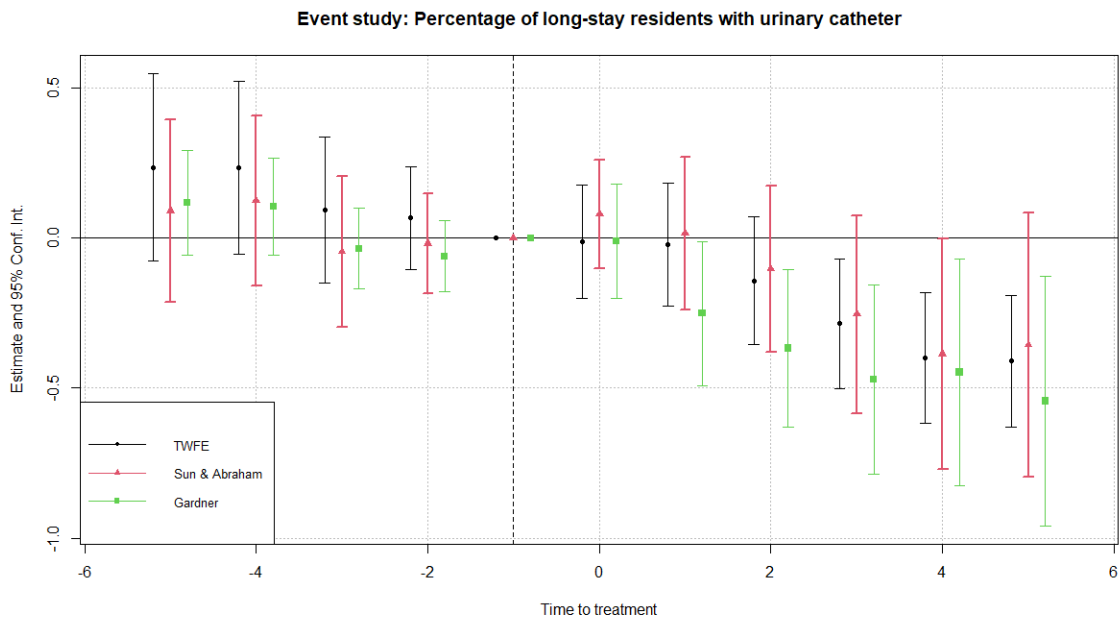


Figure 2.14: Event study model estimations for the percentage of long-stay residents with urinary catheter usage

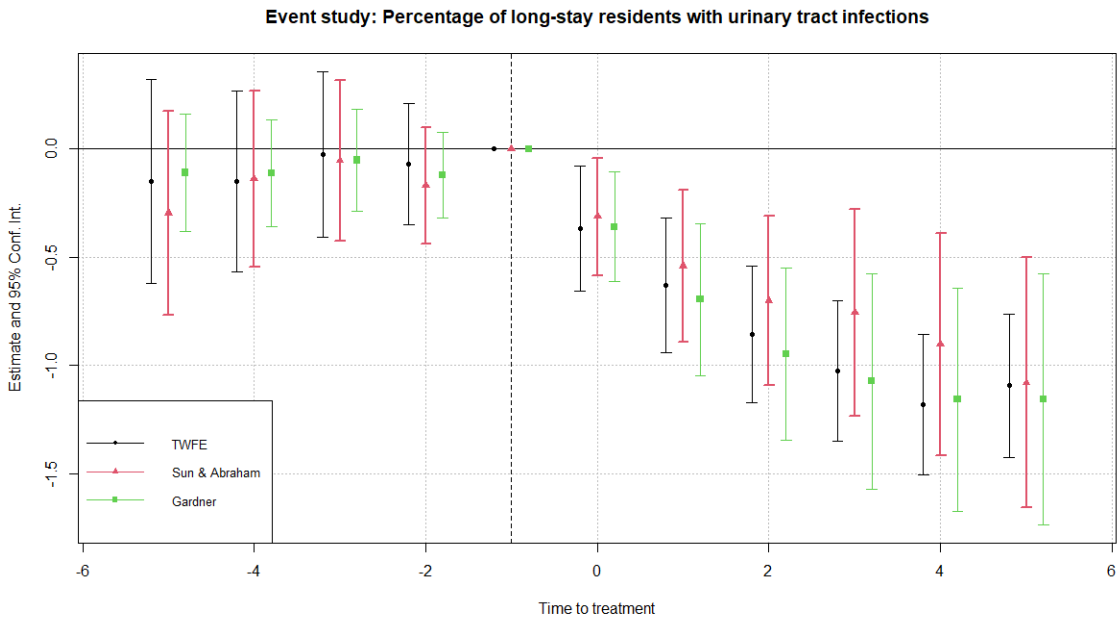


Figure 2.15: Event study model estimations for the percentage of long-stay residents with urinary tract infection

Estimated effects of for-profit conversion on pressure ulcer rates among long-stay and short-stay residents are provided in Figure 2.16 and Figure 2.17 below. We observe that percentage of long-term residents with pressure ulcers is significantly higher in treated nursing homes in the year after for-profit conversion compared to nursing homes that did not convert. However, the effect size is small, an increase of around 0.5 percentage points. Although estimated effects are also positive for the following periods, they are insignificant. So, H2.3(e) is partially supported. The estimated impact of the conversion on short-stay pressure ulcer rates is mostly insignificant, supporting H2.3(f). Only the Sun-Abraham method estimations show a slight increase in the short-stay pressure ulcer rates in converted nursing homes for one period. Yet, according to Gardner’s method, estimation results don’t show any significant effect.

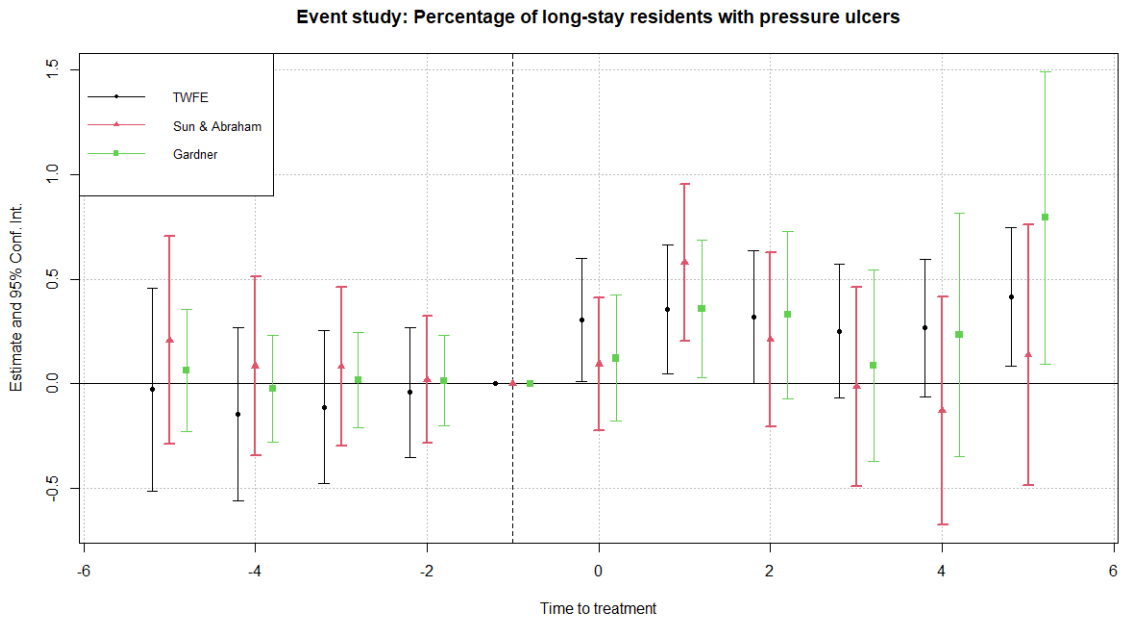


Figure 2.16: Event study model estimations for the percentage of long-stay residents with pressure ulcers

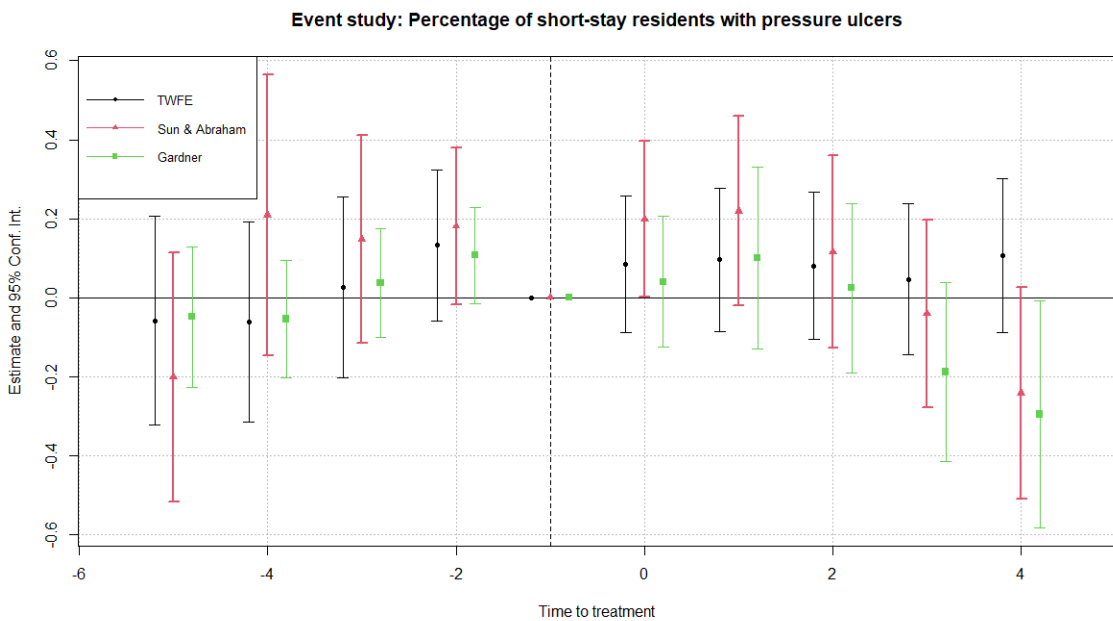


Figure 2.17: Event study model estimations for the percentage of short-stay residents with new or worsened pressure ulcers

Overuse of chemical restraints (antipsychotics) is an undesirable outcome in nursing homes, so an increase in the antipsychotic usage rates indicates a lower quality of care. The percentage of antipsychotic usage is analyzed separately for long-stay and short-stay residents, and the results are presented in Figure 2.18 and 2.19. The Sun-Abraham estimation results show between 0.5 to 1.5 percentage points higher rates of antipsychotic medication receipt among long-stay and short-stay residents in converted nursing homes in the year of for-profit conversion and immediately following periods. On the other hand, effect estimations with Gardner's two stages method show either insignificant results or even lower rates of antipsychotic usage among long-term residents in some of the lag periods. The reason behind divergent findings is unclear. Given this inconsistency between results by different methods, the effects of the for-profit conversion on rates of antipsychotic usage in nursing homes are inconclusive, and so are H2.3(g) and H2.3(h).



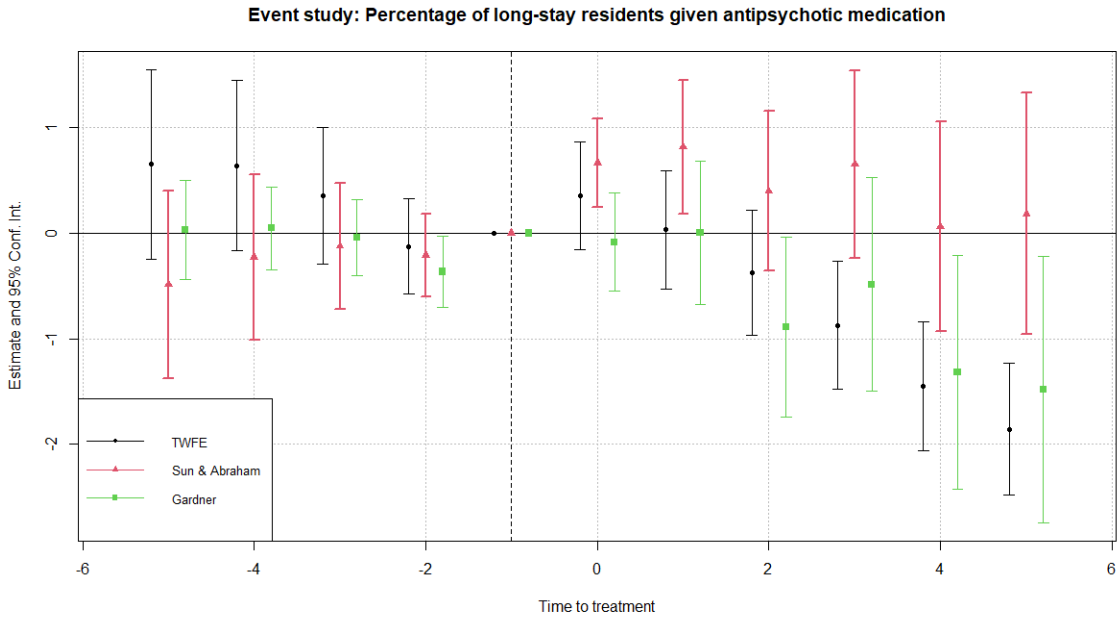


Figure 2.18: Event study model estimations for the percentage of long-stay residents who got an antipsychotic medication

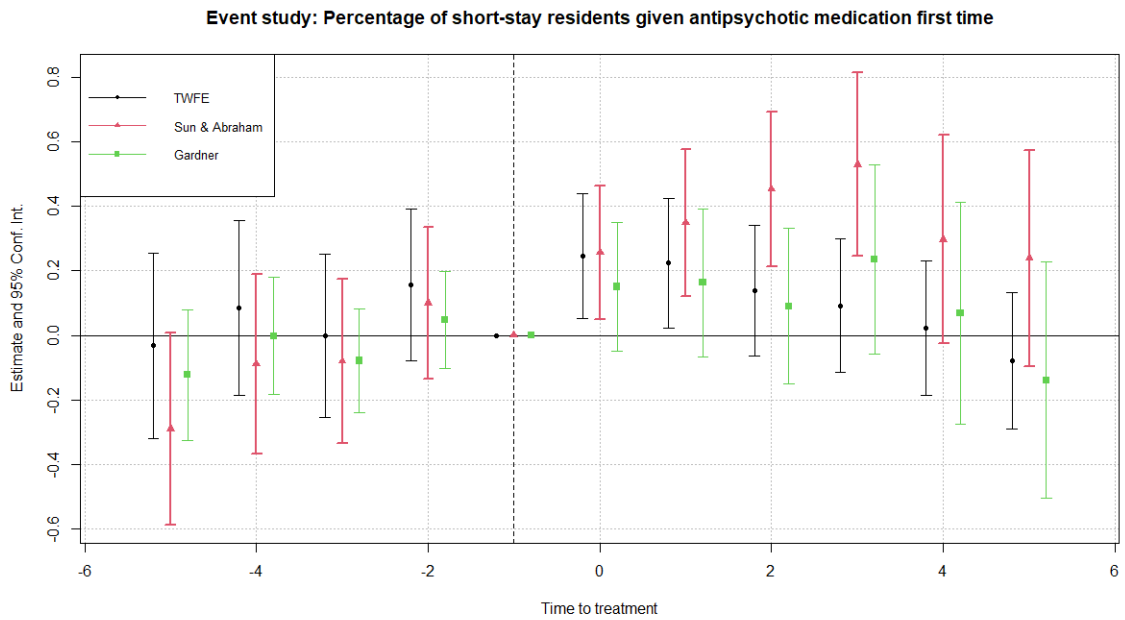


Figure 2.19: Event study model estimations for the percentage of short-stay residents who got antipsychotic medication for the first time

The final self-reported MDS-based quality measure analyzed is the percentage of long-stay residents experiencing one or more falls with injuries. Figure 2.20 shows the event study estimations for this measure. According to the two-way fixed-effects and Gardner estimates, no significant change is observed in the percentage of long-stay residents who had falls with major injuries following conversion into for-profit ownership. Conversely, Sun-Abraham estimates show a significant increase in rates of falls in the second period after conversion. Yet, this effect is significant only for one period and is inconsistent with the other methods' estimates. Overall, results indicate that the for-profit conversion does not affect the rates of falls with injuries among long-stay residents in nursing homes, supporting hypothesis 2.3(i).

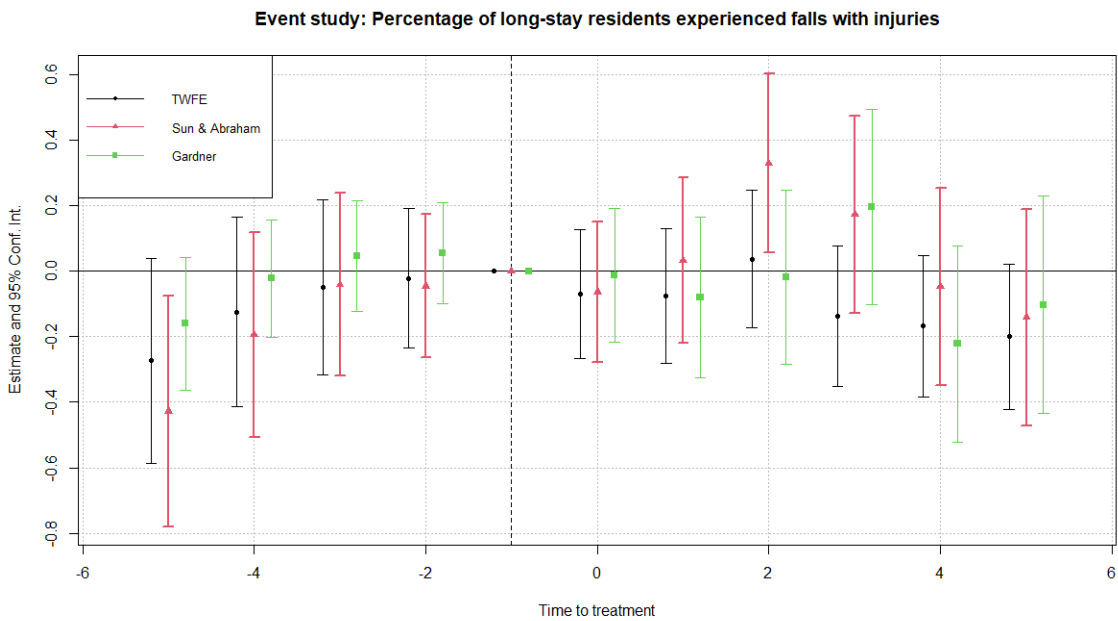


Figure 2.20: Event study model estimations for the percentage of long-stay residents experiencing one or more falls with major injury

## 2.8 Conclusion

In this chapter, I analyzed the relationship between nursing home quality measures and the for-profit conversion of a nursing home using event study models. The event study method is a dynamic difference-in-differences (DID) approach that provides a more robust identification of treatment effects than a cross-sectional analysis. Moreover, I employed bias-correcting estimation techniques provided through the most recent methodological advancements in the DID analysis. Specifically, I employed alternative estimates offered by Sun and Abraham (2021) and Gardner (2021). Event study estimations were run with panel data of 9 years long using 19 different nursing home quality measures, including overall summary ratings and individual government inspected, Medicare claims-based, and self-reported MDS-based quality indicators.

Estimation results for all overall quality summary ratings show lower quality in nursing homes converted into for-profit ownership following the conversion. Among these, however, estimations for the overall Five-Star ratings and staffing ratings showed the existence of pre-trends, implying that differences between these quality ratings for treated and untreated nursing homes have existed even before the for-profit conversion. Specifically, the Five-Star ratings are based on other overall ratings, so observed pre-trends in the overall staffing ratings are likely the driving factor behind the pre-trend fluctuation in the Five-Star ratings. On the other hand, pre-treatment estimations were insignificant for overall QM and health inspection ratings, and estimated ratings were significantly lower for periods after the conversion. These results indicate that for-profit ownership conversion is significantly associated with lower quality measured with the overall QM and health inspection ratings.

Along with the overall ratings, individual quality indicators were used to assess quality differences between converted and unconverted nursing homes. Individual indicators were grouped into three categories: government inspected, Medicare claims-based, and self-reported MDS-based quality measures. The government-inspected measurements are numbers of total health inspection deficiencies, complaint-based deficiencies, case-mix adjusted total staffing hours per resident-day, and case-mix adjusted RN hours per resident day. Results show significant increases in total numbers of health deficiencies and complaint-based deficiencies in converted nursing homes following the for-profit ownership conversion. These findings support hypotheses 2.1(a) and 2.1(b) and are also consistent with previous studies that found higher numbers of deficiencies in for-profit facilities (Grabowski et al., 2016; Harrington et al., 2012; Lu & Lu, 2021; Pradhan, Weech-Maldonado, Harman, Laberge, & Hyer, 2013).

Event study estimations for staffing hours measures also show that for-profit ownership conversion led to lower quality in converted facilities. Specifically, for-profit converted nursing homes had significantly lower case-mix adjusted total nursing staff and registered nurse hours following the for-profit conversion. This result supports a recent study that used DID approach and found that for-profit converted nursing homes cut registered nurse staffing to reduce operating costs (Lu & Lu, 2021). It might also explain the underlying factor behind other lower quality measures associated with the for-profit conversion because staffing levels have been shown to be directly related to higher quality in nursing homes in the literature (Castle, 2008; Castle & Engberg, 2005; Harrington, Chapman, Halifax, Dellefield, & Montgomery, 2021; Harrington et al., 2000). The uncorrected two-way fixed effects estimations showed that the staffing hours

decreased even before the conversion, which was parallel to findings in some previous studies (Grabowski & Stevenson, 2008; Stevenson & Grabowski, 2008). However, the corrected estimates showed that no pre-trends exist, which implies that the significantly lower levels after conversion are clearly attributable to the for-profit conversion of a nursing home. This is the exact phenomenon mentioned in the recent literature about difference-in-differences models, that simple two-way fixed effects method estimations are biased in the sense that estimated effects are contaminated by effects from other periods (Athey & Imbens, 2022; Callaway & Sant'Anna, 2021; de Chaisemartin & D'Haultfoeuille, 2021; Gardner, 2021; Goodman-Bacon, 2021; Imai & Kim, 2021; Sun & Abraham, 2021). This is the most important methodological finding of the analysis provided here, that a simple pre/post model or simply including nursing home and time fixed effects in the estimation models are not methodologically strong enough to capture true effects of ownership conversions.

It is crucial to note that the results for individual hours-based staffing measures differ from the results for the overall staffing ratings, even though the latter is based on the former. Specifically, results for individual total nursing staff hours and RN staff hours variables do not show any pre-trends. On the other hand, estimates for the overall staffing rating show pre-trends. The staffing rating is assigned by CMS between one to five stars depending on a nursing home's staffing hours relative to thresholds determined by CMS. Therefore, the difference in results for individual staffing quality measures and the overall staffing rating is surprising. One possible explanation is that a rating of 1 to 5 stars is not enough to capture nuances of the individual hours-based staffing measures. Moreover, issues with the star rating system and how it is open to manipulation have

been discussed and reported before (Han et al., 2018; Integra Med Analytics, 2020; Sanghavi et al., 2020; Silver-Greenberg & Gebeloff, 2021). Therefore, the usefulness of the star ratings in measuring the overall nursing home quality should be reexamined.

Overall, event study results for Medicare claims-based and self-reported MDS-based quality measures are mixed. Estimation results for the two Medicare-claims-based measures, which were obtained by CMS from Medicare data, show that the for-profit ownership conversion was associated with a short-term increase in rehospitalization rates but had no effect on emergency department visit rates among short-stay residents. So, hypothesis 2.2 is only partially supported. Among the self-reported MDS-based quality measures, the for-profit ownership conversion was followed by short-term increases in rates of higher need for help with activities of daily living, worsened mobility, and pressure ulcers among long-stay residents. However, increases in these rates were observed only for one or two periods and quickly disappeared afterward. Estimations for the self-reported pressure ulcer rates among short-stay residents and rates of falls among long-stay residents show no effect of the conversion event.

Moreover, results for self-reported urinary catheter usage among long-stay residents and usage of chemical restraints on long-stay and short-stay resident measures were inconsistent between the estimates of different methods used, therefore inconclusive. The only positive finding associated with the for-profit conversion is decreasing rates of urinary tract infections among long-stay residents, which goes against previous studies that found it to be related to nonprofit ownership (Chou, 2002). Therefore, results about the effect of the for-profit conversion on self-reported quality measures are mixed. Overall, results show decreasing quality after the for-profit

conversion for all the government inspected quality measures but mixed and insignificant findings for most of the self-reported quality measures. These findings increase the suspicion about the unreliability of self-reported quality data, either due to the manipulability of these self-reported measures or their insensitivity to capture real change in underlying conditions. Thus, hypothesis 2.3 is partially supported.

The analysis results in this chapter provide essential insights into the effects of ownership on nursing home quality. The quasi-experimental method and the correction methods used to estimate the effects of ownership conversions make findings methodologically strong. To summarize, overall QM ratings, health inspection ratings, and government-inspected quality measures went down after a nursing home's for-profit ownership conversion. For-profit ownership conversion is associated with significant increases in deficiency citations and decreases in staffing hours provided for care. For-profit conversions were also followed by brief periods of lower quality measured by Medicare claims-based short-stay residents' hospitalization measure and three self-reported MDS-based quality indicators. Results for other self-reported quality measures were inconclusive because they showed no effect or different effect estimations based on the estimation method used. Considering these findings, I conclude that the impact of the for-profit conversion on nursing home quality is primarily negative.

Moreover, the inconclusive results regarding most of the self-reported MDS-based quality measures raise questions about the usefulness of these measures to capture change in quality over time. One possible explanation is that these measures are not sensitive enough. Another possibility is that some for-profit converted nursing homes

underreport negative self-reported indicators to keep their quality ratings high, which makes the reliability of these measures questionable.

## **2.9 Limitations**

One limitation of the analysis presented here is the length of the panel data used, which is nine years. Even though this data is enough to estimate short-term changes in the quality indicators after a conversion event, assessing the long-term effects of the conversion requires more comprehensive panel data. More specifically, each lag effect after the conversion event can only be estimated by the number of conversions occurring the same number of years ago. For example, with the 2013-2021 data, calculating a 5<sup>th</sup>-year lag effect is only possible with nursing homes that converted in 2016 and before. The short panel length decreases the number of conversions that can be used in the estimation. However, changes in measurements and reporting of the CMS data over the years make it challenging to construct a long panel data on nursing home quality measures. A related limitation is caused by inconsistencies between estimations of the correction methods used here. Specifically, the Sun-Abraham (2021) method and Gardner's (2021) method are used to estimate bias-corrected effects in event study models. These methods produce different estimation results, which result in inconsistent findings for five of the 19 dependent variables used in the analysis. The reason behind the inconsistency is not apparent. I suspect that it could be related to the length of the panel data used, which limits the estimation power of the models. Researchers are warned that results from corrected DID models can be method sensitive depending on the correction method used.



A third limitation is the nature of measures used to assess the quality of facilities. The main reason behind the frequent usage of health and safety outcomes in LTC research is the availability and reliability of government inspection data (Castle & Ferguson, 2010). However, these measures are criticized as only focusing on negative aspects of care and missing important elements about residents' quality of life (Kane, 2001). Long-term care encompasses many aspects, and there are alternative frameworks that can capture more positive aspects of service quality that is more aligned with residents' perspective, such as attempts to measure service quality through the quality of life perspective based on residents' definition well-being (Cummings, 2002; Kasser & Ryan, 1999; Raphael, Renwick, Brown, & Rootman, 1996). However, the lack of data currently limits the usability of these alternative quality measures.

## **CHAPTER 3: REGULATORY CHANGES AND THE RELATIONSHIP BETWEEN NURSING HOME QUALITY AND OWNERSHIP TYPE**

### **3.1 Introduction**

Government regulation of long-term care remains an integral part of the sector as necessitated by heavy involvement of public funds to pay for services provided by primarily for-profit companies, along with the frail nature of residents who need protection. Federal-level regulations in the nursing home sector are overseen by the Centers for Medicare & Medicaid Services (CMS) and the U.S. Department of Health and Human Services. These regulatory provisions constitute an environment that sets the boundaries within which nursing homes operate. The federal-level regulations have recently been updated in 2016 for the first time since 1991. Although previous research has examined the effects of regulations on the quality of nursing homes in the context of old regulations, no study has been conducted on the effectiveness of the 2016 regulatory updates in improving quality and reducing unwanted outcomes until the current study. This chapter provides the first investigation of the effects of the 2016 regulatory reforms on nursing home quality trends and quality differences between nonprofit and for-profit nursing homes. I first visually explore time trends in the quality indicators using locally estimated scatterplot smoothing (LOESS) curves and generalized additive models (GAM) with polynomial estimation plots. I then employ a pre-post comparison analysis using interrupted time-series models to formally investigate how the 2016 regulatory changes have influenced nursing home quality trends and differences in quality between for-profit and nonprofit nursing homes.

### **3.2 History of Nursing Home Regulations**

The nursing home sector has been subject to increasingly firm regulations at the federal and state levels as necessitated by the growing influx of public funding and the reported history of quality problems in the sector (Grabowski, 2014). A serious turning point in the regulation of the nursing home sector came following news about nationwide quality problems and an Institution of Medicine report about the effects of inadequate staffing on poor nursing home quality (Institute of Medicine, 1986). Comprehensive new regulatory requirements were introduced with the passage of the Nursing Home Reform Act (NHRA) in 1987, part of the Omnibus Budget Reconciliation Act (OBRA) of 1987. This act went into effect in 1990, and its provisions included improved standards of care, resident rights, minimum staffing standards (requirement of a licensed practical nurse on duty 24 hours a day and a registered nurse on duty eight hours a day), new mandatory periodic assessments of all residents (Resident Assessment Instrument) resulting in the Minimum Data Set, along with quality standards about restricting the use of physical or chemical restraints and prevention of pressure ulcers (Grabowski, 2008). Nursing homes have a high incentive to follow these government regulations because they need to be certified by the Center for Medicare and Medicaid Services (CMS) to accept federal and state funding through national Medicare and Medicaid programs. Even though these public funding programs finance most nursing home care services, the providers are primarily private organizations.

Studies evaluating the impact of NHRA on nursing home quality reported positive results after the implementation of NHRA, such as fewer deficiencies (Harrington et al., 1997), lower prevalence of physical restraint use, pressure ulcers, and lower rates of

catheterization (Hawes et al., 1997; Janelli, Kanski, & Neary, 1994; Marek, Rantz, Fagin, & Krejci, 1996; Moseley, 1996; Zhang & Grabowski, 2004). Research also revealed that nursing home staffing levels were significantly higher three years after the implementation of this reform act compared to the period before (Zhang & Grabowski, 2004). NHRA was followed by other regulations to improve nursing home quality, such as the 1998 Nursing Home Initiative, which brought more frequent inspections, enhanced federal oversight of state nursing home surveys, and increased penalties. Although these initiatives have resulted in improvements in nursing home quality and survey procedures, reports of quality issues and complaints have continued after these reforms (U.S. General Accounting Office, 1998, 1999, 2000).

### **3.3 The 2016 Reform of Requirements for Long-Term Care Facilities**

In November 2016, the federal-level regulatory provisions for the nursing home sector were comprehensively reviewed and updated to improve the quality of care and services in nursing home facilities (81 F.R. 68688, 2016). These reforms were the first comprehensive update of long-term care regulations since 1991. These regulatory changes came into effect on November 28, 2016. Although the proposed changes were implemented in three phases by the end of 2016, 2017, and 2019 respectively, most provisions were required to be implemented by November 28, 2016. Specifically, these regulatory changes include revised and updated resident rights, provisions against abuse, neglect, and exploitation, updated facility responsibilities to report grievances, requirements for person-centered care planning which allows residents to participate, and updated and improved discharge planning processes with residents' participation,

improved nursing staffing, improved pharmacy services, requirements of facility-wide resource assessments, and new infection control protocols.

New regulatory updates propose to improve resident-centered quality care and quality of life provisions, which requires facilities to provide care to maintain the residents' ability to perform activities of daily living (ADL), such as bathing, dressing, mobility, bathing, dining, communication. Provisions also include revised 'Special Care Issues' with updated requirements for specific issues such as restraints, skin integrity, bed rails, mobility, incontinence, respiratory care, and dialysis. Specifically, for instance, new regulations prohibit any unnecessary use of physical or chemical restraints which are not required to treat the resident's medical condition. These proposed changes are expected to improve the quality of care by reducing adverse events such as pressure sores, decreased ADL performances, urinary infections, falls, and the use of chemical restraints.

Regarding the nursing staffing levels, which is a significant factor for better quality, the proposed regulations did not include any minimum standards despite the calls by LTC researchers for the need for higher standards (Harrington, Schnelle, McGregor, & Simmons, 2016a). CMS's response to the comments about the minimum staffing levels in the 2016 reforms states that "this is a complex issue and we do not agree that a 'one size fits all' approach is best" and "concerns about determining a "right" number for any staffing ratio" (81 F.R. 68688, 2016). Instead, the updated regulations vaguely require facilities to assess residents' needs as well as the skill levels of the hired staff to ensure that resident needs are met.

Additional requirements are implemented around the behavioral health services, which aim to reduce the inappropriate use of antipsychotic and psychotropic medications

and improve residents' mental and psychosocial well-being. Moreover, new provisions require each facility, per the Affordable Care Act requirements, to develop and implement a 'Quality Assurance and Performance Improvement' (QAPI) program to monitor and evaluate the performance of all its services. To this end, each facility is required to have a quality assessment and assurance committee to oversee the QAPI plan and report to the state agency or federal surveyor. Overall, QAPI provisions aim to improve service quality and reduce adverse outcomes.

The proposed regulations also include infection control and prevention measures to prevent the development and transmission of infectious diseases in facilities. The proposed 'Infection prevention and control program' (IPCP) required each facility to have a system to prevent, detect, identify, and control infections for all residents, staff, volunteers, and visitors. Under these provisions, a facility must maintain policies, procedures, and protocols for IPCP and has systems in place to identify possible contagious disease or infections before they can spread. Facilities must also train staff related to the IPCP and designate an 'infection preventionist' to oversee the IPCP. The infection preventionist needs to have specialized training in infection prevention and control. The ICPC requirements were required to be implemented by the end of 2016, with some exceptions related to facility assessments and the infection preventionist, which were to be implemented by the end of 2017 and 2019. The infection prevention and control requirements were well-timed in the wake of the COVID-19 pandemic.

### **3.4 Theory and hypothesis**

Besides all other factors, environmental conditions influence for-profit vs. nonprofit quality gaps in long-term care services. The regulatory framework draws

boundaries within which long-term care organizations operate. From the perspective of organizational sociology, the regulatory powers in the market generate isomorphic pressures that have a coercive influence on organizations to make them resemble each other (DiMaggio & Powell, 1983). The theory of institutional isomorphism suggests that organizational differences disappear as their structures and behaviors are shaped by the same environmental forces at play (DiMaggio & Powell, 1983; Pfeffer & Salancik, 1978). In alignment with the theory of institutional isomorphism, increasing competition and stricter regulations are expected to pressure for-profit and nonprofit organizations to behave in similar ways to conform to the unifying external conditions imposed by the market and the government (Clarke & Estes, 1992; Sloan, 1998). Specifically, stricter regulatory measures might cause organizational differences to fade away, which would mitigate incentive problems related to asymmetric information in the market and result in for-profit vs. nonprofit quality differences disappearing over time. Therefore, the regulatory framework in a market should be considered in analyzing quality differences between services provided by for-profit and nonprofit organizations.

In diverse industries where for-profit organizations operate along with nonprofits, strict regulations might contribute to closing quality gaps between for-profit and nonprofit facilities by curbing for-profit firms' maleficent cost-cutting incentives at the expense of high quality for residents (Weisbrod, 1996; Weisbrod & Schlesinger, 1986). In the nursing home industry, the increasingly strict regulatory trend is expected to eliminate differences between nonprofit and for-profit organizations concerning their practices and quality of care (Spector et al., 1998; Weisbrod & Schlesinger, 1986). Previously, researchers argued, based on earlier nursing home studies, that such

isomorphic pressures have reduced but did not wholly eliminate performance differences between nonprofit and for-profit care providers (Schlesinger & Gray, 2006).

Under the recent regulatory changes, the quality of services is expected to improve both in for-profit and nonprofit nursing homes. Moreover, in line with the arguments about the effect of regulations made above, it is reasonable to expect for-profit and nonprofit facilities to provide similar quality in the wake of isomorphic pressures produced by the increasingly strict regulatory environment. Therefore, I expect to find improved overall quality in all nursing homes along with less pronounced quality differences between nursing homes with different ownership types following the 2016 regulatory changes. I examine overall quality trends by using the Five-Star ratings and overall QM ratings. Hence, I offer the following hypotheses:

**Hypothesis 3.1:** I expect to find that both for-profit and nonprofit nursing homes offered better quality, and there were smaller quality differences between these two types of nursing homes over the period after the implementation of 2016 regulations compared to the period before, in terms of the following overall quality ratings:

H3.1(a): overall Five-Star ratings

H3.1(b): overall quality measure (QM) ratings,

The recent regulatory changes require facilities to assess staffing resources to ensure they meet residents' care needs. However, no minimum standards were imposed. It is difficult for these soft measures to bring significant change to staffing levels. Moreover, instead of analyzing trends for the overall staffing rating, I use its components, which are individual staffing measures. The individual staffing measures are preferred



here because the overall staffing rating measure may not reflect its components well, as explained in Chapter 2. I also analyze trends for individual health inspection measures rather than the overall health inspection rating because individual measures provide a detailed picture. Given the emphasis on reducing negative resident outcomes in the recent regulation reforms, health deficiencies are expected to decline after their implementation. Therefore, I offer the following hypotheses:

**Hypothesis 3.2:** I do not expect to find any significant change in staffing levels in nursing homes after the implementation of the 2016 regulations compared to the period before, in terms of the following staffing quality measure:

H3.2(a): number of total nurse staff hours per resident day,

H3.2(b): case-mix adjusted total nurse staff hours per resident day,

**Hypothesis 3.3:** I expect to find that both for-profit and nonprofit nursing homes offered better quality, and there were smaller quality differences between these two types of nursing homes over the period after the implementation of 2016 regulations compared to the period before, in terms of the following government inspection measures:

H3.3(a): health inspection deficiency scores,

H3.3(b): number of health inspection deficiency citations,

### **3.5 Methods Data**

Using the same nursing home data described in Chapter 2, I employ pre-post comparison analyses to estimate the immediate short-term effects of the recent regulatory

changes implemented at the end of 2016 by comparing how quality varies by organizational characteristics during the periods before and after 2016. The quality measures examined in the analysis are overall Five-Star rating, overall QM rating, total nurse staffing hours per resident day, case-mix adjusted nurse staffing hours per resident day, total deficiency score, and the number of total deficiency citations. These quality measures are selected based on their reliability. The Five-Star and QM ratings are selected for this analysis to evaluate how the overall performance of nursing homes responds to the regulatory changes. The staffing hours and deficiency variables are chosen to be included because they are inspected measures. I first explore time trends in the selected outcome variables using locally estimated scatterplot smoothing (LOESS) curves and generalized additive models (GAM) with polynomial estimation plots. The advantages of using these methods are that they are flexible, nonparametric, and make minimal assumptions about the underlying trend model. These time-trend plots are followed by a series of formal estimation models to find the effect of regulatory changes on quality outcomes. Specifically, interrupted time series models are used to estimate the effects of the regulatory changes after 2016. Regression models also include interaction effects between the regulatory change period dummy and for-profit ownership dummy to estimate the effect of the regulatory changes on the quality difference between the for-profit and other ownership type nursing homes.

The time-trends for outcome variables are estimated using loess and gam methods. Loess is a non-parametric method that allows us to visualize the trend of selected outcome variables using locally estimated weighted regressions that follow the moving central tendency over time (Cleveland, Grosse, & Shyu, 1992). All the time

trends for outcome variables in this section are plotted with the LOESS method. The trend curves for each average quality measure are estimated separately for nonprofit, government, and for-profit owned nursing homes. Notice that the loess fitted curves are presented in the plots without confidence intervals because of the computational intensity of the loess estimation method. Estimations with samples of data confirmed that confidence intervals follow along the fitted loess curves without any dramatic changes.

Moreover, generalized additive models with polynomial fits are also used to estimate trend curves for the periods before and after 2016, the year the new regulatory changes were implemented. Broadly, a generalized additive model is a generalized linear model which estimates a nonlinear relationship using smoother functions such as penalized regression splines instead of linear parameters (Wood, 2017). The advantage of a GAM estimation is that it provides a nonparametric fit estimation for the nonlinear relationship. Loess and gam functions in R software are used to estimate these trends.

Interrupted time-series models are used to estimate changes in time trends for the average quality measures after the regulatory changes implemented by the end of 2016. The nature of these models is a regression setting where an immediate shift and change in trend is estimated for the years after 2016. A standard time-series model is represented by a second-order polynomial regression equation (Eq. 3.1). A second-degree (quadratic) polynomial estimation is chosen to model outcome time trends because higher-order polynomials are known to cause large fluctuations around the boundaries, which may introduce noise to the estimated treatment effect (Gelman & Imbens, 2019). In the below equation,  $Y$  is the quality outcome measure, the year variable is centered around 2017, and  $D$  is a dummy variable to mark the period after regulatory changes. In this design  $D$

is the treatment dummy variable which marks the years after 2016 to capture the effect of recent regulatory changes. The model estimates a quadratic time trend and includes interaction effects between the treatment dummy and time-trend variables. Since the year variable is centered around 2017 in the equation, estimation results for the  $\tau$  coefficient of  $D$  give us the immediate effect of the new regulatory updates on the outcome variable  $Y$  in 2017. The  $\beta_1$  and  $\beta_2$  coefficients yield the time trend of the outcome variable before regulatory changes were implemented, whereas the  $\beta_3$  and  $\beta_4$  coefficients show how the time-trend changes after the regulatory changes. Moreover, to capture the effect of ownership a dummy variable for for-profit ownership status is included in the model along with its interaction with the treatment dummy  $D$ . The  $\gamma$  coefficient is estimated to capture the difference in the mean outcome variable between for-profit nursing homes and nonprofit/government-owned facilities before the regulatory changes. The  $\rho$  coefficient of the interaction between for-profit and treatment dummy ( $D$ ) variables is of critical importance as it shows how the recent regulatory changes influenced the mean outcome difference between the for-profit and other ownership-type nursing homes.

$$Y_{it} = \alpha + \tau \cdot D + \gamma \cdot FP_i + \beta_1 \cdot (Year - 2017) + \beta_2 \cdot (Year - 2017)^2 + \rho \cdot D \cdot FP_i + \beta_3 \cdot D \cdot (Year - 2017) + \beta_4 \cdot D \cdot (Year - 2017)^2 + \epsilon_{it} \quad (3.1)$$

where  $D = \mathbb{I}\{t > 2016\}$

I first ran the regression estimation for model (3.1) with the data for the years between 2013 and 2019 to avoid capturing the effect of the Covid-19 pandemic. Then I reran the estimation models by including data for all the years in the analysis. The results are given in the below tables.

### 3.6 Results:

#### 3.6.1 Effects of regulatory Changes

As shown in Figure 3.1 and Figure 3.2, second- and third-degree polynomial fits for overall 5-Star ratings time trends show an immediate increase in the average 5-Star ratings after the regulatory changes were implemented in 2016. However, the trend following the jump is still negative as the average 5-Star ratings revert to their pre-regulatory change levels. These trend estimates imply that the 2016 regulatory changes had a short-term impact on the average 5-Star ratings. To further analyze 5-Star rating trends for different ownership groups over time, loess smoothing estimation and GAM with third-degree polynomial fits were calculated for average 5-Star rating trends for the three ownership groups. These estimated trend fits are presented in Figures 3.3 and 3.4.

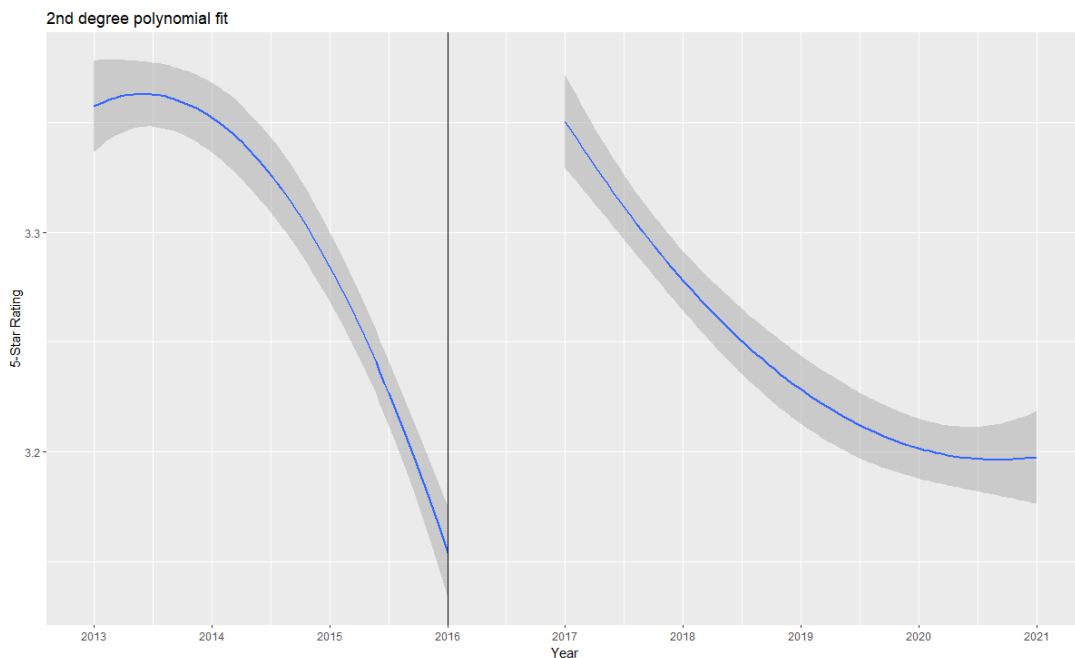


Figure 3.1: Second degree polynomial fits for the average 5-Star Ratings time-trends before and after 2016



Figure 3.2: Third degree polynomial fits for the average 5-Star Ratings time-trends before and after 2016

Figure 3.3 Figure 3.4, respectively, demonstrate a locally estimated scatterplot smoothing (LOESS) with the linear method and a generalized additive model (GAM) with 3rd-degree polynomial estimations to capture the time-trend of the average 5-Star ratings across the three nursing home ownership types. In both graphs, we observe that nonprofits consistently have higher average 5-Star quality ratings than government-owned NHs, which have higher rates than for-profit NHs. Furthermore, average 5-Star ratings for all types of NHs followed similar trends across the years. Notice that average 5-Star ratings were declining until 2016, the year at the end of which new regulatory changes went into effect. In 2017, the year after the new regulations, there was a short-term increase in the average 5-Star ratings, which then dwindles within two years. When

trends for different ownership types are compared, overall quality ratings for nonprofit and government-owned nursing homes seem to follow a flatter trend after 2017 than before. Still, the trend for for-profit nursing homes quickly decreases over the same period. These graphs show that regulatory changes have had a positive short-term effect on overall 5-Star quality ratings. Still, some of this effect deflated over time and even disappeared entirely among for-profit nursing homes. This last point might indicate that the regulatory changes widened quality gaps between nonprofit and for-profit nursing homes. In the next section (3.6.2), interrupted time-series models are estimated to test these implications statistically.

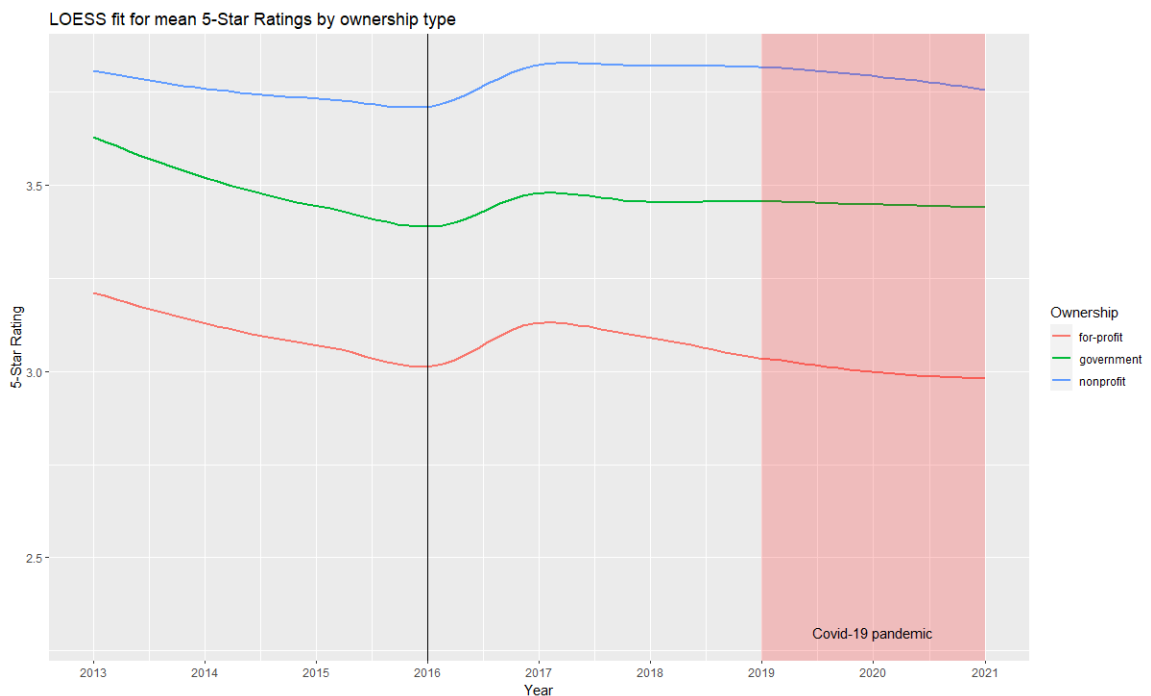


Figure 3.3: LOESS fits for the average Five-Star ratings across NH ownership types

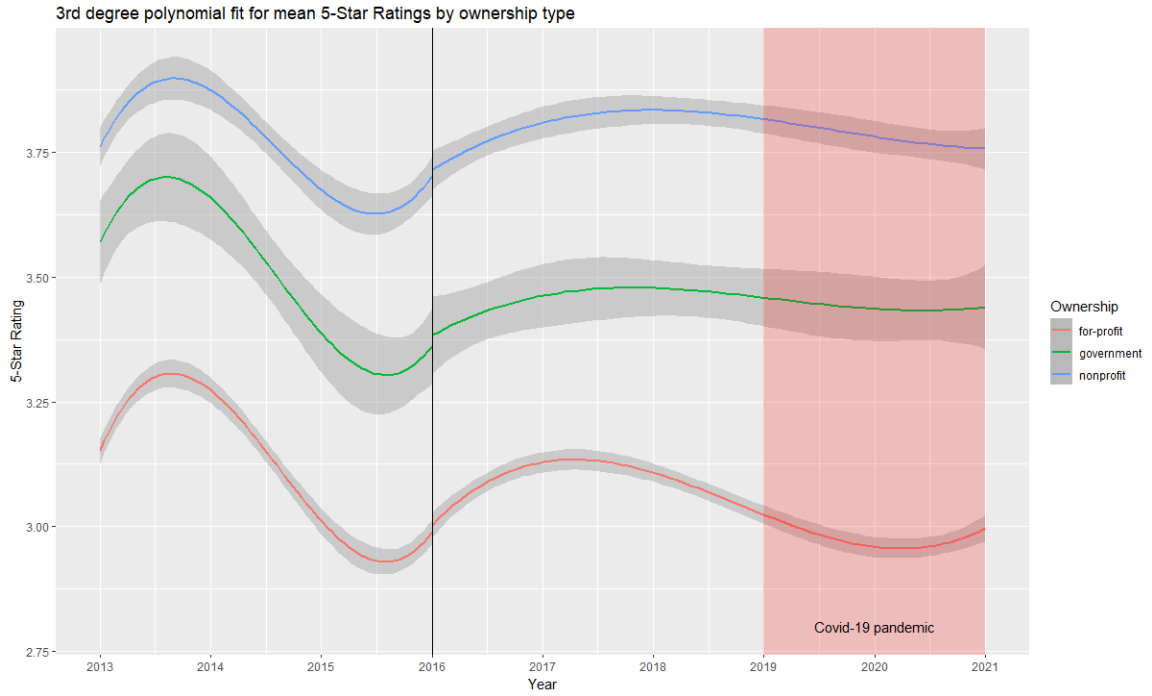


Figure 3.4: Third degree polynomial fits for the average Five-Star ratings across NH ownership types

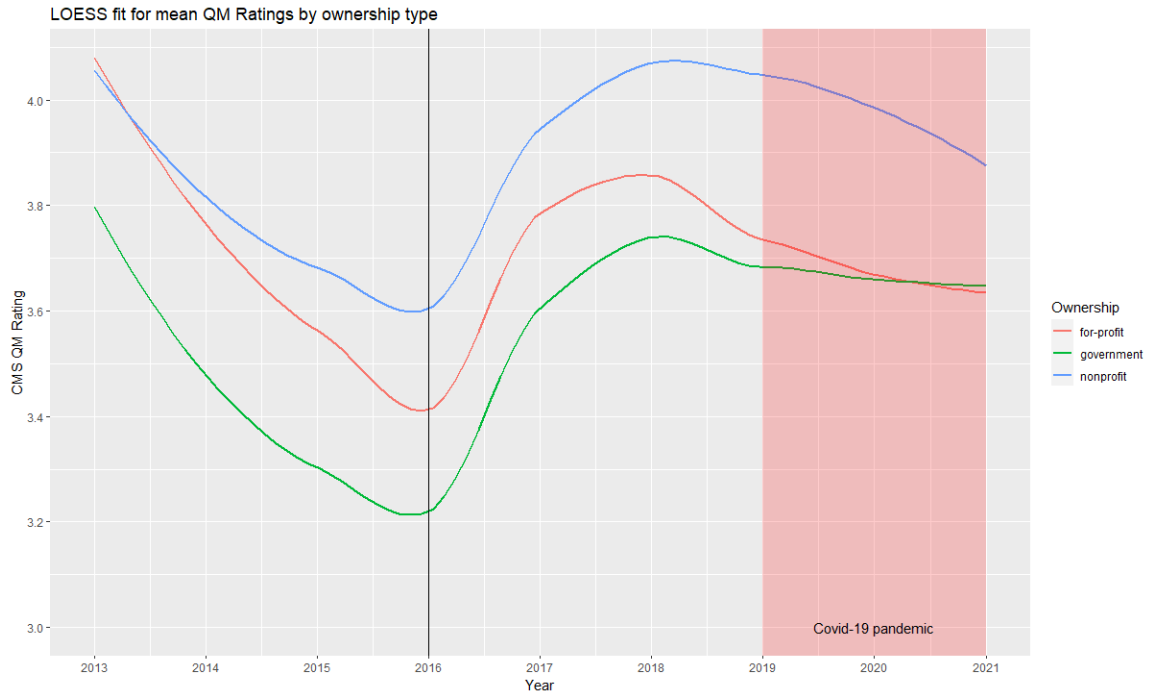


Figure 3.5: Mean quality-measure (QM) rating across NH ownership types over time



A similar picture arises when average overall QM ratings are plotted over time. In Figure 3.5, only the loess smoothing fit is presented instead of GAM polynomial fits because their results were similar. The plot shows loess estimated fits for the average QM ratings over time by ownership groups. Nonprofits have higher QM ratings than for-profit NHs for most of the years. Interestingly QM ratings for government-owned facilities have been lower than the other two ownership types over the years. Average QM ratings bounced after 2016 for all three ownership types after the new regulations went into effect. Thus, the QM rating trend change shows a possible short-term effect of the regulatory changes. The QM rating trends flattened after the initial rise, similar to the Five-Star rating trends. However, the QM rating trends for the most recent years are going downward, which may be due to the COVID-19 pandemic. Therefore, average QM ratings may return to pre-regulatory change levels if the trends continue to be negative.

Figure 3.6 shows time trends for average total staff hours per resident day for each ownership type. Staffing hours in for-profit nursing homes have been consistently lower than in nonprofit and government-owned nursing homes. The total staffing hours slightly increased until 2016 and declined until 2018 among for-profit and nonprofit facilities. We also observe an uptake of staffing starting in 2019. However, this increase does not necessarily mean increasing actual staffing but rather might be an artifact of decreasing resident numbers in nursing homes during the Covid-19 pandemic, demonstrated in the resident count plot in Figure 3.7. Overall, time trends for total staffing hours indicate that staffing levels decreased in nursing homes of all ownership types after the recent regulatory changes were implemented. This implication is formally tested in the estimation models presented in the next section.

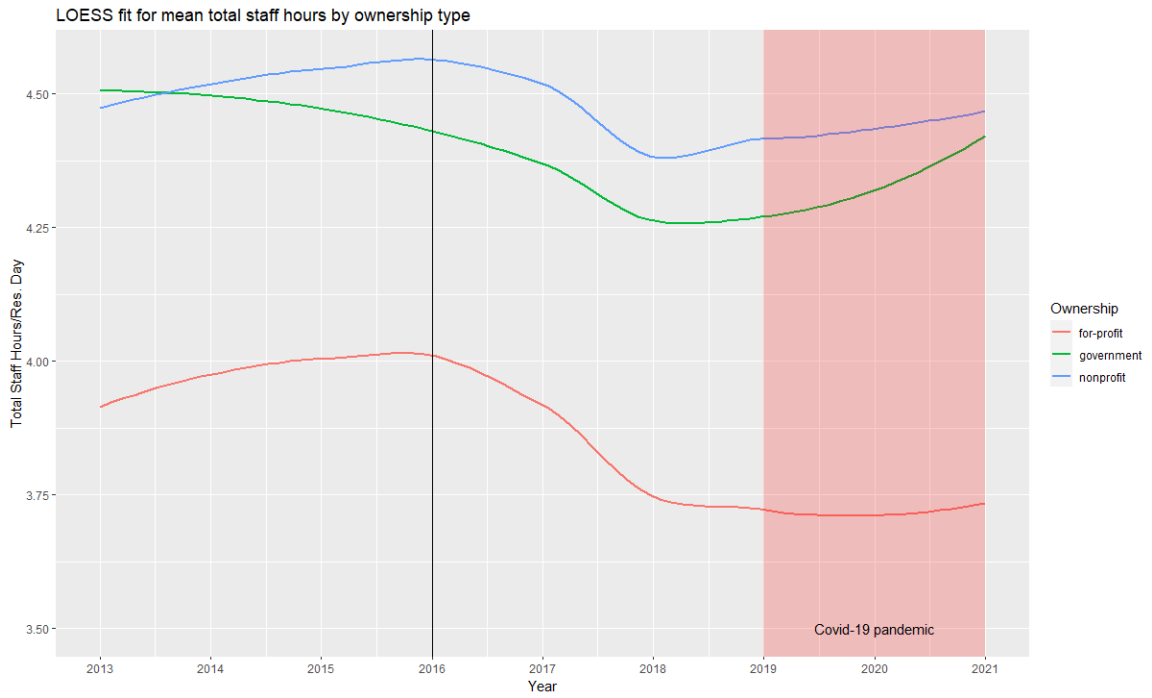


Figure 3.6: Average total staff hours per resident day across NH ownership types over time

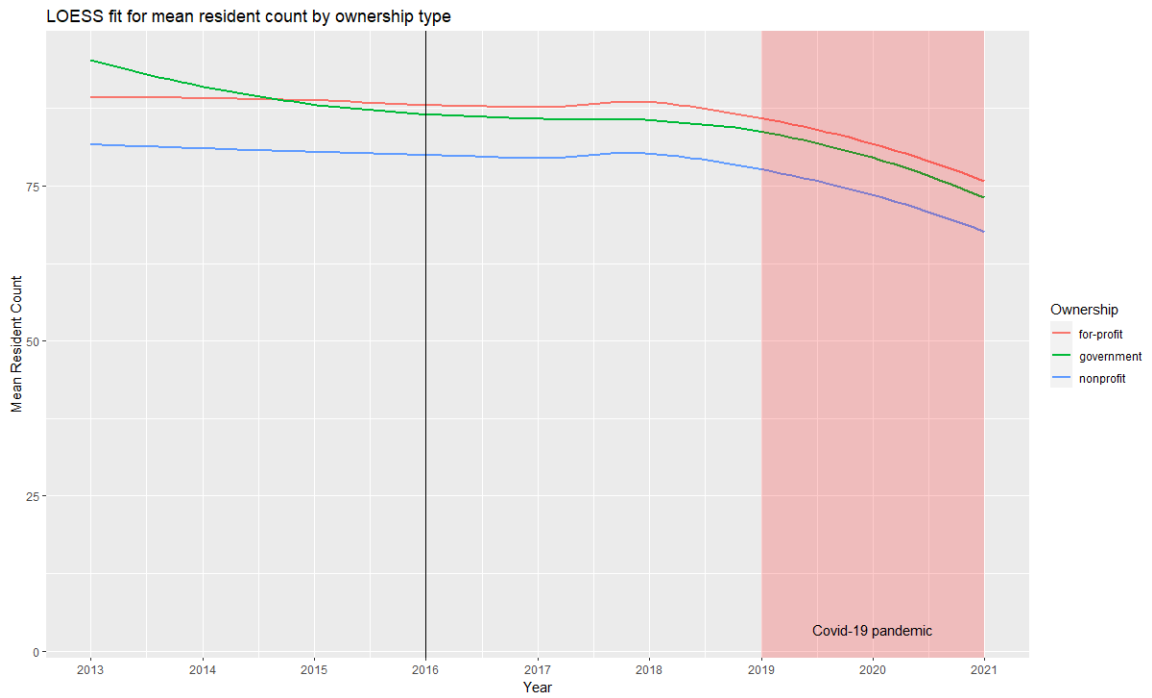


Figure 3.7: Average total resident count across NH ownership types over time

The following plots (Figure 3.8 and Figure 3.9) demonstrate trends for average inspection deficiency scores and average deficiency count measures over the years. In both cases, deficiency measures kept a similar trend following the regulatory changes in 2016. Average inspection deficiency scores and count increased over most years across all ownership types. Notice that nonprofit and government-owned nursing homes consistently have lower deficiency scores and fewer deficiencies than for-profits. Nonprofit facilities have the best deficiency measures among all ownership types, which was also the case for staffing and other quality measures, as seen in their corresponding plots.

Additionally, we observe that average deficiency citation counts fell during the Covid-19 pandemic period for nonprofit and government-owned nursing homes. On the contrary, both average deficiency scores and counts have continued to increase for for-profit facilities during the pandemic. Overall, it does not seem that the 2016 regulatory changes had an immediate effect on mean deficiency measures among nursing homes. Moreover, it is unclear if the recent fall in average deficiency counts and deficiency scores among nonprofit and government nursing homes can be attributed to the recent regulatory changes.

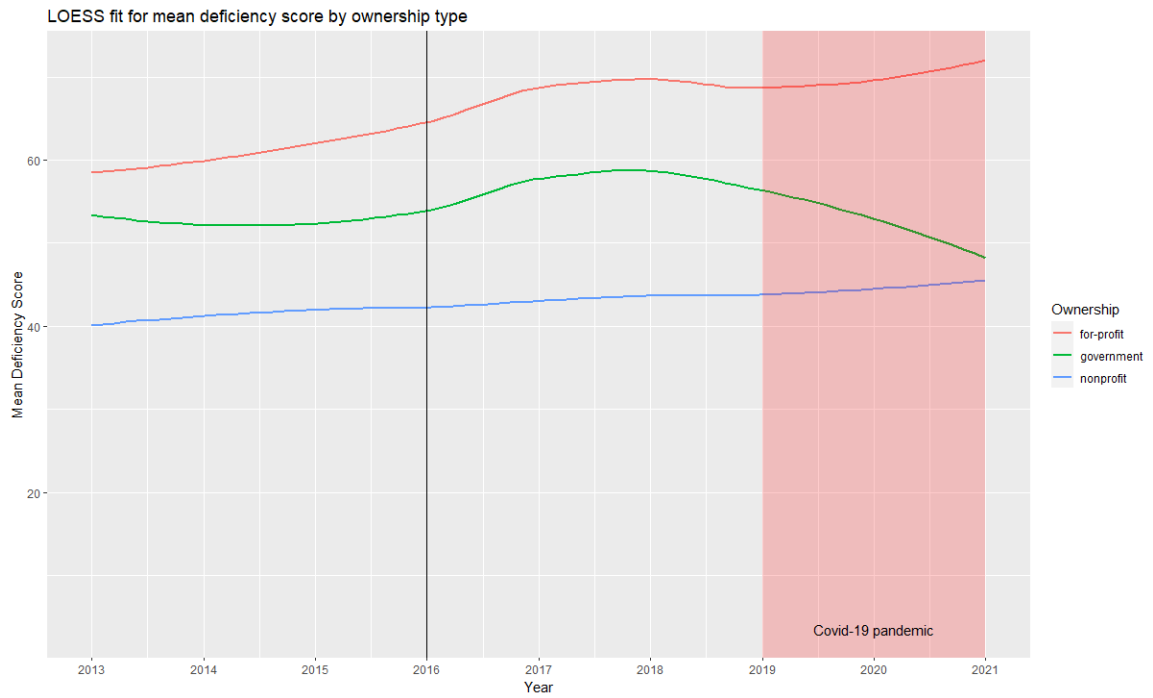


Figure 3.9: Average deficiency scores across NH ownership types over time

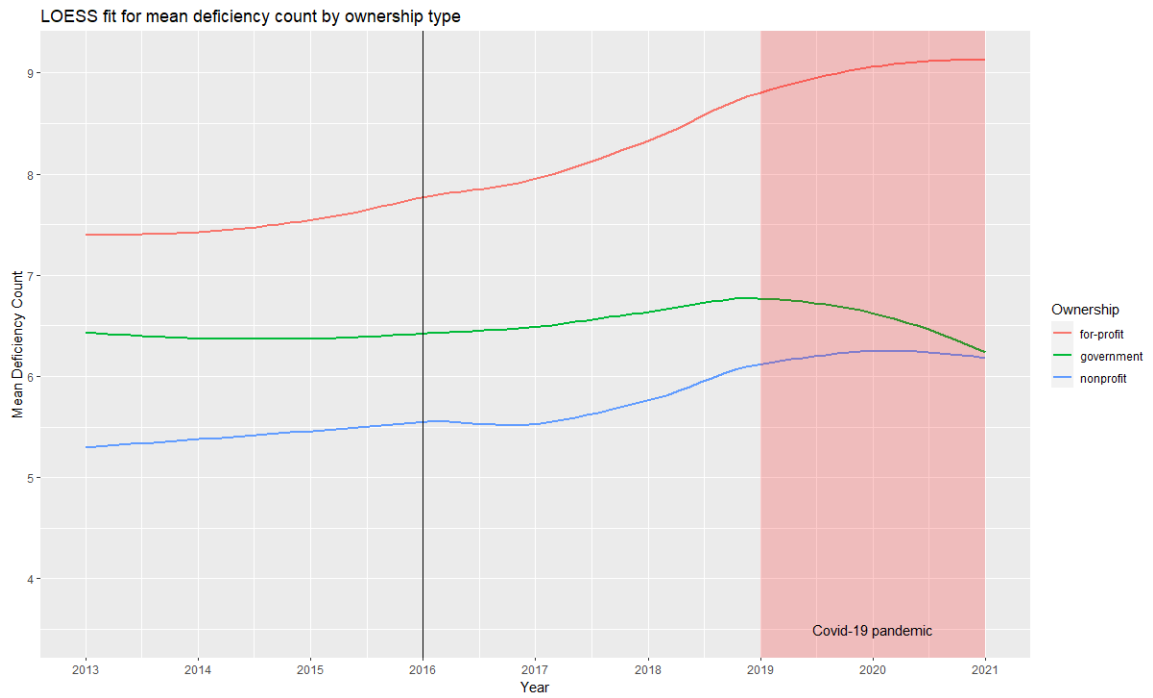


Figure 3.8: Average number of deficiencies across NH ownership types over time

### 3.6.2 Interrupted time-series analyses

Interrupted time-series models are estimated for the overall Five-Star quality rating measures separately for the years before 2020 and the whole period (Table 3-1). In both model estimations, the coefficient of the treatment dummy shows regulatory changes had an immediate positive impact of about 0.4 points increase on the average 5-star ratings of nonprofit and government-owned nursing homes. Moreover, the interactions between the treatment dummy (D) and for-profit ownership dummy are significant and equal to  $-0.07$  and  $-0.09$ , respectively, in the models, which are smaller than the coefficients of the treatment dummy. These estimates indicate that the immediate changes in mean Five-Star ratings of for-profit nursing homes after regulatory changes are smaller than those for nonprofit and government-owned facilities, though still positive. The coefficients of centered time variables show a negative quadratic time trend over the period before regulatory changes. The two models slightly differ in their findings about the shift in time trends after regulatory updates. In the before-2020 model, we found that the time-trend estimation after 2016 initially became positive but decreased again due to negative curvature. When we include years beyond 2020, the model estimates show that the time-trend in mean five-star ratings continued to decline after 2016, albeit at a lower rate than before. However, one must be cautious of attributing these trend changes solely to the recent regulatory changes, as the quality trends might have been affected by other factors, especially the influence of the Covid-19 pandemic in the later years.

Table 3-1: Interrupted time-series models for Five-Star Ratings

	Five-Star Ratings			
	Before 2020		All Years	
D (reg. change)	0.433***	(0.034)	0.459***	(0.034)
(t-2017)	-0.227***	(0.028)	-0.227***	(0.028)
(t-2017) 2nd.	-0.032***	(0.005)	-0.032***	(0.005)
For-profit	-0.591***	(0.012)	-0.591***	(0.012)
D*(t-2017)	0.319***	(0.039)	0.143***	(0.030)
D*(t-2017) 2nd.	-0.068***	(0.014)	0.044***	(0.006)
D*For-profit	-0.069***	(0.018)	-0.091***	(0.016)
Constant	3.367***	(0.031)	3.367***	(0.031)

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

Next, I estimate the time-trend estimation models for the quality measure (QM) ratings (Table 3-2). As a distinction from the above model, ownership dummy variables for nonprofit and government categories are included instead of the for-profit ownership category, which became the reference group because quality trends follow distinct paths for each ownership group for the QM rating variable. Both pre-2020 and whole period estimation results show that the regulatory changes had a large immediate impact of about a 1-point increase on the average QM ratings among all types of nursing homes. Moreover, this immediate effect is even larger for nonprofit and government-owned facilities, as indicated by positive coefficients of interaction between *D* and respective ownership dummy variables. We also observe that the base QM ratings before regulatory changes are higher in nonprofit nursing homes than for-profit facilities and lowest in government-owned facilities, which were visible from the time trends above. In both QM

rating models, the time-trend of average quality rating was negative before the regulatory changes, and there were positive changes to the trend following the new regulatory changes. However, the sums of the coefficients of time and the treatment dummy–time interactions in the whole period model indicate the mean QM rating is still declining, albeit at a lower rate over the period after 2016.

Table 3-2: Interrupted time series models for QM Ratings

	Quality Measure Ratings			
	Before 2020		All Years	
D (reg. change)	0.971***	(0.030)	1.022***	(0.030)
(t-2017)	-0.532***	(0.025)	-0.532***	(0.025)
(t-2017) 2nd.	-0.062***	(0.005)	-0.062***	(0.005)
Govt. Owned	-0.255***	(0.020)	-0.255***	(0.020)
Nonprofit	0.078***	(0.012)	0.078***	(0.012)
D*(t-2017)	0.899***	(0.036)	0.419***	(0.028)
D*(t-2017) 2nd.	-0.184***	(0.013)	0.077***	(0.006)
D*Gov. Owned	0.143***	(0.031)	0.183***	(0.027)
D*Nonprofit	0.165***	(0.018)	0.183***	(0.016)
Constant	2.844***	(0.028)	2.844***	(0.028)

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

I further estimated models for the total and case-mix adjusted nurse staff hours per resident day variables to analyze how time trends change for staffing hour levels (Table 3-3). The coefficient of the treatment dummy  $D$  is insignificant in total staffing hours models, implying no immediate change in total staffing after the 2016 regulatory changes. The treatment effect is significant for the case-mix adjusted total staff hours per resident day, but the effect is very small at just 0.05 hours per resident day. For both total and adjusted total staff hours measures, the time trend before regulatory changes ( $t - 2017$ ) and the first order change in time trend after 2016 ( $D * (t - 2017)$ ) are negative, meaning that total staffing hours have been declining before the regulatory changes, and they continued to decline at a more negative rate afterward. The second-order time-trend variables after regulation changes are positive in both models, which indicates the total staffing hours per resident day eventually increase during the later years. However, this increase in staffing hours per resident day ratio over the recent years is probably due to the decrease in total resident numbers in nursing homes during the Covid-19 pandemic, as explained by the trend plots above. As for the ownership differences, the significant and negative coefficients of the for-profit dummy variable and its interaction with  $D$  indicate lower staffing levels in for-profit facilities both before and after 2016 compared to nonprofit and government-owned nursing homes. These findings suggest that staffing hours measures increased by small amounts in 2017, the year after new regulations were implemented, but they continued to decline at even higher rates afterward. Therefore, the recent regulatory changes do not appear to significantly affect total and case-mix adjusted total staffing hours per resident day.



Table 3-3: Interrupted time series models for nurse staff hours variables

	Total Nurse Staff Hours/Res. Day		Case-mix adj. Nurse Staff Hours/Res. Day	
	pre-COVID	All Years	pre-COVID	All Years
D (reg. change)	0.038 (0.025)	0.022 (0.025)	0.046*** (0.022)	0.047*** (0.022)
(t-2017)	-0.010 (0.020)	-0.010 (0.020)	-0.002 (0.018)	-0.002 (0.018)
(t-2017) 2nd.	-0.006 (0.004)	-0.006 (0.004)	-0.003 (0.003)	-0.003 (0.004)
For-profit	-0.543*** (0.009)	-0.543*** (0.009)	-0.578*** (0.008)	-0.578*** (0.008)
D*(t-2017)	-0.361*** (0.029)	-0.135*** (0.022)	-0.162*** (0.025)	-0.033* (0.020)
D*(t-2017) 2nd.	0.124*** (0.011)	0.034*** (0.005)	0.053*** (0.009)	0.011*** (0.004)
D*For-profit	-0.062*** (0.013)	-0.108*** (0.012)	-0.083*** (0.012)	-0.133*** (0.011)
Constant	4.526*** (0.023)	4.526*** (0.023)	4.420*** (0.020)	4.420*** (0.021)

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

Finally, I estimate models with the total number of health deficiency citations and deficiency scores to analyze negative quality outcomes (Table 3-4). Negative binomial regression models are used for the deficiency count variable. These deficiency model estimations reveal several critical findings. The average number of deficiencies and average deficiency scores have been increasing before 2017, and they continued to grow afterward with varying slope and curvatures. Moreover, for-profit facilities had a higher average number of deficiencies and average deficiency scores compared to other ownership types. Most importantly, the negative and significant coefficients of the

treatment dummy variable (*D*) indicate that there has been an immediate decrease in both the average number of deficiencies (about 0.1) and average deficiency scores (about 5 points) in all types of nursing homes after the regulatory changes. This immediate impact was smaller for for-profit nursing homes, as indicated by the interaction effect. Overall, even though there were immediate decreases in deficiency measures right after the implementation of the 2016 regulatory changes, the time trends in both deficiency count and scores were still upward during the following years. These findings suggest that even if the immediate decline in deficiency scores could be attributed to the regulatory changes, the impact was not sustained over the long term.

Table 3-4: Interrupted time series models for deficiency variables

	Total Number of Health Defc. (Negative binomial)		Total Deficiency Score (OLS)	
	pre-COVID	All Years	pre-COVID	All Years
D (reg. change)	-0.110*** (0.024)	-0.124*** (0.023)	-5.212** (2.652)	-5.354** (2.591)
(t-2017)	0.095*** (0.018)	0.095*** (0.019)	4.160** (2.083)	4.160** (2.069)
(t-2017) 2nd.	0.016*** (0.004)	0.016*** (0.004)	0.484 (0.407)	0.484 (0.405)
For-profit	0.292*** (0.008)	0.292*** (0.008)	17.741*** (0.883)	17.741*** (0.877)
D*(t-2017)	0.050 (0.046)	0.021 (0.021)	21.804*** (5.190)	-4.883** (2.293)
D*(t-2017) 2nd.	-0.056*** (0.021)	-0.040*** (0.004)	-13.383*** (2.392)	0.043 (0.479)
D*For-profit	0.040*** (0.013)	0.059*** (0.012)	4.004*** (1.493)	5.200*** (1.330)
Constant	1.847*** (0.021)	1.847*** (0.021)	50.323*** (2.376)	50.323*** (2.360)

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

### 3.7 Conclusion

The time-series models in this section estimated trend changes in average outcome measures across all nursing homes following the recent regulatory changes. I analyzed trends for five quality measures: the Five-Star ratings, quality measure (QM) ratings, total staffing hours per resident day, inspection deficiency score, and the total inspection deficiency count. Interrupted time-series models for each variable are estimated with and without the pandemic years to examine how the results change when the pandemic period is included. Overall, time trends show nursing home quality has declined over the last nine years. Nonprofit nursing homes had the best average quality for all quality indicators analyzed. Specifically, nonprofit nursing homes have the highest averages of 5-Star rating, overall QM rating, overall staffing rating, total staffing hours per resident day, and lowest averages of deficiency score and number of deficiencies. On the other hand, for-profits had the worst quality measures, with the only exception being the self-reported QM ratings for which government-owned facilities had lower average ratings than for-profits.

The primary focus of inquiry in these analyses was to investigate how the quality trends have changed after the implementation of recent regulatory changes by the end of 2016. Estimation results revealed there had been immediate increases in the average Five-Star ratings and QM ratings after the recent regulatory changes, and there were positive changes to the time trends for these variables, although their trends were still negative in the long term. These findings confirm hypotheses H3.1(a) and H3.1(b) and indicate a short-term positive shock to 5-Star and QM ratings following the regulatory changes. Moreover, the positive effect of the 2016 regulations is higher for QM ratings

than 5-Star ratings, which is reasonable because 5-Star ratings are calculated based on three overall ratings, including QM rating. The positive effect of recent regulatory changes on QM ratings is expected because the changes included provisions for improved resident-centered care requirements, resource planning, and requirements to prevent adverse outcomes such as abuse, neglect, restraint use, pressure ulcers, and falls (81 F.R. 68688, 2016). This finding is also consistent with previous studies that found improved quality measures following the NHRA reforms of 1987 (Hawes et al., 1997; Janelli et al., 1994; Marek et al., 1996; Moseley, 1996; Zhang & Grabowski, 2004). However, the QM rating is calculated based on Medicare claim-based quality measures and the self-reported MDS-based quality measures. Therefore, the estimated increase in QM ratings after the 2016 regulations might be caused by underreporting of negative outcomes by some facilities to avoid fines.

In support of hypothesis 3.2, staffing hours measures continued to decline after the recent regulatory changes. The immediate effects are insignificant for total staffing and significant but very small for adjusted staff hours. These findings are not surprising given that the regulatory changes did not bring any minimum staffing standards. This result is unfortunate because researchers have consistently emphasized the importance of staffing to improve nursing home quality and pressed for improved minimum staffing standards (Harrington et al., 2016a).

The estimated immediate effects of the 2016 reforms were significant and negative for the total deficiency score and the total number of deficiency citation measures. These findings confirm hypotheses 3.3(a) and 3.3(b) and are parallel to previous findings of fewer deficiencies after the implementation of the previous

comprehensive regulatory reform, NHRA (Harrington et al., 1997). Nevertheless, the effect sizes were small, and time-trend estimations show that these effects were not durable in the long term and that deficiency numbers continued to increase after the immediate small decrease.

Regarding the impact of regulatory changes on ownership-related quality gaps, estimation results showed that the immediate effects on average quality after the regulations were smaller for for-profit nursing homes than nonprofit and government-owned facilities for all quality measures analyzed. Therefore, contrary to my hypotheses, stricter regulations do not appear to bring for-profit and nonprofit nursing homes closer. If the recent regulatory changes had any impact on the average quality of nursing homes, they widened the quality gaps between for-profit and other ownership-type facilities.

There are two caveats to the current analysis. First, regulatory changes might have had delayed effects on nursing home quality as it takes time for nursing homes to adjust to the regulatory changes, and it also takes time for inspectors to control the implementation of the new rules. Second, it is worth emphasizing that the estimated effects in the time-series models do not indicate causation because of the lack of control groups to isolate the true effect of regulatory changes. The results might have been influenced by other sector-wide events, such as the impact of the COVID-19 pandemic for the last two years of the period analyzed. Since the pandemic hit nursing homes in early 2020, it is hard to determine if any change in quality after 2020 is due to the pandemic or other changes in operation. Therefore, caution must be taken when interpreting these findings to not attribute them solely to the recent regulatory changes.

## **CHAPTER 4: DIFFERENCES IN COVID-19 OUTCOMES IN NURSING HOMES BY OWNERSHIP TYPE**

### **4.1 Introduction**

In this chapter, I analyze quality differences between for-profit and nonprofit nursing homes with respect to the outcomes of the COVID-19 pandemic. The effects of the coronavirus disease 2019 (COVID-19) pandemic on long-term care facilities have been catastrophic. The first COVID-19 outbreak in the United States occurred in a Washington State nursing home, where the virus infected 129 residents, staff, and visitors and killed 40 (Sacchetti & Swaine, 2020). As of June 2021, long-term care facilities accounted for around one-in-three COVID-19 deaths in the United States (Conlen et al., 2021). Both frail conditions of residents and unpreparedness of facilities played a role in the devastating outcome of the COVID-19 pandemic in long-term care facilities.

Although the old age and fragile health condition of LTC residents have played a role in these high ratios, the dire situation has revealed deep flaws underlying the catastrophic outcome in the long-term care system. The quick and deadly spread of the coronavirus in long-term care facilities across the nation has happened despite the most recent federal regulatory changes, which were implemented between 2017 and 2019, included requirements for facilities to develop an Infection Prevention and Control Program (IPCP) and designate an Infection Preventionist with the aim of preventing and controlling the spread of infectious diseases in facilities. For-profit nursing homes are especially suspect to have been caught unprepared by the pandemic due to their cost-cutting practices.

Research conducted in the early phases of the pandemic has identified for-profit ownership as a determinant along with other factors influencing the likelihood or severity of COVID-19 outbreaks in long-term care facilities, which include community spread in the surrounding area, inadequate staffing, weak infection control protocols, facility overall quality, lack of personal protective equipment, the racial composition of facilities or the surrounding area, facility size and occupancy rate (Ochieng, Chidambaram, Garfield, & Neuman, 2021). Most of the studies on this topic were published in the early months of the pandemic when many nursing homes had zero cases. Since then, the situation has evolved, and resident cases and deaths have increased by far. Therefore, these previous studies lacked sufficient information to thoroughly investigate the factors underlying the pandemic outcomes in nursing homes.

This chapter presents an up-to-date evaluation of factors that influence pandemic outcomes in nursing homes, particularly focusing on the effect of ownership, by using more recent data collected after the major surges in cases and deaths occurred following a series of COVID-19 waves (Chidambaram & Garfield, 2021). Moreover, as a unique contribution to the literature, two new factors are included in the analysis. Specifically, in addition to factors commonly assessed in the literature, I analyze the effects of being a hospital-based nursing home and the Zip-code area healthcare need levels measured by the social deprivation index. The analysis draws on national-level nursing home COVID-19 data collected and released by CMS from the start of the pandemic through to March 2022 to shed light on the more recent picture of the impact of the pandemic in nursing homes. Below, I first provide an overview of previous studies about the pandemic outcomes in nursing homes. Details of the data and regression models are provided in the

methodology section. Results contribute to the previous scholarship by evaluating ownership-related quality differences concerning COVID-19 outcomes and by presenting up-to-date findings about the factors behind the adverse consequences of the pandemic in nursing homes.

#### **4.2 Literature COVID-19 Studies**

Researchers found a variety of factors that influence COVID-19 outcomes in nursing homes depending on different control variables included in the analysis (Bach-Mortensen, Verboom, Movsisyan, & Degli Esposti, 2021). Regarding the ownership status of nursing homes, the majority of the studies concluded that for-profit nursing facilities were associated with higher rates of COVID-19 cases and deaths (Bach-Mortensen et al., 2021; Braun et al., 2020; Chatterjee, Kelly, Qi, & Werner, 2020; Chen, Chevalier, & Long, 2020; He, Li, & Fang, 2020; Rowan et al., 2020; Spurlock et al., 2020; M. A. Unruh, Yun, Zhang, Braun, & Jung, 2020). In contrast, results about the relationship between ownership and the probability of having at least one infected resident were mixed (Abrams et al., 2020; Chatterjee et al., 2020; Fisman, Bogoch, Lapointe-Shaw, McCready, & Tuite, 2020; Gorges & Konezka, 2020; Stall, Jones, Brown, Rochon, & Costa, 2020). A study conducted at the early stages of the pandemic revealed that a larger share of the nursing homes that reported at least one COVID-19 case were for-profit facilities (78.9%) compared to the lower prevalence of for-profits among the nursing homes that did not report any cases (69.1%) (Chatterjee et al., 2020). A study of California nursing homes found that for-profit owned facilities had significantly higher probabilities of having a COVID-19 case among residents, more COVID-19 cases, and higher growth rates of COVID-19 cases (He et al., 2020). A cohort



study of long-term care homes in Canada found that for-profit ownership status was associated with the number of COVID-19 cases and deaths in facilities but not with the probability of having at least one resident case (Stall et al., 2020). Similarly, Abrams et al. (2020) did not find a significant relationship between ownership type and the probability of having a COVID-19 outbreak, defined as having at least one positive case among residents, after adjusting for facility size, urbanity status, resident racial mix, and quality ratings. However, the same study concluded that for-profit nursing homes had significantly more COVID-19 cases among facilities with an outbreak (Abrams et al., 2020).

Researchers have also investigated factors intermediary to the relationship between ownership and COVID-19 outcomes at long-term care facilities. Some of the mediating factors between for-profit ownership type and worse COVID-19 outcomes seem to be lower nursing staffing levels and higher rates of lack of PPE in for-profit nursing homes (Bach-Mortensen et al., 2021; Gorges & Konetzka, 2020; Harrington, Ross, et al., 2020; McGarry, Grabowski, & Barnett, 2020). For-profit facilities have been reported to have lower staffing levels than nonprofit and government-owned facilities before the pandemic (Goldstein, Silver-Greenberg, & Gebeloff, 2020; Mathews, Fuller, & De Avila, 2020). Research over the last decade has shown evidence that for-profit nursing homes tend to keep staffing levels low at the detriment of quality due to their incentives to reduce costs (Grabowski et al., 2013; Gupta, Howell, Yannelis, & Gupta, 2021; Harrington et al., 2012). Lower staffing levels are thought to play a role in worse COVID-19 outcomes at for-profit facilities (Gorges & Konetzka, 2020; Harrington, Ross, et al., 2020). For-profit nursing homes were also more likely to suffer PPE shortages

during the pandemic (Braun et al., 2020; Gandhi, Song, & Upadrashta, 2020; McGarry et al., 2020). Furthermore, for-profit facilities were more crowded than nonprofit or government-owned facilities, which is shown to be associated with worse pandemic outcomes (Brown et al., 2021; Bui et al., 2020). In addition, studies found that for-profit ownership status correlated with other covariates of COVID-19 outcomes such as larger facility size (Li, Temkin-Greener, Shan, & Cai, 2020), a higher share of minority residents (Li, Cen, Cai, & Temkin-Greener, 2020), and chain affiliation (Stall et al., 2020). It is important to note that researchers reached different results regarding the factors influencing COVID-19 outcomes in nursing homes when they included different control variables in the analysis (Bach-Mortensen et al., 2021). Thus, the findings of the previous studies need to be evaluated in their research context. Discovering the total effect of ownership status on the pandemic outcomes requires excluding the mediating factors and including other covariates which are not intermediaries to the relationship between ownership and COVID-19 outcomes.

Among other influential factors, previous studies have consistently found the rates of COVID-19 infections in the community around long-term care facilities to be associated with COVID-19 rates in facilities (Bui et al., 2020; Chatterjee et al., 2020; Gorges & Konetzka, 2020; Rowan et al., 2020; Stall et al., 2020; Sugg et al., 2021; Temkin-Greener, Guo, Mao, Cai, & Li, 2020; E. M. White et al., 2020). Specifically, higher COVID-19 cases in nursing homes were associated with higher county-level COVID-19 rates and higher population density in counties (Sugg et al., 2021). Similarly, a Canadian long-term care study found that the COVID-19 incidence rate in the surrounding area was significantly associated with the odds of an outbreak (at least one

case) and the total number of COVID-19 cases in long-term care facilities (Stall et al., 2020). Moreover, the urbanity status of facilities was related to COVID-19 outbreak probability and the total number of cases (Abrams et al., 2020; Chen et al., 2020). In the case of assisted living, facilities located in counties with higher COVID-19 case rates were significantly more likely to have at least one case (Temkin-Greener et al., 2020). These studies suggest that facilities located in primarily urban communities with higher COVID-19 rates should have been more cautious about spreading the virus from communities to inside the facility by applying strict infection control measures. A novel research project employing spatial data from 50 million smartphones suggests that shared staff networks among facilities might have played a role in spreading the virus between communities and facilities (Chen et al., 2020).

Despite the federal regulations about improved infection control protocols being implemented before the pandemic between 2016 and 2019, many nursing homes met the pandemic unprepared (U.S. Government Accountability Office, [GAO], 2020). Before the pandemic, infection prevention and control-related citations were the most common violations assigned to nursing homes by government inspectors. Around 61 percent of nursing homes have been cited for infection-control deficiencies since 2017 (Rau, 2020; GAO, 2020). As the pandemic grew, government institutions issued guidance providing detailed infection prevention and control recommendations for nursing homes (Centers for Disease Control and Prevention, 2020; Centers for Medicare and Medicaid Services, 2020). Infection-control deficiencies were found to be negatively associated with staffing levels and positively associated with the probability of having COVID-19 infections among residents in nursing homes (Harrington, Ross, et al., 2020). Sugg et al. (2021)

analyzed community-level factors affecting COVID-19 transmissions in nursing homes at the national level and found average infection-control deficiencies were significantly higher in nursing homes with at least one case than in nursing homes with no cases. However, like several other studies, they did not find any significant effect of infection-control deficiencies on the number of COVID-19 cases after controlling for facility and county characteristics (Abrams et al., 2020; Sugg et al., 2021; E. M. White et al., 2020). When researchers analyzed deficiencies broadly, however, they discovered higher rates of COVID-19 cases in nursing homes with more deficiency citations (Chatterjee et al., 2020; Harrington, Ross, et al., 2020; Sugg et al., 2021). Studies found health deficiencies, infection control deficiencies, reported incidents, and complaints were more prevalent among nursing homes that reported at least one COVID-19 case than those that did not report any in the early months of the COVID-19 pandemic (Chatterjee et al., 2020).

Along with infection control protocols, personal protective equipment usage is another crucial element to fight the pandemic. Personal protective equipment (PPE) and staffing shortages played a significant role in the spread of COVID-19 cases among residents of long-term care facilities. More than one in five nursing homes reported a staff or severe PPE shortage during the pandemic's early months (McGarry et al., 2020). Researchers have discovered that for-profit nursing homes reported significantly higher PPE shortages than nonprofits (McGarry et al., 2020). Similarly, chain-affiliated facilities were likelier to report a PPE shortage than facilities unaffiliated with a chain (McGarry et al., 2020). These findings indicate that for-profit or corporate chain owner facilities have made less or no investments into PPE before the pandemic, which might be attributed to their cost-cutting incentives to increase profits.

Staffing is another critical factor in understanding the outcome of the COVID-19 pandemic in long-term care facilities. Inadequate staffing levels in many nursing homes have been a problem even prior to the pandemic, which played a role in its devastating outcome in nursing homes (Goldstein et al., 2020; Harrington, Ross, et al., 2020; Harrington et al., 2016b; Mathews et al., 2020; Rau & Almendrala, 2020). Early studies during the pandemic reported that nursing homes with higher nurse-staffing quality ratings (4-5 stars) were less likely to have large numbers of COVID-19 cases than nursing homes with lower nurse staffing ratings (Figueroa et al., 2020). Rowan et al. (2020) found that higher nurse-staffing quality ratings were associated with lower COVID-19 cases and deaths per bed in Connecticut nursing homes. Similarly, another Connecticut study has concluded that higher registered nursing (RN) hours per resident day were associated with significantly lower numbers of COVID-19 cases and deaths in nursing homes (Li, Temkin-Greener, et al., 2020). In California, nursing homes with lower five-star staffing ratings, higher health deficiencies, and more beds were more likely to have COVID-19 resident infections (Harrington, Ross, et al., 2020). Besides staffing quality ratings, researchers also found staffing levels influential on COVID-19 outcomes at facilities, where higher staffing levels were usually associated with lower COVID-19 transmission rates (Gorges & Konetzka, 2020; Spurlock et al., 2020; Sugg et al., 2021). A study of California nursing homes found that facilities with total registered nurse levels below the federally recommended minimum standard (0.75 hours per resident day) were twice more likely to have COVID-19 infections among residents (Harrington, Ross, et al., 2020). These findings regarding the role of staffing in controlling the pandemic are consistent with prior findings about the critical relationship

between staffing and quality in nursing homes (Backhaus et al., 2014; Castle, 2008; Hyer et al., 2011; Konetzka, Stearns, & Park, 2007; Lin, 2014; Schnelle et al., 2004; Shin & Bae, 2012; Stephens, 2018).

Researchers also attempted to use previous quality ratings to assess COVID-19 outcomes at nursing homes. In a study of 123 CMS-certified nursing homes in West Virginia, facilities with higher star-based quality ratings assigned by CMS were found to be less likely to have a COVID-19 outbreak than 1-star-rated facilities (Bui et al., 2020). According to a study of Connecticut nursing homes, on the other hand, star-based quality ratings were not significantly related to the probability of having at least one coronavirus case (Li, Temkin-Greener, et al., 2020). However, among nursing homes with confirmed cases, facilities with four- or five-star ratings had significantly fewer cases than facilities with lower ratings (Li, Temkin-Greener, et al., 2020). In another study, He et al. (2020) examined the quality and COVID-19 outcome association in the context of 1223 California nursing facilities. They concluded that nursing homes with higher star ratings (4-star, 5-star) were less likely to have at least one case and had lower rates of increase in cases per bed than nursing homes with lower ratings, controlling for nursing home ownership, size, racial composition, and facility age (He et al., 2020). However, other studies found insignificant or inconsistent relationships between the overall five-star ratings and the probability of outbreak when controlling for community (county) COVID-19 case rates or other location characteristics (Abrams et al., 2020; Chatterjee et al., 2020; Figueroa et al., 2020; Sugg et al., 2021; E. M. White et al., 2020).

Other findings of the previous COVID-19 studies include the relationship between racial composition and COVID-19 rates. The New York Times reported that at

the national level, nursing homes with above 25% black or Latino resident share were twice more likely to have at least one coronavirus case than nursing homes with black or Latino resident share of below 5% (Gebeloff et al., 2020). Similarly, studies conducted early in the pandemic have shown that facilities with a higher share of minority residents were significantly more likely to have resident COVID-19 infections (at least one confirmed case) both at the national level (Abrams et al., 2020) and in a single state (He et al., 2020). Moreover, in Connecticut, nursing homes with higher concentrations of minority residents had significantly larger counts of COVID-19 cases compared to nursing homes with lower percentages of minority residents (Li, Temkin-Greener, et al., 2020). Similar findings have been reported for assisted living facilities in seven states (Temkin-Greener et al., 2020). Research has also shown that nursing homes in counties with higher minority populations had higher COVID-19 cases (Sugg et al., 2021). These findings parallel the observations that black communities in the U.S. were disproportionately affected by the COVID-19 pandemic compared to other areas (Pilkington, 2020).

#### **4.3 Research questions and hypotheses**

As summarized above, previous studies have pointed out a variety of factors behind devastating outcomes of the pandemic outbreak in long-term care facilities, which include community case prevalence, staffing rates, ownership, and infection control deficiencies (Abrams et al., 2020; Ochieng et al., 2021; Sugg et al., 2021). Particularly, for-profit nursing homes were found to have higher COVID-19 cases and deaths than nonprofit facilities (Spurlock et al., 2020; Stall et al., 2020). Moreover, nursing homes with higher staffing numbers and higher quality measures had fewer cases and deaths

(Gorges & Konetzka, 2020; Harrington, Ross, et al., 2020; He et al., 2020; Ochieng et al., 2021). These findings are consistent with the view that for-profit facilities' cost-cutting practices such as reducing staff numbers or not properly investing in infection control programs might have played a role in their higher rates of COVID-19 cases and deaths. In parallel with these arguments and findings, I offer the following hypotheses regarding the outcomes of the COVID-19 pandemic in nursing homes:

**Hypothesis 4.1:** For-profit nursing homes have, on average, a higher number of resident COVID-19 cases per 1000 beds reported to the federal government compared to nonprofit nursing homes.

**Hypothesis 4.2:** For-profit nursing homes have, on average, a higher number of resident COVID-19 deaths reported to the federal government compared to nonprofit nursing homes.

#### **4.4 Methodology**

The analysis provided in this chapter draws on data collected from five different sources. The primary data sources used are the COVID-19 outcomes in nursing homes and nursing home characteristics, downloaded from the Center of Medicare and Medicaid (CMS) online data archives. The COVID-19 outcomes in nursing homes were taken from the data reported on March 27, 2022. Nursing home quality outcomes and other inspection data were retrieved from the CASPER files for the end of 2021. This data was also enriched by additional nursing home characteristics by merging it with the LTC-Focus data provided by the Brown University School of Public Health (LTCFocus, 2021). The data for the COVID-19 cases and community transmission rates in U.S.



counties were retrieved from the Center for Disease Control and Prevention Covid information website (CDC) and the New York Times's COVID-19 data website (The New York Times, 2021), both for the date of March 10, 2022.

Additionally, these data were combined with the Social Deprivation Index data to capture area characteristics. This index was developed by Butler, Petterson, Phillips, and Bazemore (2013) to predict health care access and need in an area in the United States based on a variety of socioeconomic factors ranging from income and employment characteristics to demographic and housing area characteristics. The Social Deprivation Index (SDI) was retrieved from the Roberg Graham Center's website. The Zip-code level SDI measures were used in the analysis provided here.

The nursing home COVID-19 data used in the analysis contained information about pandemic outcomes in 15,205 nursing homes in the United States. Some of these nursing homes had missing data after merging this data with CMS' CASPER-based nursing home data, which reduced the number of facilities with data available to 15,071. Since many cases with errors were discovered in the numbers of nursing home COVID-19 cases and deaths per 1000 residents, cases and deaths per 1000 beds were calculated and added to the data. Table 1 presents the summary statistics for the number of beds, total cases, and deaths for residents and staff, along with resident cases and deaths per 1000 beds.

Table 4-1: Summary statistics for COVID-19 cases and deaths in U.S. nursing homes

Statistic	N	Mean	SD.	Min	Pctl(25)	Pctl(75)	Max
Number of All Beds	15,071	106	58.6	4	65	126	815
Residents' Total Confirmed Cases	15,071	66.9	47.8	0	32	92	520
Residents' Total COVID-19 Deaths	15,071	10	11.2	0	3	14	139
Staff Total Confirmed Cases	15,071	70.6	43.2	0	42	89	549
Staff Total COVID-19 Deaths	15,071	0.2	0.7	0	0	0	27
Resident Cases Per 1000 Beds	15,071	605	280	0	390	845	1000
Resident Deaths Per 1000 Beds	15,071	93.9	90.4	0	30.3	133	1000

The analyses were conducted using residents' COVID-19 case and death numbers. In the analysis of cases among residents, the dependent variables were selected as the resident COVID-19 cases per 1000 beds. The choice of using cases per 1000 beds over total cases was made to capture relative spread numbers by normalizing total case numbers with the size of a facility. However, analysis results do not change significantly when total cases were used instead of cases per 1000 beds. Additionally, factors related to resident deaths due to COVID-19 were analyzed using the total COVID-19 deaths among residents as the dependent variable. This variable was not normalized by the size of the facility because resident deaths occurred less commonly, and the total number of deaths showed characteristics of a count variable. Moreover, conceptually resident deaths should be preventable, if possible, independent of the size of a facility, whereas it might be acceptable to have higher case numbers in a larger facility. Thus, residents' total COVID-19 deaths were used as it is reported.

The analyses for resident cases and deaths include the same independent variables. The primary independent variable of interest is the ownership type of a facility, measured by a dummy variable for for-profit ownership. Regression models include controls for eight facility characteristics and two environmental factors, selected from a list of 24 variables mostly used by previous studies. Stepwise model selection methods are applied to select the model that explains the most variation in the COVID-19 resident cases per 1000 beds. Specifically, the final model includes the overall quality measure (QM) ratings, case-mix adjusted registered nurse and total nurse staffing hours per resident day, the total number of deficiency citations, number of infection control citations from the last inspection, occupancy rate, dummy variables for for-profit, chain affiliated, and hospital-based facilities, along with location-based characteristics. The area characteristics included in the analysis are the county COVID-19 cases per 1000 people and Zip-code level social deprivation index (SDI) measures. The models were also run with a reduced form by removing staffing variables and deficiency citations from the analysis to see how the effect of ownership would change in this case. The total resident cases per bed models were analyzed using linear regressions. In the case of resident deaths, the dependent variable was an overly dispersed count variable. Therefore, negative binomial estimation techniques were used to estimate the relative effects of independent variables on the incidence rates of resident COVID-19 deaths.

#### **4.5 Results**

Analysis results for the full and reduced models are shown side-by-side for resident COVID-19 cases and deaths in Table 4-2 and Table 4-3. Estimation results for cases per 1000 beds variable show that quality measure rating, registered nurse, and total

staffing hours variables are significantly associated with a lower number of resident cases per beds. Specifically, one unit increase in registered nurse hours per resident day was linked to a 50-unit decrease in resident cases per 1000 beds, whereas a unit increase in total staffing hours was linked to an additional 20.5 unit decrease, controlling for all other variables included in the full model. The total number of deficiencies does not significantly affect the cases per bed. On the other hand, the effect of infection control citations was found to be significant. Each infection control citation was significantly associated with a 6-unit increase in resident COVID-19 cases per bed. For-profit ownership and chain affiliation were both significantly related to higher numbers of cases in both the full and reduced models. On average for-profit nursing homes were found to have 71 more cases per 1000 beds than nonprofit and government-owned facilities, corresponding to around 7 cases for an average facility with 100 beds.

Moreover, when staffing and deficiency variables are excluded from the model, the coefficient of for-profit becomes even larger, which suggests that these variables are intermediating some of the effects of for-profit status. Chain affiliation is also significantly related to more cases controlling for other factors, implying that chain affiliation contributed to higher cases on top of for-profit ownership. On the other hand, hospital-based facilities had significantly lower (73 fewer in the full model, 111 fewer in the reduced model) cases per 1000 beds. As for the area characteristics, coefficients for county case rates and SDI scores are significant and positive. These findings indicate that facilities in counties with higher case rates and located in Zip-code areas with higher socioeconomic needs have higher average resident COVID-19 cases per 1000 beds.

Table 4-2: Linear regression results for resident COVID-19 cases per 1000 beds in nursing homes

	Resident COVID-19 Cases per 1000 Beds	
	(1)	(2)
Quality Measure Rating	-16.625*** (1.885)	-21.979*** (1.845)
RN Hours/res. Day	-49.920*** (6.277)	
Total Staff Hours/res. Day	-20.557*** (3.149)	
Total number of deficiencies	-0.309 (0.334)	
Infection Control Citations	6.106*** (1.124)	
For-profit	71.461*** (5.471)	100.803*** (5.119)
Chain owned	24.750*** (4.683)	30.216*** (4.590)
Occupancy	4.112*** (0.146)	4.303*** (0.142)
Hospital based	-73.294*** (12.960)	-111.166*** (12.446)
County cases per 1000	0.602*** (0.051)	0.609*** (0.051)
SDI	35.961*** (8.796)	48.454*** (8.574)
Constant	277.575*** (22.154)	140.972*** (17.882)

Table 4-2 (Continued)

Observations	13119	13511
R2	0.142	0.123
Adjusted R2	0.142	0.122
Residual Std. Err.	255.073 (df = 13107)	258.210 (df = 13503)
F-Statistic	197.657*** (df = 11; 13107)	270.134*** (df = 7; 13503)

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

Table 4-3 presents estimation results of negative binomial regression models for total resident COVID-19 deaths in nursing homes. Estimated effects have the same signs for most variables as in the results for the resident cases model. The quality measure rating and staffing variables negatively affect the total number of resident COVID-19 deaths. The total number of deficiencies and inspection control deficiencies are significantly associated with a higher incidence of COVID-19 deaths among residents in nursing homes. Similar to the results for resident cases per bed, hospital-based facilities have a lower incidence of COVID-19 deaths. The coefficient of for-profit ownership changes signs between the full and reduced models. In the full model, for-profit ownership is associated with a lower incidence of COVID-19 deaths controlling for other factors, including staffing level variables. However, when we remove staffing and deficiency citation variables from the model, the coefficient of for-profit ownership becomes positive and significant. This finding further suggests that staffing and deficiency variables mediate the effect of ownership, and including them in the analysis takes away from the total effect of for-profit ownership. Among the area characteristics, county COVID-19 case rates are positively associated with resident COVID-19 deaths, whereas the effect of the SDI variable is negative.

Table 4-3: Negative binomial regression results for resident COVID-19 deaths in nursing homes

	Resident Total COVID-19 Deaths	
	(1)	(2)
Quality Measure Rating	-0.004 (0.008)	-0.031*** (0.008)
RN Hours/res. Day	-0.270*** (0.027)	
Total Staff Hours/res. Day	-0.118*** (0.013)	
Total number of deficiencies	0.004*** (-0.001)	
Infection Control Citations	0.032*** (0.005)	
For-profit	-0.115*** (0.023)	0.057*** (0.021)
Chain owned	-0.051*** (0.019)	-0.021 (0.019)
Occupancy	-0.001 (0.001)	0.001 (0.001)
Hospital based	-0.608*** (0.056)	-0.736*** (0.055)
County cases per 1000	0.001*** (0.0002)	0.001*** (0.0002)
SDI	-0.112*** (0.036)	-0.052 (0.036)
Constant	2.876*** (0.091)	2.189*** (0.075)

Table 4-3 (Continued)

Observations	13119	13511
Log Likelihood	-43890.58	-45448.08
Akaike Inf. Crit.	87805.16	90912.17

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

#### 4.6 Conclusion

Analysis results in this chapter contribute to the literature by providing a more complete picture of the COVID-19 outcomes in U.S. nursing homes. Most of the previous studies on the topic were conducted in 2020 and early 2021, which was before the surge in cases and deaths occurred following the spread of the variants of the virus in the Summer of 2021 (Chidambaram & Garfield, 2021) and in January 2022 (American Health Care Association and National Center for Assisted Living, 2022). Drawing on data collected until March 2022, the analyses present a more current picture of pandemic outcomes in nursing homes. Two primary outcome variables are analyzed, which are resident cases per 1000 beds and total resident deaths due to COVID-19. Analysis results, for the most part, are aligned with previous findings in related studies.

Regarding ownership status, model estimations showed that for-profit nursing homes had significantly higher resident COVID-19 cases per 1000 beds even when quality rating and staffing variables were included in the models. The estimated effect of for-profit ownership on resident case rates is even higher when staffing and deficiency variables are excluded from the analysis. Moreover, in the models for resident deaths, for-profit ownership had a negative coefficient when staffing was included, but the sign



changed to positive once staffing was excluded. These results support the assertion made by previous researchers that staffing and deficiencies play an intermediary role in the effect of ownership on COVID-19 outcomes (Bach-Mortensen et al., 2021; Gorges & Konetzka, 2020; Harrington, Ross, et al., 2020). Overall, the findings about for-profit ownership status support previous studies that showed for-profit nursing homes had higher rates of COVID-19 cases and deaths among residents (Bach-Mortensen et al., 2021; Chatterjee et al., 2020; Chen et al., 2020; He et al., 2020; M. A. Unruh et al., 2020). Moreover, chain affiliation was positively associated with resident case rates, controlling for ownership status. Considering that private equity nursing homes are mostly chain affiliated, the findings about for-profit ownership and chain affiliation together imply higher resident case rates in private equity-owned nursing homes, which is the case in previous research (Braun et al., 2020).

Nursing homes with higher average quality measure ratings were found to have significantly lower resident COVID-19 case rates and deaths, supporting similar findings in previous studies (He et al., 2020; Li, Temkin-Greener, et al., 2020). Moreover, staffing levels were significantly associated with lower resident case rates and fewer resident deaths. These findings support previous findings about the relationship between inadequate staffing and worse pandemic outcomes in nursing homes (Figueroa et al., 2020; Goldstein et al., 2020; Harrington, Ross, et al., 2020; Li, Temkin-Greener, et al., 2020; Rowan et al., 2020).

Regression estimations showed that inspection-control deficiencies are significantly associated with higher resident case rates and incidents of resident deaths. These findings parallel the previous studies that showed inspection-control deficiencies

predict worse COVID-19 outcomes in nursing homes (Harrington, Ross, et al., 2020).

The coefficient of the total number of deficiency citations was found to be insignificant in the resident case rate models but significant and positive in the model for resident deaths. Higher occupancy rates were found to have significant positive effects on resident cases per 1000 beds. Among other facility characteristics, chain ownership is significantly associated with higher case rates but fewer COVID-19 deaths. Hospital-based nursing homes were found to have significantly lower outcomes for both variables. This result about hospital-based facilities has not been mentioned in previous studies. It indicates that nursing homes in hospitals had better protection against the pandemic's adverse outcomes than other nursing homes. This finding also raises important questions as to whether preventive measures in nursing homes were inadequate compared to the measures taken in hospitals, and if so, was it because the situation seemed less important in nursing homes.

Estimation models presented here also included location-based variables in the analysis. Specifically, effects were estimated for the COVID-19 case rate per 1000 persons in the surrounding county, and the social deprivation index measure for the Zip-code where a nursing home is located. The COVID-19 case rates in the county surrounding a nursing home were positively associated with resident cases per 1000 beds and total resident COVID-19 deaths in nursing homes. These results support findings in previous studies about the relationship between community COVID-19 infection rates and case rates in nursing homes (Chatterjee et al., 2020; Gorges & Konetzka, 2020; Rowan et al., 2020; Sugg et al., 2021; E. M. White et al., 2020). Furthermore, the Zip-code level social deprivation index (SDI) measures were found to be significantly

positively related to resident COVID-19 cases per 1000 beds and negatively related to incidence rates of resident deaths due to COVID-19. This result implies that nursing homes in areas with higher socioeconomic needs had higher resident case rates but lower death rates compared to facilities in areas with lower needs. An implication is that residents of nursing homes in communities with lower socioeconomic status suffered more from the negative impacts of the pandemic as they got the coronavirus disease more often.

Moreover, the SDI scores correlate with the minority population percentages in the area. Therefore, this finding also indicates that nursing homes in communities with higher racial and ethnic minorities had higher case rates, which is also supported by previous analysis (Gebeloff et al., 2020; Mahajan & Larkins-Pettigrew, 2020). On the other hand, these nursing homes had lower incidence rates of COVID-19 deaths, implying that the COVID-19 death outcomes were relatively lower in nursing homes in areas of higher socioeconomic need compared to nursing homes elsewhere. This finding, though not significant when staffing and deficiencies are removed from the model, goes against the findings of disproportionately higher COVID-19 deaths in some regions with higher social vulnerability (Kim & Bostwick, 2020).

## **CHAPTER 5: QUALITY IN ASSISTED LIVING FACILITIES AND OWNERSHIP TYPES**

### **5.1 Introduction**

Assisted living facilities and personal care homes are alternative providers of long-term care as home and community-based services (HCBS). These facilities offer LTC services for older adults with less serious health complications than those in nursing homes. However, this difference does not mean assisted living residents are free from abuse and low-quality care. The loose regulations governing assisted living create an atmosphere where malpractice on the part of providers can cause serious harm to residents. Indeed, a recent investigation by the Atlanta Journal-Constitution (AJC) revealed that weak regulatory practices along with inadequate oversight combined with the gold-rush mentality of for-profit operators have resulted in hundreds of cases of neglect, abuse, and violation of resident rights to had gone uncited and unpunished in the assisted living sector in Georgia (Teegardin & Schrade, 2019). These circumstances in the assisted living sector in Georgia provide a significant context for analyzing the relationship between ownership and quality in the sector.

In this chapter, I analyze quality differences between for-profit and nonprofit assisted living facilities using data collected by AJC reporters from the State inspection records of 398 assisted living communities and personal living homes with 25 or more beds in Georgia conducted between 2015 and 2019 (AJC, 2021). Georgia Department of Community Health (DCH) defines assisted living communities as “personal care homes serving 25 or more residents that are licensed by the department to provide assisted living

care” (Ga. Comp. R. & Regs. R. 111-8-63-.03 (g)). Assisted living care includes specialized personal care, the administration of medications by a certified medication aide, the provision of assisted self-preservation such as evacuation services, and the provision of limited nursing services (Ga. Comp. R. & Regs. R. 111-8-63-.03 (f)). The descriptive statistics and results of the analysis were very similar for these two types of facilities in the data. Therefore, these two types of providers are analyzed together and referred to as assisted living facilities throughout the chapter. This chapter provides an unprecedented evaluation of ownership-induced quality differences in assisted living facilities in Georgia by using the inspection outcomes data reported by AJC. Another contribution of this chapter is the analysis of differences between the COVID-19 outcomes in for-profit and nonprofit assisted living facilities in Georgia by drawing on data released by the Georgia Department of Community Health. The impact of the COVID-19 pandemic in the long-term care sector was mainly studied in the context of nursing homes but not so much for assisted living facilities. Moreover, the analysis also examines the effects of the location-based socioeconomic need levels on assisted living care quality by including area social deprivation index (SDI) scores in all regression models. This adds a spatial dimension to the analysis of service quality in assisted living facilities, which has not been studied before.

### **5.1.1 History of home and community-based services (HCBS)**

The history of the home and community-based services, including assisted living facilities and personal care homes, is relatively new compared to nursing homes. HCBS have grown as a response to the rising consumer demand to receive senior care services in-home or community settings that offer home-like comfort instead of the institutional

environment of a nursing home. These comprise a range of senior care services replacing or preceding nursing home care, including home-based care, personal care, adult day care, respite care, and assisted living (Grabowski et al., 2010).

HCBS have expanded over the last three decades along with changes in Medicaid funding. First, section 1915(c) of the Social Security Act in 1981 established the HCBS waiver program, which allowed states to waive specific Medicaid requirements so that HCBS could offer long-term care services with Medicaid funding as cheaper alternatives to institutional nursing homes (Shirk, 2006). These waivers aim to reduce healthcare expenditures by shifting long-term care to HCBS as less expensive alternatives to nursing homes. The states are responsible for ensuring that Medicaid-funded HCBS meets the eligibility requirements for institutional care while providing cost-efficient services (Harrington, Ng, Kaye, & Newcomer, 2009). In the next phase, the Supreme Court's *Olmstead vs. L.C.* ruling in 1999 and subsequent lawsuits against states gave individuals the right to receive long-term care at home and in community settings, forcing states to expand HCBS availability further. Moreover, the Deficit Reduction Act of 2005 provided states with additional federal funding by allowing Medicaid recipients to access services in home and community-based settings without a specific Medicaid waiver requirement issued by the state (Grabowski et al., 2010).

Overall, these legislative and regulatory changes resulted in the rapid growth of HCBS programs, whose Medicaid long-term care spending share rose from 14.5% (\$4 billion) in 1992 to 31.6% (\$22 billion) in 2007 (Grabowski et al., 2010). HCBS has recently passed nursing home services to become the significant Medicare long-term service and support (LTSS) recipient. HCBS's share of total Medicaid LTSS spending

was 51.3% (\$74.9 billion) in 2013, which further increased to 56.6% (\$94.4 billion) in 2016 (Eiken et al., 2018). However, these HCBS figures include relatively smaller amounts of spending on home health and rehabilitative services and expenses for community-based senior care services. Specifically, the total federal and state Medicaid LTSS spending was around \$167 billion out of \$549 billion in total Medicare expenditures (30%). Regarding senior care in 2016, Medicaid LTSS expenditures included \$56.7 billion for nursing homes, \$48.3 billion to 1915(c) waivers for HCBS serving older adults and individuals with physical disabilities, \$13.9 billion for personal care, and \$4.8 billion for home health services (Eiken et al., 2018). Despite the growing share of HCBS in federal and state funding, quality issues arise as there are no national standards for HCBS and only minimal regulatory requirements (Harrington et al., 2009).

Among HCBS providers, assisted living plays a vital role in the long-term care continuum by serving residents who do not need intense care provided by nursing facilities (Zimmerman et al., 2003). Ideally, three core components of assisted living are a residential environment that offers residents a private space, provision of routine and specified health care services and an operating philosophy that emphasizes a resident's independent lifestyle and decisions (Brown Wilson, 2007). However, a 1992 national study of assisted living revealed that facilities approached assisted living in various ways that do not necessarily adhere to these ideals (Kane & Wilson, 1993). In fact, the definition and regulation of assisted living vary across states (Lewin-VHI, 1996).

After the initial experimentation and adoption period, assisted living companies started to go public during the late 1990s. Still, this growth period financed with Wall Street money attracted inexperienced and opportunist newcomers who brought quality

problems to the sector (Brown Wilson, 2007). For instance, among these newcomers were real estate developers who saw an opportunity in the residential building aspect but were not interested in service or health care aspects. This period resulted in a series of national news about cases of failures of assisted living (Brown Wilson, 2007). Indeed, a recent investigative journalism project by the Atlanta Journal-Constitution newspaper (2019) found that the involvement of for-profit companies in assisted living facilities resulted in quality problems and cases of neglect and abuse, just as what happened in the nursing home sector before the Omnibus Reconciliation Act brought strict regulations. The core of the problem was a lack of quality standards along with inadequate regulatory framework and oversight (Assisted Living Quality Coalition, 1998; Harrington et al., 2009; Mitchell & Kemp, 2000; Mollica, 2001). Therefore, a significant difference between nursing homes and assisted living is that nursing homes are subject to strict regulatory oversight, whereas assisted living sector lacks such consistency.

To summarize, assisted living facilities provide a more home-like, less institutional long-term care model. Assisted living residents have more freedom in routines and daily life compared to nursing home residents. Nonprofit organizations pioneered both institutional and HCBS long-term care services' initial service provision, followed by a period of market growth where new opportunities attracted for-profit investors. The inflow of inexperienced entrants with profit-enmeshed incentives caused service quality issues. In the case of nursing homes, legislative authorities attempted to address these debilitating conditions in the market through stricter regulations in government oversight and funding systems. The HCBS, specifically assisted living sector with its relatively short history, was never subject to similar regulatory provisions.



### **5.1.2 Regulations for home and community-based settings**

In comparison to nursing homes, HCBS are subject to lenient government regulations. HCBS providers are mainly regulated by states. State laws also need to follow federal regulations when allocating Medicaid waivers to HCBS. However, there is considerable variation within HCBS state regulations as each state determines its own definitions and regulations for HCBS (Brown Wilson, 2007; Hawes, Phillips et al., 2003; Stevenson and Grabowski, 2010; Zimmerman and Sloane, 2007). The evolution of HCBS, including assisted living and other residential care providers, have followed diverse paths in each region, which resulted in significant variability among assisted living facilities together with state regulations that govern them (Assisted Living Quality Coalition, 1998; Brown Wilson, 2007; Mollica, 2001; Zimmerman, Sloane, & Eckert, 2001). In parallel with the organizational differences, there is heterogeneity in services provided and residents served by assisted living facilities (Mitchell & Kemp, 2000). Even though Medicaid coverage waivers allowed increasing federal funding to flow towards community-based long-term care services, organizational variations in the sector make it difficult to devise federal-level regulations. Thus, each state is responsible for making its legislation and regulations about community-based services according to broadly defined federal guidelines (Hawes & Phillips, 2007). Consequently, the regulations for assisted living services have been less strict and less uniform than nursing home regulations (Grabowski & Stevenson, 2006; Trinkoff et al., 2020). Thus, the highly variable and minimal regulations in the assisted living sector render it more susceptible to quality gaps and issues due to profit motives by increasing the number of for-profit private providers in the sector (Castle & Beach, 2013).

## **5.2 Literature: Nonprofit vs. for-profit comparisons among assisted living communities**

Over the last three decades, home and community-based services, specifically assisted living, started to substitute for nursing homes as major providers of long-term care services (Bishop, 1999; Cornell, Zhang, & Thomas, 2020; Grabowski, 2008; Grabowski, Stevenson, & Cornell, 2012; Hawes, Phillips, & Rose, 2000; Hawes et al., 2003). This shift has led researchers to study the nature and quality of assisted living services in relation to their increasing role in long-term care markets (Bowblis, 2012; Lord, Davlyatov, Thomas, Hyer, & Weech-Maldonado, 2018; Silver, Grabowski, Gozalo, Dosa, & Thomas, 2018; Stevenson & Grabowski, 2010). Studying the quality of assisted living care is essential from a public policy perspective because of its implications on residents' health outcomes. For example, a survey of nurse aides in Pennsylvania revealed that resident abuse is not uncommon in assisted living facilities (Castle & Beach, 2013).

Research can help discover undesirable quality outcomes and the factors behind them so that preventive policy measures can be formulated in the same way they have for nursing homes. There are obstacles, however, to conducting research about the quality of care in assisted living facilities due to several factors such as the relatively recent history of the sector, lack of national standards, and scarcity of public data sets (Grabowski, 2008). Government regulations for assisted living facilities are set at the state level, and accompanying inspection data is not always directly available, which makes it hard to define standardized quality measures at a national level (Aud & Rantz, 2004; Hawes & Phillips, 2007; Zimmerman et al., 2003). Therefore, research on assisted living has

mostly drawn on surveys and interviews to define and measure the quality of care, and findings were mostly descriptive information about a few aspects of service quality (Hawes et al., 2003; Zimmerman et al., 2003).

Given that there is considerable heterogeneity in defining and regulating assisted living between states, researchers suggest approaching the study of assisted living facilities based on regulatory frameworks within each state (Zimmerman & Sloane, 2007). Indeed, most studies examining aspects of assisted living care have focused on only one state. In a prominent study, a group of researchers at Georgia State University approached the issue from the perspective of quality of life by interviewing residents from a small number of assisted living facilities in Georgia and found that residents prioritized their independence and autonomy, and associated quality of care commonly with staff attitude, individualized care, food quality, provision of meaningful activities, a safe environment, and having their private space in the facility (Ball et al., 2000). Mitchell and Kemp (2000) also studied the quality of life of assisted living residents based on the effect of residential, environmental, and facility characteristics in 55 assisted living facilities in California. Their results showed that nonprofit ownership status was positively correlated with higher satisfaction rates by assisted living residents. They also found nonprofit status was positively correlated with a cohesive environment and resident independence, both of which were significantly associated with life quality and facility satisfaction (Mitchell & Kemp, 2000).

The superior quality of nonprofit assisted living facilities was supported by researchers who examined quality from various aspects over the last decades. An earlier study conducted in Maryland about resident satisfaction with the quality of assisted living

concluded that nonprofit ownership status was positively associated with higher levels of satisfaction while controlling for resident characteristics (Sikorska, 1999). In a recent study, a group of scholars at the University of South Florida analyzed regulatory deficiency citations to assess quality in assisted living facilities in the State of Florida and discovered that more than 90 percent of all deficiencies cited had a potential risk of harming residents, and for-profit facilities were more likely to get cited for a higher number of deficiencies than nonprofit facilities (June, Meng, Dobbs, & Hyer, 2020).

An important aspect of quality in assisted living facilities is the adequacy of staffing resources to meet the physically and cognitively impaired residents' needs for assistance (Beeber et al., 2014; Hawes & Phillips, 2007; Hawes et al., 2003; Lewin-VHI, 1996; Stearns et al., 2007). For instance, a lack of full-time registered nursing staff in an assisted living facility is related to residents moving to a nursing home (Phillips et al., 2003). In this study, an investigation of a national sample of 278 assisted living facilities about the effects of facility characteristics on residents' departures revealed that residents leave an ALF mostly due to unmet care needs. For-profit ALF residents were significantly more likely to move to a setting other than a nursing home (typically another ALF), indicating higher dissatisfaction with for-profit facilities' quality (Phillips et al., 2003).

Researchers also compared the health conditions of residents in for-profit and nonprofit assisted living facilities. Zimmerman and colleagues (2003) compared service provision and residents in 193 assisted living facilities and 40 nursing homes in four states and discovered that residents in for-profit assisted living facilities had more severe health conditions and cognitive/behavior impairments than those in nonprofit facilities.

This finding, however, does not necessarily relate to the quality of care and might be due to less restrictive admission policies chosen by for-profit facilities (Zimmerman et al., 2003). Indeed, news reports argued that for-profit assisted living facilities were trying to take on residents they do not have the ability to care for to increase their revenue (Teegardin & Schrade, 2019, November 23). In another study, Burdick et al. (2005) assessed 198 residents in 22 facilities in Maryland to identify factors that predicted residents' functional impairment levels and declared no significant difference between nonprofit and for-profit facilities after controlling for residents' cognitive function and general health rating. Yet again, descriptive findings of this study showed for-profit facility residents were more likely to be cognitively impaired than nonprofit residents. However, their analysis only provides information about resident portfolios and does not allow discovering causal links with the quality of care provided (Burdick et al., 2005).

### **5.3 Research questions and hypotheses**

Regulations for assisted living facilities and other community-based services are more lenient compared to nursing home regulations, as reflected by less stringent staffing and staff training requirements, less frequent inspections, and lower levels of oversight. Overall, in the assisted living and other community-based services sectors, regulatory provisions are not that tight, there is no federal-level inspection, and in many cases, the state lacks the resources to inspect all facilities frequently. This regulatory environment makes the home and community-based long-term services sector more susceptible to quality problems brought by the increasing number of corporate investors (Castle & Beach, 2013; Trinkoff et al., 2020). Even though assisted living residents have lower acuity compared to nursing home residents, acute health conditions are also common

among assisted living residents. Indeed, recent data shows that among residential care community residents, 52% were over age 85, 41.9% had dementias, 42.4% had arthritis, 51.2% had hypertension, 34.3% had heart disease, 30.9% suffered from depression, and 18.1% had diabetes (Harris-Kojetin et al., 2019). Loose regulation could lead to serious problems especially owing to deteriorating health conditions of assisted living residents over the last years (Gimm & Kitsantas, 2016; Zimmerman, Sloane, & Reed, 2014). Furthermore, the minimal regulations leave more room for for-profit assisted living providers to slack high-quality service provision in favor of benefits to the organization, which is expected to result in significantly more quality problems.

Previous research has shown associations between for-profit ownership and lower quality in assisted living facilities through indirect measures such as higher severity of residents' health conditions (Zimmerman et al., 2003), lower resident satisfaction rates (Mitchell & Kemp, 2000), and higher resident move-out rates (Phillips et al., 2003) in for-profit facilities compared with residents in nonprofit facilities. Only one recent study examined assisted living quality directly by using the total number of deficiencies issued to facilities during a single relicensure inspection survey in Florida (June et al., 2020). The analysis here provides a more comprehensive examination of the quality differences between for-profit versus nonprofit assisted living facilities based on four different inspection deficiency measures along with the COVID-19 outcomes in facilities in Georgia. Moreover, influences of the area socioeconomic need levels are also examined, which adds a location-based dimension to the analysis of service quality.

Following the above discussion, I expect for-profit assisted living communities in Georgia to have lower quality ratings across all inspection quality measures than their nonprofit counterparts. More specifically, I offer the following hypothesis:

**Hypothesis 5:** For-profit assisted living facilities in Georgia are expected to offer worse service quality than nonprofits. As such, compared to their nonprofit counterparts, for-profit assisted living facilities:

H5(a): have a higher number of total inspection violations cited by the state government,

H5(b): have higher rates of higher severity inspection violations cited by the state government.

H5(c): have a higher number of resident complaint-based inspections,

H5(d): have higher rates of harm cited through the state government inspections,

In addition, assisted living facilities, lacking a strict regulatory environment, might have failed to prepare for and address the challenges of the COVID-19 pandemic. Moreover, such unpreparedness may be more severe for for-profit assisted living facilities due to their cost-cutting incentives. Under these circumstances, I expect the COVID-19 outcomes to be worse in for-profit assisted living facilities than in nonprofit facilities.

H5(e): For-profit assisted living facilities in Georgia have more resident COVID-19 cases reported to the state government than their nonprofit counterparts.

H5(f): For-profit assisted living facilities in Georgia have more resident COVID-19 deaths reported to the state government compared to their nonprofit counterparts.

#### **5.4 Methodology and data**

I assess the quality of assisted living facilities based on state and local government inspection records in Georgia. This information was collected through an investigative reporting project by the Atlanta Journal-Constitution called ‘Unprotected: Broken Promises in Georgia's Senior Care Industry’ (AJC, 2021). Reporters accumulated thousands of public records through a comprehensive examination of inspection reports by the Georgia Department of Public Health, police reports, and civil records from 2015 through 2018 (Teegardin et al., 2019). This data includes inspection records for all assisted living communities in Georgia and every personal care home with 25 or more beds in Georgia. These providers are examined together because assisted living communities in Georgia are defined as personal care homes that choose to serve 25 residents or more (DCH, 2013). The data is obtained from the AJC-Unprotected website<sup>2</sup>, which is publicly available for access. The original data included facility-level inspection record information, facility addresses, and facility bed numbers. The ownership type of each facility was manually added to this data through a web-search process using online publicly accessible sources. Since the quality measures used in the analysis are inspection records, they all reflect negative aspects. Therefore, an increase in any of these inspection-based measures indicates the lower quality of a facility.

Specific quality measures to be analyzed are the following:

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<sup>2</sup> <https://www.ajc.com/senior-care-quality-report/>



- Inspection violations: Total number of violations cited during inspections conducted by state regulatory agencies.
- Higher severity inspection violations: number of violations that are classified as highly severe during government inspections
- Complaint-based inspections: number of inspections resulting from complaints made by facility residents.
- Harm citations: Number of harm cases cited during local government inspections in which a resident suffered harm due to negligence or wrongdoing by the facility.

I analyze the effects of the facility- and area-level factors related to the COVID-19 outcomes in assisted living facilities in Georgia by drawing on data released by the Georgia Department of Community Health (DCH). Georgia DCH released the COVID-19 Long-term Care Facility Report every week until May 30, 2021, reporting resident cases, deaths, and staff cases in all nursing homes and assisted living facilities in Georgia. I used the COVID-19 data released by DCH on May 24, 2021, to examine relationships between for-profit ownership and COVID-19 outcomes while controlling for facility size and the Zip-code level SDI scores. The social deprivation index (SDI) score is an average measure of an area's socio-economic need level.

The primary research question is to examine whether there are quality differences between for-profit and nonprofit assisted living facilities. Multivariate regression models are used to answer this question because the data does not have a panel structure. All the dependent variables analyzed have count data, including quality indicators and COVID-19 outcomes. Therefore, the models are estimated using negative binomial regressions for accounting for over-dispersions in count data. Estimation models also include controls for

facility size measured with the number of beds, chain ownership status, and social deprivation index (SDI) score at the Zip-code level.

## **5.5 Results**

Descriptive statistics for all quality variables included in the estimation models are displayed separately for for-profit and nonprofit assisted living facilities, respectively, in Tables 5.1 and 5.2. There are 362 for-profit and 36 nonprofit facilities in the data, indicating that around 91 percent of the total 398 facilities were for-profit, and the remaining 9 percent were nonprofit facilities. This disparity between the for-profit and nonprofit facilities indicates a significant involvement of private businesses in the assisted living sector and is consistent with the previous reports (Harris-Kojetin et al., 2019). The summary statistics show that, on average, for-profit assisted living communities have more complaints and violations than nonprofit facilities. Specifically, as presented in the boxplot in Figure 5.1, for-profit facilities have a higher average of total inspection violations than nonprofits.

Similarly, average numbers of severe violations, harm citations, and repeat violations are higher for for-profits than nonprofits. The only measure that nonprofits score higher than for-profits is the social deprivation index (SDI) which means that more nonprofit facilities serve in areas with higher levels of socio-economic need. Figure 5.2 shows distributions of nonprofit and for-profit facilities across the range of SDI scores, which reveals a relatively denser accumulation of nonprofit facilities in areas of higher need. Including the SDI in the analysis allows us to analyze location-based differences in quality with respect to the level of need. Moreover, as seen in Figure 5.3, SDI scores positively correlate with the percentage of the black population living in the area. So,

including SDI in models is important to capture quality differences in areas with different racial compositions.

Table 5-1: Summary statistics of inspection records for for-profit facilities

Statistic	N	Mean	SD	Min	Pctl(25)	Pctl(75)	Max
Beds	362	75.434	31.421	25	50	96	194
Inspection count	362	8.406	4.818	1	5	11	27
Complaint count	362	4.696	4.115	0	2	7	20
Total Violations	362	12.547	13.401	0	3	17	78
Highly severe viol.	362	3.102	3.67	0	0	4	24
Medium severe viol.	362	4.215	5.131	0	1	6	33
Harm citations	362	1.29	1.658	0	0	2	9
Repeat violations	362	0.831	1.821	0	0	1	15
SDI	362	48.387	27.914	1	21	73	99

Table 5-2: Summary statistics of inspection records for nonprofit facilities

Statistic	N	Mean	SD	Min	Pctl(25)	Pctl(75)	Max
Beds	36	63.222	41.496	25	36	67.5	200
Inspection count	36	6.444	3.184	1	4	8	19
Complaint count	36	3.139	3.182	0	1	5	16
Total Violations	36	7	6.816	0	1	9.2	23
Highly severe viol.	36	1.361	1.915	0	0	1	6
Medium severe viol.	36	2.833	3.452	0	0	3.2	15
Harm citations	36	0.583	0.841	0	0	1	3
Repeat violations	36	0.167	0.507	0	0	0	2
SDI	36	58.667	27.889	7	34.8	79	99

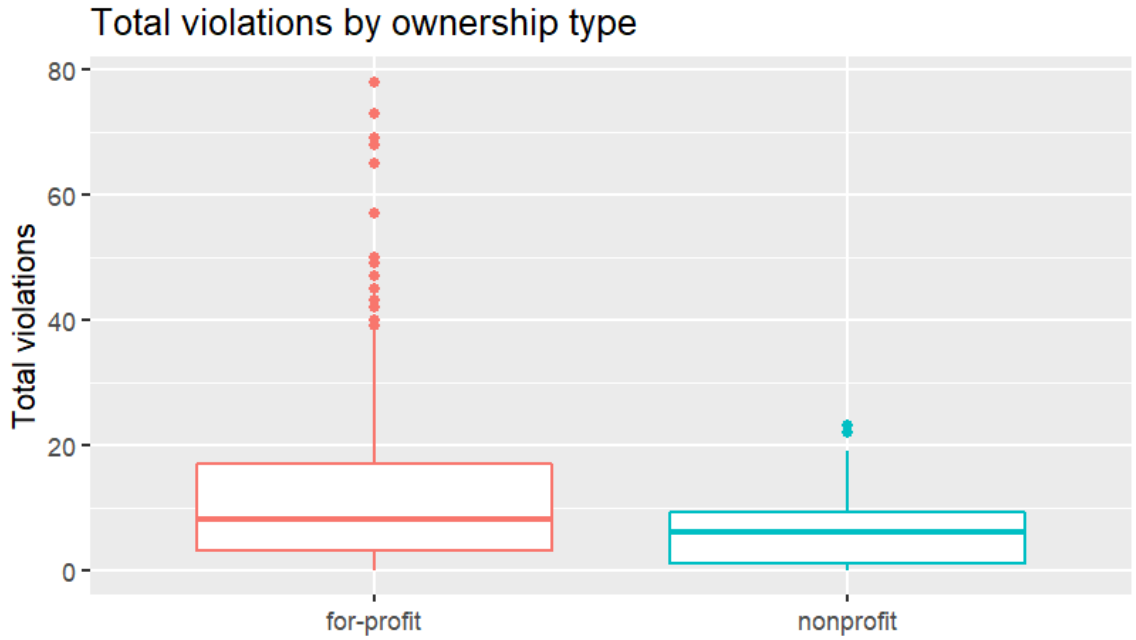


Figure 5.1: Total violations in assisted living communities by ownership

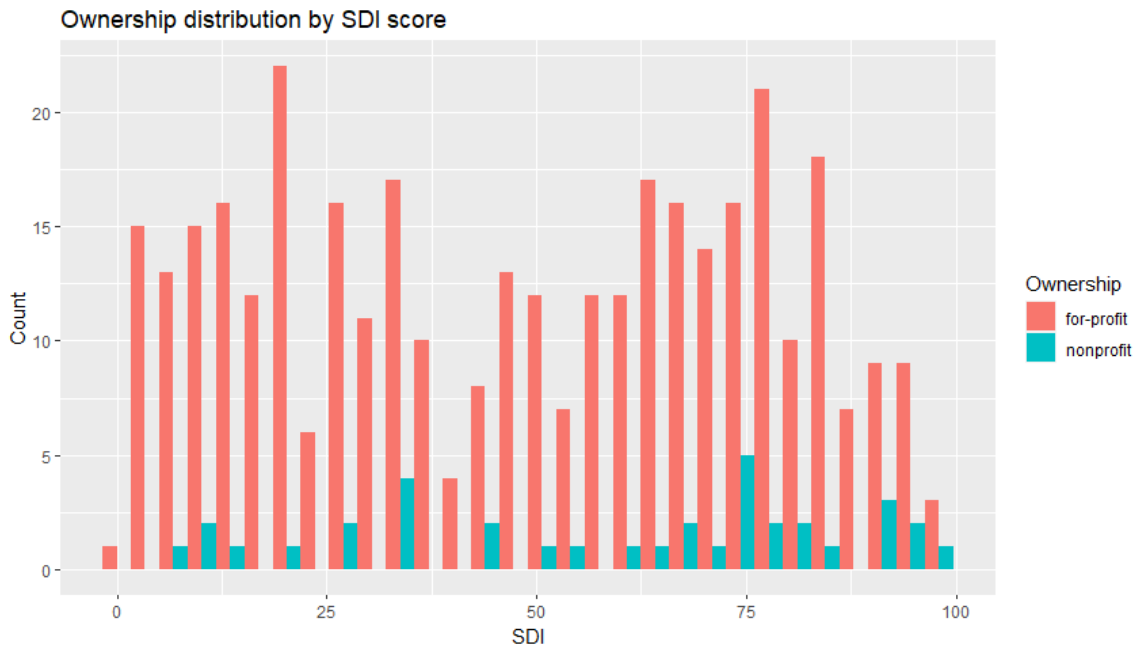


Figure 5.2: Distribution of facilities across the SDI range

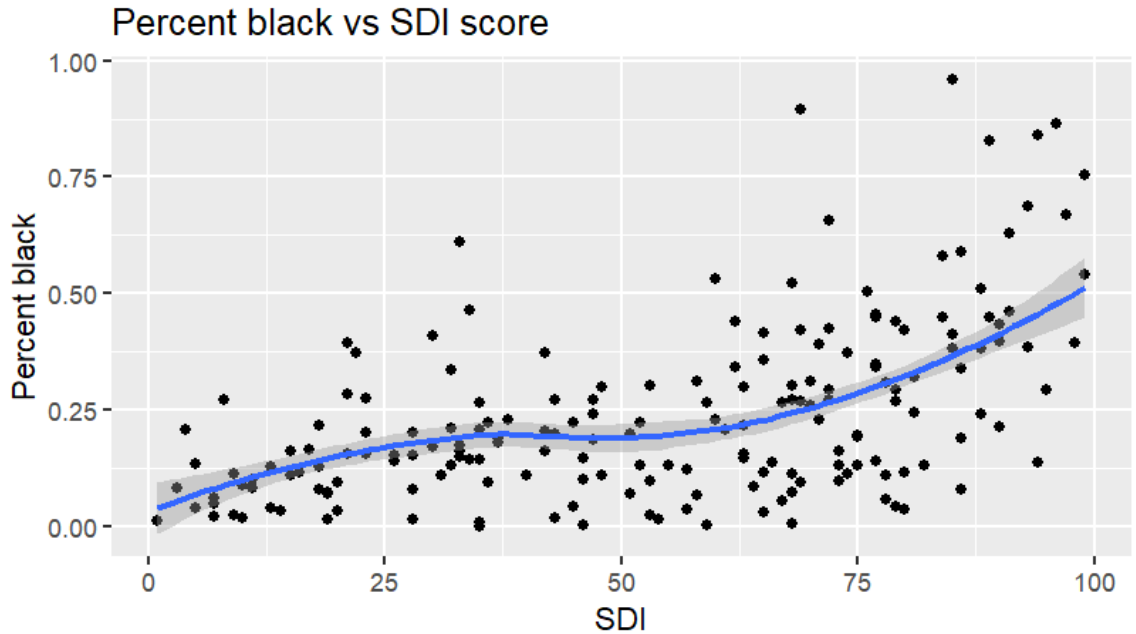


Figure 5.3: The relationship between SDI scores vs. percent black population in an area

The next two plots are presented to visually analyze the relationships between ownership, area SDI scores, and quality indicators. Figures 5.4 and 5.5 show total inspection violations and complaints plotted against SDI scores, respectively, and locally estimated smoothing curves are fitted for each ownership type. In both cases, negative quality indicators are roughly the same across SDI scores (area levels of need). We further observe that average violation and complaint indicators are higher for for-profit facilities than nonprofits across the range of SDI scores. Moreover, there is a visible difference in the average number of complaints between for-profit and nonprofit facilities in areas with higher SDI scores (as shown in Figure 5.5). However, this difference is probably caused by fewer numbers of organizations present in areas with higher need levels.

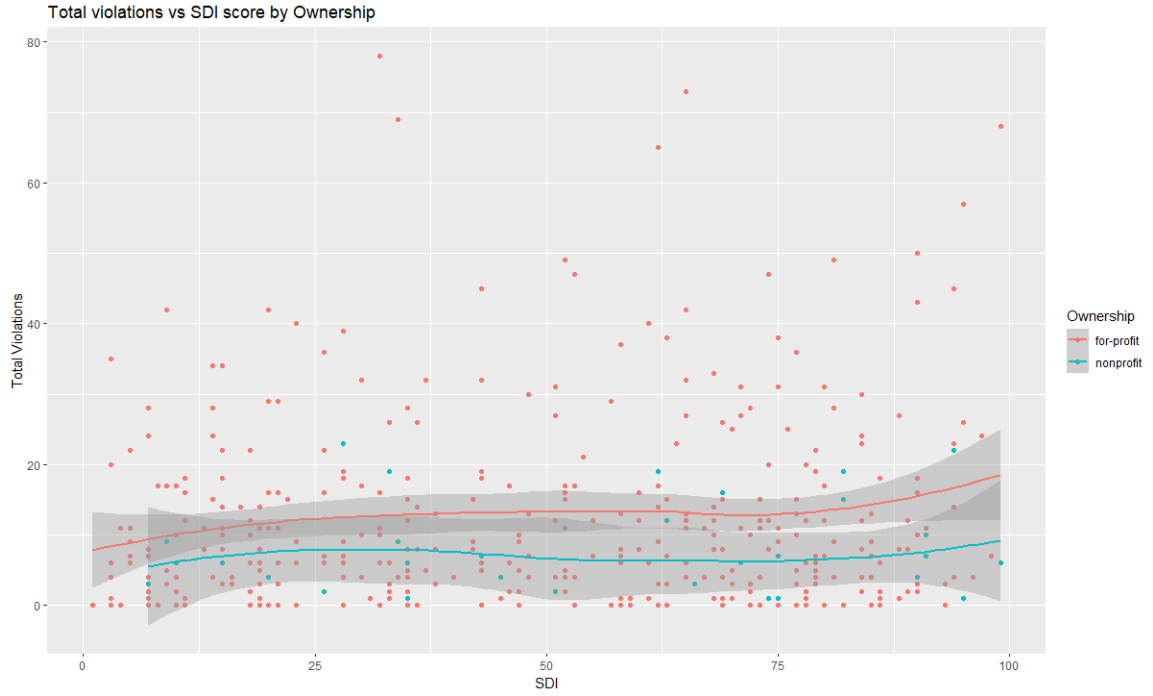


Figure 5.4: Total violations vs. SDI scores by ownership

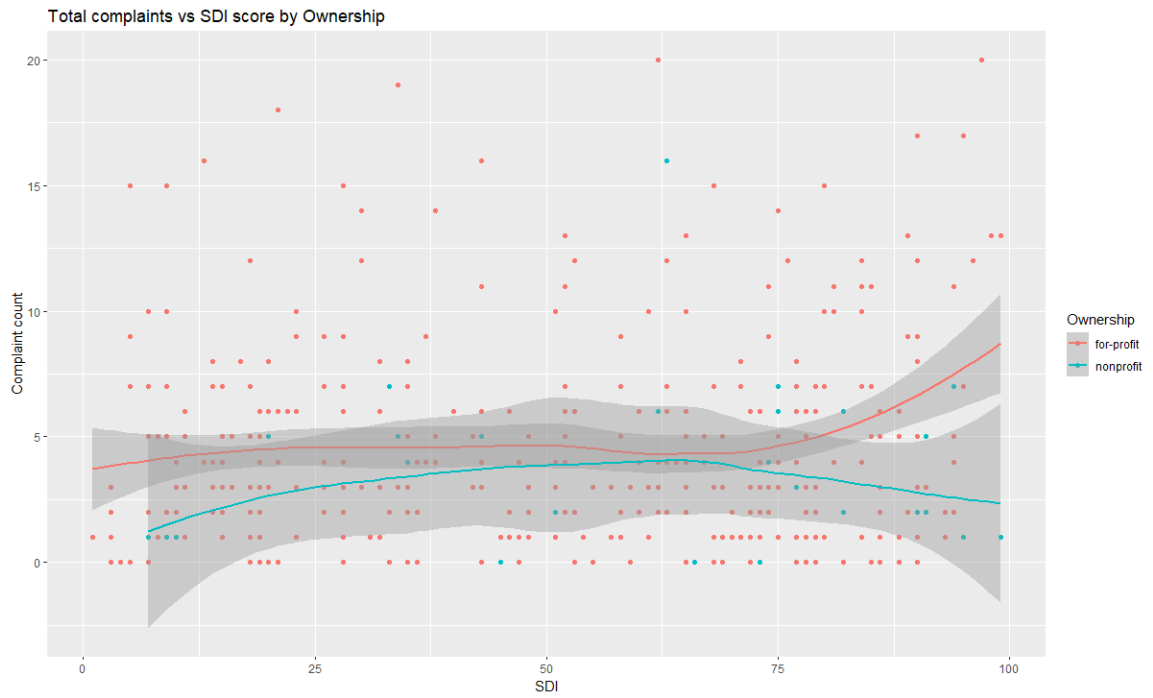


Figure 5.5: Total complaint inspections vs. SDI scores by ownership

In the next part, I formally analyze ownership and area SDI score effects on average quality measures using negative binomial regression models. Even though the percentage of nonprofits in our sample is smaller relative to for-profits, the total number of 36 nonprofit facilities is enough sample size to estimate the effects of the ownership variable. Regression models include controls for facility size, measured by the number of beds in facilities. Estimation results are presented for each quality measure with and without controlling for the chain ownership. This allows examining if a facility's chain ownership interferes with ownership's effect on quality inspection variables. Since inspection measures used as dependent variables in the models are all negative quality indicators, a negative coefficient indicates a positive effect on the average facility quality.

### **5.5.1 Estimation results for total violations**

The estimation results for total inspection violations are presented in Table 5-3. The primary coefficient of interest is the ownership variable, which shows the effect of nonprofit status. The coefficient is negative and significant, indicating that nonprofit-owned assisted living communities have lower rates of inspection violations on average compared to for-profit facilities. This finding confirms hypothesis 5(a). Specifically, the coefficient of  $-0.668$  means that, on average nonprofit facilities have  $0.51 (= e^{-0.668})$  times the incident rate of inspection violations compared to for-profit facilities, corresponding to a 49% decrease in the incident rate. Moreover, the coefficient remains negative irrespective of the inclusion of chain ownership in the model. Indeed, the effect of nonprofit status becomes even bigger when chain ownership is controlled for. The coefficient of chain ownership is negative but insignificant. Estimation results show that

the area social deprivation index does not have a significant effect on the total violation count holding ownership status and other variables included in the model constant.

Table 5-3: Negative binomial regression results for total violations

	Total Violations	
	(1)	(2)
Non-profit	-0.668*** (0.199)	-0.737*** (0.203)
Beds	-0.004** (0.002)	-0.003* (0.002)
SDI	0.003 (0.002)	0.002 (0.002)
Chain owned		-0.174 (0.126)
Constant	2.677*** (0.188)	2.786*** (0.205)
Observations	398	398
Log Likelihood	-1395.750	-1394.851
theta	0.885*** (0.068)	0.890*** (0.069)
Akaike Inf. Crit.	2799.501	2799.702

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

### 5.5.2 Estimation results for highly severe violations

Next, I analyze the number of highly severe violations cited during inspections as the dependent variable. A negative binomial regression model is used for estimation due to overdispersion in the count outcome. Table 5.4 presents estimated effects on highly severe violations. Most importantly, the effect of nonprofit ownership status is negative



and significant, as proposed in the H5(b). The nonprofit coefficient in the model with chain ownership implies that nonprofit facilities, on average, 0.4 ( $= e^{-0.924}$ ) times the incident rate of highly severe violations compared to for-profit facilities. In other words, incident rates of highly severe violations go down by 60% in a nonprofit assisted living facility compared to a for-profit facility. I also found that the area social deprivation score has a small positive effect on incident rates of highly severe violations. Still, this effect becomes insignificant when I also control for chain ownership. Chain-owned facilities seem to have a lower but insignificant incidence of highly severe violations.

Table 5-4: Negative binomial regression results for highly severe violations

	Highly Severe Violations	
	(1)	(2)
Non-profit	-0.869*** (0.243)	-0.924*** (0.248)
Beds	-0.00003 (0.002)	0.0003 (0.002)
SDI	0.004* (0.002)	0.004 (0.002)
Chain owned		-0.134 (0.143)
Constant	0.942*** (0.214)	1.029*** (0.233)
Observations	398	398
Log Likelihood	-880.429	-880.014
theta	0.830*** (0.087)	0.833*** (0.087)
Akaike Inf. Crit.	1768.859	1770.028

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

### 5.5.3 Estimation results for complaint count

Table 5-5 presents estimations for the total complaint inspection count variable. Nonprofit ownership status is again associated with a decrease in the incidence rate of this negative outcome. The incident rate of having complaint-based inspections in a nonprofit facility is, on average, about 70% of the rate in a for-profit facility. Coefficients on facility size and area SDI score are significant, but their effect sizes are negligibly small. The positive effect of the SDI score is consistent with the large difference in the average number of complaints between for-profit and nonprofit facilities in areas with higher SDI scores, shown in Figure 5.5. Moreover, chain ownership does not have a significant effect on complaint counts.

Table 5-5: Negative binomial regression results for complaint inspection counts

	Complaint Count	
	(1)	(2)
Non-profit	-0.386** (0.165)	-0.347** (0.168)
Beds	0.004*** (0.001)	0.004*** (0.001)
SDI	0.004** (0.002)	0.004** (0.002)
Chain owned		0.096 (0.102)
Constant	1.060*** (0.151)	0.993*** (0.166)
Observations	398	398
Log Likelihood	-1021.899	-1021.489
theta	1.779*** (0.188)	1.785*** (0.189)
Akaike Inf. Crit.	2051.798	2052.978

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

### 5.5.4 Estimation results for total harm citations and repeat violations

Table 5.6 shows estimation results for harm citations and repeat violations. Model outcomes for these variables are shown with chain ownership included. Their estimation results change only marginally when I exclude this variable. In both models, the negative effect of nonprofit ownership persists as significant. Accordingly, nonprofit facilities have, on average, 0.47 times harm citation incident rates and 0.14 times repeat violation incident rates of for-profit facilities. These numbers correspond to 53% lower harm citation rates and 86% lower repeat violation rates in nonprofit assisted living facilities than in for-profit facilities. These numbers imply significantly better quality provided at nonprofit facilities. Effects of other variables are either small or insignificant.

Table 5-6: Negative binomial regression results for harm citations and repeat violations

	Harm Citations (1)	Repeat Violations (2)
Non-profit	-0.760*** (0.288)	-1.982*** (0.567)
Beds	0.004* (0.002)	-0.009** (0.004)
SDI	0.004 (0.002)	0.002 (0.004)
Chain owned	0.033 (0.156)	-0.401 (0.260)
Constant	-0.218 (0.253)	0.613 (0.440)
Observations	398	398
Log Likelihood	-604.399	-431.665
theta	1.021*** (0.166)	0.268*** (0.041)
Akaike Inf. Crit.	1218.797	873.329

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

### 5.5.5 Estimation results for Covid-19 outcomes

Finally, Table 5-7 presents descriptive statistics and estimation results for COVID-19 outcomes in assisted living facilities in Georgia. There are fewer observations in these tables due to the missing COVID-19 data for some of the facilities. The descriptive statistics show that for-profit facilities, on average, have higher resident cases, resident cases per bed, and deaths due to COVID-19 compared to nonprofit facilities.

Table 5-7: Summary statistics of COVID-19 outcomes in for-profit and nonprofit assisted living facilities in Georgia

For-profit facilities:							
Statistic	N	Mean	SD	Min	Pctl(25)	Pctl(75)	Max
Beds	281	79.345	31.627	28	52	100	194
Resident COVID-19 cases	281	12.541	11.079	0	4	19	65
Resident COVID-19 cases per bed	281	0.169	0.143	0	0.052	0.25	0.7
Resident COVID-19 deaths	281	2.384	3.117	0	0	4	17
Total violations	281	11.431	12.241	0	3	16	78
Nonprofit facilities:							
Statistic	N	Mean	SD	Min	Pctl(25)	Pctl(75)	Max
Beds	31	73.419	46.615	25	43	86	200
Resident COVID-19 cases	31	8.226	10.301	0	1	12	46
Resident COVID-19 cases per bed	31	0.117	0.129	0	0.011	0.214	0.5
Resident COVID-19 deaths	31	1.677	2.856	0	0	1.5	11
Total violations	31	5.613	5.155	0	1	7	19

Table 5-8 presents the estimated effects of nonprofit ownership and other model covariates on resident COVID-19 cases and deaths in assisted living communities. Negative binomial estimations show nonprofit facilities have lower incidence rates of resident cases and deaths than for-profit facilities, holding constant facility size, area SDI scores, and chain ownership. However, the coefficient of nonprofit is significant only for effect on resident cases. Therefore, findings confirm hypothesis 5(e), but not 5(f). The pandemic outcomes in facilities do not significantly depend on the area's socioeconomic need levels.

Table 5-8: Negative binomial regressions for COVID-19 outcomes in assisted living facilities

	Resident COVID-19 Cases	Resident COVID-19 Deaths
	(1)	(2)
Non-profit	-0.468** (0.209)	-0.420 (0.295)
Beds	0.008*** (0.002)	0.006** (0.002)
SDI	0.003 (0.002)	0.002 (0.003)
Chain owned	-0.022 (0.141)	-0.075 (0.194)
Constant	1.746*** (0.219)	0.331 (0.302)
Observations	312	312
Log Likelihood	-1092.891	-622.723
theta	1.023*** (0.093)	0.629*** (0.078)
Akaike Inf. Crit.	2195.783	1255.445

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

## 5.6 Conclusion

In this chapter, the quality of assisted living facilities is analyzed with respect to ownership status by focusing on 398 facilities in Georgia. State inspection records are used to assess the quality of facilities with five inspection-based measures: total violations, highly severe violations, complaint counts, harm citations, and repeat violations. Estimation results reveal nonprofit ownership type is negatively associated with negative quality indicators, confirming all proposed hypotheses 5(a)-(e). Specifically, nonprofit facilities are found to have significantly lower incident rates of total violations, highly severe violations, complaint inspections, harm citations, and repeated violations compared to for-profit facilities. In addition, models explored how outcomes of the COVID-19 pandemic differ between for-profit and nonprofit facilities. Results show nonprofit ownership is significantly related to lower incidence rates of resident COVID-19 cases. Nonprofit facilities also have lower incidence rates of resident deaths due to the coronavirus, but this effect is not statistically significant. Estimated models also explored the effects of location-based social deprivation index measures on the quality of facilities. Area SDI levels have mostly insignificant effects on the inspection violation rates and pandemic outcomes in facilities. The effect of SDI is only significant in the case of complaint inspection counts, implying facilities in areas with higher socioeconomic need levels had a higher number of complaint inspections. Still, the size of the difference is minimal. Moreover, the effect of chain ownership status was found to be insignificant in each of the quality analysis models. Even though these effects are insignificant, their inclusion in regression models is important to show that quality outcomes differ by ownership type significantly after controlling for these factors.

Overall, nonprofit assisted living communities have better quality than their for-profit counterparts, where quality is measured by inspection citations. These findings are consistent with a study conducted in Florida that discovered higher numbers of deficiency citations in for-profit assisted living facilities than in nonprofits (June et al., 2020). Moreover, results about the difference in the adverse COVID-19 outcomes between for-profit and nonprofit facilities offer timely insights into the impact of the pandemic in the assisted living sector. Findings support previous research that shows positive associations between nonprofit ownership and quality in assisted living facilities (Mitchell & Kemp, 2000; Sikorska, 1999).

A limitation of the analysis is its cross-sectional setting, which does not allow for discovering direct causal links between the ownership type and quality outcomes. For example, higher incidence rates of inspection violations might be due to untrained staff or lack of staff in for-profit facilities. It might also be caused by a lower health condition threshold in admission policies of for-profit facilities (Zimmerman et al., 2003). Unfortunately, I could not test these scenarios given the lack of facility-level staffing and resident data. Nevertheless, the situation indicates possible incentive problems associated with for-profit assisted living care providers, like the perverse incentives of for-profit nursing homes. This finding is much concerning given the loose regulatory environment of the assisted living sector. Another caveat of the analyses provided here is that quality was measured only with negative indicators because of the nature of the data available. Future research might explore quality differences between assisted living facilities using positive quality aspects and test effects of staffing and other facility-level factors as more comprehensive data sources become available.

## CHAPTER 6: CONCLUSIONS

This dissertation examines the relationship between the quality of long-term care services and ownership types of providers concerning influences of ownership conversions, recent regulatory reforms, and the COVID-19 pandemic. The analyses were conducted separately on nursing homes at the national level and assisted living facilities in Georgia to bring unique contributions to the long-term care literature. Below I briefly summarize the findings of each chapter and discuss their strengths and limitations. This section is followed by a general discussion of findings and policy recommendations based on the results of the study.

### **6.1 Summary of findings, strengths, and limitations**

Chapter 2 analyzes the relationship between ownership and quality in nursing homes at the national level. Results provided in this chapter contribute to the research about the ownership-quality relationship in nursing homes by applying a rigorous methodology to the most recent data. Previous studies examined the effects of ownership on quality by mostly using cross-sectional regression models, which suffer from endogeneity problems such as selection bias. The strength of the analysis provided in this chapter is the quasi-experimental methods used, which provide strong identification of the effects of the for-profit ownership conversion on nursing home quality. Specifically, event study models with bias-corrected dynamic DID estimations are used to estimate the dynamic effects of the for-profit ownership conversion on a series of quality indicators. Moreover, the chapter analyzes the adverse effects of asymmetric ownership by



comparing results for government-inspected quality indicators with the results for self-reported ones.

Estimation results show inspection deficiencies significantly increase, and case-mix adjusted total and registered nurse staffing hours per resident day significantly decrease after the for-profit ownership conversion of a nursing home. Moreover, the for-profit ownership conversion is significantly associated with lower overall quality measure ratings and overall health inspection ratings. Estimation results for overall Five-Star ratings and overall staffing ratings, however, are inconclusive. The inconsistency between findings for the overall staffing ratings and stand-alone staffing hours measures indicates that the star-based quality summary system is not enough to capture the information provided by individual quality measures. As for the Medicare claim-based measures, for-profit converted nursing homes had slightly higher short-stay resident rehospitalization rates and similar short-stay emergency department visit rates compared to unconverted nursing homes.

Results for the self-reported MDS-based quality indicators are less clear because alternative estimation methods show different results. Nevertheless, among findings for the self-reported measures, estimated effects show negative outcomes were mostly higher in the nursing homes bought by for-profit companies over a short-term period after the ownership conversion. For instance, the need for ADL help increased, mobility rates worsened, and pressure ulcer rates increased among long-stay residents in converted nursing homes in the year of the conversion or the following year. Only one self-reported quality measure is found to favor the for-profit converted nursing homes, as estimations show a significant decrease in urinary tract infection rates among long-stay residents in

converted facilities after the for-profit conversion. Overall, findings indicate that government-inspected quality measures clearly worsened following the for-profit conversion, but changes in self-reported quality measures were less clear. Considering that most of the self-reported quality measures depend on staffing levels and that staffing levels decrease after the for-profit conversion, these findings put the reliability of self-reported quality indicators in question, as implied by the asymmetric information theory.

Chapter 3 contributes to the literature by providing the first investigation of the influences of the recent regulatory reforms on nursing home quality trends by ownership type. The analysis draws on the same panel data of U.S. nursing homes used in Chapter 2, which covers four years before and five years after the 2016 regulatory changes. Nonprofit nursing homes had the best quality measures in terms of 5-Star ratings, overall quality measure (QM) ratings, total staffing hours per resident day, deficiency scores, and the number of deficiencies. In contrast, for-profit facilities had the worst measures except for the QM ratings. Trend analysis plots exhibit decreasing nursing home quality over the last nine years. Time trends also show short-term increases in 5-Star and QM ratings after the regulatory changes implemented in 2016.

Moreover, interrupted time-series regression models are used to conduct pre-post analysis to statistically test how quality outcomes changed after 2016. Results reveal that following 2016 there were immediate increases in the average 5-Star ratings and overall QM ratings and decreases in average deficiency scores and the number of deficiencies in all types of nursing homes. However, these immediate effects were small and short-lived. Most quality indicators continued to decline following the regulatory reforms. Moreover, there was no significant change in total staffing hours per resident day, and staffing hours

continued to decline at even higher rates after the 2016 regulations were implemented. Estimations show that quality differences between for-profit and other ownership-type nursing homes diverged after 2016, indicating that the recent regulations did not work towards closing quality gaps between for-profit and nonprofit facilities. The strength of this chapter is that the analysis provided here is the first to examine the effects of the 2016 regulatory reforms on the quality of services in nursing homes, however, with limitations. First, because of the effects of the COVID-19 pandemic in 2020 and 2021, the analysis could capture only the short-term effects of the reforms. Another important limitation is that the time-series analyses lack a control group because regulatory changes were to be implemented in all nursing homes. Therefore, estimated effects only show if there is a significant change in quality measures after 2016, but they do not allow for establishing a causal relationship between changes in quality and the recent regulatory changes. Nevertheless, findings of no effect still hold because it is implausible that some external factor canceled any existing effects of the regulatory reforms.

In chapter 4, negative binomial regression models are used to estimate the effects of ownership types and location-based socioeconomic need levels on resident COVID-19 case rates and the number of resident COVID-19 deaths in U.S. nursing homes while controlling for other factors. The strength of the analysis in this chapter is the usage of the recent COVID-19 data available. Therefore, findings make a timely contribution by providing an up-to-date picture of the negative impact of the COVID-19 pandemic in nursing homes. The analysis used national data on COVID-19 outcomes in U.S. nursing homes from the beginning of the pandemic through to March 2022, which covers all major COVID-19 waves. Most importantly, I found that for-profit nursing homes have

higher COVID-19 case rates and deaths among residents compared to nonprofit and government-owned facilities when staffing hours are excluded from the estimation models.

Along with the negative effect of staffing hours variables on the COVID-19 outcomes, this finding suggests that lower staffing levels in for-profit facilities play an intermediary role in the negative relation between for-profit status and outcomes of the pandemic. In addition, estimation results regarding the effects of area social deprivation levels show that nursing homes in Zip-code areas with higher socioeconomic needs had higher resident COVID-19 case rates but slightly lower death rates than facilities in areas with lower needs. Results for other factors are mostly parallel to previous study findings that nursing home overall quality and staffing hours per resident day measures are negatively associated with higher resident case rates and deaths. In comparison, inspection control deficiencies and community case rates are positively associated with worse COVID-19 outcomes. Moreover, a unique finding of the analysis provided in this chapter is that hospital-based nursing homes had lower resident case rates and fewer resident COVID-19 deaths than other nursing homes. This finding brings forward important questions such as whether precautions and preventive measures against the pandemic in nursing homes were short of those in hospitals.

Finally, chapter 5 explores how deficiency inspection counts and pandemic outcomes in assisted living facilities in Georgia differ with respect to ownership and area socioeconomic need level. The literature on assisted living services is fragmented and mostly based on small sample survey studies. Only a few studies have examined the relationship between ownership and quality in assisted living communities, and none did

so for COVID-19 outcomes. This chapter contributes to the knowledge of ownership vs. quality relationships in the assisted living sector by drawing on a unique dataset for 398 facilities in Georgia. This chapter also contributes to the LTC literature by analyzing COVID-19 outcomes in HCBS facilities. Negative binomial regression estimations show that nonprofit ownership status is significantly associated with lower incidence rates of inspection violations, complaints, harm citations, repeat violation citations, and resident COVID-19 case rates. In contrast, effect estimates of area socioeconomic need levels are insignificant.

These findings support previous studies that found that better quality is associated with nonprofit ownership among assisted living facilities (June et al., 2020; Mitchell & Kemp, 2000). However, one limitation is that the cross-sectional nature of the analysis does not allow to conclude causal relationships between ownership and outcomes examined in this chapter. For instance, higher inspection violation rates might be caused by for-profit facilities' profit-driven decision to admit residents with severe conditions that exceed the care capacity of the facility (Teegardin & Schrade, 2019, November 23). The lower quality could also be related to insufficient staffing in for-profit assisted living facilities. Independent of the intermediary factors, the discovered gaps between the for-profit and nonprofit facilities are still concerning for residents' well-being, given the lax regulations of the assisted living sector.

## **6.2 Discussion and policy implications**

The quality of long-term care services has been at the forefront of the news with the drastic effects of the COVID-19 pandemic and reports of scandals involving resident abuse cases. Previous research and recent news investigation reports often discussed

service quality in relation to quality problems associated with for-profit corporate actors' involvement in the sector. This dissertation contributes to public knowledge by supporting the case that for-profit ownership is associated with diminished service quality in the long-term care sector, not only among nursing homes but among assisted living facilities too. As such, policymakers are recommended to take both supply-sided and demand-sided remedies to address profit-motivated practices, which can be detrimental to the quality of services in the long-term care sector. The supply-sided recommendations include regulations for minimum staffing standards, better pay for nursing staff, improved funding for staffing retention, training, and innovation at facilities, and legal restrictions that can be imposed on ownership change deals and corporate structures in the LTC market. On the other hand, the demand-sided policy actions might include pay-for-performance funding mechanisms such as SNF value-based purchasing programs. These recommendations are discussed below.

The findings of chapter 2 regarding ownership conversions of nursing homes are solid given that robust research methodology is applied to the most recent panel data. The analysis results show that for-profit ownership conversions of nursing homes were followed by decreasing quality, such as decreasing staffing indicators, increasing inspection deficiencies, and lower overall quality ratings. In chapter 3, findings about the recent regulatory changes in the nursing home sector show that their effects on quality measures were small and short-lived. There were some immediate positive shocks to some quality indicators, but they were negligible, and overall quality continued to decline. Moreover, the regulatory changes did not narrow the quality gaps between for-profit and nonprofit nursing homes. Notably, the recently implemented regulatory

reforms did not include minimum staffing standards. Analysis results show that staffing levels in nursing homes did not change significantly after the implementation of the 2016 reforms. These findings suggest that the guidelines and suggestive planning offered by the new requirements were not enough to improve the quality of long-term care services. One implication is that regulatory provisions might not be adequate unless they bring minimum staffing standards and introduce stronger incentives to improve quality, such as more severe penalties for adverse outcomes.

Chapter 5 shows for-profit assisted living facilities had higher rates of inspection violations, complaint inspections, citations for severe violations, resident harm, and resident COVID-19 cases than nonprofit assisted living facilities. Given that assisted living sector is loosely regulated, it is more prone to leave residents unprotected against potential harm and abuse caused by misaligned incentives of profit-motivated providers. Indeed, the findings support the claim that for-profit providers cut corners to make higher profits, adversely affecting service quality. Recently, following the investigative reporting by the Atlanta Journal-Constitution that put abuse cases in Georgia's assisted living sector under the spotlight, the state of Georgia has legislated new, improved regulations for assisted living facilities in the state. The proposed regulations include increased penalties for inspection violations but no minimum staff standards for assisted living facilities. Given the ineffectiveness of the recent regulatory reforms in the nursing home sector, it is questionable to expect these new regulations in Georgia's assisted living sector to be effective.

Especially the drastic outcomes of the pandemic in long-term care facilities have shown a dire need for change. Public awareness after the pandemic provides a significant

opportunity for policymakers to correct misaligned incentives in the sector. The findings about the outcomes of the COVID-19 pandemic in chapter 4 show that lower staffing levels in for-profit nursing homes played a role in having worse outcomes in these facilities, in parallel with findings of previous studies (Harrington et al., 2021; Harrington, Ross, et al., 2020). Overall, the findings support the previous research that for-profit owned nursing homes suffer from insufficient nursing staffing levels, which lead to problems with the quality of care (Comondore et al., 2009; Grabowski, 2001; Grabowski et al., 2013; Grabowski & Hirth, 2003; Harrington et al., 2021; Harrington & Swan, 2003; Harrington et al., 2001; Lu & Lu, 2021; O'Neill et al., 2003).

Altogether these results highlight the importance of staffing levels in providing a high quality of care in nursing homes, which has been discussed and emphasized over the last four decades (Harrington, Dellefield, Halifax, Fleming, & Bakerjian, 2020; Hawes & Phillips, 1986). One effective policy solution to this issue is the requirements of minimum staffing standards. Indeed, the previously implemented minimum staff standards in the NHRA of 1987 have increased staffing levels in nursing homes (Zhang & Grabowski, 2004). However, there is an important caveat to implementing minimum staff requirements in nursing homes: the insufficient supply of nursing staff nationwide. For a long time, low pay and stressful work conditions discouraged nursing staff from remaining in the sector. Especially the COVID-19 pandemic has made it very difficult for nursing staff to care for long-term care residents under stressed conditions. The pandemic stress and the great resignation that followed led to the further exit of nursing staff from the sector. Therefore, along with minimum staff requirements, Medicare and Medicaid funding mechanisms should be made more coordinated and targeted toward sustaining



quality staffing and innovation at facilities. For instance, funding can be invested towards attracting a new workforce to nursing roles and training for existing staff. A crucial point emphasized about retaining and hiring nursing staff is sustainable wages and benefits for nursing workers (ATI Advisory, 2022; Harrington et al., 2021). Therefore, more funding should be dedicated to improving wages and benefits of nursing staff, and necessary regulations should be made to ensure that money is spent on hiring and training staff rather than diverted towards other budget items that indirectly benefit owners through outsourced services. This goal can be achieved by designated funding accounts restricted to staff improvement only. The designated funding amount for each facility can be coordinated using the pay-for-performance system discussed below.

Other supply-side policy tools include legislative regulations about ownership structures of providers and ownership change deals in the long-term care sector. To this end, legal restrictions can be imposed on ownership changes and investments in the LTC market, which are solely based on profit-motivated deals. An example is the guidelines issued by the New York State Attorney General's Charities Bureau to govern sales of nonprofit nursing homes to for-profit entities, which recommend nonprofit boards evaluate the ability and willingness of prospective buyers to continue operation for current residents and evaluate the quality of care in other facilities operated by the purchaser (CharitiesNYS, 2018). New regulations can offer effective solutions by going beyond such recommendations and requiring potential new ownership change deals to ensure that staffing levels and average quality indicators after the deals remain at least as high as the levels before. High monetary penalties can be imposed on the new facility owners who fail to keep staffing and quality levels in place.

Private equity ownership is a significant element behind the for-profit ownership activity in the long-term care sector in the last decades. Although this study does not investigate the involvement of private equity investors in the long-term care sector, the current findings about the relationship between for-profit ownership and diminishing quality resonate with research studies and news investigations that point to quality problems emerging concerning private equity investment activity in long-term care. Recent studies that investigate the effects of private equity investments on quality outcomes in the nursing home sector found that private equity ownership is associated with worse quality (Bos & Harrington, 2017; Braun et al., 2021; Braun et al., 2020; Gandhi et al., 2020; Gupta et al., 2021; Huang & Bowblis, 2019). Moreover, recent investigations about scandals in nursing homes and assisted living facilities show that perverse incentives by for-profit corporate actors are still a problem that should be addressed (Goldstein et al., 2020; Teegardin & Schrade, 2019, November 23). A critical factor behind these misaligned incentives is the real estate aspect of the LTC sector, which attracts for-profit actors who neither have the experience nor genuine interest in providing LTC services. The current structure of Medicaid and Medicare funding mechanisms is partially to blame for this inflow of capital towards new buildings rather than innovation in existing facilities (ATI Advisory, 2022). Therefore, structural and legal changes in the funding and governance of the long-term sector are necessary to prevent misaligned incentives detrimental to the quality of care.

Some structural and legal changes might include extra scrutiny on private equity deals in the LTC sector to eliminate opportunities for short-term profit making. For instance, legal restrictions could be imposed on deals solely based on real estate of

facilities, or quality improvement conditions can be imposed on ownership change deals. Moreover, regulations can be imposed on the practice of contracting out facility services to third-party providers owned by the same company or people who also own the facility. Researchers have pointed out accountability problems caused by multi-layered complex corporate structures that are detrimental to service quality in nursing homes (Harrington, Ross, & Kang, 2015). In alignment with this, I agree with Kerlin, Ye, and Chen (2022) to impose restrictions and more scrutiny on the complex corporate structures in the long-term care sector. At the very least, complex ownership structures in the sector should be made transparent to identify and regulate the third-party deals between related companies owned by the same corporate group. CMS's recent release of detailed nursing home ownership data is a positive step towards this end (CMS, 2022).

On the other hand, the demand-sided policy actions might include funding mechanisms ensuring pay for performance, such as the recently implemented SNF value-based purchasing programs (CMS, 2021b). These programs offer financial incentives to facilities that provide better service quality. However, for value-based funding mechanisms to be effective, performance measurements should be accurate, which requires an overview and revision of the current quality measurement system used by CMS. The Center for Medicare and Medicaid Services (CMS) should reconsider the benefits and limitations of the five-star based quality measurement system before making funding decisions based on the quality indicators. As shown in chapter 2, the five-star based staffing ratings do not capture the essential information provided by individual staffing indicators based on nurse hours per resident per day.

Moreover, results also show that self-reported quality measures' reliability is questionable. Given these results and reports about manipulation of the five-star ratings by some nursing homes, the star-based quality rating system could be distorting information in a way that some facilities can easily manipulate. CMS should review the star-based system to improve it towards providing better information for consumers. To that end, summary ratings should be improved by emphasizing government-inspected measures more, and their calculation methods should be reviewed to ensure that information is not lost in the process of calculating the five-star ratings. In addition, annual inspections should be more stringent to verify the accuracy of self-reported measures submitted by nursing homes.

This study brings more awareness to the topic and helps policymakers reexamine the effectiveness of regulatory restrictions in improving service quality and combatting harmful practices. As a final and important word, policymakers and researchers should also pay more attention to alternative positive and resident-centered approaches to evaluating quality in the long-term care sector, such as the quality-of-life perspective. To this end, new service quality measures should be developed and made available to the public and researchers through disseminating data. The future of long-term care can be brighter, and it is essential to make it happen not only for those who reside in the long-term care facilities now but also for future residents, who will likely include you and me one day.

## REFERENCES

- 20 H.B. 987/AP. House Bill 987, Georgia Gen. Assemb., 2019-2020 Reg. Sess., (Ga. 2020).
- Aaronson, W. E., Zinn, J. S., & Rosko, M. D. (1994). Do for-profit and not-for-profit nursing homes behave differently? *The Gerontologist*, 34(6), 775-786.
- Abrams, H. R., Loomer, L., Gandhi, A., & Grabowski, D. C. (2020). Characteristics of U.S. Nursing Homes with COVID-19 Cases. *Journal of the American Geriatrics Society*, 68(8), 1653-1656. doi:10.1111/jgs.16661
- Allen, P. D. (2001). *An exploration of complaints forwarded to the Connecticut Long Term Care Ombudsman Program: What are the correlates of nursing home complaints reported?* (Ph.D.). Fordham University, Ann Arbor. ProQuest Central; ProQuest Dissertations & Theses A&I database. (3006409)
- Allison, G. T. (1980). *Public and private management: are they fundamentally alike in all unimportant respects?* : John F. Kennedy School of Government, Harvard University Cambridge, MA.
- American Health Care Association and National Center for Assisted Living. (2022). *Nursing Homes See Spike in New COVID Cases Due to Omicron Community Spread*. Retrieved from <https://www.ahcancal.org/News-and-Communications/Fact-Sheets/FactSheets/Report-Nursing-Homes-Cases-Jan122022.pdf>:
- Amirkhanyan, A. A., Meier, K. J., O'Toole, L. J., Jr., Dakhwe, M. A., & Janzen, S. (2017). Management and Performance in US Nursing Homes. *Journal of Public Administration Research and Theory*, 28(1), 33-49. doi:10.1093/jopart/mux003
- Anderson, R. A., Issel, L. M., & McDaniel Jr, R. R. (2003). Nursing homes as complex adaptive systems: relationship between management practice and resident outcomes. *Nursing research*, 52(1), 12.
- Arrow, K. J. (1963). Uncertainty and the Welfare Economics of Medical Care. *The American Economic Review*, 53(5), 941-973.
- Assisted Living Quality Coalition. (1998). *Assisted living quality initiative: Building a structure that promotes quality*. Washington, DC: author.
- Athey, S., & Imbens, G. W. (2022). Design-based analysis in difference-in-differences settings with staggered adoption. *Journal of Econometrics*, 226(1), 62-79.
- ATI Advisory. (2022). *Access to Capital in the Nursing Home Industry: A Resource on the Role of Policy and Implications for the Future*. Retrieved from <https://atiadvisory.com/wp-content/uploads/2022/06/Access-to-Capital-in-the-Nursing-Home-Industry-A-Resource-on-The-Role-of-Policy-and-Implications-for-the-Future.pdf>:
- Aud, M. A., & Rantz, M. J. (2004). Quality concerns in assisted living facilities. *J Nurs Care Qual*, 19(1), 8-9. doi:10.1097/00001786-200401000-00003

- Bach-Mortensen, A. M., Verboom, B., Movsisyan, A., & Degli Esposti, M. (2021). A systematic review of the associations between care home ownership and COVID-19 outbreaks, infections and mortality. *Nature Aging*, *1*(10), 948-961. doi:10.1038/s43587-021-00106-7
- Backhaus, R., Verbeek, H., van Rossum, E., Capezuti, E., & Hamers, J. P. H. (2014). Nurse Staffing Impact on Quality of Care in Nursing Homes: A Systematic Review of Longitudinal Studies. *Journal of the American Medical Directors Association*, *15*(6), 383-393. doi:https://doi.org/10.1016/j.jamda.2013.12.080
- Ball, M. M., Whittington, F. J., Perkins, M. M., Patterson, V. L., Hollingsworth, C., King, S. V., & Combs, B. L. (2000). Quality of Life in Assisted Living Facilities: Viewpoints of Residents. *Journal of Applied Gerontology*, *19*(3), 304-325. doi:10.1177/073346480001900304
- Beeber, A. S., Zimmerman, S., Reed, D., Mitchell, C. M., Sloane, P. D., Harris-Wallace, B., . . . Schumacher, J. G. (2014). Licensed Nurse Staffing and Health Service Availability in Residential Care and Assisted Living. *Journal of the American Geriatrics Society*, *62*(5), 805-811. doi:10.1111/jgs.12786
- Ben-Ner, A., Karaca-Mandic, P., & Ren, T. (2012). Ownership and quality in markets with asymmetric information: Evidence from nursing homes. *The BE Journal of Economic Analysis & Policy*, *12*(1).
- Bergé, L. (2018). *Efficient estimation of maximum likelihood models with multiple fixed-effects: the R package FENmlm*. Retrieved from
- Berkowitz, E. (2005). Medicare and Medicaid: the past as prologue. *Health Care Financing Review*, *27*(2), 11-23. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/17290633>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194925/>
- Berlowitz, D. R., Bezerra, H. Q., Brandeis, G. H., Kader, B., & Anderson, J. J. (2000). Are We Improving the Quality of Nursing Home Care: The Case of Pressure Ulcers. *Journal of the American Geriatrics Society*, *48*(1), 59-62. doi:https://doi.org/10.1111/j.1532-5415.2000.tb03029.x
- Bernabei, R., & Carbonin, P. (1997). Reducing falls among patients in nursing homes. *Jama*, *278*(21), 1742-1743.
- Bishop, C. E. (1999). Where are the missing elders? The decline in nursing home use, 1985 and 1995. *Health Aff (Millwood)*, *18*(4), 146-155. doi:10.1377/hlthaff.18.4.146
- Bliesmer, M. M., Smayling, M., Kane, R. L., & Shannon, I. (1998). The relationship between nursing staffing levels and nursing home outcomes. *Journal of Aging and Health*, *10*(3), 351-371.
- Borusyak, K., Jaravel, X., & Spiess, J. (2021). Revisiting event study designs: Robust and efficient estimation. *arXiv preprint arXiv:2108.12419*.
- Bos, A., & Harrington, C. (2017). What Happens to a Nursing Home Chain When Private Equity Takes Over? A Longitudinal Case Study. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *54*, 004695801774276. doi:10.1177/0046958017742761
- Bostick, J. E., Rantz, M. J., Flesner, M. K., & Riggs, C. J. (2006). Systematic Review of Studies of Staffing and Quality in Nursing Homes. *Journal of the American Medical Directors Association*, *7*(6), 366-376. doi:10.1016/j.jamda.2006.01.024

- Bowblis, J. R. (2012). Market Structure, Competition from Assisted Living Facilities, and Quality in the Nursing Home Industry. *Applied Economic Perspectives and Policy*, 34(2), 238-257. doi:10.1093/aep/pps006
- Braun, R. T., Jung, H.-Y., Casalino, L. P., Myslinski, Z., & Unruh, M. A. (2021). Association of Private Equity Investment in US Nursing Homes With the Quality and Cost of Care for Long-Stay Residents. *JAMA Health Forum*, 2(11), e213817-e213817. doi:10.1001/jamahealthforum.2021.3817
- Braun, R. T., Yun, H., Casalino, L. P., Myslinski, Z., Kuwonga, F. M., Jung, H.-Y., & Unruh, M. A. (2020). Comparative Performance of Private Equity–Owned US Nursing Homes During the COVID-19 Pandemic. *JAMA Network Open*, 3(10), e2026702-e2026702. doi:10.1001/jamanetworkopen.2020.26702
- Brown, K. A., Jones, A., Daneman, N., Chan, A. K., Schwartz, K. L., Garber, G. E., . . . Stall, N. M. (2021). Association Between Nursing Home Crowding and COVID-19 Infection and Mortality in Ontario, Canada. *JAMA Internal Medicine*, 181(2), 229-236. doi:10.1001/jamainternmed.2020.6466
- Brown Wilson, K. (2007). Historical Evolution of Assisted Living in the United States, 1979 to the Present. *The Gerontologist*, 47(suppl\_1), 8-22. doi:10.1093/geront/47.supplement\_1.8
- Bui, D. P., See, I., Hesse, E. M., Varela, K., Harvey, R. R., August, E. M., . . . Thomasson, E. (2020). Association between CMS quality ratings and COVID-19 outbreaks in nursing homes—West Virginia, March 17–June 11, 2020. *MMWR Morbidity and Mortality Weekly Report*, 69(37), 1300. doi:http://dx.doi.org/10.15585/mmwr.mm6937a5
- Burdick, D. J., Rosenblatt, A., Samus, Q. M., Steele, C., Baker, A., Harper, M., . . . Lyketsos, C. G. (2005). Predictors of Functional Impairment in Residents of Assisted-Living Facilities: The Maryland Assisted Living Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 60(2), 258-264. doi:10.1093/gerona/60.2.258
- Butler, D. C., Petterson, S., Phillips, R. L., & Bazemore, A. W. (2013). Measures of social deprivation that predict health care access and need within a rational area of primary care service delivery. *Health Serv Res*, 48(2 Pt 1), 539-559. doi:10.1111/j.1475-6773.2012.01449.x
- Butts, K., & Gardner, J. (2021). Did2s: Two-Stage Difference-in-Differences Following Gardner (2021). R package version 0.6.0. *arXiv preprint arXiv:2109.05913*.
- Callaway, B., & Sant’Anna, P. H. C. (2021). Difference-in-Differences with multiple time periods. *Journal of Econometrics*, 225(2), 200-230. doi:https://doi.org/10.1016/j.jeconom.2020.12.001
- Castle, N. G. (1999). Changes in resident and facility risk factors for psychotropic drug use in nursing homes since the Nursing Home Reform Act. *Journal of Applied Gerontology*, 18(1), 77-98.
- Castle, N. G. (2000). Differences in nursing homes with increasing and decreasing use of physical restraints. *Medical Care*, 1154-1163.
- Castle, N. G. (2001a). Administrator turnover and quality of care in nursing homes. *Gerontologist*, 41(6), 757-767. doi:10.1093/geront/41.6.757
- Castle, N. G. (2001b). Citations and compliance with the Nursing Home Reform Act of 1987. *J Health Soc Policy*, 13(1), 73-95. doi:10.1300/j045v13n01\_04

- Castle, N. G. (2002). Nursing homes with persistent deficiency citations for physical restraint use. *Medical Care*, 868-878.
- Castle, N. G. (2008). Nursing Home Caregiver Staffing Levels and Quality of Care: A Literature Review. *Journal of Applied Gerontology*, 27(4), 375-405. doi:10.1177/0733464808321596
- Castle, N. G., & Beach, S. (2013). Elder Abuse in Assisted Living. *Journal of Applied Gerontology*, 32(2), 248-267. doi:10.1177/0733464811418094
- Castle, N. G., & Engberg, J. (2005). Staff Turnover and Quality of Care in Nursing Homes. *Medical Care*, 43(6), 616-626. Retrieved from [www.jstor.org/stable/3768180](http://www.jstor.org/stable/3768180)
- Castle, N. G., & Engberg, J. (2007). The influence of staffing characteristics on quality of care in nursing homes. *Health Serv Res*, 42(5), 1822-1847. doi:10.1111/j.1475-6773.2007.00704.x
- Castle, N. G., & Engberg, J. (2008). Further Examination of the Influence of Caregiver Staffing Levels on Nursing Home Quality. *The Gerontologist*, 48(4), 464-476. doi:10.1093/geront/48.4.464
- Castle, N. G., & Ferguson, J. C. (2010). What Is Nursing Home Quality and How Is It Measured? *The Gerontologist*, 50(4), 426-442. doi:10.1093/geront/gnq052
- Castle, N. G., & Fogel, B. (1998). Characteristics of nursing homes that are restraint free. *The Gerontologist*, 38(2), 181-188.
- Castle, N. G., & Mor, V. (1998). Advance care planning in nursing homes: pre-and post-Patient Self-Determination Act. *Health services research*, 33(1), 101.
- Catlin, A., Cowan, C., Hartman, M., & Heffler, S. (2008). National health spending in 2006: a year of change for prescription drugs. *Health Affairs*, 27(1), 14-29.
- Centers for Disease Control and Prevention. (2020). Interim infection prevention and control recommendations to prevent SARS-CoV-2 spread in nursing homes. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/hcp/long-term-care.html>
- Centers for Medicare & Medicaid Services. (2019). National Health Expenditure Data: Historical [Internet]. Retrieved from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical>
- Centers for Medicare & Medicaid Services. (2020). *Medicare Current Beneficiary Survey 2018 Chartbook*. Retrieved from <https://www.cms.gov/research-statistics-data-and-systems/researchmcsdata-tables/2018-medicare-current-beneficiary-survey-annual-chartbook-and-slides>:
- Centers for Medicare & Medicaid Services. (2021a). *Five-star quality rating system: Technical users' guide*. Retrieved from <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandCompliance/Downloads/usersguide.pdf>
- Centers for Medicare & Medicaid Services. (2021b). The skilled nursing facility value-based purchasing (SNF VBP) program. Retrieved from <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/SNF-VBP/SNF-VBP-Page>
- Centers for Medicare & Medicaid Services. (2022). *Skilled Nursing Facility Change of Ownership Data*. Retrieved from: <https://data.cms.gov/provider->



- characteristics/hospitals-and-other-facilities/skilled-nursing-facility-change-of-ownership
- Centers for Medicare and Medicaid Services. (2020). Toolkit on state actions to mitigate COVID-19 prevalence in nursing homes. Retrieved from <https://www.cms.gov/files/document/covid-toolkit-states-mitigate-covid-19-nursing-homes.pdf>
- Chapman, C. G., & Brooks, J. M. (2016). Treatment Effect Estimation Using Nonlinear Two-Stage Instrumental Variable Estimators: Another Cautionary Note. *Health services research, 51*(6), 2375-2394. doi:10.1111/1475-6773.12463
- CharitiesNYS. (2018). The Sale of Nonprofit Nursing Homes Pursuant to the Not-for-Profit Corporation Law, Guidance Document, Issue Date: November 2018, Charities Bureau of the New York State Attorney General. Retrieved from <https://www.charitiesnys.com/pdfs/NursingHomeSales.pdf>
- Chatterjee, P., Kelly, S., Qi, M., & Werner, R. M. (2020). Characteristics and Quality of US Nursing Homes Reporting Cases of Coronavirus Disease 2019 (COVID-19). *JAMA Network Open, 3*(7), e2016930-e2016930. doi:10.1001/jamanetworkopen.2020.16930
- Chen, M. K., Chevalier, J. A., & Long, E. F. (2020). Nursing Home Staff Networks and COVID-19. *National Bureau of Economic Research Working Paper Series, No. 27608*. doi:10.3386/w27608
- Cherry, R. L. (1991). Agents of nursing home quality of care: Ombudsmen and staff ratios revisited. *The Gerontologist, 31*(3), 302-308.
- Chidambaram, P., & Garfield, R. (2021). Nursing home experienced steeper increase in COVID-19 cases and death in August 2021 than the rest of the country. *Kaiser Family Foundation*.
- Chou, S.-Y. (2002). Asymmetric information, ownership and quality of care: an empirical analysis of nursing homes. *Journal of health economics, 21*(2), 293-311. doi:10.1016/s0167-6296(01)00123-0
- Clarke, L., & Estes, C. L. (1992). Sociological and economic theories of markets and nonprofits: Evidence from home health organizations. *American Journal of Sociology, 97*(4), 945-969.
- Cleveland, W., Grosse, E., & Shyu, W. (1992). Local regression models. Chapter 8 in *Statistical models in S* (JM Chambers and TJ Hastie eds.), 608 p. *Wadsworth & Brooks/Cole, Pacific Grove, CA*.
- Cohen, J. W., & Dubay, L. C. (1990). The Effects of Medicaid Reimbursement Method and Ownership on Nursing Home Costs, Case Mix, and Staffing. *Inquiry, 27*(2), 183-200. Retrieved from [www.jstor.org/stable/29772122](http://www.jstor.org/stable/29772122)
- Cohen, J. W., & Spector, W. D. (1996). The effect of Medicaid reimbursement on quality of care in nursing homes. *15*(1), 23-48. doi:10.1016/0167-6296(95)00030-5
- Colello, K. J. (2021). Who Pays for Long-Term Services and Supports? *Washington, DC: Congressional Research Service*.
- Comondore, V. R., Devereaux, P., Zhou, Q., Stone, S. B., Busse, J. W., Ravindran, N. C., . . . Cook, D. J. (2009). Quality of care in for-profit and not-for-profit nursing homes: systematic review and meta-analysis. *Bmj, 339*, b2732.
- Conlen, M., Ivory, D., Yourish, K., Lai, K., Hassan, A., Calderone, J., . . . Allen, J. (2021). Nearly one-third of US Coronavirus deaths are linked to nursing homes.

- The New York Times*. <https://www.nytimes.com/interactive/2020/us/coronavirus-nursing-homes.html>.
- Cornell, P. Y., Zhang, W., & Thomas, K. S. (2020). Changes in Long-Term Care Markets: Assisted Living Supply and the Prevalence of Low-Care Residents in Nursing Homes. *Journal of the American Medical Directors Association*. doi:10.1016/j.jamda.2020.01.006
- Cummings, S. M. (2002). Predictors of Psychological Well-being among Assisted-Living Residents. *Health & Social Work*, 27(4), 293-302. doi:10.1093/hsw/27.4.293
- Davis, M. A. (1991). On Nursing Home Quality: A Review and Analysis. *Medical Care Review*, 48(2), 129-166. doi:10.1177/002570879104800202
- Davis, M. A. (1993). Nursing Home Ownership Revisited: Market, Cost and Quality Relationships. *Medical Care*, 31(11), 1062-1068. Retrieved from [www.jstor.org/stable/3766304](http://www.jstor.org/stable/3766304)
- de Chaisemartin, C., & D'Haultfœuille, X. (2020). Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects. *American Economic Review*, 110(9), 2964-2996. doi:10.1257/aer.20181169
- de Chaisemartin, C., & D'Haultfoeuille, X. (2021). Two-Way Fixed Effects and Differences-in-Differences with Heterogeneous Treatment Effects: A Survey. In.
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American sociological review*, 147-160.
- Donabedian, A. (1966). Evaluating the Quality of Medical Care. *The Milbank Memorial Fund Quarterly*, 44(3), 166-206. doi:10.2307/3348969
- Donabedian, A. (1988). The quality of care: how can it be assessed? *Jama*, 260(12), 1743-1748.
- Easley, D., & O'Hara, M. (1983). The Economic Role of the Nonprofit Firm. *The Bell Journal of Economics*, 14(2), 531-538. doi:10.2307/3003654
- Eggleston, K., Shen, Y.-C., Lau, J., Schmid, C. H., & Chan, J. (2008). Hospital ownership and quality of care: what explains the different results in the literature? *Health Economics*, 17(12), 1345-1362. doi:10.1002/hec.1333
- Eiken, S., Sredl, K., Burwell, B., & Amos, A. (2018). Medicaid Expenditures for Long-Term Services and Supports (LTSS) in FY 2016. *Cambridge, MA: Truven Health Analytics*.
- Figueroa, J. F., Wadhera, R. K., Papanicolas, I., Riley, K., Zheng, J., Orav, E. J., & Jha, A. K. (2020). Association of Nursing Home Ratings on Health Inspections, Quality of Care, and Nurse Staffing With COVID-19 Cases. *Jama*, 324(11), 1103-1105. doi:10.1001/jama.2020.14709
- Fisman, D. N., Bogoch, I., Lapointe-Shaw, L., McCready, J., & Tuite, A. R. (2020). Risk Factors Associated With Mortality Among Residents With Coronavirus Disease 2019 (COVID-19) in Long-term Care Facilities in Ontario, Canada. *JAMA Network Open*, 3(7), e2015957-e2015957. doi:10.1001/jamanetworkopen.2020.15957
- Gandhi, A., Song, Y., & Upadrashta, P. (2020). Have Private Equity Owned Nursing Homes Fared Worse Under COVID-19? Available at SSRN 3682892. doi:<https://doi.org/10.2139/ssrn.3682892>
- Gardner, J. (2021). Two-stage differences in differences. Working paper.

- Gebeloff, R., Ivory, D., Richtel, M., Smith, M., Yourish, K., Dance, S., . . . Parker, M. (2020). The striking racial divide in how Covid-19 has hit nursing homes. *The New York Times*, 10.
- Gelman, A., & Imbens, G. (2019). Why High-Order Polynomials Should Not Be Used in Regression Discontinuity Designs. *Journal of Business & Economic Statistics*, 37(3), 447-456. doi:10.1080/07350015.2017.1366909
- Genworth Financial. (2020). *Genworth Cost of Care Survey, conducted by CareScout®*. Retrieved from <https://www.genworth.com/aging-and-you/finances/cost-of-care.html>
- Gimm, G. W., & Kitsantas, P. (2016). Falls, Depression, and Other Hospitalization Risk Factors for Adults in Residential Care Facilities. *The International Journal of Aging and Human Development*, 83(1), 44-62. doi:10.1177/0091415016645347
- Glaeser, E. L., & Shleifer, A. (2001). Not-for-profit entrepreneurs. *Journal of Public Economics*, 81(1), 99-115. doi:[https://doi.org/10.1016/S0047-2727\(00\)00130-4](https://doi.org/10.1016/S0047-2727(00)00130-4)
- Goldstein, M., Silver-Greenberg, J., & Gebeloff, R. (2020). Push for profits left nursing homes struggling to provide care. *The New York Times*, May 7, 2020. Retrieved from <https://www.nytimes.com/2020/05/07/business/coronavirus-nursing-homes.html>
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2), 254-277. doi:<https://doi.org/10.1016/j.jeconom.2021.03.014>
- Gorges, R. J., & Konetzka, R. T. (2020). Staffing Levels and COVID-19 Cases and Outbreaks in U.S. Nursing Homes. *Journal of the American Geriatrics Society*, 68(11), 2462-2466. doi:10.1111/jgs.16787
- Graber, D. R., & Sloane, P. D. (1995). Nursing home survey deficiencies for physical restraint use. *Medical Care*, 1051-1063.
- Grabowski, D. C. (2001). Medicaid reimbursement and the quality of nursing home care. *Journal of health economics*, 20(4), 549-569. doi:10.1016/s0167-6296(01)00083-2
- Grabowski, D. C. (2008). The Market for Long-Term Care Services. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 45(1), 58-74. doi:10.5034/inquiryjrnl\_45.01.58
- Grabowski, D. C. (2014). Long-Term Care. In A. J. Culyer (Ed.), *Encyclopedia of Health Economics* (pp. 146-151). San Diego: Elsevier.
- Grabowski, D. C., & Angelelli, J. J. (2004). The relationship of Medicaid payment rates, bed constraint policies, and risk-adjusted pressure ulcers. *Health services research*, 39(4 Pt 1), 793-812. doi:10.1111/j.1475-6773.2004.00258.x
- Grabowski, D. C., Angelelli, J. J., & Mor, V. (2004). Medicaid Payment And Risk-Adjusted Nursing Home Quality Measures. *Health Affairs*, 23(5), 243-252. doi:10.1377/hlthaff.23.5.243
- Grabowski, D. C., Feng, Z., Hirth, R., Rahman, M., & Mor, V. (2013). Effect of nursing home ownership on the quality of post-acute care: An instrumental variables approach. *Journal of health economics*, 32(1), 12-21. doi:10.1016/j.jhealeco.2012.08.007

- Grabowski, D. C., & Hirth, R. A. (2003). Competitive spillovers across non-profit and for-profit nursing homes. *J Health Econ*, 22(1), 1-22. doi:10.1016/s0167-6296(02)00093-0
- Grabowski, D. C., Hirth, R. A., Intrator, O., Li, Y., Richardson, J., Stevenson, D. G., . . . Banaszak-Holl, J. (2016). Low-quality nursing homes were more likely than other nursing homes to be bought or sold by chains in 1993–2010. *Health Affairs*, 35(5), 907-914.
- Grabowski, D. C., Orfaly Cadigan, R., Miller, E. A., Stevenson, D. G., Clark, M., & Mor, V. (2010). Supporting Home- and Community-Based Care: Views of Long-Term Care Specialists. *Medical care research and review*, 67(4\_suppl), 82S-101S. doi:10.1177/1077558710366863
- Grabowski, D. C., & Stevenson, D. G. (2006). Long-Term Care Regulation. In R. Schulz (Ed.), *The Encyclopedia of Aging* (4th ed.). New York: Springer Publishing Company.
- Grabowski, D. C., & Stevenson, D. G. (2008). Ownership Conversions and Nursing Home Performance. *Health services research*, 43(4), 1184-1203. doi:10.1111/j.1475-6773.2008.00841.x
- Grabowski, D. C., Stevenson, D. G., & Cornell, P. Y. (2012). Assisted Living Expansion and the Market for Nursing Home Care. *Health services research*, 47(6), 2296-2315. doi:10.1111/j.1475-6773.2012.01425.x
- Grabowski, D. C., Stewart, K. A., Broderick, S. M., & Coots, L. A. (2008). Predictors of nursing home hospitalization: a review of the literature. *Med Care Res Rev*, 65(1), 3-39. doi:10.1177/1077558707308754
- Gupta, A., Howell, S. T., Yannelis, C., & Gupta, A. (2021). Does private equity investment in healthcare benefit patients? Evidence from nursing homes. *National Bureau of Economic Research Working Paper Series, No. w28474*. doi:https://dx.doi.org/10.2139/ssrn.3790212
- Hagen, S. A. (2013). *Rising demand for long-term services and supports for elderly people*: Congressional Budget Office.
- Han, X., Yaraghi, N., & Gopal, R. (2018). Winning at All Costs: Analysis of Inflation in Nursing Homes' Rating System. *Production and Operations Management*, 27(2), 215-233. doi:https://doi.org/10.1111/poms.12804
- Hansmann, H. B. (1980). The Role of Nonprofit Enterprise. *The Yale Law Journal*, 89(5), 835. doi:10.2307/796089
- Hansmann, H. B. (1987). Economic theories of nonprofit organizations. *The nonprofit sector: Research handbook*, 27-42.
- Harrington, C., Carrillo, H., Garfield, R., Musumeci, M., & Squires, E. (2018). *Nursing Facilities, Staffing, Residents and Facility Deficiencies, 2009 Through 2016*. Menlo Park, CA: The Henry J. Kaiser Family Foundation.
- Harrington, C., Chapman, S., Halifax, E., Dellefield, M., & Montgomery, A. (2021). Time to Ensure Sufficient Nursing Home Staffing and Eliminate Inequities in Care. *J Gerontol Geriatr Med*, 7(099), 2.
- Harrington, C., Dellefield, M. E., Halifax, E., Fleming, M. L., & Bakerjian, D. (2020). Appropriate nurse staffing levels for US nursing homes. *Health Services Insights*, 13, 1178632920934785.

- Harrington, C., Ng, T., Kaye, S. H., & Newcomer, R. (2009). Home and community-based services: Public policies to improve access, costs and quality. *UCSF, PAS, January*.
- Harrington, C., Olney, B., Carrillo, H., & Kang, T. (2012). Nurse staffing and deficiencies in the largest for-profit nursing home chains and chains owned by private equity companies. *Health services research, 47*(1pt1), 106-128.
- Harrington, C., Ross, L., Chapman, S., Halifax, E., Spurlock, B., & Bakerjian, D. (2020). Nurse staffing and coronavirus infections in California nursing homes. *Policy, Politics, & Nursing Practice, 21*(3), 174-186.
- Harrington, C., Ross, L., & Kang, T. (2015). Hidden Owners, Hidden Profits, and Poor Nursing Home Care: A Case Study. *International Journal of Health Services, 45*(4), 779-800. doi:10.1177/0020731415594772
- Harrington, C., Schnelle, J. F., McGregor, M., & Simmons, S. F. (2016a). Article Commentary: The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes. *Health Services Insights, 9*, HSI.S38994. doi:10.4137/HSI.S38994
- Harrington, C., Schnelle, J. F., McGregor, M., & Simmons, S. F. (2016b). The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes. *Health Services Insights, 9*, 13-19. doi:10.4137/HSI.S38994
- Harrington, C., & Swan, J. H. (2003). Nursing home staffing, turnover, and case mix. *Med Care Res Rev, 60*(3), 366-392; discussion 393-369. doi:10.1177/1077558703254692
- Harrington, C., Swan, J. H., Nyman, J. A., & Carrillo, H. (1997). The effect of certificate of need and moratoria policy on change in nursing home beds in the United States. *Medical Care, 35*, 574-588.
- Harrington, C., Woolhandler, S., Mullan, J., Carrillo, H., & Himmelstein, D. U. (2001). Does investor ownership of nursing homes compromise the quality of care? *Am J Public Health, 91*(9), 1452-1455. doi:10.2105/ajph.91.9.1452
- Harrington, C., Woolhandler, S., Mullan, J., Carrillo, H., & Himmelstein, D. U. (2002). Does investor-ownership of nursing homes compromise the quality of care? *Int J Health Serv, 32*(2), 315-325. doi:10.2190/EBCN-WECV-C0NT-676R
- Harrington, C., Zimmerman, D., Karon, S. L., Robinson, J., & Beutel, P. (2000). Nursing Home Staffing and Its Relationship to Deficiencies. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 55*(5), S278-S287. doi:10.1093/geronb/55.5.s278
- Harris-Kojetin, L. D., Sengupta, M., Lendon, J. P., Rome, V., Valverde, R., & Caffrey, C. (2019). Long-term care providers and services users in the United States, 2015-2016.
- Hawes, C., Mor, V., Phillips, C. D., Fries, B. E., Morris, J. N., Steele-Friedlob, E., . . . Nennstiel, M. (1997). The OBRA-87 nursing home regulations and implementation of the Resident Assessment Instrument: effects on process quality. *J Am Geriatr Soc, 45*(8), 977-985. doi:10.1111/j.1532-5415.1997.tb02970.x
- Hawes, C., & Phillips, C. D. (1986). The Changing Structure of the Nursing Home Industry and the Impact of Ownership on Quality, Cost, and Access. In B. H. Gray (Ed.), *For-Profit Enterprise in Health Care* (pp. 492-541). Washington, D.C.: National Academies Press (US).

- Hawes, C., & Phillips, C. D. (2007). Defining Quality in Assisted Living: Comparing Apples, Oranges, and Broccoli. *The Gerontologist*, 47(suppl 1), 40-50. doi:10.1093/geront/47.supplement\_1.40
- Hawes, C., Phillips, C. D., & Rose, M. (2000). *High service or high privacy assisted living facilities, their residents and staff: Results from a national survey*: US Department of Health and Human Services Washington, DC.
- Hawes, C., Phillips, C. D., Rose, M., Holan, S., & Sherman, M. (2003). A National Survey of Assisted Living Facilities. *The Gerontologist*, 43(6), 875-882. doi:10.1093/geront/43.6.875
- He, M., Li, Y., & Fang, F. (2020). Is There a Link between Nursing Home Reported Quality and COVID-19 Cases? Evidence from California Skilled Nursing Facilities. *Journal of the American Medical Directors Association*, 21(7), 905-908. doi:10.1016/j.jamda.2020.06.016
- Herrera, C. A., Rada, G., Kuhn-Barrientos, L., & Barrios, X. (2014). Does Ownership Matter? An Overview of Systematic Reviews of the Performance of Private For-Profit, Private Not-For-Profit and Public Healthcare Providers. *PLoS ONE*, 9(12), e93456. doi:10.1371/journal.pone.0093456
- Hillmer, M. P., Wodchis, W. P., Gill, S. S., Anderson, G. M., & Rochon, P. A. (2005). Nursing Home Profit Status and Quality of Care: Is There Any Evidence of an Association? *Medical care research and review*, 62(2), 139-166. doi:10.1177/1077558704273769
- Hirth, R. A. (1993). *Consumer information and ownership in the nursing home industry*. Retrieved from <https://repository.upenn.edu/dissertations/AAI9413850>
- Hirth, R. A. (1999). Consumer information and competition between nonprofit and for-profit nursing homes. *Journal of health economics*, 18(2), 219-240. doi:10.1016/s0167-6296(98)00035-6
- Hirth, R. A., Grabowski, D. C., Feng, Z., Rahman, M., & Mor, V. (2014). Effect of nursing home ownership on hospitalization of long-stay residents: an instrumental variables approach. *International Journal of Health Care Finance and Economics*, 14(1), 1-18. doi:10.1007/s10754-013-9136-3
- Huang, S., & Bowblis, J. (2018). The principal-agent problem and owner-managers: An instrumental variables application to nursing home quality. *Health Economics*, 27. doi:10.1002/hec.3792
- Huang, S., & Bowblis, J. (2019). Private equity ownership and nursing home quality: an instrumental variables approach. *International Journal of Health Economics and Management*, 19(3-4), 273-299. doi:10.1007/s10754-018-9254-z
- Hughes, C. M., Lapane, K. L., & Mor, V. (2000). Influence of facility characteristics on use of antipsychotic medications in nursing homes. *Med Care*, 38(12), 1164-1173. doi:10.1097/00005650-200012000-00003
- Hyer, K., Thomas, K. S., Branch, L. G., Harman, J. S., Johnson, C. E., & Weech-Maldonado, R. (2011). The Influence of Nurse Staffing Levels on Quality of Care in Nursing Homes. *The Gerontologist*, 51(5), 610-616. doi:10.1093/geront/gnr050
- Imai, K., & Kim, I. S. (2021). On the use of two-way fixed effects regression models for causal inference with panel data. *Political Analysis*, 29(3), 405-415.
- Institute of Medicine. (1986). *Improving the Quality of Care in Nursing Homes* (Vol. 85). Washington (DC): The National Academies Press.

- Institute of Medicine. (2001). *Improving the Quality in Long-Term Care* (G. S. Wunderlich & P. O. Kohler Eds.). Washington, DC: National Academies Press.
- Integra Med Analytics. (2020). *Underreporting in Nursing Home Quality Measures*. Retrieved from <https://www.nursinghomereporting.com/post/underreporting-in-nursing-home-quality-measures>
- Intrator, O., Castle, N. G., & Mor, V. (1999). Facility characteristics associated with hospitalization of nursing home residents: results of a national study. *Med Care, 37*(3), 228-237. doi:10.1097/00005650-199903000-00003
- Janelli, L. M., Kanski, G. W., & Neary, M. A. (1994). Physical restraints: Has OBRA made a difference? In: SLACK Incorporated Thorofare, NJ.
- June, J. W., Meng, H., Dobbs, D., & Hyer, K. (2020). Using Deficiency Data to Measure Quality in Assisted Living Communities: A Florida Statewide Study. *Journal of Aging & Social Policy, 32*(2), 125-140. doi:10.1080/08959420.2018.1563471
- Kaffenberger, K. R. (2001). Nursing Home Ownership. *Journal of Aging & Social Policy, 12*(1), 35-48. doi:10.1300/j031v12n01\_04
- Kane, R. A., & Wilson, K. B. (1993). *Assisted living in the United States: A new paradigm for residential care for frail older persons?* Washington, D.C.: American Association of Retired Persons.
- Kasser, V. G., & Ryan, R. M. (1999). The relation of psychological needs for autonomy and relatedness to vitality, well-being, and mortality in a nursing home 1. *Journal of Applied Social Psychology, 29*(5), 935-954.
- Kaye, H. S., Harrington, C., & LaPlante, M. P. (2010). Long-Term Care: Who Gets It, Who Provides It, Who Pays, And How Much? *Health Affairs, 29*(1), 11-21. doi:10.1377/hlthaff.2009.0535
- Kerlin, J. A., Ye, M., & Chen, W. (2022). Exploring a Policy Mechanism for Profit Moderation and Social Mission Maximization in Long-Term Residential Care Businesses. *Unpublished manuscript*.
- Kim, S. J., & Bostwick, W. (2020). Social Vulnerability and Racial Inequality in COVID-19 Deaths in Chicago. *Health Education & Behavior, 47*(4), 509-513. doi:10.1177/1090198120929677
- Konetzka, R. T., Grabowski, D. C., Perrailon, M. C., & Werner, R. M. (2015). Nursing Home 5-Star Rating System Exacerbates Disparities In Quality, By Payer Source. *Health Affairs, 34*(5), 819.
- Konetzka, R. T., Spector, W., & Shaffer, T. (2004). Effects of Nursing Home Ownership Type and Resident Payer Source on Hospitalization for Suspected Pneumonia. *Medical Care, 42*(10), 1001-1008. Retrieved from [www.jstor.org/stable/4640847](http://www.jstor.org/stable/4640847)
- Konetzka, R. T., Stearns, S. C., & Park, J. (2007). The Staffing-Outcomes Relationship in Nursing Homes. *Health services research, 43*(3), 1025-1042. doi:10.1111/j.1475-6773.2007.00803.x
- Konetzka, R. T., Yi, D., Norton, E. C., & Kilpatrick, K. E. (2004). Effects of Medicare Payment Changes on Nursing Home Staffing and Deficiencies. *Health services research, 39*(3), 463-488. doi:10.1111/j.1475-6773.2004.00240.x
- Lawrence, D. (1997). Why We Want To Remain A Nonprofit Health Care Organization. *Health Affairs, 16*(2), 118-120. doi:10.1377/hlthaff.16.2.118
- Lendon, J., Sengupta, M., Rome, V., Caffrey, C., Harris-Kojetin, L., & Melekin, A. (2019). *Long-Term Care Providers and Services Users in the United States—*

- State Estimates Supplement: National Study of Long-Term Care Providers, 2015–2016*. Hyattsville, MD: National Center for Health Statistics.
- Lewin-VHI, I. (1996). National study of assisted living for the elderly: Literature review update (Contract No. HHS 100-94-0024). *Washington, DC: US Department of Health and Human Services*.
- Li, Y., Cen, X., Cai, X., & Temkin-Greener, H. (2020). Racial and Ethnic Disparities in COVID-19 Infections and Deaths Across U.S. Nursing Homes. *Journal of the American Geriatrics Society, 68*(11), 2454-2461.  
doi:<https://doi.org/10.1111/jgs.16847>
- Li, Y., Temkin-Greener, H., Shan, G., & Cai, X. (2020). COVID-19 Infections and Deaths among Connecticut Nursing Home Residents: Facility Correlates. *Journal of the American Geriatrics Society, 68*(9), 1899-1906.  
doi:<https://doi.org/10.1111/jgs.16689>
- Lin, H. (2014). Revisiting the relationship between nurse staffing and quality of care in nursing homes: An instrumental variables approach. *Journal of health economics, 37*, 13-24. doi:10.1016/j.jhealeco.2014.04.007
- Lord, J., Davlyatov, G., Thomas, K. S., Hyer, K., & Weech-Maldonado, R. (2018). The role of assisted living capacity on nursing home financial performance. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 55*, 0046958018793285.
- LTCFocus. (2021). *LTCFocus Public Use Data sponsored by the National Institute on Aging (P01 AG027296) through a cooperative agreement with the Brown University School of Public Health*. Retrieved from: <https://www.ltcfocus.org/>
- Lu, L. X., & Lu, S. F. (2021). Does nonprofit ownership matter for firm performance? Financial distress and ownership conversion of nursing homes. *Management Science*. Retrieved from <https://ssrn.com/abstract=3343558>
- Mahajan, U. V., & Larkins-Pettigrew, M. (2020). Racial demographics and COVID-19 confirmed cases and deaths: a correlational analysis of 2886 US counties. *Journal of Public Health, 42*(3), 445-447.
- Marek, K. D., Rantz, M. J., Fagin, C. M., & Krejci, J. W. (1996). OBRA'87: has it resulted in better quality of care? *Journal of gerontological nursing, 22*(10), 28-36.
- Marmor, T. R., Schlesinger, M., & Smithey, R. W. (1987). Nonprofit Organizations and Health Care. In W. W. Powell (Ed.), *The nonprofit sector: A research handbook* (1st ed., pp. 221-239). New Haven, CT: Yale University Press.
- Mathews, A., Fuller, A., & De Avila, J. (2020). Thinly-staffed nursing homes face challenges in pandemic. *The Wall Street Journal, May 1, 2020*. Retrieved from <https://www.wsj.com/articles/thinly-staffed-nursing-homes-face-challenges-in-pandemic-11588343407>
- McGarry, B. E., Grabowski, D. C., & Barnett, M. L. (2020). Severe Staffing And Personal Protective Equipment Shortages Faced By Nursing Homes During The COVID-19 Pandemic. *Health Affairs, 39*(10), 1812-1821.  
doi:10.1377/hlthaff.2020.01269
- McGrail, K. M., McGregor, M. J., Cohen, M., Tate, R. B., & Ronald, L. A. (2006). For-profit versus not-for-profit delivery of long-term care. *Canadian Medical Association Journal, 176*(1), 57-58. doi:10.1503/cmaj.060591



- McGregor, M. J., Cohen, M., McGrail, K., Broemeling, A. M., Adler, R. N., Schulzer, M., . . . Beck, M. (2005). Staffing levels in not-for-profit and for-profit long-term care facilities: Does type of ownership matter? *Canadian Medical Association Journal*, *172*(5), 645-649. doi:10.1503/cmaj.1040131
- Medicare and Medicaid Programs; Reform of Requirements for Long-Term Care Facilities, 81 F.R. 68688. (proposed October 4, 2016). Retrieved from <https://www.federalregister.gov/d/2016-23503>
- Mitchell, J. M., & Kemp, B. J. (2000). Quality of Life in Assisted Living Homes: A Multidimensional Analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *55*(2), P117-P127. doi:10.1093/geronb/55.2.p117
- Mollica, R. L. (2001). The evolution of assisted living. A view from the states. *Caring: National Association for Home Care magazine*, *20*(8), 24-26.
- Mollica, R. L., Houser, A. N., & Ujvari, K. (2012). Assisted living and residential care in the states in 2010.
- Moseley, C. B. (1994). Nursing home ownership and quality of care. *Journal of Applied Gerontology*, *13*(4), 386-397.
- Moseley, C. B. (1996). The impact of federal regulations on urethral catheterization in Virginia nursing homes. *American Journal of Medical Quality*, *11*(4), 222-226.
- Mukamel, D. B. (1997). Risk-adjusted outcome measures and quality of care in nursing homes. *Medical Care*, 367-385.
- Munroe, D. J. (1990). The influence of registered nurse staffing on the quality of nursing home care. *Research in Nursing & Health*, *13*(4), 263-270.
- Newhouse, J. P. (1970). Toward a theory of nonprofit institutions: An economic model of a hospital. *The American Economic Review*, *60*(1), 64-74.
- O'Neill, C., Harrington, C., Kitchener, M., & Saliba, D. (2003). Quality of care in nursing homes: An analysis of relationships among profit, quality, and ownership. *Medical Care*, 1318-1330.
- Ochieng, N., Chidambaram, P., Garfield, R., & Neuman, T. (2021). Factors associated with COVID-19 cases and deaths in long-term care facilities: Findings from a literature review. *KFF*. Retrieved from <https://www.kff.org/report-section/factors-associated-with-covid-19-cases-and-deaths-in-long-term-care-facilities-findings-from-a-literature-review-issue-brief/>
- Ouslander, J. G., & Kane, R. L. (1984). The costs of urinary incontinence in nursing homes. *Medical Care*, 69-79.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective*: New York: Harper & Row.
- Phillips, C. D., Hawes, C., & Fries, B. E. (1993). Reducing the use of physical restraints in nursing homes: will it increase costs? *American Journal of Public Health*, *83*(3), 342-348.
- Phillips, C. D., Munoz, Y., Sherman, M., Rose, M., Spector, W., & Hawes, C. (2003). Effects of Facility Characteristics on Departures From Assisted Living: Results From a National Study. *The Gerontologist*, *43*(5), 690-696. doi:10.1093/geront/43.5.690
- Pilkington, E. (2020). Black Americans dying of Covid-19 at three times the rate of white people. *The Guardian*, May 20, 2020. Retrieved from

- <https://www.theguardian.com/world/2020/may/20/black-americans-death-rate-covid-19-coronavirus>
- Pillemer, K. (1988). Maltreatment of patients in nursing homes: overview and research agenda. *J Health Soc Behav*, 29(3), 227-238. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/3071547>
- Pradhan, R., Weech-Maldonado, R., Harman, J. S., Laberge, A., & Hyer, K. (2013). Private equity ownership and nursing home financial performance. *Health Care Management Review*, 38(3), 224-233.
- Rahman, M., Grabowski, D. C., Intrator, O., Cai, S., & Mor, V. (2013). Serious Mental Illness and Nursing Home Quality of Care. *Health services research*, 48(4), 1279-1298. doi:10.1111/1475-6773.12023
- Rainey, H. G., Backoff, R. W., & Levine, C. H. (1976). Comparing public and private organizations. *Public Administration Review*, 36(2), 233-244.
- Raphael, D., Renwick, R., Brown, I., & Rootman, I. (1996). Quality of life indicators and health: Current status and emerging conceptions. *Social Indicators Research*, 39(1), 65-88. doi:10.1007/BF00300833
- Rau, J. (2020). Coronavirus stress test: many 5-star nursing homes have infection-control lapses. *Kaiser Health News*.
- Rau, J., & Almendrala, A. (2020). COVID-plagued California nursing home often had problems in past. *Kaiser Health News*.
- Rosenau, P. V., & Linder, S. H. (2003). Two Decades of Research Comparing For-Profit and Nonprofit Health Provider Performance in the United States\*. *Social science quarterly*, 84(2), 219-241. doi:10.1111/1540-6237.8402001
- Roth, J., & Sant'Anna, P. H. (2021). Efficient estimation for staggered rollout designs. *arXiv preprint arXiv:2102.01291*.
- Rowan, P., Gupta, R., Lester, R., Levere, M., Liao, K., Libersky, J., . . . Bowen, P. (2020). A study of the Covid-19 outbreak and response in Connecticut long-term care facilities. *Princeton, NJ: Mathematica, Inc., September 2020*. Retrieved from <https://www.mathematica.org/our-publications-and-findings/publications/fr-a-study-of-the-covid-19-outbreak-and-response-in-connecticut-long-term-care-facilities>
- Rubenstein, L. Z., Powers, C. M., & MacLean, C. H. (2001). Quality indicators for the management and prevention of falls and mobility problems in vulnerable elders. *Annals of Internal Medicine*, 135(8\_Part\_2), 686-693.
- Sacchetti, M., & Swaine, J. (2020). Wash. nursing home faces \$611,000 fine over lapses during fatal coronavirus outbreak. *The Washington Post*. Retrieved from [https://www.washingtonpost.com/investigations/wash-nursing-home-faces-611000-fine-over-lapses-during-fatal-coronavirus-outbreak/2020/04/02/757cee76-7498-11ea-87da-77a8136c1a6d\\_story.html](https://www.washingtonpost.com/investigations/wash-nursing-home-faces-611000-fine-over-lapses-during-fatal-coronavirus-outbreak/2020/04/02/757cee76-7498-11ea-87da-77a8136c1a6d_story.html)
- Sanghavi, P., Pan, S., & Caudry, D. (2020). Assessment of nursing home reporting of major injury falls for quality measurement on nursing home compare. *Health services research*, 55(2), 201-210.
- Schlesinger, M., & Gray, B. H. (2006). Nonprofit organizations and health care: Some paradoxes of persistent scrutiny. In W. W. Powell & R. Steinberg (Eds.), *The nonprofit sector: A research handbook* (pp. 378-414): Yale University Press.

- Schnelle, J. F., Simmons, S. F., Harrington, C., Cadogan, M., Garcia, E., & M. Bates-Jensen, B. (2004). Relationship of Nursing Home Staffing to Quality of Care. *Health services research, 39*(2), 225-250. doi:10.1111/j.1475-6773.2004.00225.x
- Shen, Y.-C., Eggleston, K., Lau, J., & Schmid, C. H. (2007). Hospital ownership and financial performance: what explains the different findings in the empirical literature? *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 44*(1), 41-68.
- Shin, J. H., & Bae, S. H. (2012). Nurse staffing, quality of care, and quality of life in US nursing homes, 1996–2011: an integrative review. *Journal of gerontological nursing, 38*(12), 46-53.
- Shirk, C. (2006). Rebalancing long-term care: The role of the Medicaid HCBS waiver program. *National Health Policy Forum, Paper 164*. Retrieved from [https://hsrc.himmelfarb.gwu.edu/sphhs\\_centers\\_nhpf/164/](https://hsrc.himmelfarb.gwu.edu/sphhs_centers_nhpf/164/)
- Sikorska, E. (1999). Organizational Determinants of Resident Satisfaction With Assisted Living. *The Gerontologist, 39*(4), 450-456. doi:10.1093/geront/39.4.450
- Silver-Greenberg, J., & Gebeloff, R. (2021). Maggots, rape and yet five stars: How US ratings of nursing homes mislead the public. *The New York Times, 13*.
- Silver, B. C., Grabowski, D. C., Gozalo, P. L., Dosa, D., & Thomas, K. S. (2018). Increasing Prevalence of Assisted Living as a Substitute for Private-Pay Long-Term Nursing Care. *Health services research, 53*(6), 4906-4920. doi:10.1111/1475-6773.13021
- Sloan, F. A. (1998). Commercialism in nonprofit hospitals. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management, 17*(2), 234-252.
- Spector, W. D., Selden, T. M., & Cohen, J. W. (1998). The impact of ownership type on nursing home outcomes. *Health Economics, 7*(7), 639-653. doi:10.1002/(sici)1099-1050(1998110)7:7<639::Aid-hec373>3.0.Co;2-0
- Spector, W. D., & Takada, H. A. (1991). Characteristics of Nursing Homes that Affect Resident Outcomes. *Journal of Aging and Health, 3*(4), 427-454. doi:10.1177/089826439100300401
- Spurlock, B., Stack, A., Harrington, C., Ross, L., Senathirajah, M., Yoon, F., . . . Benevent, R. (2020). COVID-19 in California's nursing homes: Factors associated with cases and deaths. *California Health Care Foundation*. Retrieved from <https://www.chcf.org/publication/covid-19-californias-nursing-homes-factors-cases-deaths/>
- Stall, N. M., Jones, A., Brown, K. A., Rochon, P. A., & Costa, A. P. (2020). For-profit long-term care homes and the risk of COVID-19 outbreaks and resident deaths. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne, 192*(33), E946-E955. doi:10.1503/cmaj.201197
- Starkey, K. B., Weech-Maldonado, R., & Mor, V. (2005). Market competition and quality of care in the nursing home industry. *Journal of health care finance, 32*(1), 67-81.
- Stearns, S. C., Park, J., Zimmerman, S., Gruber-Baldini, A. L., Konrad, T. R., & Sloane, P. D. (2007). Determinants and effects of nurse staffing intensity and skill mix in residential care/assisted living settings. *The Gerontologist, 47*(5), 662-671.

- Stephens, T. K. (2018). *The Relationship Between Nurse Staffing and Quality Outcomes in Georgia Nursing Homes*. (Unpublished Doctoral Dissertation). Walden University,
- Stevenson, D. G., & Grabowski, D. C. (2008). Private equity investment and nursing home care: is it a big deal? *Health Affairs*, 27(5), 1399-1408.
- Stevenson, D. G., & Grabowski, D. C. (2010). Sizing Up The Market For Assisted Living. *Health Affairs*, 29(1), 35-43. doi:10.1377/hlthaff.2009.0527
- Sugg, M. M., Spaulding, T. J., Lane, S. J., Runkle, J. D., Harden, S. R., Hege, A., & Iyer, L. S. (2021). Mapping community-level determinants of COVID-19 transmission in nursing homes: A multi-scale approach. *Science of The Total Environment*, 752, 141946.
- Sun, L., & Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2), 175-199. doi:https://doi.org/10.1016/j.jeconom.2020.09.006
- Teegardin, C., Norder, L., Thieme, N., Schrade, B., DiRico, E. M., Peebles, J., & Yoganathan, A. (2019). Unprotected: Broken promises in Georgia's senior care industry. *The Atlanta Journal-Constitution*. Retrieved from <https://www.ajc.com/senior-care-quality-report/>
- Teegardin, C., & Schrade, B. (2019, November 23). Senior home gold rush: Care suffered as investors got squeezed by rising costs, competition. *The Atlanta Journal-Constitution*. Retrieved from <https://www.ajc.com/news/state--regional/senior-home-gold-rush/30n0seXnMIGtEkC00PxRSK/>
- Temkin-Greener, H., Guo, W., Mao, Y., Cai, X., & Li, Y. (2020). COVID-19 Pandemic in Assisted Living Communities: Results from Seven States. *Journal of the American Geriatrics Society*, 68(12), 2727-2734. doi:https://doi.org/10.1111/jgs.16850
- The New York Times. (2021). *Coronavirus (Covid-19) Data in the United States*. Retrieved from <https://github.com/nytimes/covid-19-data>:
- Trinkoff, A. M., Yoon, J. M., Storr, C. L., Lerner, N. B., Yang, B. K., & Han, K. (2020). Comparing residential long-term care regulations between nursing homes and assisted living facilities. *Nursing Outlook*, 68(1), 114-122. doi:10.1016/j.outlook.2019.06.015
- Troyer, J. L., & Thompson, H. G., Jr. (2004). The Impact of Litigation on Nursing Home Quality. *Journal of Health Politics, Policy and Law*, 29(1), 11-42. doi:10.1215/03616878-29-1-11
- U.S. Department of Health and Human Services. (2003). The future supply of long-term care workers in relation to the aging baby boom generation: Report to Congress. *Washington D.C.: US DHHS*.
- U.S. General Accounting Office. (1998). *California nursing homes: Care problems persist despite federal and state oversight*. Washington, D.C.: GAO/HEHS-98-202.
- U.S. General Accounting Office. (1999). *Nursing Homes: Complaint Investigation Processes Often Inadequate to Protect Residents*. Washington, D.C.: GAO/HEHS-99-80.

- U.S. General Accounting Office. (2000). *Nursing Homes: Sustained Efforts Are Essential to Realize Potential of the Quality Initiatives*. Washington, D.C.: GAO/HEHS-00-197.
- U.S. Government Accountability Office. (2020). Infection Control Deficiencies Were Widespread and Persistent in Nursing Homes Prior to COVID-19 Pandemic. *Nursing Home Infection Control (Publication No. GAO-20-576R)*. Retrieved from <https://www.gao.gov/assets/gao-20-576r.pdf>
- U.S. Government Accountability Office (GAO). (2006). *Residential Care Facilities Mortgage Insurance Program: Opportunities to Improve Program and Risk Management (GAO-06-515)*. Retrieved from <https://www.gao.gov/assets/gao-06-515.pdf>
- Unruh, L., & Wan, T. T. H. (2004). A Systems Framework for Evaluating Nursing Care Quality in Nursing Homes. *Journal of Medical Systems, 28*(2), 197-214. doi:10.1023/b:joms.0000023302.80118.74
- Unruh, M. A., Yun, H., Zhang, Y., Braun, R. T., & Jung, H.-Y. (2020). Nursing Home Characteristics Associated With COVID-19 Deaths in Connecticut, New Jersey, and New York. *Journal of the American Medical Directors Association, 21*(7), 1001-1003. doi:10.1016/j.jamda.2020.06.019
- Vespa, J., Armstrong, D. M., & Medina, L. (2018). *Demographic turning points for the United States: Population projections for 2020 to 2060: US Department of Commerce, Economics and Statistics Administration, US ....*
- Weech-Maldonado, R., Laberge, A., Pradhan, R., Johnson, C. E., Yang, Z., & Hyer, K. (2012). Nursing home financial performance: the role of ownership and chain affiliation. *Health Care Management Review, 37*(3), 235-245. doi:10.1097/hmr.0b013e31823dfe13
- Weech-Maldonado, R., Neff, G., & Mor, V. (2003). Does Quality of Care Lead to Better Financial Performance?: The Case of the Nursing Home Industry. *Health Care Management Review, 28*(3), 201-216. Retrieved from [https://journals.lww.com/hcmrjournal/Fulltext/2003/07000/Does\\_Quality\\_of\\_Care\\_Lead\\_to\\_Better\\_Financial.2.aspx](https://journals.lww.com/hcmrjournal/Fulltext/2003/07000/Does_Quality_of_Care_Lead_to_Better_Financial.2.aspx)
- Weisbrod, B. A. (1989). Rewarding Performance that is Hard to Measure: The Private Nonprofit Sector. *Science, 244*(4904), 541-546. Retrieved from [www.jstor.org/stable/1703004](http://www.jstor.org/stable/1703004)
- Weisbrod, B. A. (1996). How does institutional form matter? The behavior of private firms, church-related non-profit facilities, and other non-profit facilities in mixed industries. In: Center for Urban Affairs and Policy Studies Chicago, IL.
- Weisbrod, B. A. (1997). The Future of the Nonprofit Sector: Its Entwinning with Private Enterprise and Government. *Journal of Policy Analysis and Management, 16*(4), 541-555. Retrieved from [www.jstor.org/stable/3325926](http://www.jstor.org/stable/3325926)
- Weisbrod, B. A., & Schlesinger, M. (1986). Public, private, nonprofit ownership and the response to asymmetric information: The case of nursing homes. In *The economics of nonprofit institutions: Studies in structure and policy*: Oxford University Press.
- Werner, R. M., Konetzka, R. T., & Polsky, D. (2016). Changes in Consumer Demand Following Public Reporting of Summary Quality Ratings: An Evaluation in

- Nursing Homes. *Health services research*, 51 Suppl 2(Suppl 2), 1291-1309.  
doi:10.1111/1475-6773.12459
- White, C. (2005). Medicare's prospective payment system for skilled nursing facilities: effects on staffing and quality of care. *Inquiry*, 42(4), 351-366.  
doi:10.5034/inquiryjrnl\_42.4.351
- White, E. M., Kosar, C. M., Feifer, R. A., Blackman, C., Gravenstein, S., Ouslander, J., & Mor, V. (2020). Variation in SARS-CoV-2 Prevalence in U.S. Skilled Nursing Facilities. *Journal of the American Geriatrics Society*, 68(10), 2167-2173.  
doi:https://doi.org/10.1111/jgs.16752
- Winblad, U., Blomqvist, P., & Karlsson, A. (2017). Do public nursing home care providers deliver higher quality than private providers? Evidence from Sweden. *BMC Health Services Research*, 17(1). doi:10.1186/s12913-017-2403-0
- Wood, S. (2017). Generalized additive models: An introduction with R 2 An Introduction with R. *Generalized Additive Models*, 10, 9781315370279.
- Zhang, X., & Grabowski, D. C. (2004). Nursing Home Staffing and Quality Under the Nursing Home Reform Act. *The Gerontologist*, 44(1), 13-23.  
doi:10.1093/geront/44.1.13
- Zimmerman, S., Gruber-Baldini, A. L., Sloane, P. D., Kevin Eckert, J., Richard Hebel, J., Morgan, L. A., . . . Konrad, T. R. (2003). Assisted Living and Nursing Homes: Apples and Oranges? *The Gerontologist*, 43(suppl\_2), 107-117.  
doi:10.1093/geront/43.suppl\_2.107
- Zimmerman, S., & Sloane, P. D. (2007). Definition and classification of assisted living. *The Gerontologist*, 47(suppl\_1), 33-39.
- Zimmerman, S., Sloane, P. D., & Eckert, J. K. (2001). *Assisted Living: Needs, Practices, and Policies in Residential Care for the Elderly*. Baltimore, MD: The John Hopkins University Press.
- Zimmerman, S., Sloane, P. D., & Reed, D. (2014). Dementia Prevalence And Care In Assisted Living. *Health Affairs*, 33(4), 658-666. doi:10.1377/hlthaff.2013.1255
- Zinn, J. S. (1993). The influence of nurse wage differentials on nursing home staffing and resident care decisions. *Gerontologist*, 33(6), 721-729.  
doi:10.1093/geront/33.6.721
- Zinn, J. S., Aaronson, W. E., & Rosko, M. D. (1993). Variations in the outcomes of care provided in Pennsylvania nursing homes: Facility and environmental correlates. *Medical Care*, 475-487.
- Zinn, J. S., Spector, W., Hsieh, L., & Mukamel, D. B. (2005). Do Trends in the Reporting of Quality Measures on the Nursing Home Compare Web Site Differ by Nursing Home Characteristics? *The Gerontologist*, 45(6), 720-730.  
doi:10.1093/geront/45.6.720