

State Quality of Care Laws and Nursing Home Outcomes in the United States

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THESIS

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SUMMARY

This study assessed the relationship between nursing home regulation and quality outcomes. More specifically, the study examined whether state laws with more stringency were associated with, or can lead to, better quality. Using an inter-governmental nursing home regulatory approach whereby nursing homes in some states were regulated entirely by federal standards, while nursing homes in other states were subject to federal and additional state regulations, analyses were conducted using both cross-sectional pooled regressions analysis and quasi-experimental methods. Quality was measured by quality indicators used by the federal regulatory body, Center for Medicare and Medicaid Services (CMS), and consumer determined quality measured by complaints reported by state long-term care ombudsmen programs (LTCOMP).

The study first compiled and analyzed state quality of care regulations via Boolean keyword searches in commercial legal databases, Westlaw and Lexis Nexis. Next, a coding scheme and longitudinal dataset of state alignment with federal standards for nine key markers was created. The law dataset was then empirically linked to the two types of quality outcomes. Results provided some evidence that more stringent regulation may lead to or is associated with better CMS quality outcomes, but the associations or effects were not consistent across multiple dimensions of quality. However, specificity in the laws mattered. Laws with targeted and defined requirements and incorporating more clinical best practices were often associated with the intended outcome, while laws which were generic in their language and without specific directions, or had relatively looser requirements, were associated with undesirable outcomes. Using a difference in differences design, results showed a worsening of outcomes when a state relaxed its standards and better outcomes when a state enhanced their standards.

SUMMARY (continued)

For consumer determined outcomes, the results were somewhat mixed. Laws that went above federal standards were significantly associated with five out of eight complaint outcomes, with four being associated with a higher rate of complaints. In addition, the majority of findings suggested that notification requirements (reporting a policy predictor condition to someone) were associated with a higher rate of complaints, whereas documentation requirements (state required documentation or medical records on a policy predictor outcome) were associated with a lower rate of complaints.

LIST of ABBREVIATIONS

Activities of Daily Living (ADL)
Administration on Aging (AOA)
Centers for Medicare and Medicaid Services (CMS)
Confidence Interval (CI)
Difference in differences (DID)
Instrumental variable (IV)
Long-term Care Ombudsman Program (LTCOMP)
Minimum Data Set (MDS)
National Ombudsmen Reporting System (NORS)
Nursing Home Compare (NHC)
Office of Inspector General (OIG)
Ordinary Least Squares (OLS)
Standard Error (SE)
Two-stage least squares (2SLS)
Two-stage residual inclusion (2SRI)
Urinary Tract Infection (UTI)

I. OVERALL INTRODUCTION

A. Overview

Low quality of care in nursing homes has been well documented and is a long-standing problem. In 2013, the U.S. Department of Health and Human Services, Office of Inspector General (OIG) found that for 37% of stays, the facilities either did not develop adequate care plans for the resident or failed to meet them. Another 31% of stays did not comply with discharge planning specifications. Reviewers also found instances of inferior care regarding wounds, medication management and therapy.^{1,2} Based on what they discovered, the OIG recommended the Center for Medicare and Medicaid Services (CMS) strengthen regulations and engage in stricter oversight and monitoring of nursing homes' performance.¹ A year later, the OIG estimated that "22% of Medicare beneficiaries experienced adverse events during their stays, while 11% more experienced temporary harm events." For the adverse events, 59% of them were deemed to be clearly or likely preventable, as they were caused by "substandard treatment, inadequate resident monitoring, or failure or delay of necessary care." What's more, over half of the residents who faced harm were treated at hospitals, equating to \$2.8 billion spent on hospital treatment in 2011.^{2,3}

While there is a large body of research surrounding different factors that influence quality of care in nursing homes, such as staffing levels, ownership status (for-profit or not-for-profit) and other facility level characteristics, as well as Medicaid and Medicare payment policies,⁴⁻⁶ few of the studies in this area have focused on the regulation of nursing homes. The federal government regulates nursing homes as part of Titles XVIII and XIX of the Social Security Act. As a result, all nursing homes that accept Medicare or Medicaid residents are required to be certified with minimum standards.⁷ In addition, CMS also "sets state survey and certification procedures, funds

state survey and certification programs and provides central and regional oversight” for the programs.⁸

Besides federal regulations, state health departments also regulate nursing homes and establish care standards through the licensure of providers. Every nursing home has to comply with federal regulations for quality of care, whether they are reiterated in state laws or not. However, some states will use entire or parts of the federal regulations as part of their own laws, while other states have additional requirements that exceed federal standards.⁹ This inter-governmental approach creates a natural experiment whereby nursing homes in some states are regulated entirely by federal standards, while nursing homes in other states are subject to federal and additional state regulations.

The impact of regulation on nursing home quality has only recently been addressed and current studies focus on staffing regulations or regulatory enforcement. Staffing regulation studies have consistently found that more stringent minimum staffing regulations increase staffing levels, but the empirical results on other quality measures are often mixed, depending on different factors such as the type of nurse and quality measure that is being examined.¹⁰⁻¹² For studies that look at quality of care regulation, they mostly assessed deficiency citations for specific outcomes (a dimension of regulatory stringency based on enforcement), or some variation thereof, such as a statewide deficiency citation rate or stringency index, and their relationship to various quality measures.¹³⁻¹⁵ The authors found that some types of issued citations influenced specific quality outcomes and a potential spillover effect, but regulatory quality initiatives didn't achieve consistency across all outcomes.¹³⁻¹⁵

B. Research Purpose and Dissertation Chapters

The main research question this dissertation seeks to contribute to is how state nursing home regulations affect, or are related to, quality of care provided in nursing homes. More specifically, I am examining whether state laws that exceed federal standards and with more stringency are associated with, or can lead to, better quality outcomes. Quality is measured through different lenses, including established quality measures used by CMS to rate nursing homes and complaints reported to state Long-term Care Ombudsman Programs (LTCOMPs) by residents and caregivers. As market-based reforms such as pay-for performance and public reporting have been unable to fully reform nursing home quality,^{6,16} state laws, in addition to federal regulation, can serve as another mechanism for boosting quality.

In order to achieve the research purpose, Chapter II compiled comparative state law data on specific policy predictors contained in federal nursing home quality of care laws for a 10-year period (2005-2014). Primary legal research was conducted in Westlaw and LexisNexis, both considered the official and authoritative sources of laws.^{17,18} A coding scale was subsequently developed to systematically rate and code the quality of care laws, using federal standards as a reference, for analyses in Chapters III and IV. Chapter II is titled “Quality of Care Laws in U.S. Nursing Homes: How Did State Laws Compare to Minimum Federal Standards Over a Ten-Year Period.”

Chapter III, “State Quality of Care Laws and Nursing Home Outcomes: Does More Stringent Regulation Mean Better Outcomes?” subsequently linked the policy predictors from Chapter II to quality measures developed by CMS utilizing Nursing Home Compare Data. Using three law categories, “Federal,” “Federal Plus” and “Federal Enhanced ” that reflect stringency in the laws, Chapter III employed pooled Ordinary Least Squares (OLS) regressions for two time

periods, 2006-2010 and 2011-2015, as well as a difference in differences (DID) analysis and two-stage least squares (2SLS) instrumental variable (IV) analysis for sensitivity and training.

Chapter IV is called “Nursing Home Regulation and Quality of Care: Using State Long-Term Care Ombudsmen Program Complaints as an Analysis.” The chapter linked the policy predictors from Chapter II to complaints filed to state LTCOMPs, as resident and caregiver derived complaints reflect another dimension of quality to supplement Chapter III and other quality reporting efforts.¹⁹ Using state-level data, Chapter IV compared laws that went above federal standards to those at or below utilizing pooled negative binomial regressions for years 2006-2015. Although subject to small sample size and convergence issues, a DID analysis and IV analysis using two-stage residual inclusion (2SRI) models were again included for sensitivity and training.

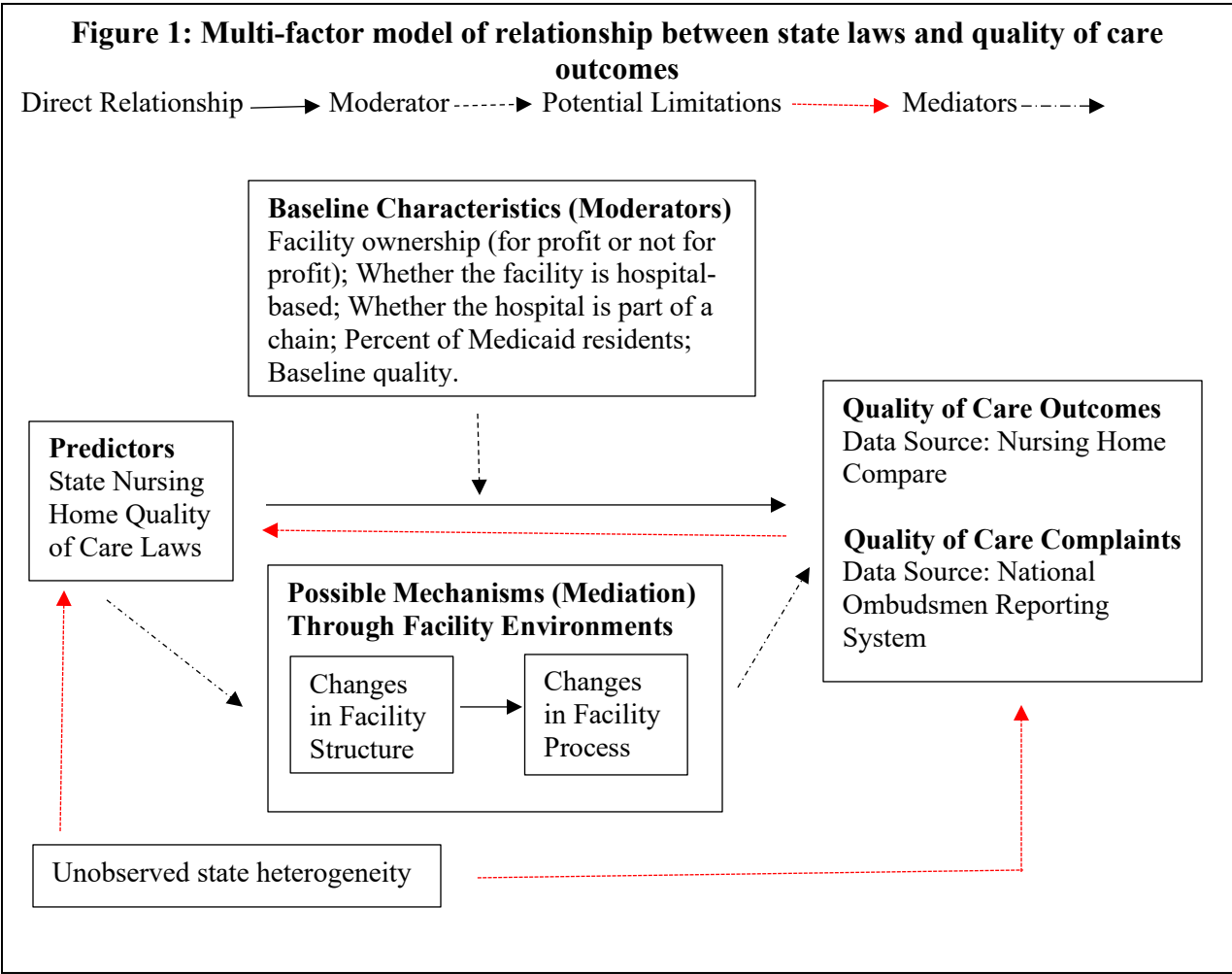
C. Conceptual Framework

Figure 1 below denotes the multi-factor conceptual framework hypothesizing the relationship between my dependent and explanatory variables of interest. Research has suggested that regulatory policies create an external context which drives how healthcare providers are structured and how they operate to improve quality.²⁰ The relationship is mediated through the effects of regulation on provider behaviors and other structures and processes in nursing homes that affect resident outcomes.²¹ In order to sustain operations and adapt to regulatory environments, changes in facility structure and processes are portrayed as a mediating force between regulations and quality measures in the figure.

The relationship between the dependent and explanatory variables may also differ based on facility characteristics such as facility ownership (for-profit or not-for-profit), whether it is hospital-based or part of a chain, the percent of Medicaid patients and baseline quantity. Accordingly, these characteristics are described as potential moderators. Potential limitations are

denoted in red. These include unobserved state heterogeneity that are correlated with both the outcomes and explanatory variables, and the possibility of “reverse causality,” where bad outcomes are driving more stringent laws in states. However, these issues are dealt with separately in the analyses.

The following includes Chapters II, III and IV respectively, and in this specific order. References and appendices from all chapters are contained at the very end.



II. QUALITY OF CARE LAWS IN U.S. NURSING HOMES: HOW DID STATE LAWS COMPARE TO MINIMUM FEDERAL STANDARDS OVER A TEN-YEAR PERIOD?

A. Background

Low quality of care in nursing homes has presented long-standing policy challenges for regulators, consumers, researchers and policy-makers at all levels. Federal reports show that for 37% of stays in 2013, facilities either did not develop adequate care plans for the resident or failed to meet them, while another 31% of stays did not comply with mandated specifications regarding discharge planning.¹ In a separate report the following year, reviewers found that 22% of Medicare beneficiaries experienced adverse events and 11% experienced temporary harm during their stays. Fifty-nine percent of the adverse events were determined to be preventable due to “substandard treatment, inadequate monitoring, or failure or delay of necessary care.” “Over half of the residents who experienced harm were hospitalized with an estimated cost to Medicare of \$208 million in August 2011.”^{2,3}

Since the 1960s, the federal government (then Public Health Service) began studying state licensure standards among growing concerns of poor quality of care. Continuing amendments to the standards and certification process were made during the 1970s and 1980s, and the Nursing Home Reform Act of 1987 mandated major regulatory controls aimed at improving the quality of nursing home care.²² Although several studies found a positive impact on quality after the legislation,⁶ a subsequent report by IOM and other studies have found that important quality concerns still persisted.²³ Recently, results from OIG reports generated congressional inquiries of the Centers for Medicare and Medicaid Services (CMS) about supposedly lax regulation.²⁴

Currently, CMS is the agency responsible for producing and maintaining federal regulations that nursing homes must comply with in order to receive Medicare or Medicaid funding.

Facilities must be annually certified through a CMS survey.⁷ The federal government also “sets state survey and certification procedures, funds state survey and certification programs and provides central and regional oversight” for the programs.²⁵ While quality of care federal standards were last updated in November, 2016, according to Section 483.25 of the Code of Federal Regulations in 2014, “each resident must receive and the facility must provide the necessary care and services to attain or maintain the highest practicable physical, mental, and psychological well-being, in accordance with the resident’s comprehensive assessment and plan of care.”²⁶ The federal regulations on quality of care cover a diverse array of topics, such as activities of daily living (ADL), urinary incontinence and pressure ulcers.

On the state level, quality standards also vary across states as states can choose to add their own standards beyond those required by CMS. All nursing homes must comply with federal stipulations, whether they are reiterated in state laws or not. However, some states mirror entire or parts of the federal regulation in their own state laws, while other states have enhanced regulations that include additional requirements exceeding the federal standards.⁹ Limited data exist on the nature and extent of these state laws and variation over time. Historical data on state laws and regulations (as of 2011) have been compiled by the University of Minnesota’s Nursing Home Regulations Plus (“NH Regs Plus”) program. They examined and compared the content of state regulations related to nursing homes for all states and the District of Columbia through the year 2011.⁹ The data in NH Regs Plus are organized by the F-tag categories used by nursing home surveyors and include topics such as administration, dental services, infection control, nursing services and residents rights, among others. One of the key goals of NH Regs Plus was to highlight regulations that “support culture change directed at increasing resident autonomy and quality of life while maintaining safety standards.”⁹

Research has also been conducted on the specifics of state minimum staffing regulations. Staffing standards were previously compiled in 2008 and 2010 by Harrington, though their compilation has not been updated to reflect recent changes in both state and federal laws.²⁷ The empirical literature often uses this state variation to examine the effects of staffing standards on nurse staffing in facilities, as well as other quality measures.^{10-12,28,29} Current empirical studies examining state non-staffing quality of care regulations have focused on deficiencies citations and the enforcement process (i.e., implementation measures), as opposed to the actual content and requirements of the laws.^{13,14,30} They have found that while more stringent minimum staffing standards mandated by state laws increase staffing levels, the results for other quality measures are often mixed.^{10,12} Studies have also shown that regulatory quality of care initiatives do not usually achieve consistency across all outcomes, and can depend on clinical complementarity and substitutability.^{14,30}

As nursing homes are regulated via an intra-governmental approach, the current study examines the intersection of federal and state law and seeks to build upon the prior research noted above. It delves deeper into quality of care regulations by understanding the extent to which state laws align with or exceed federal standards governing specific dimensions of care. It is important to look at the relationship between federal and state law, because federal law not only provides minimum standards all nursing home must meet, but also a baseline for which to assess the stringency of state regulations. The study goes a step further than prior research in this area to provide a systematic coding scheme for rating the scope and strength of the laws and leads to the compilation of a dataset based on the scale developed. As opposed to simply narrating differences, results from this study can pave the way for more empirical research assessing the effect of regulation on quality of care in the future.

B. Data Source and Methods

This study first compiles comparative state law data on specific policy predictors contained in federal nursing home quality of care laws for a 10-year period (2005-2014), thereby extending beyond what was previously collected by NH Regs Plus. (In this particular study, the definition of “state” includes the 50 states and the District of Columbia. Hereafter, reference to “state laws” refers to all states and the District of Columbia.) It then develops an ordinal rating system to determine the scope and strength of state laws, using the federal standards as a reference and based on similar public health law coding schemes employed for other topic areas.³¹⁻³⁵ Finally, the collective body of each state’s laws was coded separately for each year according to the developed ratings and policy predictors.

The nursing home quality of care laws in this study were compiled through primary legal research using LexisNexis and Westlaw. Both are commercially available legal research services and the main publishers of all codified statutory and administrative law for federal laws, law of the 50 states, and the District of Columbia.^{17,18} Unlike state legislature websites, LexisNexis and Westlaw are considered the official, authoritative sources of such laws. Only codified laws were used for the study as these, unlike non-codified laws and guidance documents, carry the force of the law.^{36,37} Relevant laws were identified by conducting Boolean keyword searches in the two databases. A list of the search terms is available in Appendix A. Secondary data sources including NH Regs Plus, which provides state nursing home regulations for the year 2011,⁹ were also cross-referenced. State laws enacted as of December 31, 2005 served as the baseline, while laws adopted as of December 31, 2014 served as the endpoint.

A coding scale was subsequently developed to rate the quality of care laws. Nine policy predictors were identified based on the federal regulations and quality measures CMS deemed

important enough to include in Nursing Home Compare. They represent different aspects of quality and were the result of extensive testing that included both provider and consumer concerns of what indicators were most useful for CMS to publicly report.²² They have been referred to in the literature as of particular importance to nursing home patients and frequently used as quality outcomes.^{6,13,30,38-41} The policy predictors are 1) Pressure Ulcer; 2) Activities of Daily Living (ADL); 3) Bowel and Bladder; 4) Catheter; 5) Pain; 6) Antipsychotic Drugs; 7) Unnecessary Drugs; 8) Weight, and 9) Therapeutic Diet. Each policy predictor measures the extent to which the given measure is addressed in each state's law. Table I below presents the definitions for each policy predictor. For the purposes of this study, antipsychotic drugs and unnecessary drugs are treated as drug use-related predictors, while the remaining are grouped into physical health-related predictors.

TABLE I: DEFINITIONS OF POLICY PREDICTOR

Physical Health-Related
1) Pressure Ulcer: the treatment of pressure ulcers in nursing home residents
2) ADL: the maintenance or restoration of residents' ADLs
3) Bowel and Bladder: the maintenance or restoration of residents' normal bladder function
4) Catheter: the use of catheters for urinary incontinence in nursing home residents
5) Pain: the recognition and management of pain in nursing home residents
6) Weight: the monitoring of weight in nursing home residents
7) Therapeutic Diet: the use of therapeutic diets for nursing home residents
Drug Use-Related
8) Antipsychotic Drug: the use of antipsychotic drugs in nursing home residents
9) Unnecessary Drug: the use of unnecessary drugs and excessive medication in nursing home residents

Individual ordinal scales were further developed for the policy predictors based on three main sources: the Guidance to Surveyors for Long Term Care Facilities contained in the State Operations Manual published by CMS, clinical guidelines and best practices, and common patterns found in the state laws.⁴²⁻⁴⁵ The State Operations Manual is an extremely detailed document that includes information on the intent of the federal regulations, interpretative guidelines, procedures and investigative protocols, setting the standard for what CMS requires of nursing homes. It also includes references and resources to clinical practice guidelines from professional healthcare associations.⁴²

State policies were evaluated based on how closely they aligned with the intent and guidelines set forth by CMS and clinical best practices.⁴²⁻⁴⁵ As a general matter, however, strong, required policy provisions (including language such as shall, must, will, require, comply, and enforce) trumped weak or recommended policy provisions (language such as should, might, encourage, some, make an effort to, partial, and try.) Consistent with other policy coding, detailed provisions with strategies also trumped broad, generic language.^{31,34,46,47} An ordinal scheme was created for each for the nine policy predictors noted above; the schemes ranged from 0-4 or 0-5 depending on the scope of the federal regulation, best practices, and variation in state regulation content. For each variable, a value of 0 indicated that a state had no policy on a particular outcome. A value of 1 indicated that a state recommended a particular outcome or course of action or had requirements that were below federal standards. If a state mirrored or repeated the minimum federal requirements, a value of 2 was assigned. When states had standards exceeding federal requirements, they were benchmarked and a value of 3 or higher was assigned accordingly. In every case, a higher score indicated a more specific and binding policy, and the highest scores reflects standards of best practices and the intent of CMS. However, because the federal regulations

did not address pain during the study period, pain was coded as 0 if state law did not address pain. A value of 1 indicated that a state had recommended provisions on pain, whereas a value of 2 or higher was assigned based on the specificity regarding pain management in the laws. A detailed description of the coding scale is available in Appendix B.

The maximum score a given state could achieve across the nine items were they to receive the maximum score on each individual variable was 40. Two “tracking variables” were also coded separately: a notification variable and a documentation variable. Notification was where a state required the notification or reporting of the policy predictor condition (ex: pressure sore) regardless to whom, such as a physician or nurse. For documentation, a state required documentation or medical records on the policy predictor outcome.

A second coder (also with a JD who also has developed and applied numerous state law rating systems) also reviewed the laws of five states, ten percent of the sample, to ensure reliability. After comparing the initial ratings, the inter-rater agreement was high at 81.11%. This process helped clarify any confusion in the coding protocol and a final coding consensus was thereby reached.

C. Results

This section is organized by first examining the strength of each policy predictor over time and displaying the number and percentage of states in each rating. Next, state-specific findings are presented for the nine policy predictors and states’ summary scores from them. Changes in state laws over the study period are detailed at the end.

1. Strength of Policy Predictors over Time

Table II below presents the strength of the state nursing home quality of care laws over time. (For brevity purposes, data for 2005 and 2014 are presented in the Table; data for all years

are presented in Appendix C.) A coding of 2 indicates that a state repeated the federal regulations as part of its own laws. A coding below 2 indicates that states either had no laws or had laws below federal standards, while a coding above 2 indicates that states had requirements that exceeded federal standards, except for pain whereby a score of 2 or higher indicates specific standards governing pain management.

Table III summarizes the areas where states had more laws exceeding federal standards, using the most recent year 2014 as the reference, include ADL (50.98%), pressure ulcers (52.94%), bowel and bladder (50.98%), catheters (45.10%), weight (39.22%) and therapeutic diets (68.63%). In contrast, states were less likely to address or exceed federal standards related to antipsychotic drugs (13.73%) and unnecessary drugs (9.80%). 21.57% of states had laws that addressed pain even though the federal regulations did not. These latter three policy predictors also had the highest percentages where states did not have any laws on the book – 66.67% for antipsychotic drugs and for unnecessary drugs, and 78.43% for pain. Bowel and bladder and therapeutic diet had the largest percentage of states in the highest rating category (i.e., meeting best practice standards), with 33.33% and 52.94% respectively.

For the two tracking variables, three states had notification requirements for pressure ulcers and weight, while urinary incontinence and antipsychotic drugs each had one state with notification requirements. Documentation requirements were slightly more prevalent. Pressure ulcers, bowel and bladder, ADL, and pain each had two states with documentation requirements. Therapeutic diets had four states, antipsychotic drugs had four, catheter had six and weight had ten states with documentation requirements in 2014. Detailed tables containing the states in each category are available in Appendix D.

The findings seem to suggest that drug use in nursing homes draws less attention than

physical health symptoms, with the exception of pain. A plausible explanation for why states did not usually mention pain in their policies could be that federal regulations did not include pain before 2016.

2. State Specific Findings

Table IV below presents the summary scores of states over time. In 2014, states ranged from a score of 0 to 30 out of a maximum score of 40. States would have a summary score of 16 if they followed federal law across all nine policy predictors. The three states with the highest scores were Oklahoma, California and New Jersey, respectively. Montana and North Dakota had the least regulation. Oklahoma and New Jersey exceeded federal standards in the areas of pressure ulcers, ADLs, bowel and bladder, and catheter and also addressed pain. On the other hand, when looking at antipsychotic drug use and unnecessary drug use, New York and Illinois were the only states that exceeded federal requirements in both areas. States that were strongest in the physical health area did not overlap with states with the most stringent laws regarding drug use. This could suggest that different states tend to emphasize different aspects of nursing home care.

Overall, there were nine states (California, Michigan, New Jersey, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee and Wisconsin) that didn't follow federal law at all in the nine policy predictors examined. Two states, Alabama and Nevada, completely followed federal law, while the remaining 40 states fell in between with some policy predictors following federal standards and others not. Detailed information on state specific values for each policy predictor is available in Appendix C. A table containing state summary scores for all years is available in Appendix E.

1. Changes in State Law over Time

When looking at changes in total summary scores from 2005 to 2014 in Table IV, six states

TABLE II: NUMBER AND PERCENTAGE OF STATES IN EACH RATING OVER TIME BY POLICY PREDICTOR CATEGORY							
Policy Predictor/ Year	0 N (%)	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	Mean (SE)
Physical Health-Related							
ADL							
2005	10 (19.61)	4 (7.84)	10 (19.61)	10 (19.61)	5 (9.80)	12 (23.53)	2.63 (0.25)
2014	10 (19.61)	5 (9.80)	10 (19.61)	9 (17.65)	5 (9.80)	12 (23.53)	2.59 (0.25)
Pressure Ulcer							
2005	11 (21.57)	5 (9.80)	10 (19.61)	7 (13.73)	13 (25.49)	5 (9.80)	2.41 (0.24)
2014	10 (19.61)	4 (7.84)	10 (19.61)	8 (15.69)	13 (25.49)	6 (11.76)	2.55 (0.24)
Bowel and Bladder							
2005	13 (25.49)	2 (3.92)	9 (17.65)	10 (19.61)	17 (33.33)	-	2.31 (0.22)
2014	13 (25.49)	3 (5.88)	9 (17.65)	9 (17.65)	17 (33.33)	-	2.27 (0.22)
Catheter							
2005	17 (33.33)	0 (0)	10 (19.61)	20 (39.22)	4 (7.84)	-	1.88 (0.20)
2014	17 (33.33)	1 (1.96)	10 (19.61)	19 (37.25)	4 (7.84)	-	1.84 (0.20)
Pain^a							
2005	40 (78.43)	0 (0)	1 (1.96)	6 (11.76)	4 (7.84)	-	0.71 (0.19)
2014	40 (78.43)	0 (0)	1 (1.96)	6 (11.76)	4 (7.84)	-	0.71 (0.19)
Weight							
2005	20 (39.22)	0 (0)	11 (21.57)	10 (19.61)	2 (3.92)	8 (15.69)	1.96 (0.26)
2014	19 (37.25)	0 (0)	12 (23.53)	10 (19.61)	3 (5.88)	7 (13.73)	1.98 (0.25)
Therapeutic Diet							
2005	9 (17.65)	1 (1.96)	6 (11.76)	8 (15.69)	27 (52.94)	-	2.84 (0.21)

TABLE II: NUMBER AND PERCENTAGE OF STATES IN EACH RATING OVER TIME BY POLICY PREDICTOR CATEGORY (continued)							
Policy Predictor/ Year	0 N (%)	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)	Mean (SE)
Therapeutic Diet							
2014	8 (15.69)	3 (5.88)	5 (9.80)	8 (15.69)	27 (52.94)	-	2.84 (0.21)
Drug Use-Related							
Antipsychotic Drug							
2005	35 (68.63)	0 (0)	10 (19.61)	3 (5.88)	1 (1.96)	2 (3.92)	0.84 (0.19)
2014	34 (66.67)	0 (0)	10 (19.61)	3 (5.88)	2 (3.92)	2 (3.92)	0.92 (0.20)
Unnecessary Drug							
2005	34 (66.67)	3 (5.88)	10 (19.61)	2 (3.92)	2 (3.92)	-	0.73 (0.16)
2014	34 (66.67)	3 (5.88)	9 (17.65)	3 (5.88)	2 (3.92)	-	0.75 (0.17)

^a As federal regulations did not address pain during the study period, pain was coded as 0 if state law did not address pain. A value of 1 indicated that a state had recommended provisions on pain, whereas a value of 2 or higher was assigned based on the specificity regarding pain recognition and management in the laws.

TABLE III: COMPARISON OF STATE LAWS TO FEDERAL STANDARDS AND NOTIFICATION/DOCUMENTATION REQUIREMENTS BY POLICY PREDICTOR, 2014				
Policy Predictor	Number and percentage (%) of states at or below federal standards	Number and percentage (%) of states exceeding federal standards	Number and percentage (%) of states with notification requirements	Number and percentage (%) of states with documentation requirements
Physical Health-Related				
Pressure Ulcer	24 (47.06)	27 (52.94)	3 (5.88)	2 (3.92)
ADL	25 (49.02)	26 (50.98)	0 (0)	2 (3.92)
Bowel and Bladder	25 (49.02)	26 (50.98)	1 (1.96)	2 (3.92)
Catheter	28 (54.90)	23 (45.10)	0 (0)	6 (11.76)
Pain	40 (78.43)	11 (21.57)	0 (0)	2 (3.92)
Weight	31 (60.78)	20 (39.22)	3 (5.88)	10 (19.61)
Therapeutic Diet	16 (31.37)	35 (68.63)	0 (0)	4 (7.84)
Drug Use-Related				
Antipsychotic Drugs	44 (86.27)	7 (13.73)	1 (1.96)	3 (5.88)
Unnecessary Drugs	46 (90.20)	5 (9.80)	0 (0)	0 (0)

increased their summary scores while one state (HI) had a lower score in 2014. Hawaii enhanced its standards with regards to pressure ulcers, but also relaxed the standards relating to ADL, Bowel and Bladder, Catheter, and weight, resulting in a lower score overall. Table V below identifies the changes states made over time; eight out of nine policy predictors had changes. Only pain did not have any changes. The notification and documentation tracking variables had changes to anti-psychotic drugs over time. Overall, however, there was minimal change to state laws or to the composition of the ratings categories reflected in Table I Between 2005 and 2014.

A. Discussion

While building off prior work in NH Regs Plus, this study digs deeper into state quality of

Table IV: STATE SUMMARY SCORES (MAXIMUM SCORE = 40 POINTS) AND COMPARISON TO FEDERAL STANDARDS												
Total Summary Score (out of 40) and Comparison Over Time				Comparison of Provisions to Federal Standards, 2014 Only								
State	2005	2014	Change	ADL ^a	PU ^b	BB ^c	Cath ^d	Pain ^e	W ^f	TD ^g	AP ^h	UN ⁱ
AL	16	16	0	= ^j	=	=	=	=	=	=	=	=
AK	15	15	0	> ^k	< ^l	>	>	=	<	>	<	<
AZ	5	6	+1	<	<	<	<	=	<	<	>	=
AR	24	24	0	>	>	>	>	=	>	>	<	<
CA	28	28	0	>	>	>	<	>	>	>	>	<
CO	22	22	0	>	>	>	>	=	>	<	>	<
CT	9	9	0	<	<	<	<	=	>	>	<	<
DE	3	7	+4	<	<	<	>	=	>	>	<	<
DC	20	20	0	>	>	>	<	=	<	>	<	<
FL	3	3	0	<	<	<	<	=	<	>	<	<
GA	0	3	+3	<	<	<	<	=	<	<	<	<
HI	19	10	-9	<	>	<	<	=	>	>	<	<
ID	18	18	0	>	>	>	>	=	<	>	<	<
IL	25	25	0	=	=	=	>	=	>	>	>	>
IN	21	21	0	>	>	=	=	=	<	>	=	=
IA	24	24	0	>	=	>	>	=	=	>	=	=
KS	17	17	0	=	>	=	=	=	=	>	<	<
KY	24	24	0	>	>	>	>	=	=	>	=	<
LA	21	21	0	>	>	>	>	=	=	>	=	<
ME	23	23	0	>	>	>	>	=	<	>	<	>
MD	22	22	0	>	>	>	>	=	>	>	<	<
MA	23	23	0	>	>	>	>	=	>	>	<	<
MI	25	25	0	>	>	>	>	>	>	>	<	<
MN	23	23	0	>	>	>	>	=	>	<	<	>
MS	11	11	0	<	=	>	=	=	=	<	<	<
MO	16	16	0	>	<	>	>	=	>	>	<	<
MT	0	0	0	<	<	<	<	=	<	<	<	<
NE	21	21	0	=	>	=	=	>	>	>	<	<
NV	16	16	0	=	=	=	=	=	=	=	=	=
NH	4	4	0	<	<	<	<	=	<	>	<	<
NJ	26	27	+1	>	>	>	>	>	>	<	<	<
NM	8	8	0	<	>	<	<	=	<	>	<	<

TABLE IV: STATE SUMMARY SCORES (MAXIMUM SCORE = 40 POINTS) AND COMPARISON TO FEDERAL STANDARDS (continued)												
Total Summary Score (out of 40) and Comparison Over Time				Comparison of Provisions to Federal Standards, 2014 Only								
State	2005	2014	Change	ADL ^a	PU ^b	BB ^c	Cath ^d	Pain ^e	W ^f	TD ^g	AP ^h	UN ⁱ
NY	21	21	0	=	=	=	=	=	=	=	>	>
NC	19	19	0 ^m	=	=	=	=	=	=	>	=	>
ND	1	1	0	<	<	<	<	=	<	<	<	<
OH	5	9	+4	<	<	<	<	=	>	>	<	<
OK	30	30	0	>	>	>	>	>	>	>	<	<
OR	19	19	0	>	<	>	>	>	>	>	<	<
PA	14	14	0	>	<	>	>	=	<	>	<	<
RI	21	21	0	>	>	>	>	>	>	<	<	<
SC	3	6	+3	<	>	<	<	=	<	<	<	<
SD	7	7	0	<	<	<	<	>	<	>	<	<
TN	23	23	0	>	>	>	<	>	>	>	<	<
TX	23	23	0	>	=	>	>	=	=	>	>	=
UT	18	18	0	=	=	>	<	=	=	=	=	=
VA	9	9	0	<	>	<	<	=	<	>	<	<
VT	21	21	0	>	=	>	>	>	=	=	=	=
WA	11	11	0	=	>	<	<	=	<	>	<	<
WI	16	19	0 ^m	>	>	<	<	>	<	<	>	<
WV	20	20	0	=	>	>	=	=	>	>	=	=
WY	19	19	0	>	>	>	>	=	<	>	<	<

^a ADL: Activities of Daily Living.

^b PU: Pressure Ulcer.

^c BB: Bowel and Bladder.

^d Cath: Catheter.

^e As the federal regulations did not address pain during the study period, any state that didn't mention pain would be equal to the federal standards in this table.

^f W: Weight.

^g TD: Therapeutic Diets.

^h AP: Antipsychotic Drugs.

ⁱ UN: Unnecessary Drugs.

^j =: State had laws mirroring federal standards.

^k >: State had laws exceeding federal standards.

^l <: State had laws below federal standards.

^m While there was no change to the summary score when comparing 2014 to 2005, there were individual changes in between (see Table V).

TABLE V: STATES WITH CHANGES TO CODING BY POLICY PREDICTOR OVER TIME					
ADL		Bowel and Bladder		Catheter	
HI	2011: 3 to 0	HI	2011: 3 to 0	HI	2011: 3 to 0
GA	2013: 0 to 1	GA	2013: 0 to 1	GA	2013: 0 to 1
Pressure ulcer		Weight		Therapeutic Diet	
SC	2008: 0 to 4	DE	2009: 0 to 4	WI	2007: 4 to 1
HI	2011: 1 to 3	HI	2011: 5 to 3	SC	2008: 2 to 1
NJ	2012: 4 to 5	NC	2012: 3 to 2	OH	2012: 0 to 4
Antipsychotic Meds		Unnecessary Drugs		Pain	
WI	2006: 0 to 3	NC	2013: 2 to 3	N/A	-
AZ	2013: 3 to 4	-		-	-
Notification Requirements (Tracking only)			Documentation Requirements (Tracking only)		
Antipsychotic Meds			Antipsychotic Meds		
WI	2007: 0 to 1	-	AZ	2014: 1 to 0	-

care policy predictors with an innovative approach. It not only presents ten years of data, extending beyond what was previously collected, but also creates a novel, longitudinal dataset of state alignment with federal standards covering nine key markers and two administrative-related provisions. Instead of a narrative or tabular form, the dataset allows for organized comparison of the scope and strength of state regulations through the intersection of federal and state law. The study provides opportunities for statistical analysis of nursing home quality of care regulation in future research.

Results show that within these nine policy predictors, state emphasized certain policy predictor areas more than others. This could potentially be that some concerns have traditionally been of more importance to regulators, or there was more awareness of the issue. In contrast, some of the areas have been more recently addressed. For example, Nursing Home Compare did not

start publicly reporting outcome data on antipsychotic drug use until 2011.⁴⁸ And, the federal regulations did not include pain until 2016.⁴⁹

1. Background and Rationale for Some States with More Stringent Laws

Recognizing that federal law technically trumps state law, state laws do not actually have to be amended to align with, much less, exceed federal standards. Understanding why certain states opted to develop standards that exceeded federal nursing home quality-related laws can be particularly insightful. This section delves into why some states have chosen to enact more stringent laws in specific areas, illustrating four states, New Jersey, Oklahoma, Michigan and Illinois as examples.

New Jersey, one of the relatively stringent states, passed a Nursing Home Act in 1976. This followed a concurrent resolution from the legislature for the creation of a commission to inquire into the condition of nursing homes in 1974, after a proliferation of facilities due to a change of familial structure and the growth of Medicaid and Medicare programs. While this had already generated several federal congressional investigations, New Jersey recognized that the primary responsibility for regulation and supervision of these facilities rested with state government.⁵⁰ Hence, a law was passed to give residents a bill of rights similar to another bill passed by the Legislature that enumerated certain rights of the mentally ill.⁵⁰

Another state, Oklahoma, had strong laws on pain since 2004. A state legislator, Rep. Rebecca Hamilton, had become aware of the pain situation regarding senior nursing home residents and dementia patients, and hence the importance of detection and management of pain. She spearheaded a legislative study at the state capitol and introduced a bill that established an advisory council on pain management. Changes to nursing home regulations were made soon after to include pain assessment and management.⁵¹ In contrast, Michigan added that residents had a

right to adequate pain and symptom management as part of an “End of Life Care Package” in 2002. However, the state mostly focused on palliative and hospice care and no specific protocols on pain management were included in the laws.⁵²

Illinois, which had strong requirements on the administration of psychoactive drugs, enacted the Nursing Home Care Reform Act of 1979 among worries of reports regarding “inadequate, improper and degrading treatment of patients in nursing homes.”⁵³ The Act was passed among specific reports of abuse, neglect and unsatisfactory treatment of residents in private nursing homes, and explicitly conferred certain rights on nursing home residents. As part of the resident’s rights’ section, unnecessary drugs and psychotropic treatments were included in 1993.^{54,55}

From these examples we see that by bringing specific issues concerning resident care in nursing homes to state legislators’ attention, or if a state recognizes more responsibility in regulation other than the federal government, increased quality regulation may arise to address the issues.

2. Rationale for Changes to States’ Laws over Time

Overall, a total of nine states had changes in eight policy predictor areas during the study period. Some of the reasons for amendments that strengthened or weakened state laws and that were cited in state legislative history include:

- Changes in applicable law and being consistent with 42 CFR Part 483 Requirements for Long Term Care Facilities (Hawaii and South Carolina).^{56,57}
- Requiring facilities to develop and implement policies and procedures that are specific to the type of population they will be serving and specific services that they will be providing (Hawaii).⁵⁶
- Updating regulations to reflect certain guidelines, directives, interpretations, and changes in licensing department policy (South Carolina)⁵⁷ as well as national trends and current practices (Arizona).⁵⁸

- Clarifying language to be more easily understood and interpreted while getting rid of outdated rules (North Carolina).⁵⁹
- Providing consistency within health care institution rules (Arizona).⁵⁸

These rationales did not always result in enhanced regulation across the board. As shown in Table V above, states sometimes enhanced their standards in specific areas while relaxing them in others.

3. Debate Surrounding Nursing Home Regulation

Opponents of nursing home regulation often claim that excessive regulation inhibits nursing home resident autonomy, staff innovation and, in turn, resident-centered care. They maintain this type of environment creates legal anxiety for providers rather than fostering collaboration and support.^{2,60,61} Proponents, on the other hand, argue that regulation is necessary given low provider performance and the OIG identified nursing home oversight as a top priority in 2014.^{1,2,60} This study is particularly relevant and valuable when addressing these arguments because the methodology and results provide specific information on what states have laws exceeding federal standards, in which areas, and how these policies have changed over time. It can be used as a reference to help understand the stringency and scopes of state laws for purposes of comparison and future research. This study is the first to offer a framework for capturing the variation in relevant state laws and rating state laws using a rigorous approach, and provides a foundation for examining other nursing home licensing laws and tracking changes over time.

B. Limitations and Future Research

Both statutory and regulatory laws were examined in this study; however, non-codified policies and guidance documents were not included. State level non-regulatory interventions, such as financial incentives provided by state Medicaid programs, and facility-level policies were also not considered. Quasi-governmental organizations, such as the Institute of Medicine (now the

National Academy of Medicine) and Joint Commission, also have recommendations and guidelines that may affect facility practices but are not captured here.

This study is not intended to be a comprehensive rating of all state nursing home licensing laws. The policy predictors reflect different dimensions of quality and should not be used to interpret the overall strength of the entirety of a state's nursing home regulation, only as it relates to these specific dimensions. For example, while Oklahoma was found to have relatively stringent laws regarding seven of the policy predictors, 46% of their nursing homes were found to have relatively low overall 5-star quality ratings (1-2 stars out of 5), compared to the national 36%. This could indicate an issue with enforcement or the state is lacking in other domains, as the five-star rating covers state health inspections, staffing ratios and quality measures.⁶² Also, resident weight is a broader policy predictor. Our coding scale focuses on the monitoring of weight, but there could be other factors not captured in a handful of laws. The coding was based on the language contained in the federal quality of care regulations, and CMS's directions to measure a resident's weight over time to identify weight loss or gain.⁴²

Future research may focus on developing a rating system for other sections of the federal and state nursing home licensing regulations. These could include, but not limited to, other aspects of quality of care, nursing services, quality of life, etc.⁹ All aspects need to be considered before an overall measure can be developed and applied. In addition, at the end of 2016, CMS made several amendments to the federal regulations on nursing home requirements, seeking to modernize standards to reflect changes that have occurred since the nursing home Reform Act of 1987.⁶⁰ Laws (both federal and state) should be followed for a longer period of time in order to assess these changes and capture any subsequent shifts in state alignment to federal standards. Future research should also seek to examine the relationship between state nursing home regulation

and quality outcomes. This will enable researchers and policy-makers to more fully understand how regulation impacts quality in nursing homes.

C. Conclusion

In summary, this study was the first of its kind to analyze the contents of specific state nursing home quality of care laws, compare them to federal standards, and develop an organized coding scale to systemically rate the strength and scope of state regulations. The study enabled us to understand which states had more stringent regulations, and in which areas, and the law changes over time. The findings showcased the areas (mostly physical health symptoms with the exception of pain) states emphasized and the limited nature of changes in state laws over the ten-year period, 2005-2014.

III. STATE QUALITY OF CARE LAWS AND NURSING HOME OUTCOMES: DOES MORE STRINGENT REGULATION MEAN BETTER OUTCOMES?

A. Introduction

Low quality of care in nursing homes has been a persistent problem for decades, catching the attention of government bodies, consumers and researchers alike. In 2013, the U.S. Department of Health and Human Services, Office of Inspector General (OIG) found that for 37% of stays, the facilities either did not develop adequate care plans for the resident or failed to meet them. Another 31% of stays did not comply with discharge planning specifications. Reviewers also found instances of poor care regarding wound care, medication management, and therapy.^{1,2} Based on what they discovered, the OIG recommended that CMS strengthen regulations and engage in stricter oversight and monitoring of nursing homes.¹ A year later, the OIG estimated that 22% of Medicare beneficiaries experienced adverse events during their stays, while 11% more experienced temporary harm events. For the adverse events, 59% of them were deemed to be clearly or likely preventable, as they were caused by “substandard treatment, inadequate resident monitoring, or failure or delay of necessary care.” What’s more, over half of the residents who experienced harm went to a hospital for treatment, equating to \$2.8 billion spent on hospital treatment in 2011.^{2,3}

At the same time, “just over 1.4 million residents were living in US nursing homes on December 31, 2014, corresponding to 2.6% of the over-65 population and 9.5 % of the over-85 population. Slightly more than fifteen percent (15.5%) of the nursing home population was under age 65, while 7.8 % was over 95 years.”⁶³ While ensuring quality of care for this vulnerable population is without a doubt critical, there have been reported issues with enforcement and debate regarding whether more stringent regulation is beneficial for residents.^{1,2,60,61}

1. Regulatory Framework

A significant influence on nursing home quality has come from federal and state regulatory oversight, including licensure and certification requirements and payments nursing homes receive from public programs.²² Currently, CMS is the agency responsible for producing and maintaining federal regulations that nursing homes must comply with in order to receive Medicare or Medicaid funding. The federal government also “sets state survey and certification procedures, funds state survey and certification programs and provides central and regional oversight” for the programs.^{7,25}

Besides federal regulations, state health departments also use a licensure process to establish standards for nursing home care. All nursing homes must adhere to federal requirements for quality of care, even if they are not reiterated in state regulations. However, some states repeat entire or parts of the federal quality of care regulation as part of their own state laws, while other states have additional requirements that exceed federal standards.⁹ This inter-governmental approach creates a natural experiment whereby nursing homes in some states are regulated entirely by federal standards, while nursing homes in other states are subject to federal and additional state regulations.

2. Literature Review

The impact of regulation on nursing home quality of care has only recently been addressed. While there is a large amount of literature examining factors influencing quality of care, such as staffing levels, ownership status and other facility level characteristics,^{4,5,64-66} few of the studies in this area have focused on the regulation of nursing homes, especially outside of staffing regulations. In addition, current studies that address quality of care regulation tend to focus on the enforcement aspect, often using deficiency citations as the main variable of interest or outcome.^{13,14,30,67}

Bowblis et al. and Bowblis and Lewis in two recent studies assessed the impact of the number of federal deficiency citations, a measure of one dimension of regulatory stringency, on quality.^{13,14} In the first article, the authors regressed “nursing home care practices of physical restraint, indwelling urinary catheter and feeding tube use” on deficiencies issued during the certification process, in order to evaluate the impact of minimum quality standards and nurse staffing requirements.¹⁴ The second article measured the impact of regulatory stringency by the statewide deficiency citation rate over the past year, while measuring quality with the proportion of residents who are using antipsychotic medication.¹³ Both studies found an impact of specific types of citations on specific quality outcomes. Furthermore, they showed that there is potentially a spillover effect across targeted dimensions of quality, depending on clinical complementarity and substitutability.^{13,14} Another article by Lucas and Bowblis found that deficiency citations for unnecessary drug use increased after CMS revised guidelines for state deficiency citations and added dementia care guidelines with surveyor training.⁶⁷

Using an instrumental variables technique, Mukamel et al. regressed “quality measures on the Harrington Regulation Stringency Index and control variables.” Quality measures included “staffing hours by type per case-mix adjusted day, hotel expenditures, and risk-adjusted decline in activities of daily living, high-risk pressure sores and urinary incontinence.” The study found four significant results among the seven measures and concluded with a cost-effectiveness analysis on quality regulations.³⁰ On the qualitative side, a single case study looked at multiple public data sources on a large for-profit nursing chain in California, with a focus on regulatory actions and litigation from 2003 to 2011. The authors found “the state issued numerous deficiencies for violations of the nurse staffing and quality standards with minimal impact on quality compliance with state law.”⁶⁸

In terms of staffing regulations, studies have consistently found that more stringent minimum staffing regulations increase staffing levels, but the empirical results on other quality measures are often mixed, depending on different factors such as the type of nurse and quality measure that is being examined.^{10,12,69}

3. Study Purpose

This chapter fills a significant gap in the study of regulation on quality of care in nursing homes. This study seeks to provide insight on how state regulations that exceed federal standards are related to the quality of care provided in nursing homes, and further understand the role that state laws can play in influencing quality in nursing homes. To the best of my knowledge, this is the first study to empirically link the contents of state quality of care regulations, and the extent they align with federal standards, to quality outcomes.

4. Hypothesis

My first hypothesis is that for each policy predictor, more stringent state laws should reflect better nursing home quality. More specifically, I hypothesize that state laws with targeted and defined requirements above federal standards should see an inverse association with poor outcomes, compared to states that follow federal standards. For states with generic requirements, it is possible to see mixed results. On one hand, one could logically infer that because states are addressing aspects the federal regulations did not, they should have better outcomes. On the other hand, empirical literature in other public health topics have shown that laws lacking specific standards may be associated with undesirable outcomes.^{70,71}

Second, I hypothesize that more stringent state regulations will positively impact quality of care in nursing homes over time. This should be reflected when there are changes to states' laws

over time. Namely, I hypothesize that when states enhance their standards, we should see a better outcome and if states relax their laws, we would expect to see a worse outcome.

B. Methods

1. Data Sources

State nursing home quality of care laws were compiled through Boolean keyword searches in LexisNexis and Westlaw. Both are commercially available legal research services and the main publishers of all codified statutory and administrative law for federal laws, law of the 50 states, and the District of Columbia.^{17,18} Details on the compilation of the state law data are contained in the measures section below. Secondary sources, such as University of Minnesota's Nursing Home Plus were also consulted.⁹ Laws enacted or adopted as of as December 31, 2005, served as baseline, while those enacted or adopted as of December 31, 2014 served as the endpoint.

Outcome data were obtained from the Nursing Home Compare (NHC) system. Nursing Home Compare data is collected by CMS and comes from three sources: CMS's health inspection database, the Minimum Data Set (MDS) and Medicare claims data.^{72,73} The MDS is an assessment done by nursing homes providers periodically on residents in Medicare or Medicaid certified nursing homes. The assessment includes a resident's physical health, mental status and others. This information is then used by both the nursing home and CMS. The nursing home will “develop a plan of care for the resident based on the needs identified in the assessments,” and CMS uses some of the data to develop quality measures for specific dimensions of nursing home care.⁷³ CMS switched from MDS version 2.0 to version 3.0 in late 2010, with changes “pertaining to quality-of-life assessment and the use of resident interviews and standardized assessment procedures,” among others.^{72,74} Deficiency data and other nursing home characteristics are also available in NHC.

Covariate data were obtained from Brown University's Long-term Care Focus Data. Partially funded by the National Institute on Aging, LTCfocus.org is a product of the Shaping Long-Term Care in America Project and is located within the Brown University Center for Gerontology and Healthcare Research.⁷⁵ Drawn from various data sources, including MDS and Online Survey Certification and Reporting (OSCAR) and Certification and Survey Provider Enhanced Reporting (CASPER) systems, LTCfocus.org provides data for researchers on nursing homes, including, but not limited to, the "health and functional status of nursing home residents and the characteristics of nursing home facilities."⁷⁵ No resident level data were available on these websites and the data is aggregated to the facility and state levels. Both outcome and covariate data were obtained for years 2006-2015.

2. Measures

a. Key Study Variables – State Policy Predictors

The main variables of interest in this study were the state policy predictors regulating different dimensions of quality of care. Seven policy predictors were identified based on the diverse array of topics covered in the federal quality of care regulations or in recommendations made to CMS, and which also corresponded to the quality outcomes used by CMS. They are: pressure ulcers, activities of daily living, bowel and bladder, catheter, pain, antipsychotic drugs and unnecessary drugs. While pain was not addressed in the federal regulations during the study period, it was included among the quality indicators that were deemed most useful for CMS to publicly measure as result of extensive testing that included both provider and consumer input.²² These policy predictors have also been referred to in the literature as of particular importance to nursing home residents and frequently examined.^{6,13,30,38-41}

A coding scale was developed to evaluate the scope and strength of state laws pertaining to each of the seven policy predictors. Detailed information on the state law coding scheme is available in Chapter II. The schemes ranged from 0-4 or 0-5 depending on the scope of the federal regulation, best practices, and variation in state regulation content. For each variable, a value of 0 indicated that a state had no policy on a particular outcome. A value of 1 indicated that a state recommended a particular outcome or course of action or had requirements that were below federal standards. If a state mirrored or repeated the minimum federal requirements, a value of 2 was assigned. When states had standards exceeding federal requirements, they were benchmarked and a value of 3 or higher was assigned accordingly. Pain was coded as 0 if state law did not address pain. A value of 1 indicated that a state had recommended provisions on pain, whereas a value of 2 or higher was assigned based on the specificity regarding pain management in the laws. In every case, a higher score indicated a more specific and binding policy, and the highest scores reflects standards of best practices and the intent of CMS. A detailed description of the coding scale and state laws, as well as changes thereto, are described in Chapter II.

For this analysis, the ordinal coding was collapsed for all policy predictors into three categories as follows: 1) “Federal:” states that follow federal law or have laws weaker than the federal standard; 2) “Federal Plus:” states that exceed federal law with one additional standard or generic additional standards (beyond the federal standard) for the given policy predictor; and 3) “Federal Enhanced:” states that exceed federal requirements with specific and/or multiple additional state standards for the given policy predictor. For purposes of this analysis, Alaska and Washington D.C. were excluded due to missing covariate data. If a state was silent on a particular policy predictor or had standards below federal requirements, they were still counted as “Federal” because all nursing homes must meet federal regulations for quality of care regardless. Each policy

predictor for each state was coded separately in every individual year. For pain, if a state's laws did not address pain, they were coded as Federal, and depending on the specificity regarding pain recognition and management, they were coded either as "Federal Plus" or "Federal Enhanced." In addition, changes to state laws were also tracked whenever a state enhanced or relaxed their laws.

b. Nursing Home Quality Outcome Measures

The study focused on long-stay outcomes only, as the nature of short-stay outcomes measures post-acute care or special care. The dependent variables were a set of quality measures used by CMS to determine specific dimensions of quality of care in nursing homes, and also conceptually matched to the state policy predictors. These included the percentage of long stay residents: 1) with pressure ulcers (high risk-and average-risk), 2) whose need for help with daily activities has increased, 3) with locomotion worsening, 4) who lose control of their bowels or bladder, 5) with indwelling catheter, 6) with a urinary tract infection, 7) with moderate to severe pain, and 8) who received an antipsychotic medication. The number of observations for each outcome varied as they were calculated from different denominators and numerators using separate criteria. While the numerator usually consisted of the number of residents with the specified outcome condition (ex: pressure ulcer), the denominator criteria for each outcome had different inclusion and exclusion criteria. For example, in MDS3 the percent of long-stay residents who lose control of their bowels or bladder had eight specific conditions that were excluded from the denominator, while the percentage of residents with indwelling catheter had four exclusions.⁷⁶ Outcomes in the NHC data were restricted to facilities that had more than 30 chronic-care residents in the denominator during a quarter. For facilities with less than 30 long-stay residents in the denominator, the outcomes were suppressed, possibly due to reliability with measure reporting and resident confidentiality reasons.⁷⁷ If no score was generated for a particular measure or a

facility was not matched to the outcome data, then the measures were considered missing and also excluded.

c. Covariates

The following facility-level characteristics were included in all analyses: the percent of residents covered by Medicaid and Medicare, ownership (for-profit or not-for-profit), whether the facility is hospital-based, whether the facility part of a chain, and occupancy rate. Facility-level summaries of resident characteristics were also included: each facility's mean age, percent female, mean activities of daily living (ADL) score for all residents, a case mix index, an acuity index and proportion of residents with low cognitive impairment. State level covariates include the unemployment rate, state median income and average number of deficiencies to control for variation in enforcement stringency among states.

3. Statistical Analysis

a. Study Sample and Time Period

This study consisted of more than 15,000 nursing home facilities that were certified to participate in Medicare and Medicaid in the United States, and whose data were available from both NHC and LTCfocus.org. The time frame for the study was 2006 to 2015. Law data, which were collected for 2005 to 2014 and discussed in more detail below, was lagged by one year and linked to outcome and covariate data using state and year identifiers. However, due to the transition from MDS2 to MDS3 and resulting changes to data collection and measurement, analyses were conducted separately for 2006 to 2010 (Sample 1) and 2011 to 2015 (Sample 2). After merging the outcomes and covariates data, the number of facilities in the samples ranged from 15,191 to 15,666 based on year, as some nursing homes went out of business while others entered the market.

b. Empirical Specification

As part of the policy predictor measures, changes to states' laws were captured whenever a state enhanced their laws to exceed federal standards or relaxed them to be at or below federal standards. Based on whether this type of variation in state law data existed, analyses were conducted using both a cross-sectional pooled regression and difference-in-differences (DID) approach. Ordinary least squares (OLS) regressions were utilized based on inspection of the distribution of the outcome variables. Difference in differences was utilized when there were changes to a state's laws over time. Three states, South Carolina, Hawaii and North Carolina had changes to their laws in five (pressure ulcer, ADL, bowel and bladder, catheter and antipsychotic drug) of the chapter's seven policy predictors in years 2008, 2011 and 2012 with reference to the federal standards. This enabled the author to take advantage of the variation to test for changes in nursing home quality. All analyses in the study was conducted using STATA version 13.1.

In the pooled cross-sectional analysis, each policy predictor was matched to a corresponding quality resident outcome. Separate models were run for each dependent variable with the following specification:

$$Quality_{sft} = B_0 + B_1 STATELAW_{st} + B_2 FACILITYCON_{sft} + B_3 STATECON_{st} + B_4 YEARD_t + \varepsilon_{sft}$$

The state-by-year main variable of interest STATELAW is a time-varying, tri-level variable reflecting the stringency (Federal, Federal Plus or Federal Enhanced) of a state's law for a given policy predictor. State-level controls are noted as STATECON, while facility level covariates are collectively noted as FACILITYCON. Models included time-varying FACILITYCON and controls for time trends with year indicators, YEARD. Subscripts f , s and t

denote facility, state and time, respectively. ε denotes the error term. Robust standard errors were used in all regressions to account for potential non-independence of observations due to clustering in states.

With regard to the DID analyses, the analysis was limited to one year prior to change and two years after the implementation to capture initial effects using a consistent length of post-treatment time. Each state that changed was compared to a group of non-changing states that had similar levels of laws prior to the change. A list of the states that changed and corresponding control states is available in Appendix F.

STATELAW equaled 1 if the facility was in a state after a law changed and 0 otherwise. In each state that changed, STATELAW equaled 1 in the two-year post period after the law change and 0 prior to change. For control states that did not have any changes, the STATELAW variable is zero and time invariant. The empirical specification is below.

$$\begin{aligned} \text{Quality}_{sft} = & B_{sf} + B_1 \text{STATELAW}_{st} + B_2 \text{FACILITYCON}_{sft} + B_3 \text{STATECON}_{st} \\ & + B_4 \text{FACILITYD}_{sf} + B_5 \text{YEARD}_t + \varepsilon_{sft} \end{aligned}$$

Besides the STATELAW variable, facility level covariates are noted as FACILITYCON and state level controls are noted as STATECON. FACILITYD indicates facility fixed effects, while YEARD indicates time (year) fixed effects. A mean zero random error component was also included. The coefficient for STATELAW, when used with both facility and time fixed effects, results in the DID estimate that reflects within-facility change in quality over time in states that changed.

c. Sub-Group Analysis and Sensitivity Analysis

Sub-group analysis was conducted to examine whether there were differential associations of state laws among varying facilities types. These involved looking at the percent of Medicaid patients, baseline quality, ownership and chain status.

The chapter also tested the robustness and sensitivity of the results in several ways. First, I compared all states whose laws exceeded the federal law to those below federal law. For the DID analysis, I also used a neighboring state (or a state within the same HHS region) as a control group to the states that changed, with a similar level of law prior to change. I also experimented with changing the control groups, though all within similar levels or laws prior to change, to see if it affected the results. Instead of facility fixed effects, a random effects model was also tested for the DID analysis, as well as utilizing state fixed effects as opposed to facility fixed effects.

In addition, an instrumental variable (IV) analysis also was included in the sensitivity analysis using NOMINATE as an instrument. While use of an IV analysis is not ideal due to issues with state-level instruments (e.g., state attributes associated with both the IV and outcomes), it is included herein for sensitivity, exploratory, and training purposes.

i. Instrumental Variable Analysis

There are two main assumptions that must be met in order for an instrument to be valid. One is that the instrument causes variation in the treatment variables, while the other is that it does not have a direct effect on the outcome variable, only indirectly through the treatment variable. NOMINATE is a scaling method that has been used widely to describe the political ideology of institutions on state policy outputs.^{78,79} The scores are government ideology indicators measuring the “average location of the elected officials in each state on a liberal-conservative continuum.” The measure “relies on the ideological orientations of members of Congress, operationalized by

interest-group ratings compiled by the Americans for Democratic Action and the AFL-CIO Committee on Political Education.”^{78,79}

NOMINATE was chosen as an instrument under the logic that more liberal states will tend to enact more stringent laws because liberal political ideology tends to support government regulation. This hypothesis is consistent with that used by Mukamel et al that hypothesized states with more economic freedom would have less stringent regulations. In that paper, the authors used Area 2 of the Economic Freedom Index of North America of 2010: “Takings and Discriminatory Taxation” as an IV and found that state regulatory stringency affected four results among seven quality measures.¹⁵ Similarly, one would not expect NOMINATE scores to affect pressure ulcers, ADL, or urinary tract infection (UTI) outcomes in nursing homes directly in this study, as government ideology does not apply directly to nursing homes and resident care. For illustrative purposes, two-stage least square (2SLS) regressions were run on four policy predictors linking to three different outcomes for one year (2013), as there was little change to the laws over time. A balance check was also conducted to examine whether states and nursing home characteristics were comparable across different levels (quartiles) of NOMINATE.

C. Results

1. Descriptives

Table VI below shows the percentage of states in each category by policy predictor for the two sample periods (2005-2010 and 2011-2015). The areas where states had more laws exceeding federal standards include ADL (57.44% and 57.33%), pressure ulcers (46.62% and 47.28%) and bowel and bladder (53.57% and 53.45%). In contrast, antipsychotic drugs (29.24%), unnecessary drugs (13.72%), and pain (23.19%) had far less states going above federal standards. The findings seem to suggest that drug use in nursing homes draws less attention than physical health symptoms,

with the exception of pain. Detailed analysis of state nursing home quality of care regulations is available in Chapter II.

Table VII below displays the means and standard deviations for the outcomes and state and facility-level characteristics. Out of all the outcomes, the percentage of long-stay residents who lose control of their bowels or bladder was the highest across both samples. The nursing home residents were predominately female, the majority were on Medicaid, and had an average age of approximately 80. For-profit and chain facilities also accounted for over 50% of nursing homes.

Tables VIII below reflect the means of the outcomes over time. We see an overall decreasing trend for several outcomes, including pressure ulcers (high risk and average risk), catheter, UTI, locomotion worsening and antipsychotic medication use. Bowel and bladder fluctuated a little bit, while ADL remained relatively stable over time. In Table XII, the mean percentage of residents who reported being in pain increased from 4.02% to 9.11% from Sample 1 to Sample 2. This could potentially be due to the shift in description of pain from MDS2 to MDS3, as pain had a higher-risk of underreporting in MDS2.⁷² Minimum Data Set 3 required that residents report “almost constant or frequent moderate to severe pain in the last 5 days,” but MDS2 required residents to report moderate pain at least daily.^{76,80} Another larger change included the percentage of high-risk residents with pressure ulcers, as the percentage decreased from 11.77% to 6.29% from Sample 1 to Sample 2. This is likely because MDS2 included Stage 1 to Stage 4 pressure ulcers for both high risk and average risk patients, while MDS3 only included high risk patients with Stage 2 to Stage 4 ulcers.^{76,80}

These tables also reflect some of the changes to the outcomes and covariates CMS made over time. These include eliminating the pressure ulcer outcome for residents with average risk and the locomotion worsening outcome, while adding an outcome on antipsychotic drug use.^{76,80}

Another transition is the use of a Cognitive Performance Scale to a Cognitive Function Scale, with the latter integrating self-reported and staff-reported data on cognitive function through resident

TABLE VI: PREVALENCE OF STATE LAWS BY POLICY PREDICTOR ACROSS SAMPLES			
Sample 1: 2005-2010		Sample 2: 2011-2015	
Policy Predictor	%^a	Policy Predictor	%^a
Pressure Ulcers		Pressure Ulcers	
Federal	53.38	Federal	52.72
Federal Plus	9.12	Federal Plus	9.28
Federal Enhanced	37.50	Federal Enhanced	38.00
ADL		ADL	
Federal	42.56	Federal	42.67
Federal Plus	21.43	Federal Plus	21.50
Federal Enhanced	36.01	Federal Enhanced	35.83
Bowel and Bladder		Bowel and Bladder	
Federal	46.43	Federal	46.55
Federal Plus	17.31	Federal Plus	17.19
Federal Enhanced	36.26	Federal Enhanced	36.26
Catheter		Catheter	
Federal	53.32	Federal	53.40
Federal Plus	36.01	Federal Plus	36.03
Federal Enhanced	10.68	Federal Enhanced	10.57
Pain		Pain	
Federal	76.67	Federal	76.81
Federal Plus	0.26	Federal Plus	0.25
Federal Enhanced	23.07	Federal Enhanced	22.94
		Antipsychotic Drugs^b	
		Federal	70.76
		Federal Plus	20.26
		Federal Enhanced	8.98
		Unnecessary Drugs^b	
		Federal	86.27
		Federal Plus	7.19
		Federal Enhanced	6.53

^a Percentages are presented due to the pooling across years.

^b Antipsychotic drug use was not available from 2006-2010 in the outcome data; hence antipsychotic drugs and unnecessary drugs policy predictors were not included for Sample 1.

TABLE VII: SUMMARY STATISTICS					
Sample 1: 2005-2010			Sample 2: 2011-2015		
Outcome	Mean	Std Dev	Outcome	Mean	Std Dev
Pressure Ulcers (high risk)	11.77	5.97	Pressure Ulcers (high risk)	6.29	3.85
Pressure Ulcers (average risk)	2.11	2.22	-	-	-
ADL	15.94	6.93	ADL	15.91	6.93
Locomotion worsening	11.89	5.88	-	-	-
Bowel/Bladder	49.72	14.88	Bowel/Bladder	44.76	16.80
Catheter	5.45	3.57	Catheter	3.50	2.70
Pain	4.02	3.89	Pain	9.11	7.12
Urinary Tract Infection (UTI)	8.98	4.61	Urinary Tract Infection (UTI)	6.32	4.48
-	-	-	Antipsychotic Medication	20.86	10.69
State-level Controls			State-level Controls		
Deficiencies	9.39	2.71	Deficiencies	8.128	2.62
Median Income	55,929	7914.56	Median Income	54,413	8777.85
Unemployment	6.65	2.45	Unemployment	6.927	1.81
Facility-level Controls			Facility-level Controls		
Total Beds	106.2	63.84	Total Beds	107.04	61.79
Occupancy Rate	83.71	15.44	Occupancy Rate	82.40	14.51
Percent Medicaid	60.07	23.69	Percent Medicaid	59.75	23.19
Percent Medicare	15.78	17.08	Percent Medicare	15.50	15.36
Average Age	80.26	7.47	Average Age	80.02	7.27
Average ADL	16.03	3.17	Average ADL	16.35	2.92
Average RUGS NCMI	0.82	0.1	Average RUGS NCMI	1.15	0.18
Average Acuity Index	11.14	1.63	Average Acuity Index	11.99	1.78
Percent female	70.69	12	Percent female	68.25	11.97
Low Cognitive Performance	40.82	15.63	Low Cognitive Function	33.27	13.25
Hospital-based	0.08	0.26	Hospital-based	0.06	0.23
Profit	0.68	0.47	Profit	0.69	0.46
Multi-facility	0.54	0.5	Multi-facility	0.56	0.5

TABLE VIII: MEAN OUTCOMES BY YEAR

Part A: Sample 1					
Outcome/Year	2006	2007	2008	2009	2010
Pressure Ulcers (high risk)	12.75	12.29	11.95	11.22	10.72
Pressure Ulcers (average risk)	2.41	2.25	2.09	1.90	1.78
ADL	15.94	15.34	15.14	14.70	14.31
Locomotion worsening	12.86	12.27	11.86	11.44	11.00
Bowel/Bladder	48.16	49.02	49.76	50.43	51.23
Catheter	5.800946	5.71	5.53	5.22	4.98
Pain	5.08	4.42	4.06	3.41	3.16
Urinary Tract Infection (UTI)	8.86	9.01	9.12	9.01	8.88
Part B: Sample 2					
Outcome/Year	2011	2012	2013	2014	2015
Pressure Ulcers (high risk)	6.98	6.54	6.15	5.93	5.87
ADL	16.75	15.98	15.66	15.57	15.56
Bowel/Bladder	42.54	43.89	44.93	45.34	46.98
Catheter	4.29	3.85	3.26	3.05	3.04
Pain	12.09	10.20	8.12	7.29	7.81
Urinary Tract Infection (UTI)	7.75	7.16	6.22	5.58	4.87
Antipsychotic Medication	23.76	23.01	20.70	19.17	17.53

interviews.⁷² Furthermore, there were changes to data collection processes and the measurement of outcomes.⁷⁴ Besides pain and pressure ulcer outcomes, the description for catheter outcomes also changed and MDS3 included more exclusions in the calculations.^{76,80}

2. OLS Pooled Regression – 2006 -2010

Table IX displays the associations between state policy predictors and nursing home quality outcomes for Sample 1 (2006-2010). Sample 1 had several different outcomes than Sample 2 as discussed in Table II above. Possibly due to this transition, there is some inconsistency between the results. Many of the “Federal Plus” categories here were associated with an increase of negative resident outcomes, similar to the results from Sample 2 (see Table X). The percentage of average-risk residents with pressure ulcers and pain were insignificant, while similar to Sample 2, bowel and bladder and catheter “Federal Plus” laws were associated with a decrease in the percentage of residents with an UTI.

However, the results for “Federal Enhanced” categories were mixed. ADL outcomes (need for help with ADLs has increased, locomotion worsening) saw decreased percentage points of 0.155, 0.259, as did bowel and bladder laws and the UTI outcome of 0.756 percentage points. The other outcomes show an association of increased negative outcomes.

3. OLS Pooled Regression – 2011 -2015

Table X presents associations between state policy predictors and nursing home quality outcomes for Sample 2, reflecting different dimensions of quality. Results using OLS regressions show that “Federal Plus” categories usually had an inverse (and counter-intuitive) association when compared to laws below or equal to federal standards. They were associated with increased percentage points of residents that experienced a negative quality outcome. These include six out of seven outcomes, with the exception of UTI.

On the other hand, “Federal Enhanced” categories, with the exception of residents who lose control of their bowel or bladder, residents who had a catheter inserted and left in their bladder and antipsychotic drugs, were associated with a positive or desired outcome (lower corresponding negative quality outcome). Pressure ulcer laws were associated with a lower percentage of high-risk residents with pressure ulcers by 0.088 ($p < 0.05$) percentage points. The ADL predictor was associated with a lower percentage of residents whose need for help with ADLs had increased by 0.698 ($p < 0.01$) percentage points. Bowel and bladder and catheter predictors were associated with a lower percentage of residents with an UTI by 0.102 and 0.134 percentage points, respectively.

Laws regarding pain were associated with a lower percentage of residents who report moderate to severe pain by 0.252 ($p < 0.01$) percentage points. The unnecessary drugs predictor’s association with residents who received an antipsychotic medication had the largest magnitude with 2.46 decreased percentage points. This suggests that states with targeted and specific laws are seeing more desirable nursing home quality outcomes, compared to states with less definitive or generic laws.

Overall, the results for UTI and ADL were relatively similar in both samples. Both samples saw decreased percentage points in ADL loss associated with “Enhanced” ADL laws, where steps to restore and maintain physical functioning are required. In addition, both bowel/bladder and catheter policy predictors were associated with lower rates of residents with UTI. It has been established in the medical literature that urinary catheterization and bladder and bowel incontinence are factors associated with UTIs, hence laws addressing these aspects of care may help prevent the condition.

4. Results for DID

Three states, South Carolina, Hawaii and North Carolina had changes to their laws, as

TABLE IX: ASSOCIATIONS BETWEEN POLICY PREDICTORS AND NURSING HOME QUALITY OUTCOMES, 2006-2010

Outcome	Policy Predictor	Law Category	Coefficient (95% CI)
Residents with pressure ulcers, high risk (%) (n=54265)	Pressure Ulcer	Plus	0.599** (0.417, 0.781)
		Enhanced	0.111* (0.004, 0.219)
Residents with pressure ulcers, average risk (%) (n=33824)	Pressure Ulcer	Plus	0.003 (-0.156, 0.014)
		Enhanced	0.059* (0.005, 0.113)
Residents whose need for help with daily activities has increased (%) (n= 63881)	Activities of Daily Living	Plus	1.348** (1.210, 1.487)
		Enhanced	-0.155* (-0.274, -0.035)
Residents with locomotion worsening (%) (n= 59121)	Activities of Daily Living	Plus	1.001** (0.874, 1.127)
		Enhanced	-0.259** (-0.364, -0.155)
Residents who lose control of their bowel or bladder (n=59953)	Bowel and Bladder	Plus	0.996** (0.73, 1.263)
		Enhanced	1.683** (1.467, 1.898)
Residents who had catheter inserted and left in their bladder (%) (n= 65498)	Catheter	Plus	0.102** (0.042, 0.162)
		Enhanced	0.79** (0.691, 0.89)
Residents with an urinary tract infection (%) (n= 65732)	Bowel and Bladder	Plus	-0.558** (-0.65, -0.466)
		Enhanced	-0.756** (-0.83, -0.682)
	Catheter	Plus	-0.49** (-0.561, -0.419)
		Enhanced	0.083 (-0.033, 0.200)
Residents who have moderate to Severe Pain (%) (n=65489)	Pain ^a	Plus	0.099 (-0.297, 0.496)
		Enhanced	0.184** (0.113, 0.255)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

^a Federal laws did not address pain

TABLE X: ASSOCIATIONS BETWEEN POLICY PREDICTORS AND NURSING HOME QUALITY OUTCOMES, 2011-2015

Outcome	Policy Predictor	Law Category	Coefficient (95% CI)
Residents with pressure ulcers, high risk (%) (n=56556)	Pressure Ulcer	Plus	0.264** (0.147, 0.381)
		Enhanced	-0.088* (-0.155, -0.02)
Residents whose need for help with ADLs has increased (%) (n=61179)	Activities of Daily Living	Plus	0.766** (0.62, 0.912)
		Enhanced	-0.698** (-0.822, -0.575)
Residents who lose control of their bowel or bladder (%) (n=37898)	Bowel and Bladder	Plus	2.063** (1.701, 2.425)
		Enhanced	0.146 (-0.178, 0.47)
Residents who had an indwelling catheter in the last 7 days (%) (n=63413)	Catheter	Plus	0.219** (0.173, 0.265)
		Enhanced	0.54** (0.467, 0.613)
Residents with an urinary tract infection (%) (n=63826)	Bowel and Bladder	Plus	-0.492** (-0.578, -0.404)
		Enhanced	-0.102* (-0.176, -0.029)
	Catheter	Plus	-0.317** (-0.389, -0.244)
		Enhanced	-0.134* (-0.251, -0.017)
Residents who self-report moderate to severe pain (%) (n=59385)	Pain ^a	Plus	3.288** (2.067, 4.508)
		Enhanced	-0.252** (-0.392, -0.111)
Residents who received an antipsychotic medication (%) (n=63024)	Antipsychotic Drugs	Plus	-0.412** (-0.62, -0.205)
		Enhanced	0.565** (0.278, 0.851)
	Unnecessary Drugs	Plus	0.615** (0.305, 0.925)
		Enhanced	-2.460** (-2.739, -2.181)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

^a Federal laws did not address pain

reflected in Table XI, in five of the chapter's seven policy predictors over the study period. States sometimes strengthened their standards while weakening or removing others. However, no policy predictor had more than one state that changed simultaneously (i.e., in the same year). Accordingly, the analyses consisted of one to many states comparisons for each policy predictor with change.

The DID regression coefficients in Table XI show the effect of these law changes on the corresponding quality outcomes after two years. Controlling for secular trends and facility fixed effects, the chapter compared states that changed to states that had similar levels of laws prior to the change (see Appendix F). In the table we see that, with the exception of high-risk pressure ulcers in SC, all the coefficients were in our hypothesized direction. When states enhanced their requirements the percentage of residents experiencing the negative patient outcome decreased, while the percentage of residents increased when states relaxed their standards.

Overall, three outcomes had statistically significant changes ($p < 0.01$) in quality, including bowel and bladder, UTI and unnecessary drugs. Relaxed bowel and bladder laws in HI were associated with an increase in the percent of residents who lose control of their bowel and bladder. However, as visual inspection of this particular outcome revealed different pre-treatment trends for the two groups, the effect is most likely overstated with a large coefficient.

Relaxed bowel and bladder laws and catheter laws in HI were associated with an increase in the percent of residents who had an UTI by 1.064 and 0.886 percentage points, respectively. Unnecessary drug laws in NC were associated with a decline in the percent of residents who were given an antipsychotic medication of 1.353 percentage points. Visual inspection of these outcomes confirmed similar pre-treatment trends for the parallel trend assumption, where the difference between the treatment and control groups should be constant over time in the absence of treatment.

TABLE XI: DID REGRESSIONS RESULTS SHOWING EFFECT OF LAW CHANGES ON QUALITY OUTCOMES

Outcome (Policy Predictor)	State	Year of Change (Type of Change)	DID Coefficient ^a
Pressure Ulcer - high risk; N=17,855 (Pressure Ulcer)	SC	2008 (Enhance)	0.658 (0.364)
Pressure Ulcer - average risk; N=10,825 (Pressure Ulcer)	SC	2008 (Enhance)	-0.400 (0.272)
Pressure Ulcer - high risk; N=18,113 (Pressure Ulcer)	HI	2011 (Enhance)	-0.223 (0.339)
Bowel and Bladder; N=4,234 (Bowel and Bladder)	HI	2011 (Relax)	9.042** (3.212)
Urinary Tract Infection; N=6,727 (Bowel and Bladder)	HI	2011 (Relax)	1.064** (0.390)
Catheter; N=13,565 (Catheter)	HI	2011 (Relax)	0.203 (0.263)
Urinary Tract Infection; N=13,666 (Catheter)	HI	2011 (Relax)	0.886** (0.367)
ADL; N=7,780 (ADL)	HI	2011 (Relax)	0.367 (0.823)
Antipsychotic Medication; N=33,197 (Unnecessary Drugs)	NC	2012 (Enhance)	-1.344** (0.267)

^a The coefficient on the policy predictor variable indicates within-facility change in quality in states that changed compared to the control group (states with similar levels of law prior to change), after the law change compared to before. All regressions used a linear model. Robust standard errors are in parentheses. The base numbers reflect the mean outcome of the changing (treatment) state prior to change.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

5. Subgroup Analysis

Subgroup analyses included interaction terms between ownership status, chain status, baseline quality measured by health deficiencies, percent of Medicaid patients, percent of Medicare patients and the seven policy predictors. Results were not consistent for any of the subgroups. Results were either insignificant, or were not in consistent directions across policy predictors. While theoretically low-quality providers could be more impacted by regulation in order to stay in compliance, the literature shows although there is a general consensus that providers that are below a staffing regulatory standard will increase staffing to meet the minimum standards, ambiguity exists in other quality dimensions such as patient outcomes.^{10,67}

6. Sensitivity Analyses and IV Findings

When examining the associations between states that were above federal law (aka “Plus” and “Enhanced” combined) versus those below, pressure ulcers became insignificant. However, for 2011-2015, ADL, UTI, pain and unnecessary drugs were still in the hypothesized direction – states that went above federal standards saw lower percentages of residents with the specific negative outcomes. For 2006-2010, only UTI remained in the hypothesized direction (See Appendix G). When using a neighboring state or state in the same HHS region as a control group for the DID analysis, with the exception of ADL, the general direction of the effects remained consistent with the main specifications, though only UTI remained significant (See Appendix H). When comparing a random effects model to the fixed effects model in DID, some coefficients changed slightly but all remained in the same direction and significance (See Appendix I). Appendix J contains the results using a state fixed effects model. All the directions are consistent with the facility fixed effects model, but the results for bowel and bladder and UTI became insignificant, while unnecessary drugs remain statistically significant.

Table XII shows the results using NOMINATE as an instrument and two stage least squares regression for year 2013. For all regressions, the F-statistic is larger than 10, indicating that the instrument is considered strong. The results for pressure ulcers were non-significant, while the bowel and bladder, catheter and ADL policy predictors yielded results of similar direction and significance compared to regular OLS pooled regression, albeit with a larger magnitude. Prior research has found that “comparing IV estimation to the OLS estimation of the first-difference model would lead to an underestimation of how nurse staffing affects quality of care in nursing homes,” as staffing decisions are inherently endogenous and patient case mix is difficult to control.^{11,81}

Bowel and bladder laws saw 1.9 decreased percentage points of residents with UTI ($p < 0.01$) and catheter laws saw a decrease of approximately 3 percentage points ($p < 0.01$). ADL laws saw a decrease of 3.32 percentage points with residents whose need for ADL had increased ($p < 0.01$). The balance check indicated some differences across states in different quartiles of NOMINATE, such as the total number of beds and the percent of facilities that were part of a chain, but the majority of observable facility and state characteristics were similar across quartiles. (See Appendix K).

D. Discussion

Whether there should be more regulation of nursing homes is an ongoing subject of debate. Proponents of more regulation point out that it is needed to address existing quality of care problems and point to weak enforcement,^{1,82} while opponents argue that it impedes person-centered care and innovation in nursing homes.^{2,60,61} There has also been concern regarding the cost of regulation, and studies have pointed out the need for future studies on the benefits that regulations entail and a comprehensive assessment of the effect of regulation.^{15,83}

TABLE XII: IV REGRESSIONS RESULTS SHOWING EFFECT OF LAW CHANGES ON QUALITY OUTCOMES

Outcome (Policy Predictor)	Coefficient ^a	Constant	First-stage F-statistic
Pressure Ulcer - high risk; N=11,319 (Pressure Ulcer)	0.247 (0.281)	6.805 (1.647)	176.80
UTI; N=12,737 (Bowel and Bladder)	-1.900** (0.236)	5.029 (1.079)	130.90
UTI; N=12,737 (Catheter)	-2.997** (0.357)	6.909 (1.164)	156.97
ADL; N=12,199 (ADL)	-3.321** (0.958)	13.544 (1.895)	132.57

^a All regressions used a linear model with two stage least squares. Robust standard errors are in parentheses.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

This chapter contributes to the literature by providing some evidence that more stringent regulation may lead to or is associated with better quality outcomes, but the associations or effects are not consistent across multiple dimensions of quality. Overall, six policy predictors in Sample 2 and three in Sample 1 had the intended direction and significance when comparing the “Federal Enhanced” category to laws equal to or below federal standards. The “Federal Enhanced” category consisted of laws with targeted and defined requirements and incorporating more clinical best practices. On the other hand, “Federal Plus” laws, which were generic in their language and without specific directions, or had relatively looser requirements, were either insignificant or often associated with the outcomes in an unintended direction. Laws lacking specific standards in other public health areas, such as competitive food laws in schools, have also been shown to have a similar pattern with BMI outcomes in schoolchildren.^{70,71}

This suggests that specificity in the laws matter and is consistent with a goal setting theory in management studies, where “specific and clear goals lead to greater output and better performance,” as opposed to ambiguous or unmeasurable goals.^{84,85} Even though the theory is not about law and is focused on organizational behavior and management, it can be seen in the context of these laws creating goals (targeted or not) that nursing home facilities must meet.

There are also several inconsistencies between MDS2 and MDS3 in this study. As previously discussed, this may be partially due to the transition and changes between the two datasets. As the definition for pressure ulcers was narrowed to exclude stage 1 ulcers (out of four stages), this could possibly indicate that we are only seeing the hypothesized association when the clinical condition is more severe. In both datasets, the results for UTI and ADL were fairly consistent. In addition, bowel/bladder and catheter policy predictors were associated with lower rates of residents with UTI in both samples. This is unsurprising as it has been clinically established that urinary catheterization for bladder and bowel incontinence are often associated with UTIs.^{86,87}

The DID design allowed the study to move closer to causal inference by absorbing state-level differences. While the author was not able to assess all outcomes due to limited changes to the laws over the study period and not all of the coefficient estimates were not statistically significant, the general direction was as hypothesized. Unnecessary drugs saw a statistically significant change after standards were enhanced, while bowel and bladder and UTI also saw significant changes after bowel and bladder and catheter laws were relaxed. The unnecessary drug finding is particularly relevant in light of the risks associated with the use of antipsychotics in people with dementia, often prescribed to manage behavior in nursing homes as opposed to addressing an underlying medical cause.⁶⁷

Other studies employing similar methods or other causal designs have also found that regulatory quality initiatives don't usually achieve consistency across all outcomes. The Mukamel study, using an IV analysis for regulatory stringency, found four significant results among seven outcome measures. Among the three clinical resident outcomes (urinary incontinence, ADL decline and high-risk pressure ulcers), only urinary incontinence was significant at the 0.05 level.³⁰ Bowblis and Lucas found evidence that nursing homes improve quality in areas where regulators issue deficiencies, but not other areas.¹⁴ Studies utilizing DID models in nursing home staffing regulations - taking advantage of a similar situation where some states have standards exceeding federal standards - have found that while more stringent minimum staffing regulations increase staffing levels, the empirical results on other quality measures are mixed.^{10,12} Another study utilizing IV models in nursing home staffing regulations have reached similar conclusions.¹¹

In summary, the results of this analysis provide some evidence that while more stringent regulation may be linked to better quality outcomes, specificity in state laws mattered. Targeted regulations often had the intended associations with improved quality outcomes, though not consistently across all dimensions or samples. Regulators and policy-makers need to take this into account if they wish to develop policies that can effectively fulfill their objective of improving quality. State laws, in addition to federal regulation, can also serve as another mechanism for boosting quality. Further research utilizing quasi-experimental designs is needed to understand more fully how regulation impacts quality.

E. Limitations

There are several limitations to this study. First, there has been some criticism surrounding MDS and OSCAR which were contained in the data sources used. The reliability and validity of MDS data have been subject to some criticism, given the concern of ascertainment bias and

interrater variability surrounding the quality indicators formulated from the data.^{22,88,89} However, both of these datasets are formally utilized by CMS in NHC and Brown University in their Long-term Care Focus data. MDS and OSCAR are also widely used in the literature, and NHC is influential because it presents publicly available standardized quality information on most nursing homes in the United States.²² Second, the quality outcomes in this study do not represent a global measure of quality within a nursing home or state, only different dimensions of care. Quality of life outcomes are not assessed and the study does not take into account person-centered care issues.

Next, there are concerns regarding state-level endogeneity and unmeasured confounding. A state's stringent regulations (or lack thereof) are likely to be endogenously associated with the quality level offered by the industry in the state.³⁰ While the DID approach can control for state-level differences, this involved three states that had changes to their laws over time. The policy predictors pain and antipsychotic drug use were not included because there were no changes to them over time and thus this analysis is potentially underpowered. As the control group was states that had similar levels of laws to the state that changed, results are not generalizable to the entire national sample. The estimation with instrumental variables can help address endogeneity, but there still could be state attributes associated with both the IV and outcomes reflecting omitted variable bias. In light of the limited variation in state laws over time, causal inference in this case should be extremely cautious and limited. Subsequent research may seek to follow laws longer (past 2014) and utilize further changes in both federal and state regulations to conduct a more comprehensive DID analysis.

F. Conclusion

This is a highly policy-relevant and innovative study and to my knowledge, the first of its kind to empirically examine non-staffing state quality of care regulations through the actual

content of the laws. Utilizing a natural experiment whereby nursing homes in some states are regulated entirely by federal standards, while nursing homes in other states are subject to federal and additional state regulations, the study was able to assess some aspects of regulation and their relationship to established quality outcomes. While causal inference should be limited in scope, this study can nevertheless help inform policy makers at all levels and help guide important decisions about current and future regulatory initiatives. Ultimately, the results from this study have implications for over 15,000 nursing homes and 1.4 million nursing home residents.

IV. NURSING HOME REGULATION AND QUALITY OF CARE: USING STATE LONG-TERM CARE OMBUDSMEN PROGRAM COMPLAINTS AS AN ANALYSIS

A. Introduction

1. Quality of Care in Nursing Homes and Regulatory Oversight

Issues with the quality of care provided in nursing homes has been a persistent issue and interest of policy-makers and regulatory bodies since the 1960s. The federal government began studying state licensure and made continuing amendments to standards and certification processes over the years, leading to the Nursing Home Reform Act in 1987. The Act mandated minimum standards for Medicare and Medicaid-certified nursing homes after decades of reported issues with quality in nursing homes.^{22,90,90} Besides producing and maintaining federal regulations that nursing homes must comply with in order to receive Medicare or Medicaid funding, the federal government (CMS) also “sets state survey and certification procedures, funds state survey and certification programs and provides central and regional oversight” for the programs.^{7,8}

In addition to federal standards, state health departments also use a licensure process to establish standards for nursing home care. All nursing homes must comply with federal standards for quality, whether they are reiterated in state laws or not. However, some states mirror entire or parts of the federal regulation in their own state laws, while other states have additional requirements that exceed federal standards.⁹

2. Long-term Care Ombudsmen Programs

As part of the efforts to combat poor quality of care, the federal government also created the Long-Term Care Ombudsmen Program (LTCOMP) in response to widespread problems of abuse, neglect, and inadequate care in long-term care facilities.⁹¹ The program started in 1972 as a demonstration project, but now exists in each state under the power of the Older Americans Act.

“Long-term care ombudsmen are advocates for residents of nursing homes, board and care homes, assisted living facilities and similar adult care facilities.” In addition to “identifying, investigating and resolving complaints on behalf of residents in long-term care settings,” they are also tasked with systemic advocacy at all policy levels to represent residents’ interests and improve their experiences.⁹²

3. Ombudsmen Complaints as Quality Indicators

Traditionally, measures of nursing home quality have included facility-level measures of staffing and inspections deficiencies, as well as other quality measures collected by CMS, such as the percentage of residents with pressure ulcers.⁹³ These measures have been subject to some criticism, since the Minimum Data Set (MDS) they are formulated from have come under scrutiny based on ascertainment bias and interrater variability concerns as the data is self-reported by nursing homes.⁴ Besides the traditional measures collected by CMS, there have been initiatives to explore quality determined from the consumer’s perspective.⁹⁴

It has been suggested that ombudsmen complaints may be a more accurate reflection of nursing home problems than CMS survey results because the ombudsmen are in contact with the residents in nursing homes on an on-going basis.⁹³ The program has been viewed as being effective at mediating and resolving complaints and advocating for residents.^{93,95,95} Consumer-generated quality concerns and complaints have also been shown to be more timely than other quality indicators, in addition to the potential to supplement quality reporting efforts.¹⁹

4. Literature Review

There is currently a large gap in the literature examining nursing home regulation and long-term care ombudsmen programs. Studies that use LTCOMP complaints focus on linking complaints to nursing home regulatory action, such as deficiencies, and usually only look at

complaints from one state. In 1995, a study found that “the presence of volunteer ombudsmen in Oregon was related to increased abuse reporting and abuse complaint substantiations, more survey deficiencies, and higher sanction activity.”⁹⁶ Another study using Connecticut data found a relationship between the rate of complaints to the ombudsman program and the number of regulatory deficiencies, but no relationship between ombudsman complaints and staffing.⁹⁷ However, a more recent study found that ombudsman complaints and inspection violations were generally unrelated in North Carolina.⁹⁸ Utilizing another type of complaint data, a few studies have assessed complaints made to nursing home licensing agencies, as opposed to long-term care ombudsmen programs. The authors generally found complaints to be correlated with deficiencies during survey visits conducted by the licensing agency.^{19,19,99}

There have also been studies assessing the impact of nursing home regulation on traditional quality of care measures. Some studies evaluated staffing regulations,^{10,10,11,11,12} while others used deficiency citations as a measure of regulatory stringency for quality of care.^{13,14,14,30,30} Staffing regulations studies have consistently found that more stringent minimum staffing regulations increase staffing levels, but the empirical results on other quality measures are often mixed, depending on different factors such as the type of nurse and quality measure that is being examined.^{10,10,11,11,12} Bowblis et al. concluded that specific types of citations had an impact on specific quality outcomes, but with potential spillover effects across targeted dimensions of quality.^{13,14,14} Using an instrumental variables technique, Mukamel et al. regressed quality measures on the Harrington Regulation Stringency Index and control variables, finding four significant results among seven outcome measures.³⁰

Given the limited research on both nursing home regulation and long-term care ombudsman complaints, this study seeks to examine the relationship between state quality of care

regulations and LTCOMP complaints via a framework for thinking about quality outside of traditional measures and regulatory enforcement actions. To the best of my knowledge, the study is the first of its kind to analyze specific laws and link them to LTCOMP complaints; thereby offering not only research on a new topic, but also a novel use of ombudsmen complaint data.

5. Study Purpose

This chapter fills a significant gap in the study of LTCOMP complaints and their relationship to nursing home regulation. Utilizing a natural experiment whereby nursing homes in some states are regulated entirely by federal standards, while nursing homes in other states are subject to federal and additional state regulations, the study seeks to provide insight on how state regulations that go above federal standards are related to consumer-determined quality outcomes. Besides using federal regulations as a reference, this study also empirically links notification and documentation requirements (explained in more detail below) in state laws to LTCOMP complaints.

6. Hypothesis

Table XIII below presents three Research Questions (RQ) in this chapter and shows my hypotheses regarding the relationships between state laws and LTCOMP complaints. I hypothesize that states with laws above federal standards would see a lower rate of complaints due to improved quality under traditional measures. For example, if more stringent laws regarding pressure ulcers lead to a lower percentage of residents with the condition, then residents may be satisfied and hence have fewer complaints. Also, I hypothesize that when states enhance their standards, we should see a lower rate of complaints and if states relax their laws, we would expect to see a higher rate of complaints.

With notification requirements, residents and their families may be more likely to complain

TABLE XIII: HYPOTHESIZED RELATIONSHIPS BETWEEN STATE LAWS AND LTCOMP COMPLAINTS		
Research Question 1: What is the relationship between states with laws going above federal standards in the following areas and LTCOMP complaints?		
Policy Predictor	Outcome (Complaint Category)	Hypothesized Association with Complaints
Pressure Ulcer	Pressure ulcer, not turned	Lower rate
ADL	Range of Motion/ambulation	Lower rate
Bowel and Bladder	Bowel and Bladder Training	Lower rate
Catheter	Toileting, Incontinent Care	Lower rate
Catheter	Neglect of Tubes, including catheter	Lower rate
Pain	Symptoms unattended, including pain	Lower rate
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate
Unnecessary Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate
Therapeutic Diet	Therapeutic Diet	Lower rate
Research Question 2: How are having notification requirements in the laws for the following areas associated with LTCOMP complaints?		
Pressure Ulcer	Pressure Ulcer, not turned	Higher rate
Bowel and Bladder	Bowel and Bladder Training	Higher rate
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Higher rate
Research Question 3: How are having documentation requirements in the laws for the following areas associated with LTCOMP complaints?		
Pressure Ulcer	Pressure Ulcer, not turned	Lower rate
ADL	Range of Motion/ambulation	Lower rate
Bowel and Bladder	Bowel and Bladder Training	Lower rate
Catheter	Toileting, Incontinent Care	Lower rate
Catheter	Neglect of Tubes, including catheter	Lower rate
Pain	Symptoms unattended, including pain	Lower rate
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate
Therapeutic Diet	Therapeutic Diet	Lower rate

after they are notified and hence aware of a problem. I also hypothesize that documentation requirements in the laws should see an inverse relationship with complaints (lower rate), because complaints often revolve around failure to document a condition or inaccurate documentation.¹⁰⁰

B. Methods

1. Data Sources

The main variables of interest, state nursing home quality of care laws, were compiled through Boolean keywords searches in LexisNexis and Westlaw. Both are commercially available legal research services and the main publishers of all codified statutory and administrative law for federal laws, law of the 50 states, and the District of Columbia.^{17,18,18} Secondary sources, such as University of Minnesota's Nursing Home Plus were also consulted.⁹ Ordinal scales for individual policy predictors were created and coded separately for each year. Laws enacted or adopted as of December 31, 2005, served as baseline, while those enacted or adopted as of December 31, 2014 served as the endpoint. The detailed methods for the scale and coding are contained in Chapter II.

Outcome data, as well as LTCOMP covariate data, were obtained from the National Ombudsman Reporting System (NORS). NORS is maintained by the Administration on Aging (AOA) as part of aging services delivered under Title VII, Chapter 2, of the Older Americans Act. Information included in the annual reports describe the efforts of ombudsmen, including the number and nature of cases, complaints, program statistics and narrative reports.¹⁰¹ National Ombudsmen Reporting System also collects information on state program characteristics, such as number of staff, volunteers and program funding. Data collection involves submitting the data via the Ombudsman Reporting Tool Portal online. The AOA then reviews the annual submissions to ensure validity and accuracy, and may follow up with states in case of questions.¹⁰¹ Since 1995,

state Ombudsman programs have used NORS to “record their advocacy, education and complaint-resolution services to individuals in long-term care facilities.”¹⁰² The information is publicly reported in an “Aging Integrated Database” maintained by the Administration for Community Living under AOA.¹⁰³

National Ombudsmen Reporting System only provides state-aggregated data. The data is reported as count data and is unweighted. It has been suggested that in some states, the complaint data system is not designed to produce data beyond reports sent directly to AOA. In addition, ombudsmen are often concerned about confidentiality issues surrounding releasing complaint-level data to researchers.⁹³

Partially funded by the National Institute on Aging, LTCfocus.org is a product of the Shaping Long-Term Care in America Project and is located within the Brown University Center for Gerontology and Healthcare Research.⁷⁵ Drawn from various data sources, including MDS and Online Survey Certification and Reporting (OSCAR) and Certification and Survey Provider Enhanced Reporting (CASPER) systems, LTCfocus.org provides data for researchers on nursing homes, including, but not limited to, the “health and functional status of nursing home residents and the characteristics of nursing home facilities.”⁷⁵ This study utilized data aggregated to the state level for years 2006-2015.

2. Measures

a. Key Study Variables – State Policy Predictors

The main variables of interest in this study are the state policy predictors regulating different dimensions of quality of care from December 31, 2005 to December 31, 2014. Eight policy predictors were created based on the diverse array of topics covered in the federal quality of care regulations or in recommendations made to CMS, and which also corresponded to the

quality outcomes used by CMS. These include: pressure ulcers, activities of daily living, bowel and bladder, catheter, pain, antipsychotic drugs, unnecessary drugs and therapeutic diet. While pain was not addressed in the federal regulations during the study period, it was included among the quality indicators that were deemed most useful for CMS to publicly measure as result of extensive testing that included both provider and consumer input.²² These policy predictors have also been referred to in the literature as of particular importance to nursing home residents and frequently examined.^{6,13,14,15,38,40,41}

A coding scale was developed to evaluate the scope and strength of state laws pertaining to each of the eight policy predictors. Detailed information on the state law coding scheme is available in Chapter II. The schemes ranged from 0-4 or 0-5 depending on the scope of the federal regulation, best practices, and variation in state regulation content. For each variable, a value of 0 indicated that a state had no policy on a particular outcome. A value of 1 indicated that a state recommended a particular outcome or course of action or had requirements that were below federal standards. If a state mirrored or repeated the minimum federal requirements, a value of 2 was assigned. When states had standards exceeding federal requirements, they were benchmarked and a value of 3 or higher was assigned accordingly. Pain was coded as 0 if state law did not address pain. A value of 1 indicated that a state had recommended provisions on pain, whereas a value of 2 or higher was assigned based on the specificity regarding pain management in the laws. In every case, a higher score indicated a more specific and binding policy, and the highest scores reflects standards of best practices and the intent of CMS. A detailed description of the coding scale and state laws, as well as changes thereto, are described in Chapter II.

For this analysis, the ordinal coding was collapsed for all policy predictors into two categories as follows: 1) “Federal:” states that follow federal law or have laws weaker than the

federal standard; and 2) “Federal Above:” states that exceed federal law. The “Federal Above” category was combined from the “Federal Plus” and “Federal Enhanced” categories in Chapter II. For purposes of this analysis, Alaska and Washington D.C. were excluded due to missing covariate data. If a state was silent on a particular policy predictor or had standards below federal requirements, they were still counted as “Federal” because all nursing homes must meet federal regulations for quality of care regardless. Each policy predictor for each state was coded separately in every individual year from 2006-2015. For pain, if a state’s laws did not address pain, they were coded as Federal, and if they referenced resident pain they were coded as “Federal Above.” In addition, changes to state laws were also tracked whenever a state enhanced or relaxed their laws over time.

b. State Requirements for Notification and Documentation

Another set of key study variables included notification and documentation requirements for each policy predictor. Notification was where a state required the notification or reporting of the policy predictor condition (ex: pressure sore) regardless of to whom, such as a physician or nurse. For documentation, a state required documentation or medical records on the policy predictor outcome (ex: pressure sore). States were coded as a 1 if they had such a requirement and 0 otherwise. Changes to notification and documentation requirements in the laws were also captured over time.

c. LTCOMP Complaint Outcome Measures

The outcomes in this study were the number of complaints state LTCOMPs received and logged in NORS. There were eight different outcomes, each matched to the corresponding policy predictors. They included:

- Pressure ulcers, not turned
- Symptoms unattended, including pain and no notice to others of changes in condition

- Toileting, incontinent care
- Tubes - neglect of catheter, gastric or nasogastric tube
- Bowel and bladder training
- Range of motion/ambulation
- Psychoactive drugs - assessment, use, evaluation
- Therapeutic diet

d. Covariates

Controls in this study involved LTCOMP resources, including the number of full-time staff, monetary funding, number of certified volunteer ombudsmen and total designated local ombudsman entities for the LTCOMPs in each state, as these factors been shown to possibly affect program effectiveness.^{95,104,104} Other state covariates included median household income, unemployment rate and the average number of deficiencies.

Facility and resident characteristics were also aggregated and included at the state level. These included: the percent of residents covered by Medicaid and Medicare, ownership (for-profit or not-for-profit), whether the facility is hospital-based, part of a chain, direct-care staff hours per resident day, total number of beds, occupancy rate, mean age, percent female, mean activities of daily living (ADL) score for all residents, percentage of residents who were low care, a case mix index and an acuity index.

3. Statistical Analysis

a. Study Sample and Time Period

The study consisted of a sample of 49 states over a ten-year period, 2006 to 2015. Washington D.C. and Alaska were excluded as they were not available in the Long-term Care Focus data. Law data (2005-2014) was lagged by one year and linked to outcome and covariate data using state and year identifiers.

b. Empirical Specification

As part of the policy predictor measures, changes to states' laws were captured whenever a state enhanced their laws to exceed federal standards or relaxed them to be at or below federal standards. Based on whether this type of variation in state law data existed, analyses were conducted using both a cross-sectional pooled regression and difference-in-differences (DID) approach. Based on the distribution of the outcome data, where the outcomes are over-dispersed and follow a negative binomial distribution (see Table XV below), cross-sectional pooled negative binomial regressions were conducted separately for each outcome. In negative binomial regressions, the dependent variable is a count variable that is either over- or under-dispersed, and the model uses the log of the expected count as a function of the predictor variables. However, for ease of interpretation, exponentiated coefficients will be reported instead. In negative binomial models, exponentiated coefficients may be interpreted as incidence rate ratios (IRR).

As the bowel and bladder training complaint outcome had a larger percentage of zero complaints (38.37%, see Table XV below), a zero-inflated negative binomial model was also considered. However, after considering factors that may potentially generate the excess zeros for the logit model part of the zero-inflated model, a Vuong closeness test did not indicate that the zero-inflated model was preferred.

Difference in differences was attempted when there were changes to a state's laws over time. Five states, Hawaii, South Carolina, North Carolina, Wisconsin and Ohio had changes to their laws in seven (pressure ulcer, ADL, bowel and bladder, catheter, antipsychotic drug, unnecessary drug and therapeutic diet) of the chapter's eight policy predictors in years 2006, 2007, 2008, 2011 and 2012 with reference to the federal standards. While this enabled the author to take advantage of the variation to test for changes in nursing home quality, not all of the DID

regressions converged due to small sample sizes. All analyses in the study was conducted using STATA version 13.1.

In the pooled cross-sectional analysis, each policy predictor was matched to a corresponding complaint outcome. Separate state-level models were run for each dependent variable with the following specification:

$$Quality_{st} = B_0 + B_1 STATELAW_{st} + B_2 PROGRAMCON_{st} + B_3 STATECON_{st} + B_4 YEARD_t + \varepsilon_{st}$$

The state-by-year main variable of interest STATELAW is a time-varying, dichotomized variable reflecting whether a state's law exceeded federal standards for a given policy predictor. State-level controls are noted as STATECON and include state characteristics, as well as resident and facility level characteristics aggregated to the state level, while program covariates are collectively noted as PROGRAMCON, though also aggregated to the state-level. STATECON and PROGRAMCON are both time-varying and the model included year fixed effects, YEARD. Subscripts s and t denote state and time, respectively. Robust standard errors were used in all regressions to account for potential non-independence of observations due to clustering in states.

With regard to the DID analyses, for each policy predictor that had changes over time, a TIME variable was created which was equal to 0 prior to a state enacting a change in their laws, and 1 afterwards. The analysis was limited to one year prior to change and two years after the implementation to capture initial effects using a consistent length of post-treatment time. A TREAT variable was also created, which equaled 1 after implementation in states that either implemented stronger laws or relaxed their laws (0 if no change). Each state that changed was

compared to a group of non-changing states that had similar levels of laws prior to the change. The TIME variable was assigned to be consistent with the paired treatment state. A list of the states that changed and corresponding control states is available in Appendix L. The coefficient for the interaction term between TIME and TREAT gives us the DID estimate. The empirical specification is below:

$$Quality_{st} = B_0 + B_1 POST_t + B_2 TREAT_s + B_3 TREAT_s * POST_t + B_4 PROGRAMCON_{st} + B_5 STATECON_{st} + B_6 YEARD_t + \varepsilon_{st}$$

However, major issues with sample size and convergence arose after matching each state that changed with a group of non-changing states with similar levels of laws prior to the change, as this removed many observations with both years and states. In the end, only changes in five states successfully displayed the DID estimate.

c. Sensitivity Analysis

The chapter also tested the robustness and sensitivity of the results in a couple of ways. First, I compared both “Federal Plus” and “Federal Enhanced” categories from Chapter III separately to “Federal.” “Federal Plus” were states that exceed federal law with one additional standard or generic additional standards (beyond the federal standard) for the given policy predictor; and “Federal Enhanced” were states that exceed federal requirements with specific and/or multiple additional state standards for the given policy predictor.

In addition, an instrumental variable (IV) analysis utilizing a two-stage residual inclusion (2SRI) model also was included in the sensitivity analysis using NOMINATE (described further below) as an instrument and bootstrapped standard errors. While use of an IV analysis is not ideal

due to issues with state-level instruments (e.g., state attributes associated with both the IV and outcomes), it is included herein for sensitivity, exploratory, and training purposes.

i. Instrumental Variable Analysis

There are two main assumptions that must be met in order for an instrument to be valid. One is that the instrument causes variation in the treatment variables, while the other is that it does not have a direct effect on the outcome variable, only indirectly through the treatment variable. NOMINATE is a scaling method that has been used widely to describe the political ideology of institutions on state policy outputs.^{78,79} The scores are government ideology indicators measuring the “average location of the elected officials in each state on a liberal-conservative continuum.” The measure “relies on the ideological orientations of members of Congress, operationalized by interest-group ratings compiled by the Americans for Democratic Action and the AFL-CIO Committee on Political Education.”^{78,79}

NOMINATE was chosen as an instrument under the logic that more liberal states will tend to enact more stringent laws because liberal political ideology tends to support government regulation. This hypothesis is consistent with that used by Mukamel et al that hypothesized states with more economic freedom would have less stringent regulations. In that paper, the authors used Area 2 of the Economic Freedom Index of North America of 2010: “Takings and Discriminatory Taxation” as an IV and found that state regulatory stringency affected four results among seven quality measures.¹⁵ Similarly, one would not expect NOMINATE scores to affect complaint outcomes directly in this study, as government ideology does not apply directly to nursing homes or state LTCOMPs. For illustrative purposes, 2SRI regressions were run on three policy predictors (pressure ulcers, ADL and catheter) linking to four different outcomes (pressure ulcers, range of motion/ambulation, toileting/incontinent care and tubes). As this was intended as a sensitivity

analysis and for exploratory purposes, only a subset of outcomes were used. A balance check was also conducted to examine whether states and nursing home characteristics were comparable across different levels (quartiles) of NOMINATE.

Instead of the traditional two stage least squares approach which assumes a linear relationship between the variables of interest and outcomes, the 2SRI model allowed for a linear first stage and a second stage regression using negative binomial with the inclusion of the residuals from the first stage.¹⁰⁵ Standard errors were bootstrapped since while a 2SRI approach will give the unbiased estimates of the true coefficient values, the standard errors will be incorrect as they need to take into account the predicted unobserved confounding factor was an estimated as opposed to known quantity.¹⁰⁵

C. Results

1. Descriptives

Table XIV (Part A) below shows the percentage of states at or below federal standards and above federal standards by policy predictor across the pooled sample. The areas where states had more laws exceeding federal standards include therapeutic diets (66.53%), ADL (51.22%), pressure ulcers (50.20%) and bowel and bladder (50.20%). In contrast, antipsychotic drugs (14.08%) and unnecessary drugs (8.98%) had a smaller percentage of states going above federal standards. Further analysis of state nursing home quality of care regulations is available in Chapter II.

Part B presents the percentage of states with requirements regarding notification and documentation for each specific policy predictor condition. From the table we see that these requirements were not widespread in state laws. Antipsychotic drugs had the most documentation requirements, whereas pressure ulcers had the most notification requirements.

TABLE XIV: DESCRIPTIVES OF STATE LAWS			
Part A: Percentage in Each Law Category by Policy Predictor Across Samples			
Policy Predictor	%	Policy Predictor	%
Pressure Ulcers		Pain	
Federal or Below	48.78	Federal or Below	77.55
Above Federal	51.22	Above Federal	22.45
ADL		Therapeutic Diet	
Federal or Below	49.80	Federal or Below	33.47
Above Federal	50.20	Above Federal	66.53
Bowel and Bladder		Antipsychotic Drugs	
Federal or Below	49.80	Federal or Below	85.92
Above Federal	50.20	Above Federal	14.08
Catheter		Unnecessary Drugs	
Federal or Below	55.92	Federal or Below	91.02
Above Federal	44.08	Above Federal	8.98
Part B: Percentage in Each Law Requirement by Policy Predictor Across Samples			
Policy Predictor	%	Policy Predictor	%
Pressure Ulcers		Pain	
Notification	6.12	Notification	0
Documentation	4.08	Documentation	4.08
ADL		Therapeutic Diet	
Notification	0	Notification	0
Documentation	4.08	Documentation	6.12
Bowel and Bladder		Antipsychotic Drugs	
Notification	2.04	Notification	1.84
Documentation	4.08	Documentation	7.76
Catheter		Unnecessary Drugs	
Notification	0	Notification	0
Documentation	12.24	Documentation	0

Table XV (Part A) depicts summary statistics on long-term care ombudsmen complaints across states. The outcomes are over-dispersed, as the number of complaints varied widely from state to state. The most common complaint involves symptoms unattended (including pain), while toileting and incontinence care had the second most complaints. Complaints regarding bowel and bladder training were the least frequent.

Part B displays the means and standard deviations for LTCOMP, facility and resident characteristics aggregated at the state level. The nursing home residents were predominately female, the majority were on Medicaid, and had an average age of approximately 80. For-profit and chain facilities accounted for over 50% of nursing homes. State LTCOMP characteristics also varied from state to state, as reflected by the standard deviations relative to the means.

Table XVI below presents the means of the outcomes over time. There was a continuous declining trend in complaints for almost all outcomes, including pressure ulcers, range of motion/ambulation, bowel and bladder training, neglect of catheter, symptoms unattended (including pain), psychoactive drugs and therapeutic diet. The changes in toileting (incontinent care) complaints were not as consistent. Pain and range of motion/ambulation had larger percentages of decreased complaints when comparing 2015 to 2006.

2. Pooled Negative Binomial Regressions

Table XVII displays the multivariate associations between policy predictors and LTCOMP complaints for years 2006-2015, corresponding to RQ1. Five out of the eight outcomes were significant. Out of the five policy predictors which were significant, all had expected higher rates of complaints with the exception of pain (opposite of what was hypothesized earlier). Pressure ulcer laws that exceeded federal standards were associated with a rate of 1.624 times higher (62.4% more) for complaints in a state. Compared to catheter laws at or below federal standards, those that

TABLE XV: SUMMARY STATISTICS					
Part A: Summary Statistics – Outcomes					
Outcome	Mean	Std Dev	Range	% of zero complaints	
Pressure sores	33.21	56.45	0 - 420	3.06	
Range of motion/ambulation	14.63	21.58	0 - 156	8.78	
Bowel and bladder training	2.08	4.35	0 - 53	38.37	
Toileting, incontinent care	57.40	97.00	0 - 768	1.02	
Tubes - neglect of catheter, gastric, NG tube	13.31	22.15	0 - 156	10.00	
Symptoms unattended, including pain, no notice to others of changes in condition	93.09	160.84	1 - 1045	0	
Psychoactive drugs - assessment, use, evaluation	5.88	8.05	0 - 64	15.51	
Therapeutic diet	16.94	23.67	0 - 153	3.88	
Part B: Summary Statistics – Covariates					
State-level Controls	Mean	Std Dev	Facility and Resident Characteristics, continued	Mean	Std Dev
Deficiencies	8.95	3.19	Average RUGS NCMI	0.98	0.17
Median Income	55,984.68	8,734.50	Average Acuity Index	11.47	0.81
Unemployment	6.42	2.21	Percent female	68.70	3.32
LTCOMP Characteristics (state-level)			Percent low care	12.81	5.13
Total Funding	1,770,735	1,756,124	Hospital-based	9.61	11.80
Paid Full-time Staff	174.38	267.49	Profit	65.39	16.22
Total Entities	11.57	10.48	Multi-facility	54.65	12.87
Number of Certified Volunteer Ombudsmen	24.98	25.35	Direct Care Hours Per Resident Day	3.71	0.39
Facility and Resident Characteristics (state-level)			Percent Medicare	13.79	3.05
Total Beds	34098.17	32384.75	Average Age	80.22	2.11
Occupancy Rate	82.95	7.44	Average ADL	16.19	1.52
Percent Medicaid	62.35	5.87	-		

TABLE XVI: MEAN OUTCOMES BY YEAR										
Complaints /Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Pressure Ulcers	39.88	39.94	39.84	37.12	34.86	30.16	29.59	27.41	26.39	26.88
Range of Motion/ Ambulation	23.20	19.73	16.45	14.24	12.71	14.08	11.98	11.43	11.24	11.22
Bowel and Bladder Training	3.41	2.57	2.98	2.31	2.04	1.63	1.49	1.53	1.63	1.20
Toileting, Incontinent Care	73.08	77.47	69.02	59.69	52.47	50.02	45.96	47.37	47.94	50.94
Tubes- Neglect of Catheter	16.61	16.08	15.92	14.80	12.53	12.22	11.41	11.47	11.18	10.84
Symptoms Unattended, Including Pain	114.98	115.08	110.32	95.96	90.96	86	83.90	83.51	75.02	75.12
Psychoactive Drugs	7.33	7.35	7.69	6	5.65	5.55	5.22	5.04	4.80	4.18
Therapeutic Diet	21.06	21.08	19.59	16.82	15.86	15.45	15.63	15.12	14.45	14.31

TABLE XVII: ASSOCIATIONS BETWEEN POLICY PREDICTORS AND LTCOMP COMPLAINTS, 2006-2015

All laws below or equal to federal standards (REF) v. all laws above federal			
LTCOMP Complaint Outcome	Policy Predictor	Law Category	IRR (95% CI)
Pressure sores	Pressure Ulcer	Above	1.624** (1.441, 1.830)
Range of motion/ambulation	Activities of Daily Living	Above	1.320** (1.132, 1.540)
Bowel and Bladder Training	Bowel and Bladder	Above	0.957 (0.832, 1.102)
Toileting, incontinent care	Catheter	Above	1.332** (1.157, 1.534)
Tubes - neglect of catheter, gastric, NG tube	Catheter	Above	1.244** (1.082, 1.430)
Symptoms unattended, including pain, no notice to others of changes in condition	Pain ^a	Above	0.704** (0.576, 0.861)
Psychoactive drugs - assessment, use, evaluation	Antipsychotic Drugs	Above	1.890 (1.494, 2.403)
	Unnecessary Drugs	Above	1.047 (0.796, 1.376)
Therapeutic Diet	Therapeutic Diet	Above	0.921 (0.796, 1.065)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

a: Federal laws did not address pain

exceeded federal standards were associated with two outcomes, toileting/incontinent care and the neglect of tubes, by 1.332 times (33.2% more) and 1.244 times (24.4% more), respectively. ADL laws above federal standards were associated with a rate 1.32 times greater (32% more) for a range of motion/ambulation complaints. Pain was the only finding where complaints decreased (as hypothesized). For state laws that did address or recognize resident pain, their rate of complaints would be expected to decrease by a factor of 0.704 (approximately 30%). Aside from the policy predictors of interest, significant covariates are presented in Appendix M. The covariates that were significant varied by outcome. Overall, only the total number of beds in a state were generally predictive of the number of complaints.

Table XVIII below shows the associations between notification and documentation requirements in the laws and LTCOMP complaints, corresponding to RQ2 and RQ3, respectively. In total, 3 state law-related documentation requirements - pressure ulcers, catheters and pain - were associated with a lower rate of complaints, while state law-related notification requirements regarding antipsychotic drug use were associated with a higher rate of complaints at the 0.05 significance level.

Overall, the majority (with the exception of bowel and bladder - notification and therapeutic diet – documentation, which were non-significant) of the coefficient directions were fairly consistent and as hypothesized. Documentation requirements were associated with a lower rate of complaints, while notification requirements were associated with higher rates of complaints. Significant covariates are presented in Appendix N. The total number of beds and either funding or staff in a state were generally significant, while other factors varied widely from outcome to outcome, similar to the main policy predictor regressions. This suggests that the nursing home population size in a state and LTCOMP resources may play a role in the number of complaints.

TABLE XVIII: ASSOCIATIONS BETWEEN NOTIFICATION AND DOCUMENTATION REQUIREMENTS AND LTCOMP COMPLAINTS, 2006-2015

Laws that require notification/documentation vs. no requirement in laws		
Outcome	Requirement ^a	IRR (95% CI)
Pressure Ulcers	Notification	1.066 (0.842, 1.351)
	Documentation	0.659* (0.462, 0.939)
Range of motion/ambulation	Documentation	0.904 (0.632, 1.294)
Bowel and Bladder Training	Notification	1.406 (0.776, 2.550)
	Documentation	1.714+ (0.536)
Toileting, incontinent care	Documentation	0.536** (0.413, 0.670)
Tubes - neglect of catheter, gastric, NG tube	Documentation	0.854 (0.664, 1.099)
Symptoms unattended, including pain, no notice to others of changes in condition	Documentation	0.453** (0.313, 0.654)
Psychoactive drugs - assessment, use, evaluation	Notification	2.195** (1.523, 3.163)
	Documentation	0.956 (0.706, 1.295)
Therapeutic diet	Documentation	1.213 (0.857, 1.717)

a: If a notification or documentation requirement is not displayed here, it means no states had that requirement for a particular policy predictor.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

3. DID Analysis (RQ1)

Table XIX below presents the effect of law changes on the corresponding complaints outcomes after two years, controlling for secular trends. While a total of five states (Wisconsin, South Carolina, Hawaii, Ohio, North Carolina) had changes to seven of the chapter's eight policy predictors over time, Table XIX only presents the changes for antipsychotic medication, pressure ulcers and therapeutic diets as the remaining regressions did not converge. Reasons for the lack of convergence on the other outcomes may include the fact that the sample sizes are limited as they were restricted to a total of three years (one year prior to change and two years after the change) and states that changed had to be matched to states with similar levels of law prior to change. States sometimes strengthened their standards while weakening or removing others. However, no policy predictor had more than one state that changed simultaneously (i.e., in the same year). Accordingly, the analyses consisted of one to many states comparisons for each policy predictor with change. Out of the three significant outcomes, two enhancements in the laws (antipsychotic medication and pressure ulcer) were associated with a lower rate of complaints, while an enhancement in unnecessary drug laws in NC were associated with a higher rate of complaints.

4. Sensitivity Analyses and IV Findings

The associations between states laws in the "Federal Plus" and "Federal Enhanced" categories and complaint outcomes are available in Appendix O. Six out of the eight outcomes (excluding bowel and bladder training and therapeutic diet) were significantly associated with at least a "Federal Plus" or "Federal Enhanced" category for the corresponding policy predictors, including pressure ulcers, catheters, ADL, antipsychotic medication, unnecessary drugs and pain. All of these were associated with a higher rate of complaints except for the "Federal Plus" categories of unnecessary drugs and pain, which were associated with a lower rate. The direction

TABLE XIX: DID REGRESSIONS RESULTS SHOWING EFFECT OF LAW CHANGES ON COMPLAINT OUTCOMES BY YEAR OF CHANGE

Outcome (Policy Predictor)	State	Year of Change (Type of Change)	Interaction Coefficient ^a (SE)	Base Number of Complaints
Antipsychotic Medication; N=129 (Antipsychotic Medication)	WI	2006 (Enhance)	0.606** (0.094)	18
Therapeutic Diet; N=75 (Therapeutic Diet)	WI	2007 (Relax)	1.650 (0.593)	13
Pressure Ulcer; N=75 (Pressure Ulcer)	SC	2008 (Enhance)	1.046 (0.223)	54
Pressure Ulcer; N=72 (Pressure Ulcer)	HI	2011 (Enhance)	0.578* (0.145)	2
Therapeutic Diet; N=51 (Therapeutic Diet)	OH	2012 (Enhance)	0.801 (0.134)	59
Antipsychotic Medication; N=135 (Unnecessary Drugs)	NC	2012 (Enhance)	1.775* (0.393)	5

^aThe coefficients on the policy predictor variables reflect aggregated changes in state-level complaints using one year prior to change and two changes after change. State that changed were compared with states that had similar levels of laws and did not change. All regressions used a negative binomial model. Robust standard errors are in parentheses. The base numbers reflect the mean outcome of the changing (treatment) state prior to change. * ≤ 0.05 , ** ≤ 0.01

of the relationship between “Federal Plus” or “Federal Enhanced” laws and the outcomes were not always consistent.

Table XX shows the results using NOMINATE as an instrument and two stage residual inclusion models. For all regressions, the F-statistics are not enormous, but all are larger than 10, indicating that the instrument is considered strong. The results for policy predictors pressure ulcer, catheter and ADL were all significantly associated with a higher rate of complaints. Besides direction, they were also similar to the pooled cross-sectional regression results in terms of magnitude, and were opposite of what was initially hypothesized.

D. Discussion

Even though consumer-generated quality concerns may be more timely than traditional quality measures¹⁹ and LTCOMP complaints have been suggested to be a more accurate reflection of nursing home problems compared to CMS surveys,⁹³ there is currently a large gap in the

TABLE XX: 2SRI REGRESSIONS RESULTS SHOWING EFFECT OF LAW CHANGES ON QUALITY OUTCOMES

Outcome (Policy Predictor)	Coefficient^a (SE)	First Stage F-statistic
Pressure Ulcer; N=490 (Pressure Ulcer)	1.605** (0.111)	10.26
Toileting, incontinent care; N=490 (Catheter)	1.249** (0.094)	23.17
Tubes; N=490 (Catheter)	1.339** (0.110)	23.17
Range of Motion/Ambulation; N=490 (ADL)	1.275** (0.109)	33.41

^aAll regressions used two-stage residual inclusion models with a linear first stage and negative binomial second stage. Bootstrapped standard errors are in parentheses.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

literature regarding LTCOMP complaints, as well as their relationship to nursing home regulation.

This study contributes to the literature by being the first study to analyze specific state-level nursing home laws and link them to LTCOMP complaints via a novel use of the complaint data. Table XXI below summarizes actual relationships between state laws and LTCOMP complaints compared to the initial hypotheses. The results were somewhat mixed. Laws that went above federal standards were significantly associated with five (pressure ulcers, range of motion/ambulation, toileting and incontinent care, neglect of tubes and pain symptoms unattended) out of eight complaint outcomes. Out of the five results which were significant, all were associated with a higher rate of complaints with the exception of pain.

Even though it was initially hypothesized that states with more stringent laws would see fewer complaints due to improved quality under traditional measures, the literature has found little association between traditional quality measures and LTCOMP complaints.⁹⁸ In this study, I consistently found four significant findings (pressure ulcers, range of motion/ambulation, toileting and incontinent care, neglect of tubes) that were associated with a higher rate of complaints using two different analytic approaches. Although disappointing, the literature has suggested that having higher consumer complaints does not necessarily reflect worse quality, but possibly a more comprehensive solicitation process.^{99,106,107} Nursing home consumers and their caregivers are conveying information on the issues that are of the most concern to them,⁹⁹ and having more complaints is another avenue for highlighting issues and letting facilities and states know when there are problems.

Pain was the only policy predictor that was inversely associated with the corresponding outcome. State laws that addressed or recognized resident pain were associated with 30% fewer

TABLE XXI: COMPARISON OF HYPOTHESIZED AND ACTUAL RELATIONSHIPS BETWEEN STATE LAWS AND LTCOMP COMPLAINTS			
Research Question 1: How are states with laws going above federal standards in the following areas associated with LTCOMP complaints?			
Policy Predictor	Outcome (Complaint Category)	Hypothesized Association with Complaints	Actual Association with Complaints (*p < 0.05)
Pressure Ulcer	Pressure ulcer, not turned	Lower rate	Higher rate*
ADL	Range of Motion/ambulation	Lower rate	Higher rate*
Bowel and Bladder	Bowel and Bladder Training	Lower rate	Lower rate
Catheter	Toileting, Incontinent Care	Lower rate	Higher rate*
Catheter	Neglect of Tubes, including catheter	Lower rate	Higher rate*
Pain	Symptoms unattended, including pain	Lower rate	Lower rate*
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate	Higher rate
Unnecessary Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate	Higher rate
Therapeutic Diet	Therapeutic Diet	Lower rate	Lower rate
Research Question 2: How are having notification requirements in the laws for the following areas associated with LTCOMP complaints?			
Pressure Ulcer	Pressure Ulcer, not turned	Higher rate	Higher rate
Bowel and Bladder	Bowel and Bladder Training	Higher rate	Higher rate
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Higher rate	Higher rate*
Research Question 3: How are having documentation requirements in the laws for the following areas associated with LTCOMP complaints?			
Pressure Ulcer	Pressure Ulcer, not turned	Lower rate	Lower rate*
ADL	Range of Motion/ambulation	Lower rate	Lower rate
Bowel and Bladder	Bowel and Bladder Training	Lower rate	Higher rate
Catheter	Toileting, Incontinent Care	Lower rate	Lower rate*

TABLE XXI: COMPARISON OF HYPOTHESIZED AND ACTUAL RELATIONSHIPS BETWEEN STATE LAWS AND LTCOMP COMPLAINTS (continued)			
Research Question 3: How are having documentation requirements in the laws for the following areas associated with LTCOMP complaints?			
Policy Predictor	Outcome (Complaint Category)	Hypothesized Association with Complaints	Actual Association with Complaints (*p < 0.05)
Catheter	Neglect of Tubes, including catheter	Lower rate	Lower rate
Pain	Symptoms unattended, including pain	Lower rate	Lower rate*
Antipsychotic Drugs	Psychoactive Drugs – assessment, use, evaluation	Lower rate	Lower rate
Therapeutic Diet	Therapeutic Diet	Lower rate	Higher rate

complaints regarding symptoms unattended, including pain. Pain was also the only significant outcome that is subjective to the resident. With mandating pain assessment in nursing homes and residents' pain being recognized, residents may feel less of a need to complain to ombudsmen about pain symptoms being unattended to.

Three documentation requirements—pressure ulcers, catheters and pain—were associated with decreased complaints, while notification requirements regarding antipsychotic drug use were associated with increased complaints at a 0.05 significance level. Though not entirely consistent with the hypotheses, the majority of findings did suggest that notification requirements (reporting a policy predictor condition to someone) are associated with a higher rate of complaints, whereas documentation requirements are associated with a lower rate of complaints. Requiring notification of a condition can lead to greater awareness of the problem and possibly more complaints, and highlights the importance of communication and transparency regarding resident care. There is a need to notice and report a resident's condition or changes thereto, especially since it has been deemed to be an important safety issue in nursing homes.¹⁰⁸ Requiring facilities to document a condition may help ensure they are addressing the issue, as complaints often involve failing to document or notice a condition. For example, pressure ulcer complaints are recorded when a facility fails to treat, document, monitor pressure sores.¹⁰⁹

The DID analysis showed that out of the three significant outcomes, raised standards in antipsychotic medication and pressure ulcer laws were associated with a lower rate of complaints, while enhanced standards in unnecessary drug laws in NC were associated with a higher rate. While the outcome psychoactive drug use showed two different findings, antipsychotic medication and unnecessary drugs are separate policy predictors measuring the conditions for antipsychotic drug use and the prohibition of excessive medication, respectively. They reflect different

dimensions of a boarder outcome. In addition, as visual inspection revealed different pre-change trends for the psychoactive drug outcome, the estimates may be biased. Overall, the findings from the DID regressions in this study are somewhat limited and inconsistent, and therefore harder to interpret or draw conclusions from. However, the IV analysis rendered similar estimates, both in magnitude and significance to the pooled regression results, reflecting consistent parameter estimates assuming the IV was a truly exogenous source of variation.¹¹⁰

In summary, findings from this study help supplement quality reporting efforts and also provide insight into the role that state laws, in addition to federal regulations, can play in enhancing residents' experiences with the quality of care provided in nursing homes. The study provides some evidence that requiring documentation on specific conditions or pain assessment in nursing home laws may be associated with lesser complaints. Further research is needed to understand more fully the relationship between nursing home regulation and resident or caregiver-derived quality complaints. Besides descriptive and correlational research, state laws can also be followed over a longer period of time, enabling more studies with quasi-experimental designs to take advantage of this to assess the effect of regulation on nursing home complaints.

E. Limitations

There are several limitations to this study. First, with state-level analysis there are concerns regarding state-level endogeneity and unmeasured confounding. A state's stringent regulations (or lack thereof) are likely to be endogenously associated with the quality level offered by the industry in the state.¹⁵ In addition, ombudsman programs and practices have been documented to vary from state to state.^{93,93,98} While a DID and IV design was attempted in this study to help address these issues and, due to the limited changes in state laws and small sample size/convergence issues, the DID results did not provide a consistent interpretation or overall feasible approach. The estimation

with instrumental variables can help address endogeneity, but there still could be state attributes associated with both the IV and outcomes reflecting omitted variable bias. Accordingly, these analyses suggest the relationship between state nursing home quality of care regulation and LTCOMP complaints cannot be interpreted as cause and effect.

Second, the quality measures used as outcomes in this study do not represent a global measure of quality within a nursing home or state, only as it relates to specific complaints reflecting different dimensions of resident care. It is also important to avoid the “ecological fallacy.” The ecological fallacy refers to “a failure in reasoning that arises when an inference is made about an individual based on aggregate data for a group.”^{111,112} As details about individuals may be lost or concealed in aggregate datasets, it would be incorrect to apply the group findings to every individual in the group. Thus, while the results from this study can inform readers on how nursing home regulation is *associated* with consumer-determined quality, they should not be interpreted as all nursing homes in a particular state with less complaints providing better quality of care.

Third, the nature of state-level data means that certain details which may help explain the relationship regarding complaints is not available. For example, the author is unable to measure whether more “active” ombudsmen or a more comprehensive solicitation process is driving more complaints, or whether retaliation plays a role. It is possible that residents and family members would be more inclined to complain if there was more access to ombudsmen or if they felt resident concerns were being taken seriously. Residents may be less inclined to complain if they thought they would be retaliated against.

Future research should try to obtain, if possible, ombudsmen complaint data on the facility level from state LTCOMPs, though this may prove challenging due to confidentiality issues.⁹³ Facility-level data can then be linked to state regulations to conduct studies with quasi-

experimental designs for causal inference. With facility-level data, it would also be beneficial to see more studies on which potential factors are driving more or less complaints in nursing homes. Another way to expand use of the underutilized complaint data is to further assess the relationship between ombudsmen complaints and CMS quality measures.

F. Conclusion

This is a highly innovative study as to the best of my knowledge, it is the first study in the literature to analyze state nursing home quality of care laws and link them to LTCOMP complaints. The study offers research on a new topic and provides a starting foundation for future research regarding regulation and LTCOMP complaints. The study also offers a framework for thinking about quality outside of traditional CMS measures and regulatory actions while employing underutilized data. Its findings help inform policy makers at all levels about residents' experiences in nursing homes and complements research on nursing home regulation and traditional quality measures.

V. OVERALL CONCLUSION

This study aimed to examine how state nursing home regulations are related to quality of care provided in nursing homes. While “quality” itself can be a generic and subjective concept and hard to capture with one measurement,¹¹³ this study conceptualized quality via two different and complementary perspectives. One was based on the main federal regulatory oversight body for nursing homes, while the other came from the perspective of the consumer themselves. The Centers for Medicare and Medicaid Services created several quality indicators for the agency and the public to rate the quality of nursing homes, reflecting clinical care and processes that nursing homes can do to improve their quality measure outcomes.⁴² The other perspective involves quality determined from a consumer’s standpoint, utilizing complaints reported to state LTCOMPs by residents and caregivers. As shown in Figure 1, laws, through their impact on provider behaviors (such as turning patients to prevent pressure sores or keeping waste areas clean to prevent UTIs) and nursing home environments, have the potential to influence not only clinical outcomes, but also how residents perceive their experience in nursing homes.

Results from this dissertation suggest that more stringent regulation may lead to or is associated with better clinical quality outcomes, even if not completely consistent across multiple dimensions of quality. Laws going above federal standards were mostly associated with increased complaints. The author thereby believes that regulation has both positive and negative implications. Specificity in the laws may be linked with better care processes and a lower percentage of residents with a poor clinical condition. However, it is also possible that rigid requirements may hinder resident-centered care and staff innovation.^{60,61} In addition, this study does not examine the cost of regulation and whether it is justified in that context.

The author would also argue that while laws exceeding federal standards were mostly associated with increased complaints, this should not necessarily be viewed in an unfavorable light. Residents are primarily reflecting concerns that are of the most importance to them, and hence complaints serve as another avenue for facilitating awareness of problems for both nursing homes and oversight bodies. The goal is for facilities and policy-makers to pay attention to resident perspectives to not only address both individual and systemic issues raised, but ultimately enhance residents' experiences in nursing homes.

In conclusion, this dissertation formed an innovative and significant study that contributed to the nursing home regulation literature in various ways. A novel, longitudinal dataset of state alignment with federal standards covering nine key markers and two administrative-related provisions was created originally. This not only allows for organized comparison of the scope and strength of state regulations, but also paves the way for statistical analysis of nursing home regulation in future research extending beyond Chapters III and IV. The empirical research from the study provided some evidence that more stringent regulation may lead to or is associated with better quality outcomes, but that specificity in the laws matter. The study also took a diverse approach to "quality" and saw that documentation requirements in the laws were associated with decreased complaints made to ombudsmen. While causal inference should be limited in scope, these are findings that regulators and policy-makers at all levels may take into account to help guide future quality improvement initiatives. Ultimately, the findings from this study have implications for over 15,000 nursing homes and 1.4 million nursing home residents.

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APPENDICES

APPENDIX A

Westlaw and LexisNexis Search Strings

Westlaw Search Strings

(nursing (standard quality /3 care) facility! resident!) /50 pain pressure sore! skin (urinary /3 infection incontinence) ulcer! decubiti decubitus bowel bladder catheter (bowel /3 bladder) (catheter /10 bladder) % PR("correctional treatment center" "assisted living" hospice "birth centers" dental oil gas "continuing education" "medical malpractice" veteran insurance plumbing)

(nursing (standard quality /3 care) facility resident!) /50 locomotion ambulate! (ability/5 move) (range /3 motion) (activities daily/5 living) contracture! "restorative nursing" "rehabilitative nursing" "rehabilitation nursing" % pr ("assisted living" hospice "birth centers" "continuing education" "community residential facility" "substance abuse" "home and community-based" child! school! pupil! student!)

(nursing (standard quality /3 care) facility! resident!) /50 anxiety! psychotic psychotropic psychoactive psychotherapeutic psychopharma! (unnecessary /5 drug!) (hypnotic antipsychotic psychotropic psychoactive/5 medication drug) "drug regime" % PR("assisted living" hospice "birthing centers" "continuing education" "community residential" "workers compensation" "mental retardation" "mentally retarded")

(nursing (standard quality /3 care) facility! resident!)/50 weigh! protein "nutritional status" (therapeutic/5 diet!) % pr ("assisted living" hospice "birthing centers" "continuing education" school! pupil! student! "disease transmission" tuberculosis)

LexisNexis Search Strings

(nursing or (standard or quality w/3 care) or facility! or resident!) w/50 pain or pressure or sore! or skin or (urinary /3 infection or incontinence) or ulcer! or decubiti or decubitus or bowel or bladder or catheter or (bowel w/3 bladder) or (catheter w/10 bladder) and not heading ("correctional treatment center" or "assisted living" or hospice or "birth centers" or dental or oil or gas or "continuing education" or "medical malpractice" or veteran or insurance or plumbing)

(nursing or (standard or quality w/3 care) or facility! or resident!) w/50 locomotion or ambulate! or (ability w/5 move) or (range w/3 motion) or (activities or daily w/5 living) or contracture! or "restorative nursing" or "rehabilitative nursing" or "rehabilitation nursing" and not heading ("assisted living" or hospice or "birth centers" or "continuing education" or "community residential facility" or "substance abuse" or "home and community-based" or child! or school! or pupil! or student! "group homes")

(nursing or (standard or quality w/3 care) or facility! or resident!) w/50 anxiety! or psychotic or psychoactive or psychotherapeutic or psychopharma! or psychotropic or (unnecessary w/5 drug!) or (hypnotic or antipsychotic or psychotropic or psychoactive w/5 medication or drug) or "drug

APPENDIX A (continued)

regime” and not heading ("assisted living" hospice "birthing centers" "continuing education"
"community residential" "workers compensation" "mental retardation" "mentally retarded")

(nursing or (standard or quality w/3 care) or facility! or resident!) w/50 weigh! or protein or
“nutritional status” or (therapeutic w/5 diet!) and not heading (“assisted living” hospice “birthing
centers” “continuing education” school! pupil! student! “disease transmission” tuberculosis)

APPENDIX B

Nursing Home Quality of Care Coding Rubric

Item	Value	Coding Description
Pressure Ulcer The extent to which laws address pressure ulcers in nursing home care.	0	State law does not address pressure ulcers
	1	State has recommended policy provisions regarding pressure ulcers, or has requirements below federal standards Example: <ul style="list-style-type: none"> The policies shall be designed and implemented to ensure that the resident receives proper care to prevent pressure sores and deformities.
	2	State mirrors federal law Example: <ul style="list-style-type: none"> Based on the comprehensive assessment of a resident, the facility must ensure that—(1) A resident who enters the facility without pressure sores does not develop pressure sores unless the individual's clinical condition demonstrates that they were unavoidable; and (2) A resident having pressure sores receives necessary treatment and services to promote healing, prevent infection and prevent new sores from developing.
	3	State requires skin care only Examples: <ul style="list-style-type: none"> Nursing personnel shall employ appropriate nursing management techniques to promote the maintenance of skin integrity and to prevent development of decubiti filed in the resident's clinical record. The nursing home must ensure that the appropriate care and services are provided to the resident in the following areas, as applicable in accordance with the resident's individualized assessments and plan of care: (b) Skin.
	4	State requires changing of positions for bedfast or chair-fast residents Example: <ul style="list-style-type: none"> Measures shall be taken toward the prevention of pressure sores, and if they exist, treatment shall be given on written medical order. The position of bed patients shall be changed every two (2) hours during the day and night.
	5	State requires changing of positions for bedfast or chair-fast residents and the provision of supportive or pressure reducing devices. Example:

APPENDIX B (continued)

		<ul style="list-style-type: none"> An inactive or bedfast patient shall be positioned according to written procedures so that major body parts are in natural alignment. Such position shall be changed appropriately at regular and specified intervals. Supportive devices shall be employed as indicated to maintain posture, support weakened body parts, or relieve undue pressure.
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Item	Value	Coding Description
Activities of Daily Living (ADL) The extent to which laws address ADLs in nursing home care.	0	State law does not address ADLs
	1	State has recommended policy provisions regarding ADLs, or has requirements below federal standards Examples: <ul style="list-style-type: none"> Each resident shall receive assistance as needed with activities of daily living to maintain the highest practicable well being. These shall include, but not be limited to: <ol style="list-style-type: none"> Bath, dressing and grooming; Transfer and ambulate; Good nutrition, personal and oral hygiene; and Toileting. Services shall be provided to prevent clinically avoidable complications, including, but not limited to: <ol style="list-style-type: none"> Pressure ulcer development; Contracture;
	2	State mirrors federal law Example: <ul style="list-style-type: none"> Based on the comprehensive assessment of a resident, the facility must ensure that—(1) A resident’s abilities in activities of daily living do not diminish unless circumstances of the individual’s clinical condition demonstrate that diminution was unavoidable. This includes the resident’s ability to—(i) Bathe, dress, and groom; (ii) Transfer and ambulate; (iii) Toilet;(iv) Eat; and (v) Use speech, language, or other functional communication systems. (2) A resident is given the appropriate treatment and services to maintain or improve his or her abilities specified in paragraph (a)(1) of this section.
	3	State requires restorative or rehabilitative nursing generically Examples: <ul style="list-style-type: none"> A nursing home must have an active program of rehabilitation nursing care directed toward assisting each resident to achieve and maintain the highest

APPENDIX B (continued)

		<p>practicable physical, mental, and psychosocial well-being according to the comprehensive resident assessment and plan of care described in parts 4658.0400 and 4658.0405.</p> <ul style="list-style-type: none"> • Facilities shall provide each resident, according to his/her needs, with restorative nursing to encourage independence, activity and self-help to maintain strength and mobility.
	4	<p>State doesn't mention restorative or rehabilitative nursing directly, but requires components of restorative nursing that address ADL and/or Range of Motion</p> <p>Examples:</p> <ul style="list-style-type: none"> • Residents who are not bedfast shall be encouraged to be dressed each day. • Good body alignment and adequate exercises and range of motion. • Nursing personnel shall provide care designed to maintain current functioning and to improve the resident's ability to carry out activities of daily living, including assistance with maintaining good body alignment and proper positioning to prevent deformities.
	5	<p>State requires restorative or rehabilitative nursing with specifications</p> <p>Example:</p> <ul style="list-style-type: none"> • Restorative nursing services shall include such procedures as: <ol style="list-style-type: none"> (1) Maintaining good body alignment, keeping range of motion of weak or paralyzed limbs, proper positioning and support with appropriate equipment - particularly of bedfast or wheel chair patients. (2) Assisting patients to keep active and out of bed for reasonable periods of time except when contraindicated by physician's or physician-physician assistant team's or physician-nurse practitioner team's orders or the patient's condition. (3) Assisting patients to maintain or restore function and activity through proper general exercises and activities appropriate to their condition. (4) Assisting and teaching the activities of daily living (such as feeding, dressing, grooming and toilet activities).

APPENDIX B (continued)

Item	Value	Coding Description
Bowel and Bladder – Urinary Incontinence The extent to which laws address urinary incontinence in nursing home care.	0	State law does not address urinary incontinence
	1	State has recommended policy provisions regarding urinary incontinence, or has requirements below federal standards Example: <ul style="list-style-type: none"> The nursing home must ensure that the appropriate care and services are provided to the resident in the following areas, as applicable in accordance with the resident's individualized assessments and plan of care: (c) Continence
	2	State mirrors federal law Example: <ul style="list-style-type: none"> Based on the resident's comprehensive assessment, the facility must ensure that— (2) A resident who is incontinent of bladder receives appropriate treatment and services to prevent urinary tract infections and to restore as much normal bladder function as possible.
	3	State requires rehabilitative or restorative nursing
	4	State requires specifics on bowel and bladder care, such as bowel and bladder training Example: <ul style="list-style-type: none"> Program of bowel and bladder retraining for incontinence, in accordance with the individual's potential for restoration.

Item	Value	Coding Description
Catheters The extent to which laws address catheter care in nursing homes.	0	State law does not address catheters in nursing homes
	1	State has recommended policy provisions regarding catheters, or has requirements that are below federal law Example: <ul style="list-style-type: none"> Other (skilled nursing care) examples include the administration of oxygen, the use of suction, the insertion or changing of catheters, the application of medicated dressings, the use of aseptic technique and preparation of the patient for special procedures.
	2	State mirrors federal law Example: <ul style="list-style-type: none"> Based on the resident's comprehensive assessment, the facility must ensure that— (1) A resident who enters the facility without an indwelling catheter is not catheterized unless the resident's clinical condition demonstrates that catheterization was necessary.
	3	State requires rehabilitative or restorative nursing

APPENDIX B (continued)

	4	State requires specifics on catheter care Examples: <ul style="list-style-type: none"> • Performing catheter care with proper positioning of bag and tubing at all times. • Catheter care including intermittent or continuous bladder irrigations, intermittent catheterizations, and use of other drainage catheters.
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Item	Value	Coding Description
Pain The extent to which laws address pain in nursing home care. Note: federal regulations were silent on pain prior to 2016. Hence, there is no federal reference category for my study period.	0	State law does not address pain
	1	State has recommended policy provisions regarding pain
	2	State stipulates that residents should have freedom or right to be free from pain Example: <ul style="list-style-type: none"> • A patient with pain has the right to request or reject the use of any or all treatments in order to relieve his or her pain.
	3	State references pain management (including any of type recognition, assessment, or management) generically Example: <ul style="list-style-type: none"> • The nursing home shall provide a process that assesses pain in all patients. There shall be an appropriate and effective pain management program.
	4	State requires pain management with specific protocols Example: <ul style="list-style-type: none"> • All health care providers licensed by Rhode Island to provide health care services and all health care facilities licensed under RIGL Chapter 23-17 shall assess patient pain in accordance with the requirements of the Rules and Regulations Related to Pain Assessment (R5-37.6-PAIN) promulgated by the Department.

Item	Value	Coding Description
Antipsychotic Drug The extent to which laws address antipsychotic drug use in nursing home care, exclusive of chemical restraints.	0	State law does not address antipsychotic drugs, exclusive of chemical restraints
	1	State has recommended policy provisions regarding antipsychotic drug use, exclusive of chemical restraints, or has requirements below federal standards
	2	State mirrors federal law Example: <ul style="list-style-type: none"> • Based on a comprehensive assessment of a resident, the facility must ensure that—(i) Residents who have not used antipsychotic drugs are

APPENDIX B (continued)

		<p>not given these drugs unless antipsychotic drug therapy is necessary to treat a specific condition as diagnosed and documented in the clinical record; and (ii) Residents who use antipsychotic drugs receive gradual dose reductions, and behavioral interventions, unless clinically contraindicated, in an effort to discontinue these drugs.</p>
	3	<p>State requires any one of the following:</p> <ul style="list-style-type: none"> • Consent for use • Further Restrictions on the condition for use • Dose and duration requirements • Monitor response to medication <p>Example:</p> <ul style="list-style-type: none"> • Obtain the informed consent of the resident for purposes of prescribing, ordering, or increasing an order for the medication.
	4	<p>State requires any two of the following:</p> <ul style="list-style-type: none"> • Consent for use • Further Restrictions on the condition for use • Dose and duration requirements • Monitor response to medication <p>Examples:</p> <ul style="list-style-type: none"> • The consent is evidenced in the resident's clinical record by a signed form prescribed by the facility, or by a statement of the person who prescribes the medication or that person's designee, that documents consent was given by the appropriate person and the circumstances under which the consent was obtained. • For purposes of this rule, a medication will be considered to be discontinued if therapy has been suspended for more than 70 days. If the suspended therapy is resumed within the 70-day period, an oral explanation of side effects should be documented in the clinical record.
	5	<p>State requires more than two of the following:</p> <ul style="list-style-type: none"> • Consent for use • Further Restrictions on the condition for use • Dose and duration requirements • Monitor response to medication <p>Example:</p> <ul style="list-style-type: none"> • The use of psychotropic drugs shall: <ol style="list-style-type: none"> (a) meet all conditions of paragraph (1) of this subdivision; (b) be ordered by a physician who, in accordance with generally accepted standards of care and

APPENDIX B (continued)

		<p>services, specifies the problem for which the drug is prescribed;</p> <p>(c) be used, except in emergencies, only as an integral part of a resident's comprehensive care plan and only after alternative methods for treating the condition or symptoms have been tried and have failed; and</p> <p>(d) be discontinued if harmful effects of the medication outweigh the beneficial effects of the drug.</p> <p>(ii) residents who use psychotropic drugs receive gradual dose reductions and behavioral interventions, unless clinically contraindicated, in an effort to discontinue these drugs and assist the resident to attain and maintain optimum physical and emotional functioning.</p>
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Item	Value	Coding Description
Unnecessary Drug	0	State law does not address unnecessary drugs
The extent to which laws address unnecessary drug use in nursing home care.	1	<p>State has recommended policy provisions regarding unnecessary drug use, or has requirements below federal standards</p> <p>Example:</p> <ul style="list-style-type: none"> Each resident's drug regimen is free of unnecessary drugs. For each drug ordered for residents there must be a diagnosis or condition to validate the use of the drug.
	2	<p>State mirrors federal law</p> <p>Example:</p> <ul style="list-style-type: none"> (l) Unnecessary drugs—(1) General. Each resident's drug regimen must be free from unnecessary drugs. An unnecessary drug is any drug when used: <ul style="list-style-type: none"> (i) In excessive dose (including duplicate drug therapy); or (ii) For excessive duration; or (iii) Without adequate monitoring; or (iv) Without adequate indications for its use; or (v) In the presence of adverse consequences which indicate the dose should be reduced or discontinued; or (vi) Any combinations of the reasons above.
	3	State requires review for unnecessary drugs specifically in drug regime, or monitoring (for effectiveness, adverse

APPENDIX B (continued)

		<p>consequences, etc), or further elaborates on what constitutes unnecessary drugs</p> <p>Example:</p> <ul style="list-style-type: none"> • Reviews the drug regimen of each resident monthly and as needed, including monitoring for unnecessary drugs. • The unnecessary drug criterion of "adequate indications for use" does not simply mean that the physician's order must include a reason for using the drug (although such order writing is encouraged). It means that the resident lacks a valid clinical reason for use of the drug as evidenced by the evaluation of some, but not necessarily all, of the following: resident assessment, plan of care, reports of significant change, progress notes, laboratory reports, professional consults, drug orders, observation and interview of the resident, and other information.
	4	<p>State requires review for unnecessary drugs and monitoring</p> <p>Example:</p> <ul style="list-style-type: none"> • A nursing home must monitor each resident's drug regimen for unnecessary drug usage, based on the nursing home's policies and procedures, and the pharmacist must report any irregularity to the resident's attending physician. If the attending physician does not concur with the nursing home's recommendation, or does not provide adequate justification, and the pharmacist believes the resident's quality of life is being adversely affected, the pharmacist must refer the matter to the medical director for review if the medical director is not the attending physician.

Item	Value	Coding Description
Weight	0	State law does not address resident weight
The extent to which laws address requirements on weight monitoring in nursing homes.	1	State has recommended policy provisions regarding weight , or has requirements below federal standards
	2	<p>State mirrors federal law</p> <p>Example:</p> <ul style="list-style-type: none"> • Based on a resident's comprehensive assessment, the facility must ensure that a resident—(1) Maintains acceptable parameters of nutritional status, such as body weight and protein levels, unless the resident's clinical condition demonstrates that this is not possible

APPENDIX B (continued)

	3	State requires weighing residents upon admission only, or weighing residents less than monthly, or state only address what to do in case of weight change, or weight is included in quality assurance only Examples: <ul style="list-style-type: none"> • Notification of any significant unplanned or undesired weight change shall be made to the resident's attending physician and the dietitian required by paragraph (K) of this rule. • Facility staff shall include the following general information in admission records: height and weight on admission.
	4	State requires weighting residents at least monthly Example: <ul style="list-style-type: none"> • Residents' weights shall be taken and recorded at least monthly unless contraindicated by a physician's order.
	5	State requires weighting residents periodically (monthly or less than monthly) and any of the following: <ul style="list-style-type: none"> • Record weight upon admission • Scale requirements • What to do in case of weight change • Quality assurance addresses weight Example: <ul style="list-style-type: none"> • The weight and length of each patient shall be taken and recorded in the patient's health record upon admission, and the weight shall be taken and recorded once a month thereafter.

Item	Value	Coding Description
Therapeutic Diets The extent to which laws address therapeutic diets in nursing home care.	0	State law does not address therapeutic diets in nursing homes
	1	State has recommended policy provisions regarding therapeutic diets, or has requirements below federal standards Example: <ul style="list-style-type: none"> • Therapeutic diets when prescribed by the licensed health care practitioner.
	2	State mirrors federal law Example: <ul style="list-style-type: none"> • Based on a resident's comprehensive assessment, the facility must ensure that a resident—(2) Receives a therapeutic diet when there is a nutritional problem. • Therapeutic diets must be prescribed by the attending physician.

APPENDIX B (continued)

	3	States has regulations on therapeutic diet menus, manuals, or standards only Examples: <ul style="list-style-type: none"> • Therapeutic diets shall be planned in accordance with the physician's order. To the extent that it is medically possible, it shall be planned from the regular menu and shall meet the patient's/resident's daily need for nutrients. • The menu for regular and therapeutic or special diets for the current week shall be posted in the dietary department and either in the patient dining room or a public place as defined in R 325.20104.
	4	State requires the involvement of a dietitian, whether it's in prescribing, planning, preparing, developing, serving therapeutic diets, assessment, etc. Example: <ul style="list-style-type: none"> • A current therapeutic diet manual approved by the dietitian and medical staff shall be readily available to all medical, nursing, and food service personnel.

Tracking Variables	Value	Coding Description
Recording Requirement State requires documentation or records on the policy predictor outcome (ex: pressure sore).	0	State law does not require documentation
	1	State requires documentation on the policy predictor outcome Example: <ul style="list-style-type: none"> • Detailed descriptions of all pressure ulcers, or other skin lesions, shall be recorded in the resident's record.
Reporting Requirement State requires notification or reporting of the policy predictor outcome (ex: pressure sore), regardless to whom.	0	State law does not require documentation
	1	States requires notification or reporting of the policy predictor outcome Example: <ul style="list-style-type: none"> • The facility shall notify the resident's physician of any accident, injury, or significant change in a resident's condition that threatens the health, safety or welfare of a resident, including, but not limited to, the presence of incipient or manifest decubitus ulcers or a weight loss or gain of five percent or more within a period of 30 days.

APPENDIX C

TABLE XXII: PERCENTAGE OF STATES IN EACH RATING OVER TIME

Policy Predictor/Year	0, %	1, %	2, %	3, %	4, %	5, %	Mean Score (SE)
Physical-Health Related							
ADL							
2005	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2006	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2007	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2008	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2009	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2010	19.61	7.84	19.61	19.61	9.80	23.53	2.63 (0.25)
2011	21.57	7.84	19.61	17.65	9.80	23.53	2.57 (0.26)
2012	21.57	7.84	19.61	17.65	9.80	23.53	2.57 (0.26)
2013	19.61	9.80	19.61	17.65	9.80	23.53	2.59 (0.25)
2014	19.61	9.80	19.61	17.65	9.80	23.53	2.59 (0.25)
Pressure Ulcer							
2005	21.57	9.80	19.61	13.73	25.49	9.80	2.41 (0.24)
2006	21.57	9.80	19.61	13.73	25.49	9.80	2.41 (0.24)
2007	21.57	9.80	19.61	13.73	25.49	9.80	2.41 (0.24)
2008	19.61	9.80	19.61	13.73	27.45	9.80	2.49 (0.23)
2009	19.61	9.80	19.61	13.73	27.45	9.80	2.49 (0.23)
2010	19.61	9.80	19.61	13.73	27.45	9.80	2.49 (0.23)
2011	19.61	7.84	19.61	15.69	27.45	9.80	2.53 (0.23)
2012	19.61	7.84	15.69	15.69	25.49	11.76	2.55 (0.24)
2013	19.61	7.84	15.69	15.69	25.49	11.76	2.55 (0.24)
2014	19.61	7.84	15.69	15.69	25.49	11.76	2.55 (0.24)
Bowel and Bladder							
2005	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)
2006	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)
2007	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)
2008	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)
2009	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)
2010	25.49	3.92	17.65	19.61	33.33	-	2.31 (0.22)

APPENDIX C (continued)

Policy Predictor/Year	0, %	1, %	2, %	3, %	4, %	5, %	Mean (SE)
2011	27.45	3.92	17.65	17.65	33.33	-	2.25 (0.23)
2012	27.45	3.92	17.65	17.65	33.33	-	2.25 (0.23)
2013	25.49	5.88	17.65	17.65	33.33	-	2.27 (0.22)
2014	25.49	5.88	17.65	17.65	33.33	-	2.27 (0.22)
Catheter							
2005	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2006	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2007	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2008	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2009	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2010	33.33	0	19.61	39.22	7.84	-	1.88 (0.20)
2011	35.29	0	19.61	37.25	7.84	-	1.82 (0.20)
2012	35.29	0	19.61	37.25	7.84	-	1.82 (0.20)
2013	33.33	1.96	19.61	37.25	7.84	-	1.84 (0.20)
2014	33.33	1.96	19.61	37.25	7.84	-	1.84 (0.20)
Pain							
2005	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2006	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2007	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2008	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2009	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2010	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2011	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2012	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2013	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
2014	78.43	0	1.96	11.76	7.84	-	0.71 (0.19)
Weight							
2005	39.22	0	21.57	19.61	3.92	15.69	1.96 (0.26)
2006	39.22	0	21.57	19.61	3.92	15.69	1.96 (0.26)
2007	39.22	0	21.57	19.61	3.92	15.69	1.96 (0.26)
2008	39.22	0	21.57	19.61	3.92	15.69	1.96 (0.26)
2009	37.25	0	21.57	19.61	5.88	15.69	2.04 (0.26)
2010	37.25	0	21.57	19.61	5.88	15.69	2.04 (0.26)

APPENDIX C (continued)

Policy Predictor/Year	0, %	1, %	2, %	3, %	4, %	5, %	Mean (SE)
2011	37.25	0	21.57	21.57	5.88	13.73	2.00 (0.25)
2012	37.25	0	23.53	19.61	5.88	13.73	1.98 (0.25)
2013	37.25	0	23.53	19.61	5.88	13.73	1.98 (0.25)
2014	37.25	0	23.53	19.61	5.88	13.73	1.98 (0.25)
Therapeutic Diet							
2005	17.65	1.96	11.76	15.69	52.94	-	2.84 (0.21)
2006	17.65	1.96	11.76	15.69	52.94	-	2.84 (0.21)
2007	17.65	3.92	11.76	15.69	50.98	-	2.78 (0.22)
2008	17.65	5.88	9.80	15.69	50.98	-	2.76 (0.22)
2009	17.65	5.88	9.80	15.69	50.98	-	2.76 (0.22)
2010	17.65	5.88	9.80	15.69	50.98	-	2.76 (0.22)
2011	17.65	5.88	9.80	15.69	50.98	-	2.76 (0.22)
2012	15.69	5.88	9.80	15.69	52.94	-	2.84 (0.21)
2013	15.69	5.88	9.80	15.69	52.94	-	2.84 (0.21)
2014	15.69	5.88	9.80	15.69	52.94	-	2.84 (0.21)
Drug-Use Related							
Antipsychotic Drug							
2005	68.63	0	19.61	5.88	1.96	3.92	0.84 (0.19)
2006	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2007	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2008	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2009	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2010	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2011	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2012	66.67	0	19.61	7.84	1.96	3.92	0.90 (0.20)
2013	66.67	0	19.61	5.88	3.92	3.92	0.92 (0.20)
2014	66.67	0	19.61	5.88	3.92	3.92	0.92 (0.20)
Unnecessary Drug							
2005	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2006	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2007	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2008	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2009	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)

APPENDIX C (continued)

Policy Predictor/Year	0, %	1, %	2, %	3, %	4, %	5, %	Mean (SE)
2010	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2011	66.67	5.88	19.61	3.92	3.92	-	0.73 (0.16)
2012	66.67	5.88	17.65	5.88	3.92	-	0.75 (0.17)
2013	66.67	5.88	17.65	5.88	3.92	-	0.75 (0.17)
2014	66.67	5.88	17.65	5.88	3.92	-	0.75 (0.17)

APPENDIX D

States in Each Category Rating by Policy Predictor and Year

ADL	0	1	2	3	4	5	Documentation	Notification
2005	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, HI, LA, MN, MO, OR, PA RI, TX, VT (10)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2006	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, HI, LA, MN, MO, OR, PA RI, TX, VT (10)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2007	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, HI, LA, MN, MO, OR, PA RI, TX, VT (10)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2008	AZ, CT,	MS, NM,	AL, IL,	AK, HI,	CA, ID,	AR, CO,	FL, TX (2)	(0)

APPENDIX D (continued)

	DE, FL, GA, MT, ND, NH, OH, SD (10)	SC, VA (4)	KS, NC, NE, NV, NY, UT, WA, WV (10)	LA, MN, MO, OR, PA RI, TX, VT (10)	IN, TN, WI (5)	DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)		
2009	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, HI, LA, MN, MO, OR, PA RI, TX, VT (10)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2010	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, HI, LA, MN, MO, OR, PA RI, TX, VT (10)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2011	AZ, CT, DE, FL, GA, HI, MT, ND, NH,	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT,	AK, LA, MN, MO, OR, PA RI, TX, VT	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI,	FL, TX (2)	(0)

APPENDIX D (continued)

	OH, SD (11)		WA, WV (10)	(9)		NJ, OK, WY (12)		
2012	AZ, CT, DE, FL, GA, HI, MT, ND, NH, OH, SD (11)	MS, NM, SC, VA (4)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, LA, MN, MO, OR, PA RI, TX, VT (9)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2013	AZ, CT, DE, FL, HI, MT, ND, NH, OH, SD (10)	GA, MS, NM, SC, VA (5)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, LA, MN, MO, OR, PA RI, TX, VT (9)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)
2014	AZ, CT, DE, FL, HI, MT, ND, NH, OH, SD (10)	GA, MS, NM, SC, VA (5)	AL, IL, KS, NC, NE, NV, NY, UT, WA, WV (10)	AK, LA, MN, MO, OR, PA RI, TX, VT (9)	CA, ID, IN, TN, WI (5)	AR, CO, DC, IA, KY, MA, MD, ME, MI, NJ, OK, WY (12)	FL, TX (2)	(0)

APPENDIX D (continued)

Pressure Ulcer								Documentation	Notification
0	1	2	3	4	5				
2005	AZ, CY, DE, FL, GA, MT, ND, NH, OH, SD, SC (11)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, TN, WI, WY (13)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)	
2006	AZ, CY, DE, FL, GA, MT, ND, NH, OH, SD, SC (11)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, TN, WI, WY (13)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)	
2007	AZ, CY, DE, FL, GA, MT, ND, NH, OH, SD, SC (11)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, TN, WI, WY (13)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)	
2008	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, SC, TN, WI, WY (14)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)	
2009	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, SC, TN, WI, WY (14)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)	

APPENDIX D (continued)

2010	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, HI, MO, OR, PA (5)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, LA, NE, NM, VA, WA, WV (7)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, SC, TN, WI, WY (14)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)
2011	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, MO, OR, PA (4)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, HI, LA, NE, NM, VA, WA, WV (8)	AR, DC, ID, KY, MA, MD, ME, MN, NJ, RI, SC, TN, WI, WY (14)	CA, IN, KS, MI, OK (5)	AR, RI (2)	CA, IL, IN (3)
2012	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, MO, OR, PA (4)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, HI, LA, NE, NM, VA, WA, WV (8)	AR, DC, ID, KY, MA, MD, ME, MN, RI, SC, TN, WI, WY (13)	CA, IN, KS, MI, NJ, OK (6)	AR, RI (2)	CA, IL, IN (3)
2013	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, MO, OR, PA (4)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, HI, LA, NE, NM, VA, WA, WV (8)	AR, DC, ID, KY, MA, MD, ME, MN, RI, SC, TN, WI, WY (13)	CA, IN, KS, MI, NJ, OK (6)	AR, RI (2)	CA, IL, IN (3)
2014	AZ, CT, DE, FL, GA, MT, ND, NH, OH, SD (10)	AK, MO, OR, PA (4)	AL, IA, IL, MS, NC, NV, NY, TX, UT, VT (10)	CO, HI, LA, NE, NM, VA, WA, WV (8)	AR, DC, ID, KY, MA, MD, ME, MN, RI, SC, TN, WI, WY (13)	CA, IN, KS, MI, NJ, OK (6)	AR, RI (2)	CA, IL, IN (3)

APPENDIX D (continued)

Urinary Incontinence	0	1	2	3	4	Documentation	Notification
2005	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI (13)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	HI, KY, LA, MD, MI, MO, OR, PA, VT, WY (10)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2006	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI (13)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	HI, KY, LA, MD, MI, MO, OR, PA, VT, WY (10)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2007	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV,	HI, KY, LA, MD, MI, MO, OR,	AK, AR, CA, CO, DC, IA, ID,	AR, TX (2)	CO (1)

APPENDIX D (continued)

	(13)		NY, WV (9)	PA, VT, WY (10)	MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)		
2008	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI (13)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	HI, KY, LA, MD, MI, MO, OR, PA, VT, WY (10)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2009	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI (13)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	HI, KY, LA, MD, MI, MO, OR, PA, VT, WY (10)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT	AR, TX (2)	CO (1)

APPENDIX D (continued)

					(17)		
2010	AZ, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, WI (13)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	HI, KY, LA, MD, MI, MO, OR, PA, VT, WY (10)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2011	AZ, CT, DE, FL, GA, HI, MT, ND, NH, NM, OH, SC, SD, WI (14)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	KY, LA, MD, MI, MO, OR, PA, VT, WY (9)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2012	AZ, CT, DE, FL, GA, HI, MT, ND, NH, NM, OH, SC, SD, WI (14)	VA, WA (2)	AL, IL, IN, KS, NC, NE, NV, NY, WV	KY, LA, MD, MI, MO, OR, PA, VT, WY	AK, AR, CA, CO, DC, IA, ID, MA, ME,	AR, TX (2)	CO (1)

APPENDIX D (continued)

			(9)	(9)	MN, MS, NJ, OK, RI, TN, TX, UT (17)		
2013	AZ, CT, DE, FL, HI, MT, ND, NH, NM, OH, SC, SD, WI (13)	GA, VA, WA (3)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	KY, LA, MD, MI, MO, OR, PA, VT, WY (9)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)
2014	AZ, CT, DE, FL, HI, MT, ND, NH, NM, OH, SC, SD, WI (13)	GA, VA, WA (3)	AL, IL, IN, KS, NC, NE, NV, NY, WV (9)	KY, LA, MD, MI, MO, OR, PA, VT, WY (9)	AK, AR, CA, CO, DC, IA, ID, MA, ME, MN, MS, NJ, OK, RI, TN, TX, UT (17)	AR, TX (2)	CO (1)

APPENDIX D (continued)

Catheter	0	1	2	3	4	Documentation	Notification
2005	AZ, CA, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2006	AZ, CA, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2007	AZ, CA, CT, DE, FL, GA, MT, ND, NH,	(0)	AL, IN, KS, MS, NC, NE, NV, NY,	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD,	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)

APPENDIX D (continued)

	NM, OH, SC, SD, TN, VA, WA, WI (17)		UT, WV (10)	ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)			
2008	AZ, CA, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2009	AZ, CA, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)

APPENDIX D (continued)

2010	AZ, CA, CT, DE, FL, GA, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, HI, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (20)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2011	AZ, CA, CT, DE, FL, GA, HI, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (18)	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (19)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2012	AZ, CA, CT, DE, FL, GA, HI, MT, ND, NH, NM, OH, SC, SD,	(0)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO,	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)

APPENDIX D (continued)

	TN, VA, WA, WI (18)			OR, PA, RI, TX, VT, WY (19)			
2013	AZ, CA, CT, DE, FL, HI, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	GA (1)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (19)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)
2014	AZ, CA, CT, DE, FL, HI, MT, ND, NH, NM, OH, SC, SD, TN, VA, WA, WI (17)	GA (1)	AL, IN, KS, MS, NC, NE, NV, NY, UT, WV (10)	AK, AR, DC, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VT, WY (19)	CO, IL, NJ, OK (4)	AR, CA, IL, IN, OK, TX (6)	(0)

APPENDIX D (continued)

Antipsychotic Drug	0	1	2	3	4	5	Documentation	Notification
2005	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WI, WY (35)	(0)	AL, IA , IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO (3)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	(0)
2006	AK, AR, CT, DC, DE, FL, GA, HI,	(0)	AL, IA , IN, KY, LA, NC, NV, UT,	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)		VT, WV (10)					
2007	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND,	(0)	AL, IA , IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)							
2008	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD,	(0)	AL, IA, IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	TN, VA, WA, WY (34)							
2009	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)	(0)	AL, IA , IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)
2010	AK, AR, CT, DC, DE, FL,	(0)	AL, IA , IN, KY, LA, NC,	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)		NV, UT, VT, WV (10)					
2011	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS,	(0)	AL, IA, IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)							
2012	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI,	(0)	AL, IA, IN, KY, LA, NC, NV, UT, VT, WV (10)	AZ, CA, CO, WI (4)	TX (1)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

	SC, SD, TN, VA, WA, WY (34)							
2013	AK, AR, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)	(0)	AL, IA , IN, KY, LA, NC, NV, UT, VT, WV (10)	CA, CO, WI (3)	AZ, TX (2)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)
2014	AK, AR, CT, DC,	(0)	AL, IA , IN, KY,	CA, CO, WI (3)	AZ, TX (2)	IL, NY (2)	AZ, LA, MD, TX (4)	WI (1)

APPENDIX D (continued)

DE, FL, GA, HI, ID, KS, MA, MD, ME, MI, MN, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WA, WY (34)		LA, NC, NV, UT, VT, WV (10)					
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APPENDIX D (continued)

Unnecessary Drug	0	1	2	3	4	Documentation	Notification
2005	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (10)	IL, ME (2)	MN, NY (2)	(0)	(0)
2006	AK, AR, CA, CO, CT, DC, DE, FL,	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT,	IL, ME (2)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)		VT, WV (10)				
2007	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH,	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (10)	IL, ME (2)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)						
2008	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA,	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (10)	IL, ME (2)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	WI, WY (34)						
2009	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (10)	IL, ME (2)	MN, NY (2)	(0)	(0)
2010	AK, AR, CA, CO, CT, DC, DE, FL, GA,	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV	IL, ME (2)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)		(10)				
2011	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ,	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (10)	IL, ME (2)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)						
2012	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY	KY, LA, WA (3)	AL, AZ, IA, IN, NC, NV, TX, UT, VT, WV (9)	IL, ME, NC (3)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	(34)						
2013	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)	KY, LA, WA (3)	AL, AZ, IA, IN, NV, TX, UT, VT, WV (9)	IL, ME, NC (3)	MN, NY (2)	(0)	(0)
2014	AK, AR, CA, CO, CT, DC, DE, FL, GA, HI, ID, KS,	KY, LA, WA (3)	AL, AZ, IA, IN, NV, TX, UT, VT, WV (9)	IL, ME, NC (3)	MN, NY (2)	(0)	(0)

APPENDIX D (continued)

	MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, OH, OK, OR, PA, RI, SC, SD, TN, VA, WI, WY (34)						
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Weight	0	1	2	3	4	5	Documentation	Notification
2005	AK, AZ, DC, DE, FL, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (20)	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (11)	CO, IL, MA, MD, MI, MO, NC, OR, RI, WV (10)	OK, TN (2)	AR, CA, CT, HI, MN, NE, NJ, OH (8)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)

APPENDIX D (continued)

2006	AK, AZ, DC, DE, FL, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (20)	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (11)	CO, IL, MA, MD, MI, MO, NC, OR, RI, WV (10)	OK, TN (2)	AR, CA, CT, HI, MN, NE, NJ, OH (8)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)
2007	AK, AZ, DC, DE, FL, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (20)	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (11)	CO, IL, MA, MD, MI, MO, NC, OR, RI, WV (10)	OK, TN (2)	AR, CA, CT, HI, MN, NE, NJ, OH (8)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)
2008	AK, AZ, DC, DE,	(0)	AL, IA, KS, KY,	CO, IL, MA, MD,	OK, TN (2)	AR, CA, CT, HI,	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK	CA, IL, OH (3)

APPENDIX D (continued)

	FL, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (20)		LA, MS, NV, NY, TX, UT, VT (11)	MI, MO, NC, OR, RI, WV (10)		MN, NE, NJ, OH (8)	(11)	
2009	AK, AZ, DC, FL, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (19)	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (11)	CO, IL, MA, MD, MI, MO, NC, OR, RI, WV (10)	DE, OK, TN (3)	AR, CA, CT, HI, MN, NE, NJ, OH (8)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)
2010	AK, AZ, DC, FL, GA, ID, IN, ME, MT,	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX,	CO, IL, MA, MD, MI, MO, NC, OR,	DE, OK, TN (3)	AR, CA, CT, HI, MN, NE, NJ, OH (8)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)

APPENDIX D (continued)

	ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (19)		UT, VT (11)	RI, WV (10)				
2011	AK, AZ, FL, DC, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (19)	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (11)	CO, HI, IL, MA, MD, MI, MO, NC, OR, RI, WV (11)	DE, OK, TN (3)	AR, CA, CT, MN, NE, NJ, OH (7)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)
2012	AK, AZ, FL, DC, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD,	(0)	AL, IA, KS, KY, LA, MS, NV, NY, TX, UT, VT (12)	CO, HI, IL, MA, MD, MI, MO, OR, RI, WV (10)	DE, OK, TN (3)	AR, CA, CT, MN, NE, NJ, OH (7)	AR, AZ, DC, DE, IL, MI, MN, NE, NJ, OH, OK (11)	CA, IL, OH (3)

APPENDIX D (continued)

	VA, WA, WI, WY (19)							
2013	AK, AZ, FL, DC, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (19)	(0)	AL, IA, KS, KY, LA, MS, NC, NV, NY, TX, UT, VT (12)	CO, HI, IL, MA, MD, MI, MO, OR, RI, WV (10)	DE, OK, TN (3)	AR, CA, CT, MN, NE, NJ, OH (7)	AR, DC, DE, IL, MI, MN, NE, NJ, OH, OK (10)	CA, IL, OH (3)
2014	AK, AZ, FL, DC, GA, ID, IN, ME, MT, ND, NH, NM, PA, SC, SD, VA, WA, WI, WY (19)	(0)	AL, IA, KS, KY, LA, MS, NC, NV, NY, TX, UT, VT (12)	CO, HI, IL, MA, MD, MI, MO, OR, RI, WV (10)	DE, OK, TN (3)	AR, CA, CT, MN, NE, NJ, OH (7)	AR, DC, DE, IL, MI, MN, NE, NJ, OH, OK (10)	CA, IL, OH (3)

APPENDIX D (continued)

Therapeutic Diet	0	1	2	3	4	Notification	Documentation
2005	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND (1)	AL, NV, NY, SC, UT, VT (6)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WI, WV, WY (27)	AR, DC, NM, NY (4)	(0)
2006	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND (1)	AL, NV, NY, SC, UT, VT (6)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA,	AR, DC, NM, NY (4)	(0)

APPENDIX D (continued)

					SD, TN, VA, WA, WI, WV, WY (27)		
2007	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND, WI (2)	AL, NV, NY, SC, UT, VT (6)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY (26)	AR, DC, NM, NY (4)	(0)
2008	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC,	AR, DC, NM, NY (4)	(0)

APPENDIX D (continued)

					NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY (26)		
2009	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY (26)	AR, DC, NM, NY (4)	(0)
2010	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA,	AR, DC, NM, NY (4)	(0)

APPENDIX D (continued)

					MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY (26)		
2011	AZ, CO, GA, MN, MS, MT, NJ, OH, RI (9)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY (26)	AR, DC, NM, NY (4)	(0)
2012	AZ, CO, GA, MN, MS,	ND, SC, WI (3)	AL, NV, NY, UT, VT	AR, DE, FL, ID, MI, MO,	AK, CA, CT, DC, HI, IA,	AR, DC, NM, NY (4)	(0)

APPENDIX D (continued)

	MT, NJ, RI (8)		(5)	OR, TX (8)	IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OH, OK, PA, SD, TN, VA, WA, WV, WY (27)		
2013	AZ, CO, GA, MN, MS, MT, NJ, RI (8)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OH, OK, PA, SD, TN, VA, WA, WV, WY	AR, DC, NM, NY (4)	(0)

APPENDIX D (continued)

					(27)		
2014	AZ, CO, GA, MN, MS, MT, NJ, RI (8)	ND, SC, WI (3)	AL, NV, NY, UT, VT (5)	AR, DE, FL, ID, MI, MO, OR, TX (8)	AK, CA, CT, DC, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OH, OK, PA, SD, TN, VA, WA, WV, WY (27)	AR, DC, NM, NY (4)	(0)

Pain	0	1	2	3	4	Notification	Documentation
2005	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)						
2006	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)						
2007	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	UT, VA, WA, WV, WY (40)						
2008	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

2009	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)
2010	AK, AL, AR, AZ, CO, CT, DC, DE,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)						
2011	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)						
2012	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)						
2013	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX,	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX D (continued)

	UT, VA, WA, WV, WY (40)						
2014	AK, AL, AR, AZ, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NH, NM, NV, NY, OH, PA, SC, TX, UT, VA, WA, WV, WY (40)	(0)	VT (1)	CA, MI, NE, OR, SD, TN (6)	NJ, OK, RI, WI (4)	NE, RI (2)	(0)

APPENDIX E

TABLE XXIII: NURSING HOME QUALITY STATE LAW SUMMARY SCORES BY STATE, 2005-2014 (MAXIMUM SCORE = 40 POINTS)

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Change
AL	16	16	16	16	16	16	16	16	16	16	0
AK	15	15	15	15	15	15	15	15	15	15	0
AZ	5	5	5	5	5	5	5	5	6	6	+1
AR	24	24	24	24	24	24	24	24	24	24	0
CA	28	28	28	28	28	28	28	28	28	28	0
CO	22	22	22	22	22	22	22	22	22	22	0
CT	9	9	9	9	9	9	9	9	9	9	0
DE	3	3	3	3	7	7	7	7	7	7	+4
DC	20	20	20	20	20	20	20	20	20	20	0
FL	3	3	3	3	3	3	3	3	3	3	0
GA	0	0	0	0	0	0	0	0	3	3	+3
HI	19	19	19	19	19	19	10	10	10	10	-9
ID	18	18	18	18	18	18	18	18	18	18	0
IL	25	25	25	25	25	25	25	25	25	25	0
IN	21	21	21	21	21	21	21	21	21	21	0
IA	24	24	24	24	24	24	24	24	24	24	0
KS	17	17	17	17	17	17	17	17	17	17	0
KY	24	24	24	24	24	24	24	24	24	24	0
LA	21	21	21	21	21	21	21	21	21	21	0
ME	23	23	23	23	23	23	23	23	23	23	0
MD	22	22	22	22	22	22	22	22	22	22	0
MA	23	23	23	23	23	23	23	23	23	23	0
MI	25	25	25	25	25	25	25	25	25	25	0
MN	23	23	23	23	23	23	23	23	23	23	0
MS	11	11	11	11	11	11	11	11	11	11	0
MO	16	16	16	16	16	16	16	16	16	16	0
MT	0	0	0	0	0	0	0	0	0	0	0
NE	21	21	21	21	21	21	21	21	21	21	0
NV	16	16	16	16	16	16	16	16	16	16	0
NH	4	4	4	4	4	4	4	4	4	4	0
NJ	26	26	26	26	26	26	26	27	27	27	+1
NM	8	8	8	8	8	8	8	8	8	8	0
NY	21	21	21	21	21	21	21	21	21	21	0
NC	19	19	19	19	19	19	19	18	19	19	0*

APPENDIX E (continued)

TABLE XXIII: NURSING HOME QUALITY STATE LAW SUMMARY SCORES BY STATE, 2005-2014 (MAXIMUM SCORE = 40 POINTS) (continued)											
State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Change
ND	1	1	1	1	1	1	1	1	1	1	0
OH	5	5	5	5	5	5	5	9	9	9	+4
OK	30	30	30	30	30	30	30	30	30	30	0
OR	19	19	19	19	19	19	19	19	19	19	0
PA	14	14	14	14	14	14	14	14	14	14	0
RI	21	21	21	21	21	21	21	21	21	21	0
SC	3	3	3	6	6	6	6	6	6	6	+3
SD	7	7	7	7	7	7	7	7	7	7	0
TN	23	23	23	23	23	23	23	23	23	23	0
TX	23	23	23	23	23	23	23	23	23	23	0
UT	18	18	18	18	18	18	18	18	18	18	0
VA	9	9	9	9	9	9	9	9	9	9	0
VT	21	21	21	21	21	21	21	21	21	21	0
WA	11	11	11	11	11	11	11	11	11	11	0
WI	16	19	16	16	16	16	16	16	16	16	0 ^a
WV	20	20	20	20	20	20	20	20	20	20	0
WY	19	19	19	19	19	19	19	19	19	19	0

^aWhile there was no change to the summary score when comparing 2014 to 2005, there were individual changes in between.

APPENDIX F

List of changing states and control group of states with similar levels of law prior to change

Policy Predictor	Changing State	Year of Change - Type of Change	Control States
Pressure Ulcer	SC	2008 – Enhance	AL, AZ, CT, DE, FL, GA, HI, IA, IL, MO, MS, MT, NC, ND, NH, NV, NY, OH, OR, PA, SD, TX, UT, VT
Pressure Ulcer	HI	2011- Enhance	AL, AZ, CT, DE, FL, GA, IA, IL, MO, MS, MT, NC, ND, NH, NV, NY, OH, OR, PA, SD, TX, UT, VT
Bowel and Bladder	HI	2011- Relax	KY, LA, MD, MI, MO, OR, PA, VT, WY
Catheter	HI	2011 – Relax	AR, IA, ID, KY, LA, MA, MD, ME, MI, MN, MO, OR, PA, RI, TX, VY, WY
Activities of Daily Living	HI	2011 – Relax	LA, MN, MO, OR, PA, RI, TX, VT
Unnecessary Drugs	NC	2012 - Enhance	AL, AR, AZ, CA, CO, CT, DE, FL, GA, HI, IA, ID, IN, KS, KY, LA, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, NV, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY

States either enhanced their standards by making them more stringent or relaxed their standards.

APPENDIX G

TABLE XXIV: ASSOCIATIONS BETWEEN POLICY PREDICTORS AND NURSING HOME QUALITY OUTCOMES, SENSITIVITY MODEL

Sample 1 (2005-2010):

Outcome	Policy Predictor	All laws below or equal to federal standards (REF) v. all laws above federal	
Residents with Pressure Ulcers, high risk (%) (n=54265)	Pressure Ulcer	Above	0.21 (0.108, 0.312)
Residents with Pressure Ulcers, average risk (%) (n=33824)	Pressure Ulcer	Above	0.046+ (-0.004, 0.965)
Residents whose need for help with ADLs has increased (%) (n= 63881)	Activities of Daily Living	Above	0.454** (0.349, 0.559)
Residents with locomotion worsening (%) (n= 59121)	Activities of Daily Living	Above	0.25** (0.156, 0.344)
Residents who lose control of their Bowel or Bladder (n=59953)	Bowel and Bladder	Above	1.444** (1.253, 1.636)
Residents who had Catheter Inserted and left in bladder (%) (n= 65498)	Catheter	Above	0.233** (0.175, 0.291)
Residents with an Urinary Tract Infection (%) (n= 65732)	Bowel and Bladder	Above	-0.688** (-0.754, -0.622)
	Catheter	Above	-0.38** (-0.448, -0.313)
Residents Who Self-Report Moderate to Severe Pain (%) (n=65489)	Pain	Above	0.183** (0.113, 0.253)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

a: Federal laws did not address pain

APPENDIX G (continued)

Sample 2 (2011-2015):

Outcome	Policy Predictor	All laws below or equal to federal standards (REF) v. all laws above federal	
Residents with Pressure Ulcers (%) (n=56556)	Pressure Ulcer	Above	-0.024 (-0.089, 0.041)
Residents whose need for help with ADLs has increased (%) (n=61179)	Activities of Daily Living	Above	-0.14* (-0.249, -0.031)
Residents who lose control of their Bowel or Bladder (n=37898)	Bowel and Bladder	Above	0.87** (0.588, 1.152)
Residents who had Catheter Inserted and left in bladder (%) (n=63413)	Catheter	Above	0.293** (0.25, 0.335)
Residents with an Urinary Tract Infection (%) (n=63826)	Bowel and Bladder	Above	-0.237** (-0.302, -0.172)
	Catheter	Above	-0.275** (-0.342, -0.208)
Residents Who Self-Report Moderate to Severe Pain (%) (n=59385)	Pain ^a	Above	-0.205* (-0.345, -0.065)
Residents Who Received an Antipsychotic Medication (%) (n=63024)	Antipsychotic Drugs	Above	-0.073 (0.301, 0.666)
	Unnecessary Drugs	Above	-0.871** (-1.088, -0.654)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

a: Federal laws did not address pain

APPENDIX H

The regressions below show the effect of law changes on nursing home quality in each state two years following implementation. Each state is paired with a non-changing state listed, which is either a neighboring state or a state in the same HHS region that had similar levels of law prior to change. Each coefficient shown is derived from a separate regression.

TABLE XXV: EFFECT OF LAW CHANGES ON QUALITY USING A NEARBY STATE AS A CONTROL

States	Facility-level outcomes						
	Catheter	ADL	UTI	Bowel and Bladder	Pressure ulcer (high risk)	Pressure Ulcer (average risk)	Unnecessary Drugs
Hawaii (vs. Oregon)	0.564 (0.463)	-0.806 (1.162)	1.881** (0.642)	6.299 (4.361)	-0.093 (0.670)		
South Carolina (vs. Florida)					0.508 (0.392)	-0.570+ (0.295)	
North Carolina (vs. Alabama)							-0.032 (0.520)

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

APPENDIX I

TABLE XXVI: DID REGRESSION RESULTS SHOWING EFFECT OF LAW CHANGES ON QUALITY OUTCOMES, RANDOM EFFECTS

Outcome (Policy Predictor)	State	Year of Change (Type of Change)	DID Coefficient ^a	Base
Pressure Ulcer - high risk; N=17,855 (Pressure Ulcer)	SC	2008 (Enhance)	0.494 (0.356)	11.736 (0.460)
Pressure Ulcer - average risk; N=10,825 (Pressure Ulcer)	SC	2008 (Enhance)	-0.394 (0.251)	2.504 (0.282)
Pressure Ulcer - high risk; N=18,113 (Pressure Ulcer)	HI	2011 (Enhance)	-0.151 (0.337)	4.270 (0.474)
Bowel and Bladder; N=4,234 (Bowel and Bladder)	HI	2011 (Relax)	6.905* (3.051)	41.723 (3.919)
Urinary Tract Infection; N=6,727 (Bowel and Bladder)	HI	2011 (Relax)	1.059** (0.368)	4.662 (0.540)
Catheter; N=13,565 (Catheter)	HI	2011 (Relax)	0.261 (0.260)	2.479 (0.309)
Urinary Tract Infection; N=13,666 (Catheter)	HI	2011 (Relax)	0.702* (0.361)	4.662 (0.540)
ADL; N=7,780 (ADL)	HI	2011 (Relax)	0.467 (0.851)	13.746 (1.225)
Antipsychotic Medication; N=33,197 (Unnecessary Drugs)	NC	2012 (Enhance)	-1.862** (0.266)	20.235 (0.389)

^aThe coefficient on the policy predictor variable indicates the DID coefficient using random effects. Robust standard errors are in parentheses. The base numbers reflect the mean outcome of the changing (treatment) state prior to change.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

APPENDIX J

TABLE XXVII: DID REGRESSIONS RESULTS SHOWING EFFECT OF LAW CHANGES ON QUALITY OUTCOMES USING STATE FIXED EFFECTS

Outcome (Policy Predictor)	State	Year of Change (Type of Change)	DID Coefficient ^a
Pressure Ulcer - high risk; N=17,855 (Pressure Ulcer)	SC	2008 (Enhance)	0.498 (0.531)
Pressure Ulcer - average risk; N=10,825 (Pressure Ulcer)	SC	2008 (Enhance)	-0.357 (0.347)
Pressure Ulcer - high risk; N=18,113 (Pressure Ulcer)	HI	2011 (Enhance)	-0.300 (0.517)
Bowel and Bladder; N=4,234 (Bowel and Bladder)	HI	2011 (Relax)	7.103 (4.514)
Urinary Tract Infection; N=6,727 (Bowel and Bladder)	HI	2011 (Relax)	0.712 (0.625)
Catheter; N=13,565 (Catheter)	HI	2011 (Relax)	0.353 (0.414)
Urinary Tract Infection; N=13,666 (Catheter)	HI	2011 (Relax)	0.541 (0.611)
ADL; N=7,780 (ADL)	HI	2011 (Relax)	0.939 (1.496)
Antipsychotic Medication; N=33,197 (Unnecessary Drugs)	NC	2012 (Enhance)	-1.120* (0.507)

^aThe coefficient on the policy predictor variable indicates change in quality in states that changed compared to the control group (states with similar levels of law prior to change), after the law change compared to before. All regressions used a linear model. Robust standard errors are in parentheses.

+p ≤ 0.1; *≤ 0.05, **≤ 0.01

APPENDIX K

TABLE XXVIII: NURSING HOME AND RESIDENT CHARACTERISTICS ACROSS NOMINATE SCORE QUANTILES (FROM LOW TO HIGH)

Covariates	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Number of beds	102.47	103.09	102.07	120.82
Occupancy Rate (%)	77.82	84.36	82.81	84.75
Medicaid patients (%)	59.78	58.44	60.33	60.35
Medicare patients (%)	16.29	14.48	15.22	15.91
Average age	79.52	80.40	80.29	79.85
Average ADL score	16.82	16.08	16.20	16.32
Case Mix Index	1.15	1.15	1.14	1.17
Acuity Index	12.14	11.97	11.83	12.02
Female (%)	67.78	68.96	69.23	66.90
Low Cognitive Impairment (%)	31.93	34.54	32.86	34.01
Hospital Based (%)	4.95	4.83	6.52	6.25
Profit (%)	71.63	66.19	69.33	70.69
Chain (%)	63.84	58.66	53.52	46.29
Average Deficiencies	8.37	7.22	7.92	9.13

APPENDIX L

List of changing states and control group of states with similar levels of law prior to change

Policy Predictor	Changing State	Year of Change - Type of Change	Control States
Antipsychotic Medication	WI	2006 – Enhance	AL, AR, CT, DE, FL, GA, HI, IA, ID, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, OH, OK, OR, PA, RI, SC, SD, TN, UT, VA, VT, WA, WV, WY
Therapeutic Diet	WI	2007 - Relax	CA, CT, HI, IA, IL, IN, KS, KY, LA, MA, MD, ME, NC, NE, NH, NM, OK, PA, SD, TN, VA, WA, WV, WY
Pressure Ulcer	SC	2008 – Enhance	AL, AZ, CT, DE, FL, GA, HI, IA, IL, MO, MS, MT, NC, ND, NH, NV, NY, OH, OR, PA, SD, TX, UT, VT
Pressure Ulcer	HI	2011- Enhance	AL, AZ, CT, DE, FL, GA, IA, IL, MO, MS, MT, NC, ND, NH, NV, NY, OH, OR, PA, SD, TX, UT, VT
Unnecessary Drugs	NC	2012 - Enhance	AL, AR, AZ, CA, CO, CT, DE, FL, GA, HI, IA, ID, IN, KS, KY, LA, MA, MD, MI, MO, MS, MT, ND, NE, NH, NJ, NM, NV, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Therapeutic Diet	OH	2012 - Enhance	AL, AZ, CO, GA, MN, MS, MT, ND, NJ, NV, NY, RI, SC, UT, VT, WI

APPENDIX M

Significant covariates for multivariate associations between policy predictors and LTCOMP complaints		
Outcome	Policy Predictor	Significant Covariates
Pressure Ulcers	Pressure Ulcer	total beds, occupancy rate, percent Medicare, percent Medicaid, average age, average rugcmi, acuity index, percent female, average deficiencies, ownership (for-profit or not), average adl score, direct care hours per resident day, funding, percent low care, total volunteers, 2009, 2010
Range of Motion/ Ambulation	ADL	total beds, occupancy rate, percent Medicare, percent female, state median income, average deficiencies, ownership (for-profit or not), average adl score, direct care hours per resident day, total entities, percent low care, 2009, 2010
Bowel and Bladder Training	Bowel and Bladder	acuity index, state median income, ownership (for-profit or not), whether the facility is part of a chain, whether the facility is hospital based, average adl, score, percent low care, total volunteers
Toileting, Incontinent Care	Catheter	total beds, occupancy rate, percent Medicare, average rugcmi, percent female, unemployment rate, average deficiencies, ownership (for-profit or not), whether the facility is part of a chain, average adl score, direct care hours per resident day, percent low care, total paid staff, 2009, 2010, 2015
Tubes- Neglect of Catheter	Catheter	total beds, occupancy rate, percent Medicare, average rugcmi, acuity index, percent female, unemployment rate, ownership (for-profit or not), average adl, direct care hours per resident day, percent low care, total paid staff, 2009, 2010
Symptoms Unattended, Including Pain	Pain	total beds, occupancy rate, average rugcmi, acuity index, percent female, average deficiencies, ownership (for-profit or not), average adl, direct care hours per resident day, percent low care, total paid staff, 2011, 2012
Psychoactive drugs	Antipsychotic Drug	total beds, percent Medicare, percent Medicaid, state median income, state unemployment rate, average adl, direct care hours per resident day, funding, total entities, percent low care, total volunteers, 2009, 2010
Psychoactive drugs	Unnecessary Drug	total beds, percent Medicare, percent Medicaid, average age, state median income, state unemployment rate, average adl, direct care hours per resident day, funding, total entities, percent low care, total volunteers, 2009, 2010
Therapeutic Diet	Therapeutic Diet	total beds, percent Medicare, percent female, median income, average deficiencies, ownership (for-profit or not), whether the facility is part of a chain, direct care hours per resident day, total entities

APPENDIX N

Significant covariates for multivariate associations between tracking variables and LTCOMP complaints		
Outcome	Tracking Variable	Significant Covariates
Pressure Ulcers	Pressure Ulcer – documentation	total beds, occupancy rate, percent Medicare, percent Medicaid, average age, average rugcmi, acuity index, percent female, unemployment, ownership (for-profit or not), average adl score, direct care hours per resident day, funding, total paid staff, percent low care, 2009, 2010
	Pressure Ulcer – reporting	total beds, occupancy rate, percent Medicare, percent Medicaid, average age, average rugcmi, acuity index, percent female, unemployment, ownership (for-profit or not), average adl score, direct care hours per resident day, funding, total paid staff, percent low care, 2009, 2010
Range of Motion/ Ambulation	ADL – documentation	total beds, percent Medicare, percent Medicaid, state median income, average deficiencies, ownership (for-profit or not), funding, total paid staff, direct care hours per resident day, percent low care, 2008-2010.
Bowel and Bladder Training	Bowel and Bladder – documentation	occupancy rate, acuity index, state median income, funding, total paid staff, average adl, percent low care
	Bowel and Bladder – reporting	occupancy rate, acuity index, state median income, funding, total paid staff, average adl, percent low care
Toileting, Incontinent Care	Catheter – documentation	total beds, percent Medicare, average rugcmi, acuity, unemployment rate, whether the facility is part of a chain, hospital-based, average adl, direct care hours per resident day, total paid staff, percent low care, 2009, 2010
Tubes- Neglect of Catheter	Catheter – documentation	total beds, percent Medicare, average rugcmi, average adl, unemployment rate, average deficiencies, whether the facility is part of a chain, ownership (for-profit or not), total paid staff, direct care hours per resident day, percent low care, 2009, 2010, 2012, 2014, 2015
Symptoms Unattended, Including Pain	Pain – documentation	total beds, occupancy rate, percent Medicaid, average rugcmi, acuity index, percent female, state median income, average deficiencies, ownership (for-profit or not), total paid staff, average adl, direct care hours per resident day, percent low care, 2011-2015
Psychoactive drugs	Antipsychotic Drug – documentation	total beds, percent Medicare, percent Medicaid, average age, state median income, state unemployment rate, funding, total entities, average adl, direct care hours per resident day, percent low care, total volunteers, 2009, 2010
	Antipsychotic Drug – reporting	total beds, percent Medicare, percent Medicaid, state median income, state unemployment rate, funding, total

APPENDIX N (continued)

		entities, average adl, direct care hours per resident day, percent low care, total volunteers, 2009, 2010
Therapeutic Diet	Therapeutic Diet – documentation	total beds, occupancy rate, percent Medicare, percent Medicaid, percent female, median income, ownership (for-profit or not), total entities, direct care hours per resident day

APPENDIX O

TABLE XXIX: ASSOCIATIONS BETWEEN POLICY PREDICTORS AND LTCOMP COMPLAINTS, 2006-2015 (TRICHOTOMIZED)

Outcome: Number of complaints (n=490)	Policy Predictor	All laws below or equal to federal standards (REF) v. above: generic v. above: specific	
Pressure Ulcers	Pressure Ulcer	Plus	1.386** (1.178, 1.630)
		Enhanced	1.767** (1.553, 2.011)
Range of motion/ambulation	Activities of Daily Living	Plus	0.941 (0.751, 1.179)
		Enhanced	1.509172** (1.264, 1.803)
Bowel and bladder training	Bowel and Bladder	Plus	1.157 (0.864, 1.549)
		Enhanced	0.901 (0.674, 1.204)
Toileting, incontinent care	Catheter	Plus	1.151+ (0.993, 1.333)
		Enhanced	1.657** (1.352, 2.031)
Tubes - neglect of catheter, gastric, NG tube	Catheter	Plus	1.242** (1.072, 1.440)
		Enhanced	1.679** (1.366, 2.064)
Symptoms unattended, including pain, no notice to others of changes in condition	Pain ^a	Plus	0.258** (0.183, 0.364)
		Enhanced	0.749 (0.607, 0.925)
Psychoactive drugs - assessment, use, evaluation	Antipsychotic Drugs	Plus	2.044 (1.583, 2.638)
		Enhanced	1.320** (0.867, 2.010)
	Unnecessary Drugs	Plus	0.748* (0.561, 0.997)
		Enhanced	1.743** (1.181, 2.571)
Therapeutic diet	Therapeutic diet	Plus	0.950 (0.720, 1.253)
		Enhanced	0.916 (0.792, 1.060)

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Slater S, Pugach O, Lin W, Bontu A. If you build It will they come? Does involving community groups in playground renovations affect park utilization and physical activity? *Environ Behav.* 2016;48(1):246-265.

Mullner R, Lin W. (2015) Health. In *Oxford Encyclopedia of Latinos and Latinas in Contemporary Politics, Law, and Social Movements*. Oxford University Press.

Piekartz E, Lin W, Chriqui J. Smart Snacks fundraiser exemption policies: Are states supporting the spirit of Smart Snacks? (Currently scheduled for publication in the September 2019 issue for *Journal of School Health*.)

Shang C, Leider J, Lin W, Chriqui F, Hennessy E, Frank M. Perna. The Association between State Physical Education Laws and Student Physical Activity. (Manuscript under review with *American Journal of Preventive Medicine*.)

Piekartz-Porter E, Lin W, Leider J, Turner L, Perna F, Chriqui J. State laws matter when it comes to school provisions for structured PE and daily PE participation. (Manuscript under National Cancer Institute clearance review.)

Chriqui J, Leider J, Piekarcz-Porter E, Lin W, Turner L, Michaels S, Brener N, Perna F. Waiving Good-Bye to PE in Schools: An Examination of State Laws and School Practices in the U.S. (Manuscript under National Cancer Institute clearance review.)

Shang C, Lin W, Leider J, Perna F, Chriqui J. The Association between State Snack Laws and Consumption of Fruits and Vegetables among High School Students (Manuscript in progress.)
Chriqui J, Leider J, Lin W. Pedestrian-Oriented Zoning and Physical Activity in Older Adults. (Manuscript in progress.)

PROFESSIONAL PRESENTATIONS

Lin W. State Quality of Care Laws and Nursing Home Outcomes in the United States. Poster presented at 2017 Association for Public Policy Analysis and Management (APPAM) Fall Research Conference, Chicago, IL, Nov 2017.

Lin W. State Quality of Care Laws and Nursing Home Outcomes in the United States. Poster presented at the 21st IAGG World Congress of Gerontology and Geriatrics, San Francisco, CA, July 2017.

Chriqui J, Piekartz E, Lin W. Smart Snacks suspended: State fundraiser exemption policies. Presented at American Public Health Association, Annual Meeting, Denver, CO, November 2016.

Lin W, Jenkins A, Sobczyk J. Forest Park Community Enhancements. Poster presented at Aging in America Conference, the Annual Conference of the American Society on Aging, Chicago, IL, March 2015.

Lin W, Slater S, Bontu A. Healthy Schools, Healthy Kids: Evaluating the Impact of a Mandatory Recess Policy in Chicago Public Schools. Presented at UIC Minority Health Midwest Conference, Chicago, IL, March 2015.

MEMBERSHIPS

American Public Health Association