The Effects of Reducing Minimum Staffing Requirements on Nursing Home Staffing and Quality: Evidence from Florida

Christopher S. Brunt*

July 6, 2026

Abstract

Given a strong association and causal relationship between staffing levels and quality of care, many states have imposed minimum staffing requirements for nursing homes. However, relatively few studies have attempted to evaluate the causal effect of these requirements. In this study, I exploit an April 2022 reduction in Florida's minimum staffing requirement (HB 1239), which lowered the state's mandated 2.5 Nurse Aide (NA) Hours Per Resident Day (HPRD) to 2.0 and permitted nursing homes to meet the 3.6 HPRD direct-care requirement using other non-nursing staff (such as therapists), and evaluate the effects of the policy on staffing and risk-adjusted quality outcomes. Using event study and difference-in-differences models with entropy-balanced weights that weight non-treated states based on their similarity to Florida's pre-treatment characteristics, I find that Florida's nursing homes responded almost entirely through reductions in NA HPRD, a 6.8 to 8.8 percent reduction, with negligible changes among other occupational categories despite the option to substitute toward them. Consistent with the theoretical model, these reductions are statistically larger at lower-acuity facilities, which are more likely to be bound by the mandate, and statistically smaller at high-acuity facilities. Entropy-weighted quality estimates, which adjust for Florida's distinct attributes, show statistically significant increases in risk-adjusted hospitalizations, with partially offsetting reductions in emergency department visits, among both short- and long-stay residents. Since these outcomes are mutually exclusive by construction, this pattern is consistent with residents reaching to the emergency department in worse health and being admitted rather than discharged, implying lower-quality care.

Keywords: Minimum Staffing Requirements, Nursing homes, Staffing, Health Care Quality, Regulation

JEL Classification: I11, I18, L51

*Solomons Endowed Chair, Department of Economics, Georgia Southern University, P.O. Box 8153, Statesboro, GA 30458, cbrunt@georgiasouthern.edu

1 Introduction

Minimum staffing requirements (MSRs) in U.S. nursing homes have been imposed at both the federal and state levels based on the foundation that adequate direct-care staffing is essential to the quality of care residents receive. Federally, nursing facilities are required to have an RN or LPN available 24 hours per day, with an RN available 8 hours per day (1819(b)(4)(C), 1919(b)(4)(C), 42 CFR §483.35(b)). As of 2022, 38 states and the District of Columbia had imposed additional MSRs exceeding these federal standards, though the types and structures of these mandates varied widely (Medicaid and CHIP Payment and Access Commission, 2022b). Mandates can take the form of staff-to-resident ratios, hours per resident day (HPRD), or both, and can vary by staff type. Some states impose total direct care staffing requirements that typically include Registered Nurses (RNs), Licensed Practical Nurses (LPNs), and Certified Nurse Aides (CNAs). Others impose specific ratios or hourly requirements for each nurse staffing type.

In April 2024, the Centers for Medicare and Medicaid Services (CMS) finalized the first national minimum staffing requirement for long-term care facilities, establishing a federal minimum of 3.48 HPRD, including 0.55 HPRD for RNs, and 2.45 HPRD for NAs (89 Fed. Reg. 40876, 2024). The rule's preamble described its purpose as addressing "ongoing safety and quality concerns" with long-term care facilities. Subsequently, the rule was vacated in federal court and ultimately repealed by CMS in late 2025, but its rationale, that minimum staffing standards are imposed to improve quality of care, remains the explicit basis for the state-level requirements that continue to govern nursing home staffing.

Florida has traditionally maintained one of the highest MSRs in the nation. In March 2022, Florida required 3.6 direct care staffing hours (including CNAs, RNs, and LPNs), 2.5 HPRD for CNAs, and 1 HPRD for licensed nurses (defined as RNs and LPNs). On April 6, 2022, HB 1239 was signed into law, which immediately lowered the state's CNA requirement from 2.5 HPRD to 2.0 HPRD and flexibly permitted nursing homes to meet their total direct care staffing requirement of 3.6 HPRD through the use of staff in "interpersonal contact" with residents and resident care management. Proponents of the legislation indicated that its aim was to modernize staffing regulations, alleviate staffing shortages, and provide patient-centered care (Florida Health Care Association, 2022b). Opponents argued that weekly average nursing care would be reduced by 20%, with CNAs replaced by staff not trained to provide bedside care, resulting in poorer care for nursing home residents (AARP Florida, 2022b,a). Several reports commissioned by AARP Florida have documented downward trends in staffing hours following the passage of HB 1239, including HPRD reductions of 0.22, 0.08, and 0.07 in CNA, RN, and non-nursing direct care staffing positions from April 2021 to September 2022 (Peterson, 2023, 2024). Further, the AARP commissioned reports expressed concern about

Florida's quality of care given upward trends in short- and long-stay emergency department visits as well as long-stay resident hospitalizations (Peterson, 2024; Peterson and Jester, 2025).[1] Industry representatives expressed skepticism of such findings, arguing that the trends in short- and long-stay hospital visits as well as long-stay hospitalizations are not due to Florida-specific policy changes, but trends impacting nursing homes nationally (Stulick, 2024).

Previous empirical evidence supports the hypothesis that Florida's loosening of MSRs may both lower staffing levels and reduce the quality of care. For example, a large literature has documented a strong positive relationship between higher staffing levels and quality of care in nursing homes (Spilsbury et al., 2011; Backhaus et al., 2014; Armijo-Olivo et al., 2020), with causal evidence supporting the relationship ((Lin, 2014; Brunt, 2023). However, despite the legislative use of MSRs as the primary policy lever for improving nursing home quality, relatively few studies have conducted causal evaluations of how these requirements affect staffing and care outcomes. The broader literature on staffing mandates documents that their imposition increases staffing in targeted occupations (Harrington, 2005b,a; Mueller et al., 2006; Park and Stearns, 2009; Bowblis, 2011; Chen and Grabowski, 2015; Bowblis and Ghattas, 2017; Werner et al., 2026), reduces staffing from non-targeted occupations (Chen and Grabowski, 2015; Bowblis and Hyer, 2013), and generally produces modest improvements in quality (Janelli et al., 1994; Moseley, 1996; Zhang and Grabowski, 2004; Park and Stearns, 2009; Bowblis, 2011; Lin, 2014; Chen and Grabowski, 2015; Bowblis and Ghattas, 2017), though much of this work examines historical mandate changes.

To my knowledge, only three studies have conducted causal evaluations of the relationship between minimum staffing standards and quality of care. Brunt (2023) examined CMS enforcement of federal minimum staffing standards using an intent-to-treat sample of nursing homes subject to five-star rating downgrades for noncompliance, finding that enforcement both increased staffing levels and quality of care across several dimensions. Bowblis and Brunt (2024) (working paper) evaluated California's 2018 increase in MSRs (from 3.2 to 3.5 direct care HPRD and the imposition of a 2.4 HPRD CNA requirement) relative to neighboring states using July 2017 to September 2019 data, finding increases in both CNAs and total nurse staffing, weak evidence of quality improvements (long-stay pressure ulcers and short-stay rehospitalization rates), and no improvement in most evaluated quality measures. Most recently, Abt Associates (2023), on behalf of CMS, evaluated Massachusetts's 2020 minimum staffing increase and the simultaneous imposition of financial penalties for noncompliance using synthetic control methods, finding statistically significant increases in nurse staffing levels but no significant impact for quality measures or safety scores.

[1] Though they also document quality improvement trends in several dimensions (improved short-stay functioning, reduced long-stay ADL decline, reduced short- and long-stay antipsychotic medication use, and lower rates of urinary tract infections).

To my knowledge, no studies have attempted to causally evaluate the impact of Florida's reduction in MSRs or evaluate the directional question of what happens when a binding minimum staffing standard is relaxed. This study is the first to do so in the context of Florida's MSRs, using a clean policy event, given that the reduction in standards took effect immediately upon the signing of HB 1239, and occurred in a state with one of the most stringent direct-care staffing requirements in the nation. The experiment is conducted across a restricted window (2021Q2–2022Q3) which opens after the post- Covid-vaccine rollout and return to operational normalcy but before other policies can contaminate its effects (before Florida's Medicaid Provider Minimum Wage Requirements in October 2022 or Florida's October 2023 Quality Incentive Payment [QIP] Program expansion) and the announcement of the federal minimum staffing standard rule, effectively isolating HB 1239 as the single staffing-policy event affecting the treated state during the analysis window and giving the experimental design credibility. The analysis finds strong evidence that nursing homes responded to the act effectively solely through reducing NA staffing levels (6.8 to 8.8 percent), resulting in lower quality of care, as evidenced by higher hospitalization and rehospitalization rates among residents.

The remainder of this paper is organized as follows. In the next section, I develop a theoretical model with predictions for the impact of HB 1239 on staffing changes and quality, followed by an overview of the study's analytic approach, data and sampling, a discussion of the dependent variables, regression models, weighting method, results, conclusions, and discussion.

2 Theoretical Model

Assume a representative nursing home that provides care for residents using nursing (RNs, LPNs, and CNAs denoted by R, L, and C, respectively) and non-nursing direct care staffing inputs (denoted by N), which are each measured in HPRD and represent the observed staffing level for each category. The nursing home's objective function is to minimize the cost of delivering acuity-appropriate care, subject to enforced minimum staffing requirements. The nursing home is assumed to be a price taker in the labor market and faces an exogenous acuity mix defined by scalar A, where a higher A indicates greater acuity (i.e., clinical need). Acuity-driven staffing levels are denoted by $\tilde{R}$, $\tilde{L}$, $\tilde{C}$, and $\tilde{N}$ with $\tilde{R}'(A) > 0$, $\tilde{L}'(A) > 0$, $\tilde{C}'(A) > 0$, and $\tilde{N}'(A) > 0$.

2.1 Minimum Staffing Regulatory Changes

Both before and after the minimum staffing reduction, licensed staffing requirements remained unchanged, implying that for observed licensed staffing levels, ρ:

$$\rho = R + L = \max\{1.0, \tilde{R}(A) + \tilde{L}(A)\} \tag{1}$$

ρ implies that licensed staff are determined by either the 1.0 HPRD floor or the acuity needs of the residents. Consequently, Licensed staffing does not respond to the reform (i.e., $\Delta(R + L) = 0$), and $R + L$ is treated as a fixed quantity.[2]

HB 1239 permitted nursing homes to use non-nursing HPRD to meet the total direct-care minimum staffing requirement. However, among the newly included alternative occupations, the vast majority have hourly wages that exceed the typical wages of CNAs. Consequently, a cost-minimizing nursing home will not substitute non-nursing staff to any large degree to meet their total direct-care requirement, and we assume that elasticity $\epsilon_C^N = 0$.[3]

[2]Empirically, this assumption is supported by observed staffing in pre-reform Florida. Using Florida's definition of licensed staffing, which excludes the DON and hours related to administrative tasks, the mean was 1.27 HPRD, and the 14th percentile was near 1.0, with the licensed floor binding for roughly 14% of homes and acuity-driven demand determining licensed staffing for the remainder. Both subpopulations have $\Delta(R + L) = 0$.

[3]Florida hourly median wages from BLS OEWS May 2022 data for relevant direct-care occupations: CNAs $15.51; physical therapy aides $14.32; recreation workers $14.13; substance abuse, behavioral disorder, and mental health counselors $23.10; mental health and substance abuse social workers $22.16; therapeutic recreation specialists / recreational therapists $23.90; social workers, all other $25.25; healthcare social workers $26.08; physical therapy assistants $30.94; occupational therapy assistants $31.31; respiratory therapists $31.50; speech-language pathologists $41.76; occupational therapists $44.22; physical therapists $45.67. The mapping from regulatory occupation categories to BLS Standard Occupational Classification codes is exact for most occupations but ambiguous for Qualified Activities Professionals and Other Activities Staff, where federal nursing home regulations require credentialed personnel (typically certified Activities Professionals, licensed Therapeutic Recreation Specialists, or licensed Occupational Therapists/Assistants) but the SOC system does not have a dedicated nursing home activities code; the closest matches are SOC 29-1125 Recreational Therapists (FL median $23.90, applicable to credentialed staff) and SOC 39-9032 Recreation Workers (FL median $14.13, a broader category that includes camp counselors, parks workers, and youth program staff and is therefore an imperfect match for nursing home activities staff). Further, while physical therapy aides earn less than CNAs in Florida among the occupations that map cleanly to a BLS SOC code, and they represent approximately 1% of the CNA workforce (960 versus 89,110)

2.2 CNA Constraint Pre-HB 1239

To meet the nursing home CNA and total direct care staffing requirements before HB 1239:

$$C \geq 2.5 \tag{2}$$

$$\rho + C \geq 3.6 \implies C \geq 3.6 - \rho \tag{3}$$

implying that the effective pre-HB 1239 constraint on CNAs is:

$$C \geq \max\{2.5,\ 3.6 - \rho\} \tag{4}$$

2.3 CNA Constraint Post-HB 1239

To meet the nursing home CNA and total direct care staffing requirements after HB 1239:

$$C \geq 2.0 \tag{5}$$

$$\rho + C + N \geq 3.6 \implies C \geq 3.6 - \rho - N \tag{6}$$

implying that the effective post-HB 1239 constraint on CNAs is:

$$C \geq \max\{2.0,\ 3.6 - \rho - N\} \tag{7}$$

Under the assumption that the licensed nursing floor is binding,[4] $\rho = 1.0$ and the nursing home's CNA Cost-Minimization becomes:

$$C_{\text{pre}}(A) = \max\{\tilde{C}(A),\ 2.6\} \tag{8}$$

$$C_{\text{post}}(A) = \max\{\tilde{C}(A),\ 2.0,\ 2.6 - \tilde{N}(A)\} \tag{9}$$

Post-HB 1239, nursing homes can staff to their acuity level A assuming $\tilde{C}(A)$ exceeds minimum staffing requirements. However, if their acuity level is lower, they must, at a minimum, meet their CNA requirement of 2.0 HPRD, and if they do not have sufficient non-nursing staffing to meet the direct care staffing requirement (i.e., when $N < 0.6$), they will need CNA HPRD= $2.6 - N > 2.0$.

2.4 Critical Acuity and Staffing Treatment Effects

The treatment effect of Florida's Minimum Staffing Reductions on CNA staffing is $\Delta C(A) \equiv C_{\text{post}}(A) - C_{\text{pre}}(A)$, which we can define for three acuity regions. We know that for $C = 2.6$ both CNA and direct care staffing requirements are satisfied. Consequently, we can identify the critical acuity level A^*, which is defined such that A^* solves $\tilde{C}(A^*) = 2.6$.

[4]The model is easily extended to alternative assumptions about the licensed nursing floor.

High Acuity Nursing Homes: $\tilde{C}(A) \geq 2.6$ The nursing home's optimal $\tilde{C}$ exceeds minimum staffing regulations (Pre- and Post-HB 1239). As a result

$$\Delta C(A) = 0$$

Moderate Acuity Nursing Homes: $\tilde{C}(A) < 2.6$ **and** $\tilde{C}(A) \geq \max\{2.0, 2.6 - \tilde{N}(A)\}$ Pre-HB 1239, minimum staffing requirement binds, forcing $C_{\text{pre}} = 2.6$. The post-HB 1239 regulation does not bind because acuity-driven C meets or exceeds the post-HB 1239 floor. So $C_{\text{post}} = \tilde{C}(A)$ and:

$$\Delta C(A) = \tilde{C}(A) - 2.6 < 0$$

Low Acuity Nursing Homes $\tilde{C}(A) < \max\{2.0, 2.6 - \tilde{N}(A)\}$ The minimum staffing requirements bind both Pre- and Post-HB 1239. Prior to HB 1239, the nursing home is bound by $C_{\text{pre}} = 2.6$. Post-HB 1239 the nursing home is bound by $C_{\text{post}} = \max\{2.0, 2.6 - \tilde{N}(A)\}$.

$$\Delta C(A) = \max\{2.0,\ 2.6 - \tilde{N}(A)\} - 2.6 = -\min\{\tilde{N}(A),\ 0.6\} < 0 \tag{10}$$

The reduction in CNA staffing is equal to the nursing home's non-nursing staffing HPRD ($N = \tilde{N}$), and is capped at 0.6 HPRD.

2.5 Predictions and Quality Implications

The model produces several testable hypotheses:

Hypothesis 1. All Adjustments Occur Through CNAs ($\Delta R = \Delta L = \Delta N = 0$) Given no changes in the floor on licensed nursing staff and the fact that wages for non-nursing direct care staff are typically greater than CNAs, cost-minimizing nursing homes will only adjust staffing through CNAs.

Hypothesis 2. Quality Should Decline Under the assumption that quality is positively produced through higher staffing levels $Q(R, L, C, N, A)$, it directly follows that quality should decline with reduced CNA staffing levels.

Hypothesis 3. CNA Staffing Changes Exhibit Heterogeneity By Acuity Nursing homes with high acuity ($A \geq A^*$) should exhibit no effects, given that they are staffing to acuity beyond state requirements. As acuity declines, the difference between the state-required minimum staffing levels for CNAs and the acuity-driven levels, $\tilde{C}(A)$, increases, implying that CNA reductions will be **larger** for nursing homes with lower

acuity levels who were bound by the pre-HB1239 minimum staffing regulation. The maximum potential reduction in CNAs is 0.6 HPRD.

Hypothesis 4. Quality Changes Exhibit Heterogeneity By Acuity Under the assumption that for quality, Q, C exhibits increasing marginal productivity in resident acuity (A), (i.e., $\frac{\partial^2 Q}{\partial C \partial A} > 0$), it directly follows that:

Hypothesis 4a. Quality declines should only be observed among nursing homes that reduce CNA staffing levels in response to the minimum staffing requirement reductions, i.e., lower acuity nursing homes.

Hypothesis 4b. Conditional on the same staffing decline, quality reductions should be **larger** among moderate acuity facilities than low acuity facilities.

3 Overview of Analytic Approach

Credibly evaluating the causal effect of Florida's reduction in MSRs is difficult for several reasons. First, Florida is unique in its characteristics of residents and nursing homes, as well as its MSRs, presenting distinct challenges for identification. For example, based on RTI International's Analysis of State Policies Related to Nursing Facilities performed for MacPAC (evaluating policies effective as of October 2021), Florida's pre-treatment CNA requirement of 2.5 HPRD was the highest CNA minimum staffing requirement in the nation. Further, Florida was one of only a handful of states with *any* CNA requirements.[5] Consequently, Florida's average NA HPRD prior to the minimum staffing reduction was 22% higher than the US average, leading to above-average total nurse staffing levels (see Table 1). In addition, Florida's nursing home characteristics differ from those of the rest of the nation. For example, based on patient demographics, Florida had a larger share of Medicare patients but a lower overall average acuity. These beneficiaries were served by larger nursing homes that were also more likely to be not-for-profits, chain-affiliated, less likely to be part of a CCRC, had worse risk-adjusted hospitalization rates, and had better risk-adjusted emergency department visit rates.[6]

Second, several policy-relevant events could confound the pre- and post-treatment periods. Prior to the minimum staffing reduction, nursing homes experienced the COVID-19 pandemic, which had direct national

[5]Other states with CNA requirements included: CA=2.4 HPRD, Delaware=1.6 HPRD, Montana=1.2 HPRD, New Jersey=1.04 HPRD, New York=2.2 HPRD, Oregon=2.16 HPRD, Rhode Island=2.44 HPRD, South Carolina=1.63 HPRD, and Vermont=2 HPRD.

[6]Pairwise tests examining equality of means for characteristics in Table 1 reveal that only licensed and Other Non-Nurse Direct Care HPRD were found to be statistically the same at conventional levels.

impacts on nursing home resident admissions and health status/mortality rates, and created nursing home-specific workforce challenges both during and after the pandemic. After the minimum staffing reduction, several Florida-specific policy changes further confound identification. For example, the Florida Medicaid Provider Minimum Wage Requirement required nursing homes to attest to paying employees at least $15 per hour as of 10/1/2022 and permit employees to bring civil action if not compensated at least $15 per hour as of 1/1/2023. This funded mandate both required nursing homes to pay higher wages and simultaneously increased nursing home reimbursement based on actuarial projections of their increased labor costs (Florida Agency for Health Care Administration, 2022). In addition, Florida's quality incentive payment (QIP) program, which has remained active since 2018, incentivized higher staffing levels directly for social workers and activity staff through QIP Structure Measures, and for direct care staff (RNs, LPNs, and CNAs) both directly through QIP Structure Measures and indirectly through Credentialing Measures (i.e., the overall 5-Star Nursing home rating, which uses nurse staffing levels for its construction).

Third, Florida's QIP program directly complicates the evaluation of the impact of minimum staffing reductions on quality, because it directly incentivizes quality improvements through higher reimbursement for several dimensions, including Process/Outcome Measures (such as flu vaccines, antipsychotic medication use, restraint use, urinary tract infections, pressure ulcers, falls, incontinence, and declines in activity of daily living quality metrics) which are each self-reported and could be subject to the strategic manipulation of nursing homes (Florida Agency for Health Care Administration, 2021). Florida's QIP is additionally complicated by the increase in QIP payment rates in 2023Q3 (SB 2510 passed 5/9/2023, effective 10/1/2023), which added $93 million in Medicaid payments (on top of the $140 million previously allocated) based on QIP performance (State of Florida, 2023; Florida Agency for Health Care Administration, 2024; Florida House of Representatives, 2023).

To avoid contamination from the COVID-19 pandemic, Florida's Medicaid Provider Minimum Wage Requirement, and the QIP incentive payments, the analysis is limited to observations between 2021Q2 and 2022Q3. This period occurred after the COVID-19 vaccine rollout and effectively before the minimum wage attestation data and expanded reimbursement for QIP payments. This effectively evaluates staffing and quality over a period when QIP payments related to staffing were unchanged, and focuses solely on quality outcomes derived from claims data that were not included in the QIP during the evaluation period and cannot be directly manipulated through self-reporting. Finally, it evaluates staffing and quality using an event-study and difference-in-differences framework that excludes states with concurrent nursing home-related policy changes and uses entropy balancing to assign control-group weights and to construct a counterfactual control group with pre-treatment characteristics highly similar to Florida's.

4 Data and Sampling

To evaluate the predicted hypotheses, the analysis uses data from several sources. Staffing levels for nursing and non-nursing occupations are derived from the 2021Q2 to 2022Q3 public releases of the Payroll Based Journal (PBJ) system. Payer mix (Percent of resident days Medicare and percent of resident days Medicaid), chain affiliation, and an indicator for whether the nursing home experienced a change in ownership in the last year are obtained from the most recent Medicare Cost Report. Contemporary nursing home characteristics, including hospital affiliation, the number of certified beds, CCRC status, ownership types, acuity (as measured by quarterly case-mix-adjusted total nurse staffing hours per resident day), and risk-adjusted hospitalization measures, are obtained from the Care Compare Archives.

From nursing homes observed between 2021Q2 and 2022Q3, I include only nursing homes that are observed across the entire evaluation period, who are free-standing (i.e., no hospital-based nursing homes), that are located in contiguous states (i.e., excluding AK and HI), with more than 50 nursing homes (i.e., excluding states with small cluster size [DC, WY, VT, DE, NV]), with stable nursing home policies within the Florida evaluation window (i.e., excluding AR, CT, IL, NY, OR, RI, and SC),[7] as well as nursing homes that were missing any control variable characteristics during the period of evaluation. Full sampling criteria are reported in Appendix Figures A1 and A2.

5 Dependent Variables

Given that Florida's MSR statutes are defined for the week (Sunday through Saturday), I use the Payroll Based Journal (PBJ) system to construct weekly measures of staffing levels (in hours per resident day). To directly align the analysis with the generated hypotheses, the primary analysis evaluates four staffing outcomes as dependent variables, including: (1) Licensed HPRD, (2) Other Non-Nursing Direct Care Staffing

[7] Arkansas is excluded due to legislation (Act 715, HB 1776, signed 4/14/21, effective date: 7/28/2021) which increased the MSR for DC from 2.8 to 3.6 HPRD. Connecticut is excluded due to legislation (Public Act 21-185, signed 10/1/2021, effective 1/1/2022), which increased the MSR for DC from 1.9 to 3.0 HPRD. Illinois is excluded due to legislation (PA 102-1035, HB 246, Effective 7/1/2022), which added a per-diem Medicaid add-on based on payroll-based journal staffing levels relative to the STRIVE study. New York is excluded due to legislation (Public Health Law (PHL) § 2895-b, Effective 4/1/2022), which established a new MSR for DC of 3.5 HPRD as well as CNA, and licensed requirements. Oregon is excluded due to OAR 411-086-0100 (via APD 29-2021, filed August 24, 2021), which temporarily relaxed CNA requirements (expired 2/19/2022). Rhode Island is excluded due to legislation (2021-S 0002A / 2021-H 5012Aaa, signed 5/25/2021, effective 1/1/2022) establishing a 3.58 HPRD MSR, which increased to 3.81 HPRD on 1/1/2023. Finally, South Carolina is excluded due to the July 1, 2021, expiration of the Department of Public Health memorandum (5/12/2020) permitting flexible staffing for the remainder of the fiscal year, which effectively lowered South Carolina's staffing requirements in the same direction as Florida's during the observation period.

HPRD, (3) NA HPRD, and (4) Total Nurse Staffing HPRD. The three nurse staffing outcomes are defined in accordance with CMS's definitions for RNs, LPNs, NAs, and Total Nurse Staffing (Centers for Medicare & Medicaid Services, 2022). Using CMS's definitions, licensed staffing includes RNs (defined as RN director of nursing, RNs with Administrative Duties, and RNs [i.e., RNs without administrative duties]) and LPNs (defined as LPNs with administrative duties and LPNs [i.e., LPNs without administrative duties]). NAs, according to CMS' definition, are defined as Certified Nurse Aides, Nurse Aides in Training, and Medication Aides/Technicians.[8] Following CMS's definition, Total Nurse Staffing is defined to include RNs, LPNs, and NAs as previously defined. Finally, Other Non-Nursing Direct Care Staffing is defined as non-nurse staffing occupational categories that qualify in meeting Florida's direct care staffing requirement *after* HB 1239 became effective. HB 1239 defines Direct Care Staff as individuals providing nursing, dietary, therapeutic, and mental health services, and excludes those whose primary duty is maintaining the physical environment. To operationalize this definition, I use occupations listed by the Florida Health Care Association, a Florida Nursing Home Advocacy group representing 88% of the state's nursing homes (Florida Health Care Association, 2023), as non-nursing direct care hours in their compliance worksheet (Florida Health Care Association, 2022a). According to their definition, Other Non-Nursing Direct Care Staffing includes: Dieticians, Feeding Assistants, Occupational Therapists, Occupational Therapy Assistants, Occupational Therapy Aides, Physical Therapists, Physical Therapy Assistants, Physical Therapy Aides, Respiratory Therapists, Speech/Language Pathologists, Therapeutic Recreation Specialists, Qualified Activities Staff, Other Activities Staff, Qualified Social Worker, Other Social Worker, and Mental Health Social Worker.

In addition to the staffing measures, I evaluate the implications of the MSR reform for four risk-adjusted, claims-based quality measures. These include: (1) Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission, (2) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit, (3) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days, and (4) Risk-Adjusted Number of Outpatient Emergency Department Visits per 1,000 Long-stay Resident Days. These quarterly measures are constructed from claims data using a rolling four-quarter window and are risk-adjusted for the acuity of the nursing home's residents. The rolling nature of the measures produces quarter-to-quarter variation as new claims enter and old claims roll off the window. This study exploits within-facility variation in these rolling measures over the evaluation

[8] While this study's general approach is to evaluate staffing in accordance with Federal norms and definitions of staffing, Florida has distinct definitions for its MSRs. For example, Florida's statutes do not permit time spent on administrative tasks to count toward meeting its direct care staffing or licensed mandate, nor do they explicitly permit the use of Medication Aides/Technicians to satisfy the CNA requirements. As a robustness test, this study also estimates results in accordance with Florida's definitions (reported in Appendix Table A6), yielding similar conclusions.

window. Because each quarterly observation embeds claims from the prior 12 months, post-period changes gradually attenuate toward the policy effect as pre-period claims roll out of the window, with full effects only observed four quarters after treatment. Consequently, given that the observation window is limited to two post-treatment quarters due to potentially confounding additional policies, the quality results likely underestimate the full effects.

6 Regression Models

To evaluate staffing level measures, I evaluate the following model for nursing home i, at week t:

$$\text{Staffing Level}_{i,t} = FL_i \times \sum_{\tau=-52, \tau \neq -1}^{24} \beta_\tau I(\tau) + \text{Controls}_{i,t} + NH_i + \text{Time}_t + \varepsilon_{i,t} \tag{11}$$

where FL in an indicator for whether the nursing home is in Florida, τ indicates weeks relative to the passage of the minimum staffing reduction, $I(\tau)$ is an indicator for whether an observation occurs in week τ, nursing home fixed effects (NH), week fixed effects ($Time$), and where controls is a vector of control variables (chain affiliation, change in ownership in last year, payer mix [% Medicare, % Medicaid], Ownership type [Government, Not-for-profit, For-profit (reference category)], CCRC status, and the number of certified beds). Additionally, the control vector contains acuity as measured by the quarterly national percentile of case-mix total nurse staffing HPRD.[9] In addition to the event study specification under Equation 11, I estimate a difference-in-differences version:

$$\text{Staffing Level}_{i,t} = FL_i \times Post + \text{Controls}_{i,t} + NH_i + \text{Time}_t + \varepsilon_{i,t} \tag{12}$$

For quality measures, I evaluate the following model for nursing home i, at quarter t:

[9] As part of its adjustment process in the construction of Care Compare quality measures, CMS constructs case-mix total nurse staffing HPRD, which this study uses in a similar manner to previous studies (For example, Brunt (2023)) to measure acuity. Case-mix total nurse staffing HPRD uses the daily distribution of residents' Resource Utilization Groups, which measure clinical need through activities of daily living index scores, along with average staffing times from the CMS Staff Time and Resource Intensity Verification (STRIVE) Study in its construction (Center for Medicare & Medicaid Services, 2026). Given that this measure is based on fixed historical times (i.e., times measured in 2006-2007) for nurse staffing, it effectively captures the average acuity distribution, as measured by RUGs, of nursing home residents. Case-mix total nurse staffing HPRD, which measures acuity based on historic staffing times and resident RUGs **does not** reflect observed staffing hours in a nursing home during the quarter. In fact, the Pearson Correlation coefficient between the observed total nurse staffing HPRD and Case-mix total nurse staffing HPRD across the sample is only 0.1788 nationally, implying that these measures are not even highly correlated.

$$\text{Risk-Adjusted Quality Measure}_{i,t} = FL_i \times \sum_{\tau=-4,\tau\neq-1}^{1} \beta_\tau I(\tau) + \text{Controls}_{i,t} + NH_i + \text{Time}_t + \varepsilon_{i,t} \quad (13)$$

where τ now measures quarters relative to the MSR quarter (2022Q2), and $Time$ measures quarterly fixed effects. Similar to equation 12, I estimate a difference-in-differences version that replaces the relevant quarterly indicators with $FL_i \times Post$. Under all estimated models, given that there is only one treatment cluster, standard errors are constructed using sub-cluster wild bootstrapping (MacKinnon and Webb, 2018; MacKinnon et al., 2023) using Stata with linkage to the programming language Julia (Roodman et al., 2019; The Julia Project, 2026).[10]

7 Weighting

As previously noted, Florida's residents, nursing home characteristics, and staffing requirements were unique, presenting distinct challenges for identification. The observed pre-treatment differences that led to the passage of HB 1239 could imply that Florida was on a distinct trajectory for the evaluated outcomes relative to the rest of the nation, potentially violating the parallel trends assumption necessary for causal inference. To help mitigate such a threat and create a control group that more closely resembles the day-to-day staffing decisions made by Florida nursing homes, this study uses Stata's ebalance (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment nursing characteristics (Hainmueller, 2012). Entropy balancing is a reweighting method that weighs control group observations so that their covariate moments (such as the mean) exactly match those of the treated group. In this example, entropy balancing assigns higher weights to control nursing homes, so that the pre-treatment means closely resemble those of Florida's nursing homes across the sample.

To conduct entropy balancing for each weekly staffing outcome, pre-treatment means (for Florida vs. the control group) are balanced for the staffing outcome and control variables. For quarterly quality outcomes, entropy balancing includes the pre-treatment mean of the dependent variable, the pre-treatment means of the control variables, and the pre-treatment average total nurse staffing levels. The addition of total nurse staffing levels as a balancing target reflects the fact that overall staffing intensity is itself a confounder for claims-based quality outcomes since Florida's above-average pre-treatment nurse staffing levels may directly impact hospitalization and emergency department visit rates, independent of the minimum staffing reduction.

[10] Sub-cluster wild bootstrapping clusters errors at the state level and resamples at the facility level to provide valid inference in a one-treatment-cluster setting (MacKinnon et al., 2023) and is implemented with 9,999 Rademacher replications.

Entropy balancing produces a singular, time-invariant weight for each nursing home, with each of Florida's nursing homes assigned a weight of 1 and control-group nursing homes assigned weights based on their contribution to the entropy balance in the moment distributions.

Figure 1 illustrates the weekly average HPRD for two of the main staffing measures, NA HPRD and Total Nurse Staffing HPRD, both with and without the application of entropy weights.[11] As previously noted, Florida's NA and Total Nurse Staffing levels were substantially higher than those of the rest of the nation. With the application of singular, time-invariant entropy weights, the control groups' staffing levels closely follow Florida's outcomes, with entropy weights effectively matching Florida's dependent variable moments 12 weeks prior to treatment. Table 2 further illustrates the relative balance of pre-treatment and post-treatment nursing home characteristics for unweighted and NA HPRD entropy balanced samples.[12] Within the Table, Panel A illustrates the balance of characteristics included in the entropy balancing and illustrates that pre-treatment covariate means for the entropy-weighted control group closely match Florida's across all balancing targets.

8 Primary Results

8.1 Staffing Results

Event study plots for each staffing category are reported in Figure 2 with difference-in-differences results reported in Table 3. For event study estimates, a consistent pattern of statistically insignificant noise 21 weeks prior to the passage of HB 1239 supports the parallel-trend assumption and the validity of the treatment-control design.

In Table 3, difference-in-differences results for licensed nursing staff HPRD and non-nursing direct care staffing indicate that after the minimum staffing standard reduction, no statistically significant change was observed, consistent with Hypothesis 1 generated from the theoretical model. However, results for NA HPRD indicate that following the minimum staffing reduction for CNAs from 2.5 to 2.0, Florida's NA HPRD fell by 0.177 to 0.23 HPRD relative to the control group. Given a pre-treatment NA staffing level mean of 2.62 HPRD in Florida, this is consistent with a 6.8-8.8 percent reduction in NA staffing after the mandate was relaxed. Examining the results for total nurse staffing levels, which include RNs, LPNs, and NAs, estimates ranged from 0.176 to 0.226 HPRD, representing a 4.2 to 5.4 percent reduction relative to Florida's pre-treatment mean total staffing level of 4.16 HPRD. The magnitude of the decline in total staffing levels

[11] Weighted and unweighted trends for the other dependent variables are reported in Appendix Figures B1 and B2.

[12] The Relative balance for other dependent variables is reported in Appendix Tables B1-B7.

is effectively indistinguishable from the NA results, implying that the policy's primary driver of reduced staffing is almost entirely through reductions in NAs, consistent with the prediction from Hypothesis 1.

8.2 Quality Results

Event study estimates for risk-adjusted quality outcomes are reported in Figure 3 with difference-in-differences estimates presented in Table 4. Because Florida's nursing homes are unique, with distinct attributes and a sharply lower acuity distribution than the national average, entropy-weighted estimates, which reweight the control group to more closely match Florida's, are the preferred specification for quality outcomes. However, results are presented both with and without entropy weighting for completeness. Difference-in-differences results without weights are statistically insignificant and close to zero, which is consistent with offsetting effects observed across acuity thresholds found in Section 9. However, under entropy-balanced models, where weights reflect the degree to which control units are collectively similar to Florida's nursing homes based on pre-treatment characteristics, including Florida's more moderate levels of acuity, we observe a highly significant and economically meaningful 1.12-percentage-point increase in the share of short-stay residents who were rehospitalized after a nursing home admission. Relative to the pre-HB 1239 Florida mean of 25.67 percent, these estimates represent a 4.4 percent increase in the rehospitalization rate for short-stay residents.

Event study estimates for the long-stay risk-adjusted hospitalization rate are reported in Figure 3, subfigures g and h, with difference-in-differences estimates presented in Table 4. For risk-adjusted hospitalizations per 1,000 long-stay resident days, the entropy-weighted event study (subfigure h) exhibits cleaner pretrends than the unweighted event study.[13] Examining the difference-in-differences estimates, we observe statistically significant increases in hospitalizations per 1,000 resident-days in the post period, ranging from 0.081 to 0.114 hospitalizations per 1,000 resident days, which is consistent with a 4.7 to 6.6% increase relative to the pre-staffing-reduction Florida mean rate of 1.73.

Both short- and long-stay emergency department visits follow a similar pattern. Unweighted event studies for both measures exhibit declining pre-period estimates, consistent with characteristic differences between Florida and the control group, which are reduced with entropy weighting. Short-stay ED visits exhibit no statistically significant change under unweighted models. Under entropy weighting, short-stay ED visits *declined* by 0.56 percentage points (6.1 percent relative to the Florida mean of 9.14 percent), and long-stay ED visits are insignificant. The unweighted long-stay estimate implies a 0.052 ED visit per

[13] The statistically significant negative estimates prior to treatment could imply a potential downward trend prior to the intervention, which could be caused by pandemic-related differences between Florida and the control group, though comparable estimates are found with a limited pre-treatment period (see Appendix Table A3).

1,000 long-stay resident day *reduction* (8.7 percent), significant at the 10 percent level. While these results may initially appear counterintuitive, in that they run in the opposite direction to the rehospitalization and hospitalization rate results, hospitalizations and ED measures are mutually exclusive in their construction, i.e., CMS only counts a visit toward the ED measure if it did not result in a hospital admission. Consequently, the observed pattern of higher hospitalization rates coupled with lower ED visit rates, with the increase in hospitalization rates exceeding the magnitude of the emergency department decline, is consistent with greater patient illness severity at the time of the emergency department encounter among residents, implying lower quality of care.

9 Results by Pre-Treatment Acuity Levels

9.1 Staffing Results by Pre-Treatment Acuity

The basic theoretical model (Hypothesis 3) predicted that nursing homes with higher acuity who were staffing to their acuity would likely experience no change in NA staffing with the reduction in the minimum staffing mandate, because they were not bound by the mandate prior to its relaxation. Consequently, we should observe larger staffing reductions among nursing homes with lower acuity levels. To evaluate this hypothesis, I used acuity, as measured by the quarterly national percentile of case-mix total nurse staffing HPRD, to divide the sample into three groups based on each nursing home's observed pre-treatment percentile relative to the 33rd and 66th percentiles of pre-treatment case-mix total nurse staffing HPRD percentiles for Florida.[14] Nursing homes are defined as high, moderate, or low acuity when their pre-treatment average case-mix total nurse staffing HPRD percentile is (1) above Florida's 66th percentile, (2) greater than Florida's 33rd percentile, and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively.

Table 5 presents results for subsamples based on pre-treatment mean acuity.[15] Hypothesis 3 suggests that reductions in staffing should be larger as acuity declines. Consistent with this hypothesis, lower acuity is typically associated with larger staffing reductions when the minimum staffing mandate is relaxed. For example, with entropy-balanced weights, we observe a 0.13 (4.9%) reduction in NA HPRD among High-acuity facilities, compared to reductions of 0.198 (7.6%) and 0.21 (8.2%) among moderate and low-acuity

[14]Since acuity is measured using a quarterly national percentile, this is effectively taking a percentile of a percentile. Since Florida tends to have lower acuity than the rest of the nation, Florida's 33rd percentile is 31.79, and Florida's 66th percentile is 53.89.

[15]Event Study Figures for NA HPRD are provided in Appendix Figure A3.

facilities, respectively.[16] Subcluster wild bootstrapped pairwise tests with a one-sided alternative hypothesis reveal no statistical difference between NA HPRD reductions for low and moderate acuity facilities. However, moderate-acuity and low-acuity facilities exhibit statistically larger reductions in NA HPRD than high-acuity facilities for virtually all estimated models at conventional significance levels.[17]

9.2 Quality Results by Pre-Treatment Acuity

Staffing results indicated declines in NA HPRD across all pre-treatment acuity levels. The effects are statistically larger in magnitude for nursing homes with low and moderate pre-treatment acuity than for those with high pre-treatment acuity. Further, hypothesis tests evaluating the effects of moderate and low pre-treatment acuity indicate no statistically significant difference in their effect sizes.

Since staffing reductions are observed across all acuity levels, hypothesis 4a is not directly testable. However, given the lack of meaningful difference in NA HPRD reductions between low- and moderate-pre-treatment-acuity nursing homes, I can directly test Hypothesis 4b: conditional on the same staffing decline, quality reductions should be larger among moderate-acuity facilities than among low-acuity facilities.

Table 6 reports the effects of the minimum staffing reduction on quality outcomes by pre-treatment mean acuity levels.[18] Results for unweighted risk-adjusted short-stay rehospitalizations (Model 1) indicate statistically significant quality improvements for high-acuity facilities (i.e., lower rehospitalization rates), higher rehospitalization rates for moderate-acuity facilities, and no statistically significant results for low-acuity facilities. Subcluster wild bootstrapped pairwise tests with a one-sided alternative hypothesis reveal no statistical difference in quality between low- and moderate-acuity facilities. However, pairwise tests reveal that estimates for low- and moderate-acuity nursing homes are each greater than those for high-acuity nursing homes at conventional significance levels.

Results for risk-adjusted short-stay rehospitalizations with entropy weighting on pre-treatment means to make the control group more closely resemble Florida on pre-treatment mean characteristics (Model 2) find statistically insignificant effects for high-acuity nursing homes, highly significant reductions in quality for moderate-acuity nursing homes with a 1.78 percentage points, i.e., 7 percent relative to the pre-treatment Florida-mean increase in short-stay rehospitalization rates, and a statistically significant 1.22 percentage point increase in the rehospitalization rate among low-acuity facilities. Pairwise tests reveal no difference between low- and moderate-acuity estimates, but statistically significant differences between low- and high-

[16] Percentage derived using Florida's Pre-treatment NH HPRD means, which were 2.68 HPRD, 2.61 HPRD, and 2.57 HPRD for High, Moderate, and Low Acuity nursing homes, respectively.

[17] Moderate vs. High is marginally insignificant, P-value=10.7% for the unweighted model.

[18] Corresponding Event Study plots are reported in Figures A4 and A5.

acuity nursing homes, and between moderate- and high-acuity nursing homes.

Risk-adjusted short-stay emergency department visits show statistically significant reductions consistent with the primary analysis across high and moderate acuity levels. Coupled with increased rehospitalization rates and the mutually exclusive construction of ED visits and rehospitalizations, these findings suggest greater illness severity at the emergency department, leading to admission.

For Long-Stay Hospitalizations, statistically significant increases in hospitalizations are observed for high- and moderate-acuity nursing homes without weighting (Model 5), and only among high-acuity nursing homes when entropy weighting is applied (Model 6). Similar to short-stay measures, long-stay emergency department visit declines are observed for high- and moderate-acuity nursing homes, consistent with increased severity of illness leading to admission. Pairwise tests indicate no statistically significant differences in coefficient estimates across acuity levels.

10 Sensitivity Analysis

In addition to the primary models, I ran several tests to assess the sensitivity and robustness of the results. These tests include the evaluation of: (1) potential for bad controls to contaminate average treatment effects, (2) entropy weighting through in-space placebo tests, (3) potential for pandemic-related contamination of quality outcomes, (4) the sensitivity of the results to alternative control groups, (5) robustness and sensitivity of the results to Federal vs. Florida specific staffing definitions, (6) the potential for changes in specific non-nurse direct care staffing as a result of the policy change, (7) the effects across an extended time horizion, and (8) potential heteogeneity by pre-treatment NA staffing levels. While the details of each additional analysis are outlined in the following subsections, the results generally confirm and support the effects estimated through the primary analysis.

10.1 Evaluation of Potential for Bad Controls

A potential concern with the inclusion of control variables in any event study or difference-in-differences setting arises when the control variable is affected by the treatment. In such a case, "bad" controls can indirectly affect the outcome variable by biasing treatment estimates through the control variable (Karim and Webb, 2025). For example, all estimated models control for acuity by including the case-mix total nurse staffing HPRD percentile. If Florida's previous nursing home mandates required staffing at higher-than-optimal levels due to the low average acuity of their residents, nursing homes may have been more likely to accept higher-acuity residents, altering the facility's acuity composition. Given that the inclusion

of controls is not a necessary assumption for the identification of effects under difference-in-differences or event study models, to evaluate whether any of the controls, including acuity, are driving the results through contamination of the treatment effects, I estimated models without control variables. Results for these models are reported in Appendix Table A1 and are effectively indistinguishable from those of the primary models, suggesting that bad controls are not a concern.

10.2 Potential for Results as an Artifact of Entropy Weighting

Given that Florida's observable characteristics, such as average acuity, were noticeably different from those of other states, entropy balancing was imposed to create a more directly comparable counterfactual. Entropy weighting was applied to balance the pre-treatment mean observations between Florida and the control group for the dependent variable and other observable characteristics. Consequently, models with entropy balancing, particularly among quality outcomes, produced stronger and more statistically significant estimates. While the underlying purpose of entropy weighting was to create a more valid counterfactual, a potential concern with this method is that it could assign extreme weights to outlier observations to balance the sample, resulting in the so-called regression-to-the-mean problem. To assess whether the results are an artifact of the entropy weighting procedures, I performed in-space placebo tests in which Florida is excluded from the analysis and "treatment" is assigned, in turn, to each of the 36 control-group states.

A summary of the findings from these 36 in-space placebo tests is reported in Appendix Table A2. In the absence of weighting, the percentage of placebo coefficients that are significant at the 5% level (or lower) never exceeds 8.33% (3 of 36 estimated models). The use of entropy weights increases the significance rate across all models, with a maximum of 19.44%. However, examining the extremity of the estimated coefficients for Florida relative to other states under the placebo treatment (i.e., denoted as Randomization Inference [RI] P-Value), we observe that for licensed and other non-nurse direct care HPRD, placebo coefficients were larger in magnitude 61 to 100% of the time, consistent with a null effect consistent with the primary analysis. For NA and Total Nurse staffing HPRD, 0 to 2.78% of placebo coefficient estimates were larger in magnitude across models.

Among quality outcomes, RI P-values are less informative. Coupled with higher significance rates with entropy balancing, one could remain concerned that quality results are due to entropy balancing. However, increases in long-stay hospitalization rates were identified without any weights under the primary model (Table 4), and strongly significant effects for short-stay rehospitalizations were observed without weighting (Table 6, Model 1) for moderate acuity nursing homes. Given that Florida, on average, had a lower acuity distribution than the rest of the US and entropy balancing effectively weights nursing homes that

more closely match Florida's acuity distribution, the transition from negative and insignificant to positive and strongly significant in Table 4 is consistent with weighting to more moderate acuity nursing homes. Consequently, we can conclude that the effects are independent of the use of entropy weights.

10.3 Potential for Pandemic-Related Contamination of Quality Outcomes

The quality outcomes were intentionally selected because they are generated from claims data and, during the observation period, were not elements of Florida's QIP. However, a potential weakness of the measures is that they are based on 4-quarters of rolling claims data. As previously noted, because each quarterly observation embeds claims from the prior 12 months, post-period changes gradually attenuate toward the policy effect as pre-period claims roll out of the window, with full effects only observed four quarters after treatment, resulting in the underestimation of quality effects.

This also means that the first quarterly observation of the 4-quarter quality measures (i.e., 2021Q2 contains claims data from 2020Q3 to 2021Q2, which almost certainly implies contamination of the quality measures from the Covid-19 pandemic. While entropy weighting, which includes pre-treatment means of the outcome quality measures, reduces and stabilizes many potential pre-trends (See Figures 3, A4, and A5), it may not fully recover true effects if Florida was differentially affected by the Covid-19 pandemic. To better isolate the pre-treatment period from the pandemic, I estimated difference-in-differences models that limit the pre-treatment period to only the last observed pre-treatment quarter (i.e., 2022Q1, which contains claims from 2021Q2 to 2022Q1) as the reference period. Results for these alternative models are reported in Appendix Table A3, which exhibits point estimates that are slightly smaller, but well within the 95% confidence interval range of the primary results. Results for long-stay measures exhibit greater statistical significance than the primary results despite smaller sample sizes. Overall, these results suggest that pandemic-related contamination of quality outcomes is not a concern.

10.4 Alternative Control Groups

An additional concern is whether the results are robust to alternative control groups. The control group consisted of nursing homes located in contiguous states with more than 50 nursing homes (i.e., excluding AK, HI, and states with small cluster size [DC, WY, VT, DE, NV]) with stable nursing home minimum staffing regulations (i.e., excluding AR, CT, IL, NY, OR, RI, and SC). To determine the level of sensitivity of the results to alternative control groups, I estimated the primary results for the following control groups: (1) nursing homes across all other states, (2) nursing homes with comparable total direct care staffing requirements, which include states with binding total direct-care staffing mandates $\geq$ 3 HPRD that did not change

during the evaluation window. These include: CA (DC MSR 3.56 HPRD), MA (DC MSR 3.64 HPRD), MD (DC MSR 3.06 HPRD), ME (3.02 HPRD), and WA (DC MSR 3.46 HPRD) (Medicaid and CHIP Payment and Access Commission, 2022a,b).

A summary of the results estimated with these alternative control groups is reported in Appendix Tables A4 and A5, which produced estimates consistent with the primary analysis, suggesting that the results are not sensitive to the states included in the control group.

10.5 Florida Defined Staffing Outcomes

Recall that the primary analysis defines nurse staffing-related outcomes using CMS's definitions of RNs, LPNs, and NAs as an operational choice, given that these definitions are widely used across states and within the academic literature. However, Florida's definitions of direct care staffing in its statutes specify the hours that can be counted, which are distinct from Federal definitions for occupational categories. For example, Florida's statutes do not permit time spent on administrative tasks to count toward meeting its direct care staffing or licensed mandate, nor do they explicitly permit the use of Medication Aides/Technicians to satisfy the CNA requirements, despite their inclusion in the definition of CNA for Care Compare staffing measures. As a robustness test to determine whether the primary results are affected by the distinction between Federal and State definitions of occupational categories, I evaluated the results using Florida-specific definitions. Results for these models are reported in Appendix Table A6. Using Florida-specific occupational definitions yielded results almost identical to the primary results. Licensed HPRD continues to exhibit no change in conjunction with the minimum staffing reduction. NA HPRD and Total Nurse Staffing HPRD produce effects of almost identical magnitude, which are slightly smaller in magnitude than the primary results, but well within the primary result confidence intervals. Additionally, evaluating hours spent on nurse administration, I see no statistically significant changes before and after the minimum staffing reduction. Collectively, the results do not appear to be sensitive to the specific definition used for nursing staffing.

10.6 Alternative Staffing Outcomes

The primary results showed no net changes in other non-nursing direct-care staffing occupations associated with the minimum staffing reduction, implying that NA HPRD was the primary driver. However, shifts in specific non-nursing direct care staffing or other occupations could occur in conjunction with the policy that may not appear in the aggregate. To assess whether dramatic changes in staffing hours for specific occupation types occurred in conjunction with the minimum staffing reduction, I examined a wide range of alternative staffing outcomes. Results for these models are reported in Appendix Table A7. These results suggest no

shifting between RN and LPNs within the licensed staff category, and no changes in hours reported for the nursing home administrator or non-nursing medical personnel (such as the Medical Director). However, coefficient estimates suggest a slight decline in therapy hours, and a small uptick in both Activities HPRD and Dietician HPRD. Collectively, the magnitude of these effects appears very small and is unlikely to be of any major concern.

10.7 Evaluation of Extended Time Horizon

The primary analysis limited the post-HB 1239 period to 2022Q3 to eliminate the potential influence of Florida's Medicaid Provider Minimum Wage Requirement, with attestation by nursing homes in 2022Q4 to a $15-per-hour minimum compensation, and the potential for civil action for non-compliance at the beginning of 2023Q1. Since the minimum wage increase was a funded mandate that compensated nursing homes based on actuarial projections of the mandate's cost increases, it is unclear how it would affect staffing and quality beyond the effects of HB 1239's minimum staffing reduction. As a result of the shorter post-treatment time horizon and quality measures based on claims from the prior 12 months, the gradual attenuation of the policy's effects is not fully observed, and the quality results likely underestimate the full effect.

As a robustness check, I extended the time horizon to include observations from 2021Q2 to 2023Q1. Using an extended period reduces the risk of attenuation at the expense of contamination from the subsequent minimum wage policy. This extended period occurred after the Covid-19 vaccine rollout and includes the potential influence of the Minimum Wage increase, but ends before the expanded reimbursement for QIP payments was introduced in the Florida Legislature (HB 5305 on 3/22/2023) to avoid intent-to-treat changes in nursing home behavior (Florida House of Representatives, 2023). Using this extended time horizon, I first estimated event studies of staffing and quality to evaluate whether there were distinct changes in the dynamic paths of these outcomes associated with the secondary minimum wage policy. Event study figures for staffing outcomes are reported in Appendix Figure A6 with vertical dashed lines indicating week -1 from the implementation of HB 1239 and week 24 (the week prior to the minimum wage attestation date), suggesting modest temporary changes from the minimum wage mandate that do not appear to deviate nursing homes from their long-run trajectory response to the minimum staffing reduction. This implies that the estimated dynamic effects for quality event studies (Appendix Figure A7) are likely due purely to the minimum staffing reductions. These results are further reinforced by A8, which yields staffing outcomes comparable to the primary analysis but larger magnitudes for short-stay quality outcomes. Long-stay quality outcomes remain weakly statistically significant, with variation across weighting methods.

10.8 Heterogeneity by Pre-Treatment NA Staffing Levels

If nursing homes are staffing to their acuity, then nursing homes with pre-treatment NA staffing levels that are at or above 2.6 HPRD, the NA staffing level that satisfies both the CNA requirement and total direct care staffing requirements,[19] are more likely to be making their staffing decision voluntarily to meet resident care needs, implying that the previous minimum staffing requirement was non-binding. Consequently, we can evaluate the potential for heterogeneous responses at or above this threshold.

Tables A9 and A10 present results for subsamples based on pre-treatment mean NA HPRD for high (i.e., pre-treatment mean NA HPRD ≥ 2.6) and moderate/low (i.e., pre-treatment mean NA HPRD < 2.6). Statistically significant declines in NA HPRD are observed for nursing homes with staffing above and below the pre-mandate NA HPRD sufficient level, with moderate/low coefficient estimates that are 1.4 to 2.5 times larger than those for high pre-mandate NA HPRD nursing homes, consistent with the generated hypothesis. One-sided pairwise subcluster-robust bootstrapped tests indicate that these effect sizes differ statistically at conventional levels. For quality measures, both short- and long-stay quality decline is observed, though pairwise hypothesis tests do not detect any statistically significant difference in the magnitudes of the coefficients. Collectively, these staffing results reinforce the binding/non-binding minimum staffing mechanism developed in the theoretical model: facilities not yet bound by the pre-treatment floor exhibited reliably smaller reductions. The results, however, do not speak to the acuity-based heterogeneity evaluated in Section 9, given that staffing reductions are observed even among those who were previously staffing above the threshold.

11 Discussion

This paper provides the first causal evidence of a state-level *reduction* in MSRs. These effects are identified in the context of Florida, which has historically had the highest NA minimum staffing requirement in the nation. Florida's NA staffing requirement was dramatically lowered by 20% (.5/2.5 HPRD) under HB 1239, which simultaneously permitted nursing homes to meet their total direct care staffing requirements with non-nursing direct care labor. HB 1239 can be considered a clean policy event, given that the minimum staffing reduction took effect immediately upon signing and, with an appropriate evaluation window, can be isolated from other potentially confounding events and policies. The analysis is directly relevant, considering that CMS's repeal of the expanded MSRs effectively places regulatory control in the hands of state policymakers.

Proponents argued that the bill modernized staffing regulations and permitted highly trained (non-

[19] Assuming that the nursing homes are meeting their 1.0 HPRD Licensed Nursing Staff Requirement.

nursing) caregivers to satisfy direct care requirements, thereby personalizing care and ensuring higher-quality care than would be available in the bill's absence (Florida Health Care Association, 2022b). Opponents argued that weekly average nursing care would be reduced by 20%, with CNAs replaced by staff not trained to provide bedside care, resulting in poorer care for nursing home residents (AARP Florida, 2022b,a). Empirically, we observe a 6.8 to 8.8% reduction in NA HPRD, with no substitution toward licensed nursing staff or collectively among non-nursing staff occupations despite explicit regulatory permission.[20] This is not surprising given that NA wages were substantially lower than those of effectively all other occupations that fulfill the direct care staffing requirement.

Evaluating the effects on staffing by pre-HB 1239 acuity levels, this study finds statistically significant reductions in NA staffing across all acuity levels, even among the highest pre-treatment acuity levels. However, consistent with predictions from the theoretical model, these reductions are statistically larger for moderate- and low-acuity facilities than high acuity facilities. Such a result is consistent with Florida's pre-HB 1239 MSRs binding nursing home staffing decisions, effectively forcing them to staff at NA levels beyond those the nursing home would have chosen on its own. Consequently, once the mandate was loosened/removed, nursing homes with lower acuity levels responded more intensely with greater reductions in their NA staffing levels.

These findings contribute to and complement the small causal literature on minimum staffing standards. These finds are consistent with Brunt (2023) who found that CMS enforcement of federal staffing minimums increased both staffing and quality and Bowblis and Brunt (2024) who found that California's 2018 increase in minimum staffing raised CNA and total nurse staffing but produced only weak evidence of quality improvement, which was limited to long-stay pressure ulcers and short-stay rehospitalization, but with no improvement on most other measures. They are also consistent with Abt Associates (2023), who evaluated Massachusetts's 2020 minimum staffing requirement increase and found significant staffing gains but no detectable effect on quality or safety scores. Consistent with the previous work, the present study found that HB 1239's reduction in MSRs produced an immediate reduction in NA staffing levels and reductions in quality, including, notably, a result on the same outcome (short-stay rehospitalization) as Bowblis and Brunt (2024).

In assessing the impact of the minimum staffing reduction on quality, this paper consistently finds that hospitalization rates among long-stay residents and rehospitalization rates among short-stay residents in-

[20] While robustness tests confirm small increases in activities HPRD and dietician HPRD, these modest within-facility reallocations are too small to meaningfully offset the reductions in NA HPRD, and simultaneous reductions in therapy HPRD appear to collectively cancel out in the aggregate.

creased as a result of the MSR reduction under HB 1239, while emergency department visits decreased. Given that hospitalizations and emergency department visits are mutually exclusive in their construction, these results are consistent with increased illness severity at emergency department encounters that lead to admission rather than to outpatient discharge. For short-stay resident outcomes, these results are most pronounced and statistically the strongest for moderate-acuity nursing homes. For long-stay resident outcomes, while quality declines are observed, they do not appear to differ statistically across pre-treatment acuity levels.

These causal results corroborate the directional trend reported in AARP Florida's commissioned analyses (Peterson, 2024; Peterson and Jester, 2025), which suggested that long-stay hospitalizations increased after the passage of HB 1239. Simultaneously, these results do not support their hypothesis that emergency department visits may increase due to HB 1239's staffing-related reductions. While they document upward trends in Florida's short- and long-stay emergency department visits, when directly compared to control group states, the current analysis finds that these visits declined after the staffing reduction, consistent with a shift toward inpatient hospital admissions. The result of this study also speaks directly to the industry's response that the observed hospitalization trends reflected national patterns rather than Florida's policy specifically (Stulick, 2024). Because the study design compares Florida against a control group free of simultaneous nursing-home-related policy changes, the results are attributable to Florida's policy change rather than a shared national trend.

This analysis is subject to several limitations that qualify the findings. First, the design relies on a single treated state, Florida, with atypical population and nursing home characteristics such as unusually high pre-treatment nursing staffing requirements, lower average acuity, and a greater share of not-for-profit and chain-affiliated facilities. These unique attributes imply that the estimated effects and magnitudes may not generalize directly to states considering similar reforms from a different baseline. Second, the primary analysis window is restricted to two post-treatment quarters to avoid contamination from Florida's subsequent minimum wage and QIP reimbursement changes. Since rolling four-quarter claims-based quality measures only fully reflect a policy change after four quarters, the reported quality effects likely understate the policy's full impact.

12 Conclusion

Florida's HB 1239 lowered the state's nurse aide requirement by 20 percent and simultaneously permitted nursing homes to flexibly meet their direct-care staffing requirement with non-nursing labor. The regulatory

logic behind HB 1239 was based on the premise that flexibly permitting nursing homes to adjust staffing would lead to more optimal patient-centered care. However, the economic reality of relative wage differentials within nursing homes makes nurse aides the least expensive form of labor for meeting MSRs. Rather than substituting with or increasing other forms of labor within nursing homes, HB 1239 effectively permitted nursing homes to reduce nurse aide staffing by using their established non-nurse direct care staffing to indirectly reduce the total direct care nurse staffing requirements. Other states considering flexible direct care staffing requirements for specific occupations should be aware of relative wages and the available supply of staff across occupational categories when considering such legislation. Given that cost-minimizing nursing homes may choose an occupation mix and hours of care that minimize labor costs rather than meet clinical needs, such mandates may result in a pure reduction in bedside hours and reduced quality of care.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process.

During the preparation of this work, the author(s) used Anthropic's Claude, xAI's Grok, and Google's Gemini for editorial assistance during manuscript preparation, including draft review, revision suggestions, streamlining author-written code, and the construction of sampling flow charts from author-generated Excel files. After using these tools/services, the author reviewed and edited the content as needed and takes full responsibility for the article's contents.

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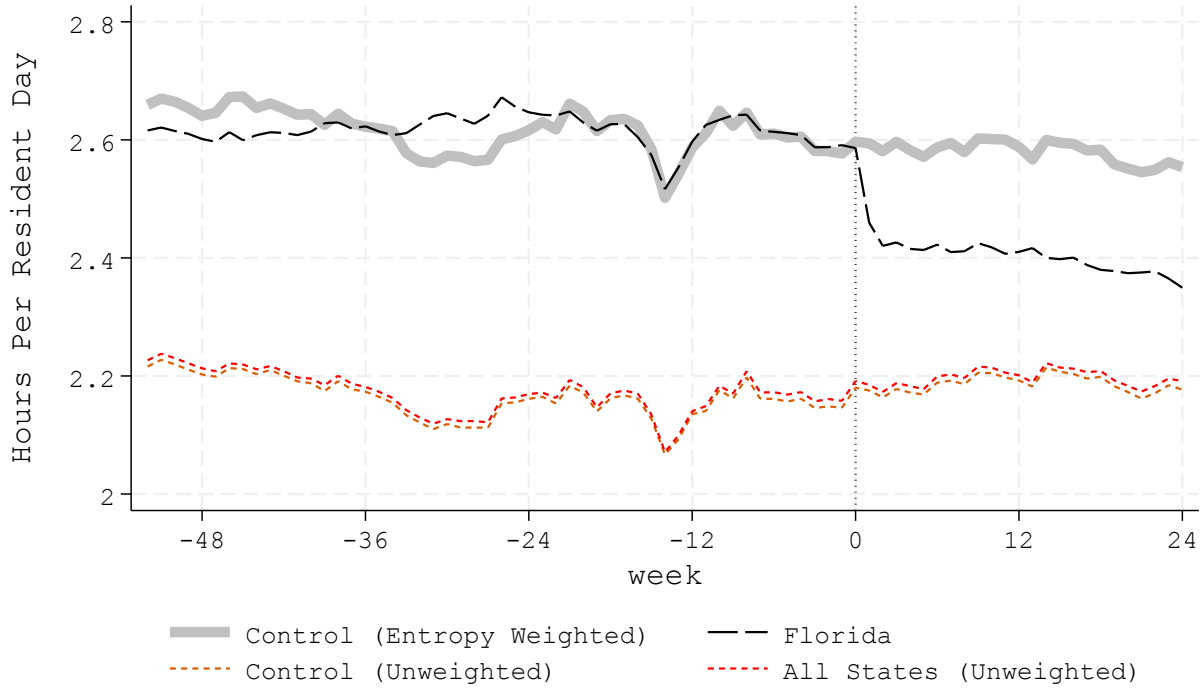
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Table 1: Summary Statistics for Florida and Control Group (Unweighted)

Variable	Pre-		Post-	
	Control Mean (SD.)	Treatment Mean (SD.)	Control Mean (SD.)	Treatment Mean (SD.)
Panel A: Weekly Staffing Sample				
NA HPRD	2.16	2.62	2.19	2.41
	(0.57)	(0.37)	(0.73)	(0.43)
Total Nurse Staffing HPRD	3.71	4.16	3.70	3.92
	(0.86)	(0.69)	(1.17)	(0.73)
Licensed HPRD	1.55	1.55	1.51	1.51
	(0.47)	(0.42)	(0.57)	(0.37)
Other Non-Nursing Direct Care HPRD	0.74	0.74	0.72	0.73
	(0.43)	(0.38)	(0.42)	(0.38)
RN HPRD	0.64	0.70	0.61	0.66
	(0.38)	(0.34)	(0.37)	(0.31)
LPN HPRD	0.91	0.85	0.90	0.85
	(0.36)	(0.30)	(0.44)	(0.30)
% Medicaid	55.67	56.92	55.63	55.45
	(26.21)	(21.54)	(25.65)	(22.30)
% Medicare	13.02	17.66	12.89	18.15
	(11.78)	(12.30)	(11.92)	(12.54)
Acuity Percentile	50.91	43.58	50.77	43.39
	(28.18)	(23.25)	(28.19)	(22.61)
Certified Beds	103.88	121.22	103.60	121.19
	(49.35)	(44.85)	(49.39)	(44.83)
Chain Affliated	57.76	61.79	57.06	60.49
Change in Ownership	0.85	1.13	4.12	10.14
Government	4.91	1.52	4.91	1.64
Not-for-Profit	21.26	26.56	20.93	26.18
CCRC	12.05	10.53	12.02	10.83
N	468,520	30,004	225,250	14,425
Panel B: Quarterly Short-Stay Quality Sample				
Risk-Adjusted Percentage of Short-stay Residents Who Were	22.22	25.67	22.05	25.36
Rehospitalized After A Nursing Home Admission	(6.85)	(5.65)	(6.89)	(5.58)
Risk-Adjusted Percentage of Short-stay Residents Who had an	11.20	9.14	12.06	9.79
Outpatient Emergency Department Visit	(5.74)	(4.35)	(6.09)	(4.47)
N	33,239	2,306	16,432	1,150
Panel C: Quarterly Long-Stay Quality Sample				
Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay	1.45	1.73	1.61	1.98
Resident Days	(0.67)	(0.62)	(0.74)	(0.71)
Risk-Adjusted Number of Outpatient Emergency Department	0.89	0.60	1.06	0.72
Visits per 1,000 Long-stay Resident Days	(0.59)	(0.36)	(0.68)	(0.42)
N	32,803	2,252	16,025	1,129

Figure 1: Mean Staffing Levels in Hours Per Resident Day (HPRD) for Florida and the Nation

(a) NA HPRD



(b) Total Nurse Staffing HPRD

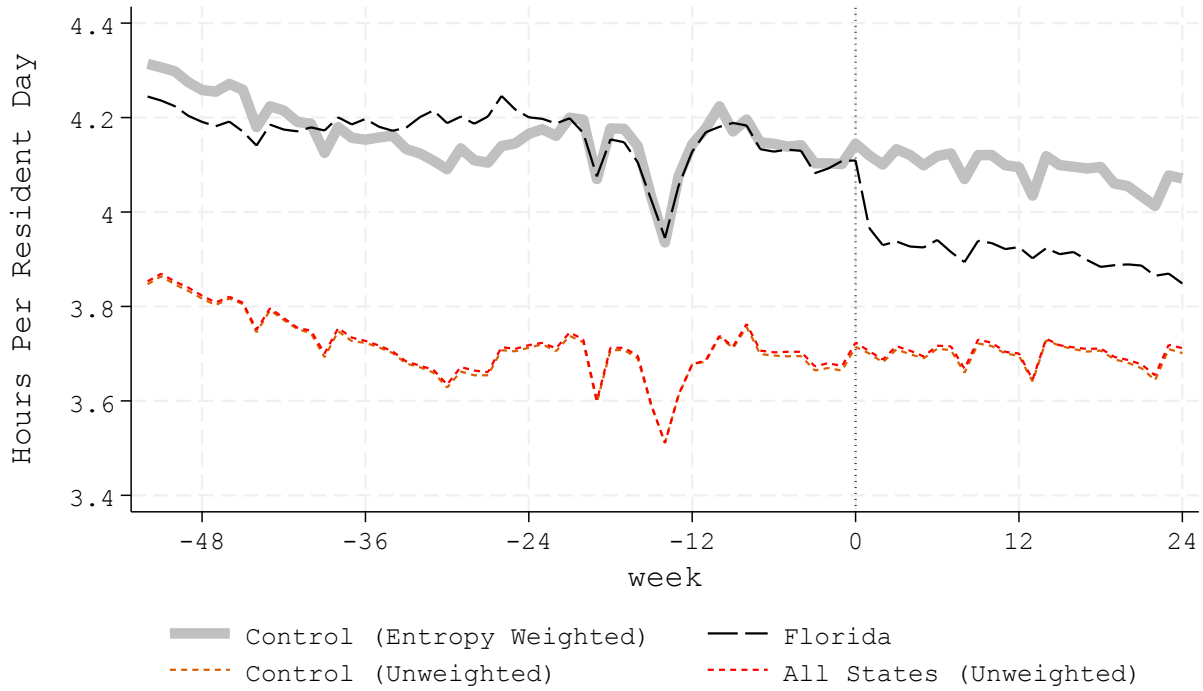


Table 2: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without NA HPRD Balanced Entropy Weights)

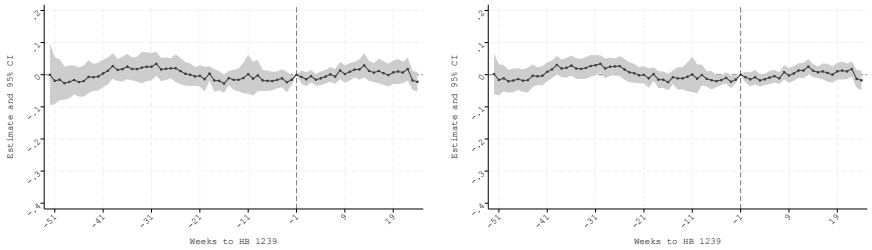
Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
NA HPRD	2.62	2.16	2.62	2.41	2.19	2.58
% Medicaid	56.92	55.67	56.90	55.45	55.63	56.18
% Medicare	17.66	13.02	17.66	18.15	12.89	17.27
Acuity	43.58	50.91	43.60	43.39	50.77	43.44
Certified Beds	121.22	103.88	121.21	121.19	103.60	120.98
Chain Affliated	61.79	57.76	60.31	60.49	57.06	60.30
Change in Ownership	1.13	0.85	1.13	10.14	4.12	3.69
Government	1.52	4.91	1.89	1.64	4.91	2.04
Not-for-Profit	26.56	21.26	26.92	26.18	20.93	26.52
CCRC	10.53	12.05	10.53	10.83	12.02	10.77
Panel B: Other (Non-Entropy Balancing) Characteristics						
Total Nurse Staffing HPRD	4.16	3.71	4.25	3.92	3.70	4.17
Other Non-Nursing Direct Care HPRD	0.74	0.74	0.78	0.73	0.72	0.74
RN HPRD	0.70	0.64	0.68	0.66	0.61	0.65
LPN HPRD	0.85	0.91	0.95	0.85	0.90	0.94
Licensed HPRD	1.55	1.55	1.64	1.51	1.51	1.58

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Figure 2: Event Study Estimates of the Effect of Florida's Minimum Staffing Reductions on Staffing Hours per Resident Day (HPRD)

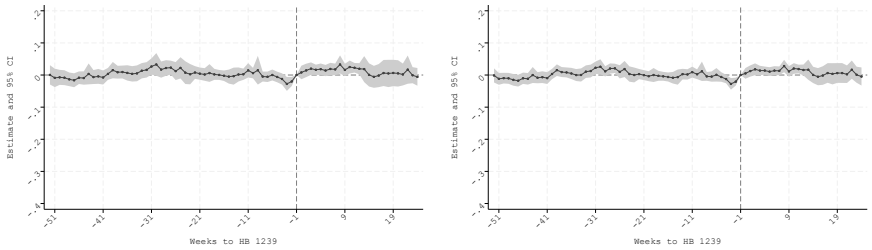
(a) Licensed HPRD
(Unweighted Control)

(b) Licensed HPRD
(Entropy Weighted Control)



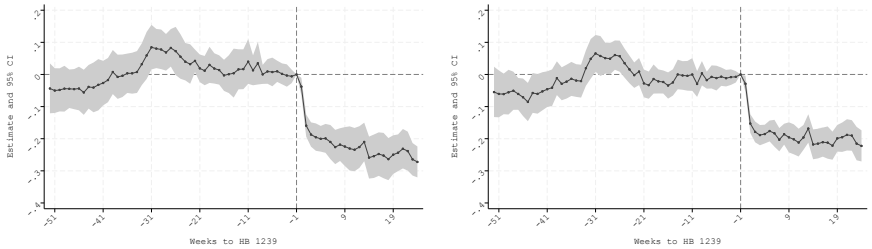
(c) Non-Nursing Direct Care Employee HPRD
(Unweighted Control)

(d) Non-Nursing Direct Care Employee HPRD
(Entropy Weighted Control)



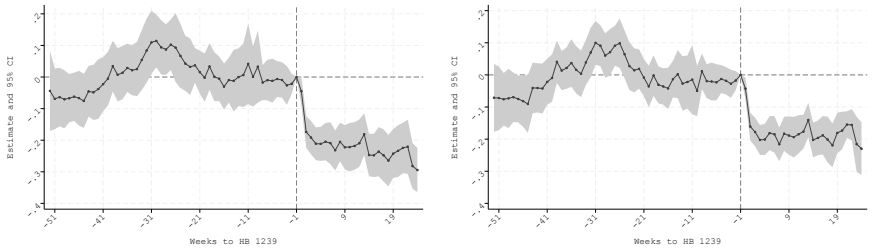
(e) NA HPRD
(Unweighted Control)

(f) NA HPRD
(Entropy Weighted Control)



(g) Total Nurse Staffing HPRD
(Unweighted Control)

(h) Total Nurse Staffing HPRD
(Entropy Weighted Control)



Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). All samples exclude non-contiguous states (Alaska and Hawaii), Puerto Rico, and several states/territories with less than 50 nursing homes (Delaware, District of Columbia, Nevada, Vermont, and Wyoming).

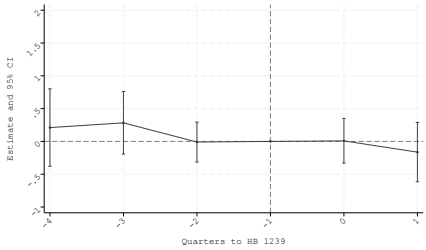
Table 3: Difference-in-Differences Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on Staffing

Dependent Variable	Unweighted Control Coeff. [95% CI]	Entropy Weighted Control Coeff. [95% CI]
Licensed HPRD	0.004	0.000
	[-0.020, 0.029]	[-0.018, 0.019]
	p=0.709	p=0.967
N	738,199	738,199
Other Non-Nursing Direct Care HPRD	0.009	0.009
	[-0.013, 0.031]	[-0.008, 0.027]
	p=0.386	p=0.266
N	738,199	738,199
NA HPRD	-0.230***	-0.177***
	[-0.274, -0.186]	[-0.215, -0.137]
	p<0.001	p<0.001
N	738,199	738,199
Total Nurse Staffing HPRD	-0.226***	-0.176***
	[-0.280, -0.171]	[-0.230, -0.121]
	p<0.001	p<0.001
N	738,199	738,199

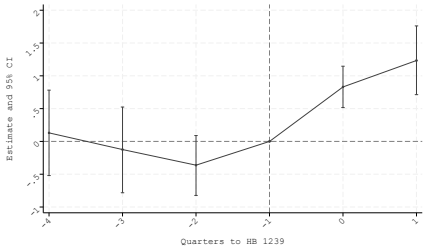
Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) from Equation 12 that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Figure 3: Event Study Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Risk-Adjusted Hospitalizations and Emergency Department Visits

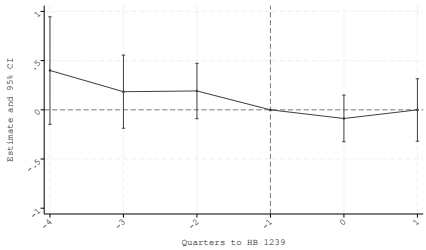
(a) Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission (Unweighted)



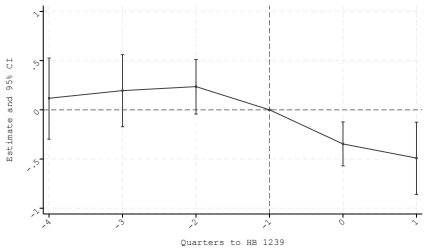
(b) Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission (Full Weighting)



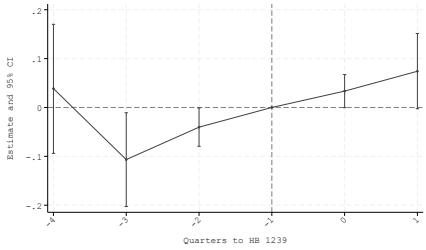
(c) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit (Unweighted)



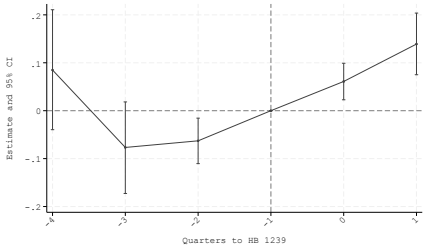
(d) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit (Full Weighting)



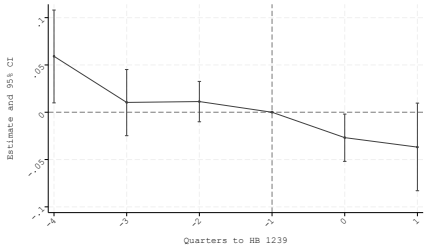
(e) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days (Unweighted)



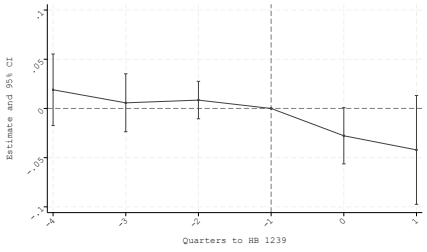
(f) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days (Full Weighting)



(g) Risk-Adjusted Long-Stay ED Visits per 1,000 Resident Days (Unweighted)



(h) Risk-Adjusted Long-Stay ED Visits per 1,000 Resident Days (Full Weighting)



Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity).

Table 4: Difference-in-Differences Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Risk-Adjusted Hospitalizations and Emergency Department Visits

Dependent Variable	Unweighted Control Coeff. [95% CI]	Entropy Weighted Control Coeff. [95% CI]
Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission	-0.198 [-0.673, 0.276] p=0.397	1.120*** [0.607, 1.637] p<0.001
N	53,127	53,037
Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit	-0.238 [-0.560, 0.085] p=0.140	-0.555*** [-0.944, -0.161] p=0.009
N	53,127	53,037
Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days	0.081* [-0.005, 0.168] p=0.064	0.114** [0.027, 0.200] p=0.012
N	52,209	52,165
Risk-Adjusted Number of Outpatient Emergency Department Visits per 1,000 Long-stay Resident Days	-0.052* [-0.105, 0.001] p=0.054	-0.043 [-0.097, 0.011] p=0.110
N	52,209	52,165

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table 5: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on NA HPRD by Pre-Treatment Mean Acuity (Case-Mix Total Nurse Staffing)

		Pre-Treatment Mean Acuity			One-sided WCB tests of equality:		Entropy
Model	Dependent Variable	High	Moderate	Low	Alternative	P-Value	Weighting?
		Coeff. [95% CI]	Coeff. [95% CI]	Coeff. [95% CI]			
1	NA HPRD	-0.205***	-0.239***	-0.250***	Low < Moderate	0.360	No
		[-0.279, -0.131]	[-0.289, -0.189]	[-0.307, -0.192]	Low < High	0.090	
		p<0.001	p<0.001	p<0.001	Moderate < High	0.107	
	N	346,269	174,559	217,371			
2	NA HPRD	-0.134***	-0.198***	-0.210***	Low < Moderate	0.321	Yes
		[-0.176, -0.091]	[-0.256, -0.139]	[-0.269, -0.150]	Low < High	0.008	
		p<0.001	p<0.001	p<0.001	Moderate < High	0.027	
	N	346,269	174,559	217,371			

Notes: * p<0.10, ** p<0.05, *** p<0.01. Pre-treatment mean acuity is defined as High, Moderate, or Low if the nursing home's mean pre-treatment case-mix total nurse staffing HPRD percentile was above Florida's 66th percentile (i.e., 53.89%), greater than Florida's 33rd percentile (i.e, 31.79%), and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table 6: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Risk-Adjusted (RA) Quality Outcomes by Pre-Treatment Mean Acuity (Case-Mix Total Nurse Staffing)

Model	Dependent Variable	Pre-Treatment Mean Acuity			One-sided WCB tests of equality:		Entropy
		High	Moderate	Low	Alternative	P-Value	Weighting?
		Coeff. [95% CI]	Coeff. [95% CI]	Coeff. [95% CI]			
1	RA Short-Stay Rehospitalizations	-0.997***	0.632**	-0.169	Low > Moderate	0.880	No
		[-1.650, -0.349]	[0.032, 1.234]	[-1.273, 0.942]	Low > High	0.069	
		p=0.006	p=0.040	p=0.756	Moderate > High	0.001	
	N	24,630	11,863	12,523			
2	RA Short-Stay Rehospitalizations	0.337	1.777***	1.218*	Low > Moderate	0.729	Yes
		[-0.339, 1.013]	[0.498, 3.100]	[-0.028, 2.496]	Low > High	0.096	
		p=0.312	p=0.008	p=0.054	Moderate > High	0.015	
	N	24,614	11,843	12,475			
3	RA Short-Stay ED Visits	-0.229	-0.685**	-0.114	Low < Moderate	0.941	No
		[-0.731, 0.271]	[-1.218, -0.154]	[-0.739, 0.513]	Low < High	0.630	
		p=0.344	p=0.014	p=0.706	Moderate < High	0.105	
	N	24,630	11,863	12,523			
4	RA Short-Stay ED Visits	-0.613**	-0.905***	-0.461	Low < Moderate	0.843	Yes
		[-1.197, -0.035]	[-1.510, -0.300]	[-1.220, 0.287]	Low < High	0.640	
		p=0.038	p=0.004	p=0.215	Moderate < High	0.248	
	N	24,614	11,843	12,475			
5	RA Long-Stay Hospitalizations	0.108*	0.084*	0.057	Low > Moderate	0.666	No
		[-0.022, 0.238]	[-0.016, 0.184]	[-0.054, 0.167]	Low > High	0.776	
		p=0.093	p=0.092	p=0.288	Moderate > High	0.646	
	N	21,473	11,690	15,052			
6	RA Long-Stay Hospitalizations	0.188***	0.073	0.09	Low > Moderate	0.406	Yes
		[0.094, 0.285]	[-0.032, 0.173]	[-0.051, 0.230]	Low > High	0.921	
		p<0.001	p=0.152	p=0.193	Moderate > High	0.944	
	N	21,465	11,678	15,032			
7	RA Long-Stay ED Visits	-0.081**	-0.067**	-0.031	Low < Moderate	0.847	No
		[-0.160, -0.003]	[-0.128, -0.006]	[-0.098, 0.034]	Low < High	0.880	
		p=0.044	p=0.036	p=0.331	Moderate < High	0.676	
	N	21,473	11,690	15,052			
8	RA Long-Stay ED Visits	-0.051*	-0.057*	-0.016	Low < Moderate	0.898	Yes
		[-0.107, 0.006]	[-0.119, 0.006]	[-0.082, 0.051]	Low < High	0.848	
		p=0.075	p=0.073	p=0.632	Moderate < High	0.431	
	N	21,465	11,678	15,032			

Notes: * p<0.10, ** p<0.05, *** p<0.01. Pre-treatment mean acuity is defined as High, Moderate, or Low if the nursing home's mean pre-treatment case-mix total nurse staffing HPRD percentile was above Florida's 66th percentile (i.e., 53.89%), greater than Florida's 33rd percentile (i.e, 31.79%), and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Appendix A

Figure A1: Construction of Staffing Analytic Sample

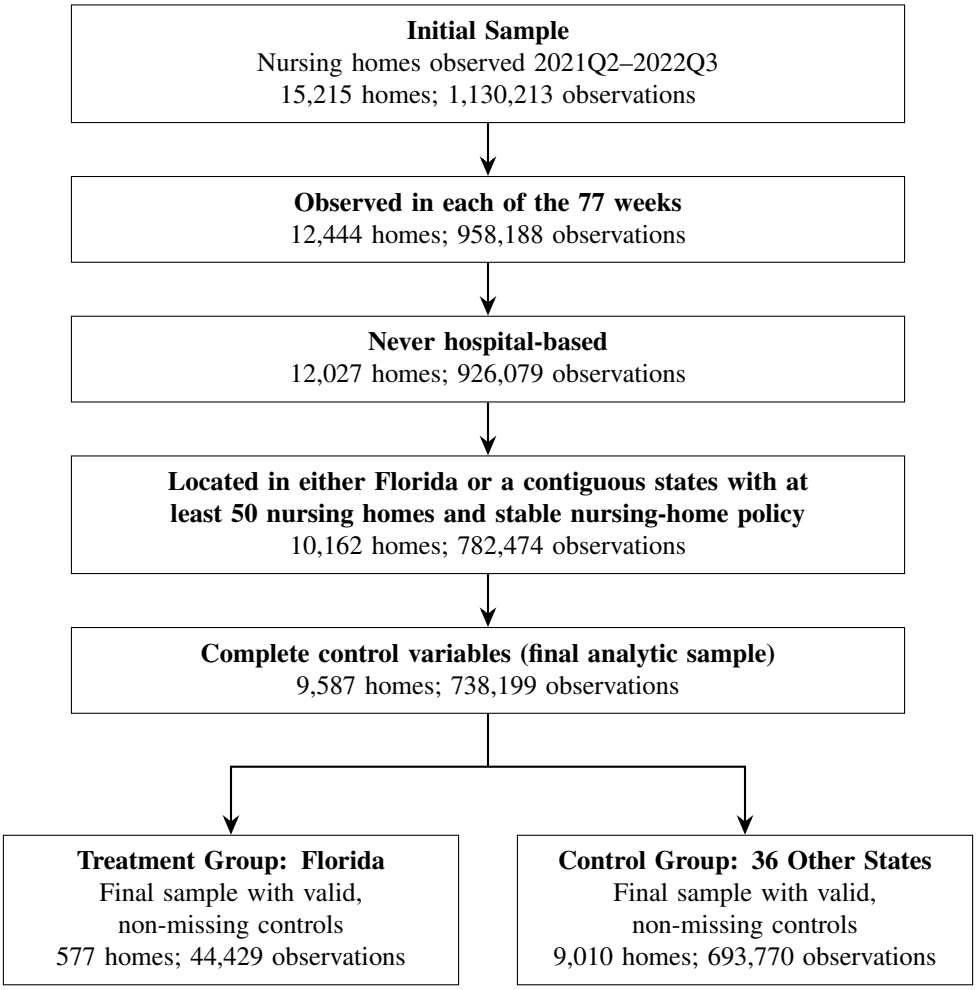


Figure A2: Construction of the Quality Analytic Sample

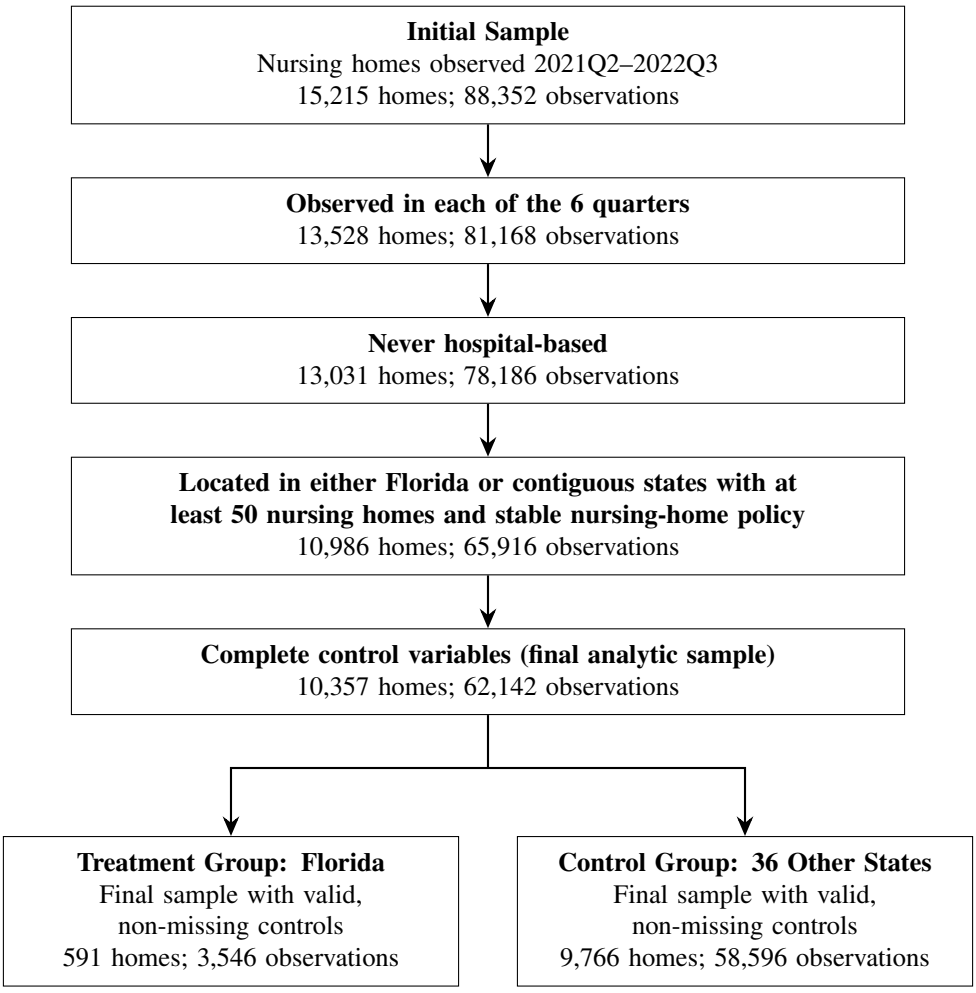
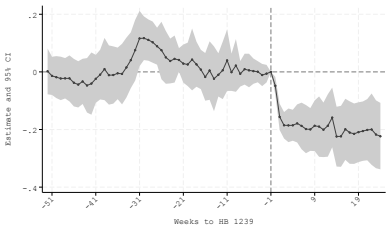
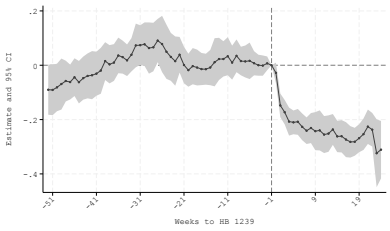


Figure A3: Event Study Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Nurse Aide HPRD By Pre-Treatment Mean Acuity

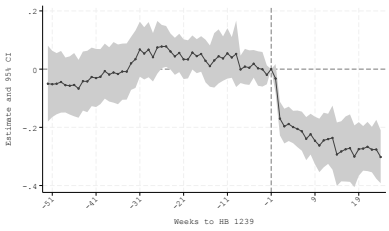
(a) NA HPRD (High-Acuity Unweighted)



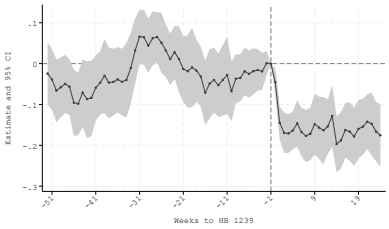
(b) NA HPRD (Moderate-Acuity Unweighted)



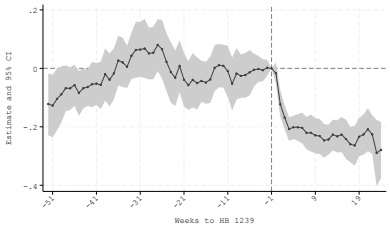
(c) NA HPRD (Low-Acuity Unweighted)



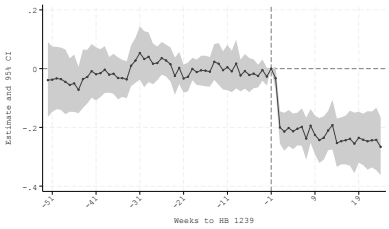
(d) NA HPRD (High-Acuity Entropy Weighted)



(e) NA HPRD (Moderate-Acuity Entropy Weighted)



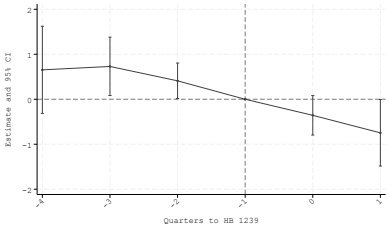
(f) NA HPRD (Low-Acuity Entropy Weighted)



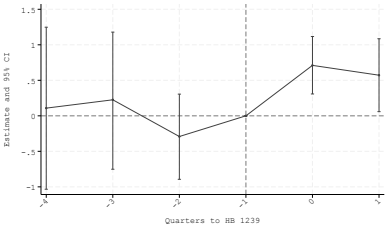
Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Pre-treatment mean acuity is defined as High, Moderate, or Low if the nursing home's mean pre-treatment case-mix total nurse staffing HPRD percentile was above Florida's 66th percentile (i.e., 53.89%), greater than Florida's 33rd percentile (i.e, 31.79%), and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). All samples exclude non-contiguous states (Alaska and Hawaii), Puerto Rico, and several states/territories with less than 50 nursing homes (Delaware, District of Columbia, Nevada, Vermont, and Wyoming).

Figure A4: Event Study Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission and Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit By Pre-Treatment Mean Acuity

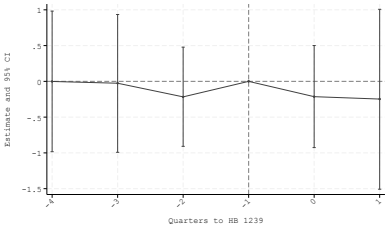
(a) RA Short-stay Rehospitalizations (High-Acuity Unweighted)



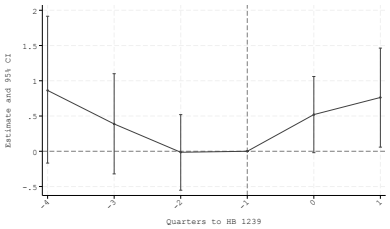
(b) RA Short-stay Rehospitalizations (Moderate-Acuity Unweighted)



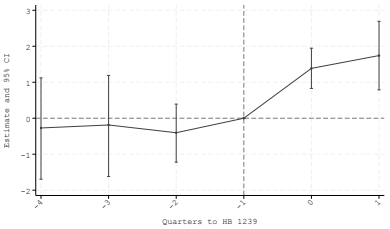
(c) RA Short-stay Rehospitalizations (Low-Acuity Unweighted)



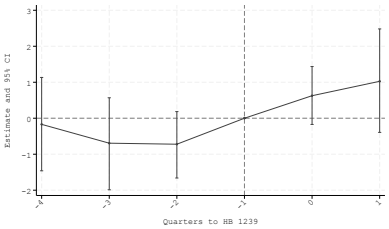
(d) RA Short-stay Rehospitalizations (High-Acuity Entropy Weighted)



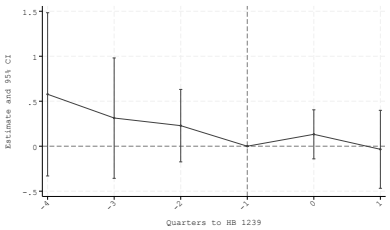
(e) RA Short-stay Rehospitalizations (Moderate-Acuity Entropy Weighted)



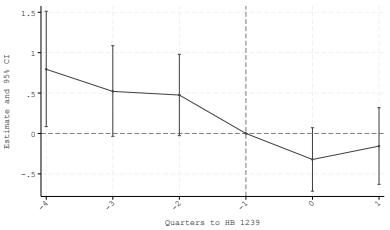
(f) RA Short-stay Rehospitalizations (Low-Acuity Entropy Weighted)



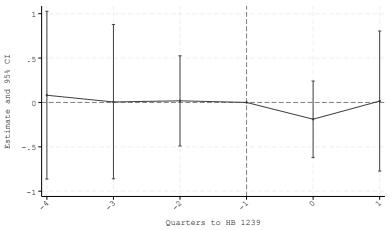
(g) RA Short-stay ED Visits (High-Acuity Unweighted)



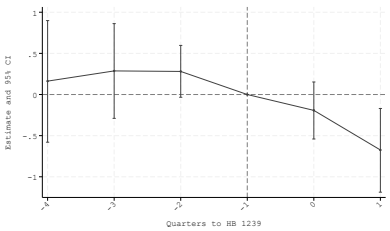
(h) RA Short-stay ED Visits (Moderate-Acuity Unweighted)



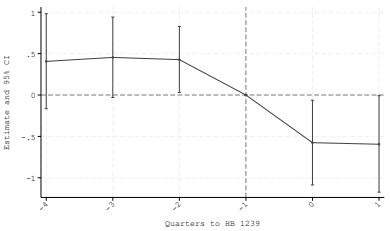
(i) RA Short-stay ED Visits (Low-Acuity Unweighted)



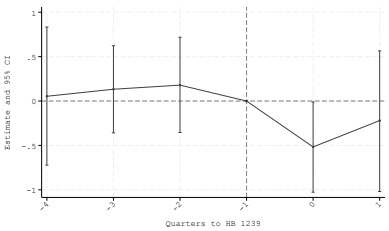
(j) RA Short-stay ED Visits (High-Acuity Entropy Weighted)



(k) RA Short-stay ED Visits (Moderate-Acuity Entropy Weighted)



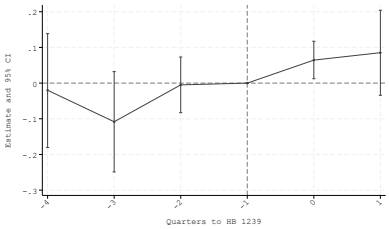
(l) RA Short-stay ED Visits (Low-Acuity Entropy Weighted)



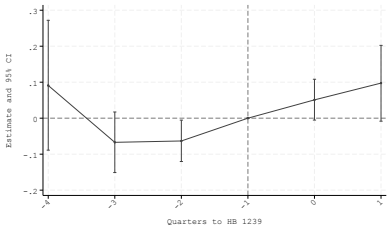
Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Pre-treatment mean acuity is defined as High, Moderate, or Low if the nursing home's mean pre-treatment case-mix total nurse staffing HPRD percentile was above Florida's 66th percentile (i.e., 53.89%), greater than Florida's 33rd percentile (i.e, 31.79%), and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity).

Figure A5: Event Study Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days and Risk-Adjusted Long-Stay ED Visits per 1,000 Resident Days By Pre-Treatment Mean Acuity

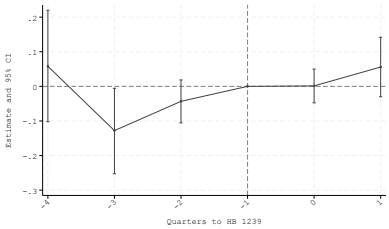
(a) RA Long-stay Hospitalizations (High-Acuity Unweighted)



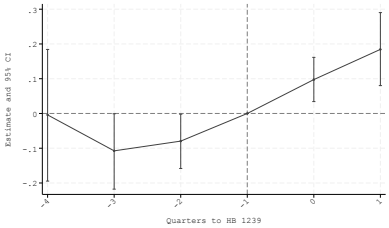
(b) RA Long-stay Hospitalizations (Moderate-Acuity Unweighted)



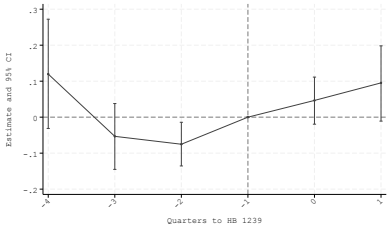
(c) RA Long-stay Hospitalizations (Low-Acuity Unweighted)



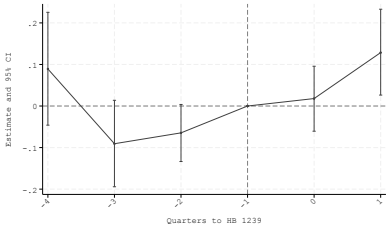
(d) RA Long-stay Hospitalizations (High-Acuity Entropy Weighted)



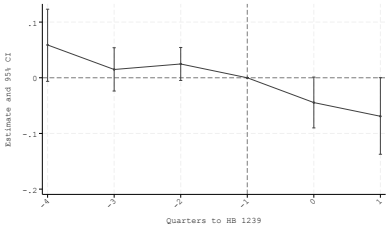
(e) RA Long-stay Hospitalizations (Moderate-Acuity Entropy Weighted)



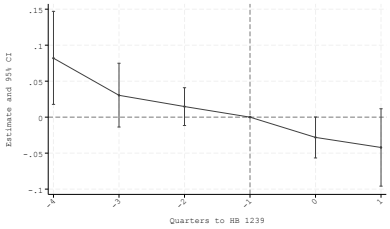
(f) RA Long-stay Hospitalizations (Low-Acuity Entropy Weighted)



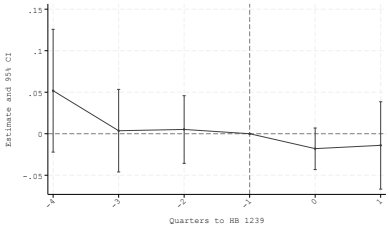
(g) RA Long-stay ED Visits (High-Acuity Unweighted)



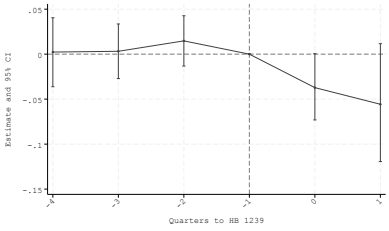
(h) RA Long-stay ED Visits (Moderate-Acuity Unweighted)



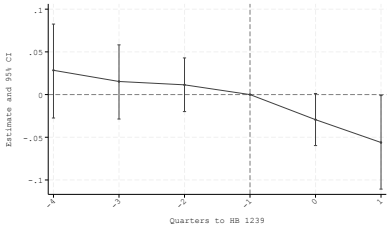
(i) RA Long-stay ED Visits (Low-Acuity Unweighted)



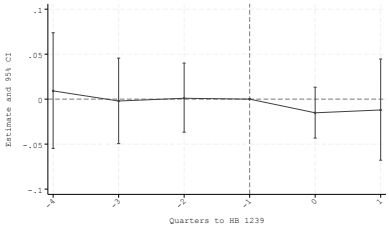
(j) RA Long-stay ED Visits (High-Acuity Entropy Weighted)



(k) RA Long-stay ED Visits (Moderate-Acuity Entropy Weighted)



(l) RA Long-stay ED Visits (Low-Acuity Entropy Weighted)



Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Pre-treatment mean acuity is defined as High, Moderate, or Low if the nursing home's mean pre-treatment case-mix total nurse staffing HPRD percentile was above Florida's 66th percentile (i.e., 53.89%), greater than Florida's 33rd percentile (i.e, 31.79%), and simultaneously less than or equal to Florida's 66th percentile, and (3) less than or equal to Florida's 33rd percentile, respectively. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity).

Table A1: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Outcomes Estimated with No Control Variables

Dependent Variable	Unweighted Control	Entropy Weighted Control
Licensed HPRD	0.002	0.000
	[-0.025, 0.029]	[-0.019, 0.019]
	p=0.904	p=0.983
N	738,199	738,199
Other Non-Nursing Direct Care HPRD	0.011	0.013
	[-0.013, 0.035]	[-0.004, 0.029]
	p=0.353	p=0.128
N	738,199	738,199
NA HPRD	-0.231***	-0.172***
	[-0.275, -0.186]	[-0.208, -0.135]
	p<0.001	p<0.001
N	738,199	738,199
Total Nurse Staffing HPRD	-0.229***	-0.175***
	[-0.282, -0.176]	[-0.226, -0.123]
	p<0.001	p<0.001
N	738,199	738,199
Risk-Adjusted Short-Stay Rehospitalizations	-0.192	1.106***
	[-0.686, 0.300]	[0.628, 1.585]
	p=0.425	p<0.001
N	53,127	53,037
Risk-Adjusted Short-Stay ED Visits	-0.228	-0.560***
	[-0.552, 0.094]	[-0.955, -0.160]
	p=0.155	p=0.009
N	53,127	53,037
Risk-Adjusted Long-Stay Hospitalizations	0.084*	0.114**
	[-0.007, 0.176]	[0.025, 0.205]
	p=0.069	p=0.016
N	52,209	52,165
Risk-Adjusted Long-Stay ED Visits	-0.052**	-0.044
	[-0.104, -0.000]	[-0.098, 0.011]
	p=0.049	p=0.111
N	52,209	52,165

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated for the Staffing (Quality) measure using high dimensional fixed effects OLS with fixed effects for the nursing home, week (quarter) of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A2: In-Space Placebo Test of Significance Rates Across 36 Placebo States

	Unweighted:			Entropy Weighted:		
	Significance Rate:		RI	Significance Rate:		RI
	1% Level	5% Level	P-Value	1% Level	5% Level	P-value
Licensed HPRD	0.00%	8.33%	89.19%	2.78%	11.11%	100.00%
Other Non-Nursing Direct Care HPRD	0.00%	2.78%	61.11%	5.56%	11.11%	72.22%
NA HPRD	0.00%	5.56%	0.00%	2.78%	19.44%	0.00%
Total Nurse Staffing HPRD	2.78%	8.33%	2.78%	8.33%	16.67%	0.00%
Risk-Adjusted Short-Stay Rehospitalization	0.00%	8.33%	63.89%	13.89%	19.44%	27.78%
Risk-Adjusted Short-Stay ED Visits	2.78%	2.78%	52.78%	5.56%	13.89%	41.67%
Risk-Adjusted Long-Stay Hospitalization	0.00%	8.33%	25.00%	5.56%	8.33%	22.22%
Risk-Adjusted Long-Stay ED Visits	0.00%	2.78%	38.89%	2.78%	13.89%	41.67%

Significance rate is the percentage of estimates that are statistically significant at the indicated significance level or lower. The Randomization inference (RI) P-value is the percentage of Placebo coefficients greater than Florida's estimated coefficient in magnitude.

Table A3: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Quality Outcomes with Limited Pre-Treatment Period

Dependent Variable	Unweighted Control	Entropy Weighted Control
Short-Stay Rehospitalizations	-0.025	0.913***
	[-0.399, 0.351]	[0.439, 1.392]
	p=0.887	p<0.001
N	26,596	26,330
Short-Stay ED Visits	-0.04	-0.382***
	[-0.275, 0.196]	[-0.637, -0.127]
	p=0.723	p=0.006
N	26,596	26,330
Long-Stay Hospitalizations	0.056**	0.096***
	[0.005, 0.108]	[0.040, 0.152]
	p=0.034	p=0.002
N	25,943	25,765
Long-Stay ED Visits	-0.035**	-0.035**
	[-0.066, -0.003]	[-0.070, -0.000]
	p=0.035	p=0.048
N	25,943	25,765

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A4: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Outcomes Estimated with All State Control Group

Dependent Variable	Unweighted Control	Entropy Weighted Control
Licensed HPRD	0.003	0.000
	[-0.021, 0.026]	[-0.017, 0.018]
	p=0.806	p=0.964
N	873,642	873,642
Other Non-Nursing Direct Care HPRD	0.010	0.009
	[-0.011, 0.031]	[-0.010, 0.028]
	p=0.329	p=0.327
N	873,642	873,642
NA HPRD	-0.233***	-0.183***
	[-0.281, -0.184]	[-0.221, -0.144]
	p<0.001	p<0.001
N	873,642	873,642
Total Nurse Staffing HPRD	-0.230***	-0.187***
	[-0.289, -0.171]	[-0.233, -0.140]
	p<0.001	p<0.001
N	873,642	873,642
Short-Stay Rehospitalizations	-0.177	1.086***
	[-0.625, 0.270]	[0.616, 1.559]
	p=0.422	p<0.001
N	63,658	63,558
Short-Stay ED Visits	-0.262	-0.633***
	[-0.642, 0.119]	[-1.018, -0.249]
	p=0.172	p=0.002
N	63,658	63,558
Long-Stay Hospitalizations	0.078*	0.124***
	[-0.007, 0.164]	[0.039, 0.210]
	p=0.069	p=0.007
N	62,102	62,046
Long-Stay ED Visits	-0.053**	-0.046*
	[-0.106, -0.001]	[-0.095, 0.003]
	p=0.047	p=0.067
N	62,102	62,046

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated for the Staffing (Quality) measure using high dimensional fixed effects OLS with fixed effects for the nursing home, week (quarter) of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A5: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Outcomes Estimated with Comparable Total Direct Care Staffing Requirement Control Group

Dependent Variable	Unweighted Control	Entropy Weighted Control
Licensed HPRD	0.003	-0.013
	[-0.020, 0.027]	[-0.033, 0.008]
	p=0.771	p=0.185
N	158,389	158,389
Other Non-Nursing Direct Care HPRD	0.010	0.008
	[-0.013, 0.033]	[-0.013, 0.030]
	p=0.273	p=0.354
N	158,389	158,389
NA HPRD	-0.215***	-0.182***
	[-0.254, -0.176]	[-0.221, -0.143]
	p<0.001	p<0.001
N	158,389	158,389
Total Nurse Staffing HPRD	-0.211***	-0.197***
	[-0.265, -0.158]	[-0.246, -0.148]
	p<0.001	p<0.001
N	158,389	158,389
Short-Stay Rehospitalizations	0.049	1.457*
	[-0.629, 0.717]	[-0.075, 3.071]
	p=0.844	p=0.057
N	12,901	12,893
Short-Stay ED Visits	-0.116	-0.256
	[-1.066, 0.837]	[-1.507, 1.023]
	p=0.749	p=0.594
N	12,901	12,893
Long-Stay Hospitalizations	0.065	0.101*
	[-0.094, 0.223]	[-0.024, 0.231]
	p=0.307	p=0.089
N	12,398	12,390
Long-Stay ED Visits	-0.013	-0.016
	[-0.077, 0.052]	[-0.073, 0.039]
	p=0.612	p=0.466
N	12,398	12,390

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated for the Staffing (Quality) measure using high dimensional fixed effects OLS with fixed effects for the nursing home, week (quarter) of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A6: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Florida Defined Nurse Staffing Categories (N=738,199)

Dependent Variable	Unweighted Control	Entropy Weighted Control
Licensed HPRD (FL)	0.003	0.003
	[-0.018, 0.025]	[-0.012, 0.019]
	p=0.739	p=0.660
NA HPRD (FL)	-0.225***	-0.151***
	[-0.265, -0.185]	[-0.184, -0.117]
	p<0.001	p<0.001
Total HPRD (FL)	-0.222***	-0.157***
	[-0.272, -0.172]	[-0.208, -0.103]
	p<0.001	p<0.001
Nurse Administration HPRD	0.001	-0.003
	[-0.010, 0.012]	[-0.011, 0.005]
	p=0.860	p=0.407

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) from Equation 12 that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Licensed HPRD (FL) is defined as RNs and LPNs without administrative duties. NA HPRD (FL) is defined as Certified Nurse Aides and Nurse Aides in Training. Total HPRD (FL) is defined as RNs and LPNs without administrative, Certified Nurse Aides and Nurse Aides in Training. Nurse Administration HPRD is defined as RN director of nursing, RNs with Administrative Duties, and LPNs with Administrative Duties.

Table A7: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Detailed Alternative Staffing Outcomes (N=738,199)

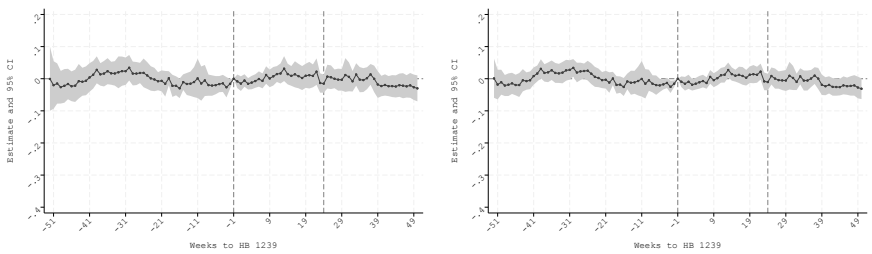
Dependent Variable	Unweighted Control	Entropy Weighted Control
RN HPRD	-0.003	0.007
	[-0.034, 0.027]	[-0.014, 0.027]
	p=0.811	p=0.546
LPN HPRD	0.008	-0.004
	[-0.015, 0.030]	[-0.018, 0.011]
	p=0.480	p=0.626
Therapy HPRD	-0.022**	-0.014*
	[-0.038, -0.005]	[-0.029, 0.001]
	p=0.013	p=0.077
Social Work HPRD	0.004*	0.003
	[-0.000, 0.009]	[-0.001, 0.006]
	p=0.061	p=0.141
Activities HPRD	0.012**	0.008**
	[0.002, 0.023]	[0.000, 0.015]
	p=0.026	p=0.038
Dietician HPRD	0.007**	0.008**
	[0.001, 0.014]	[0.001, 0.015]
	p=0.036	p=0.035
Administrator HPRD	-0.010	-0.016
	[-0.037, 0.017]	[-0.037, 0.004]
	p=0.438	p=0.103
Medical HPRD	0.001	0.001
	[-0.000, 0.003]	[-0.001, 0.002]
	p=0.139	p=0.299

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) from Equation 12 that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Therapy HPRD includes Occupational Therapists, Occupational Therapy Assistants, Occupational Therapy Aides, Physical Therapists, Physical Therapy Assistants, Physical Therapy Aides, Respiratory Therapists, Respiratory Therapy Technicians, and Speech/Language Pathologists. Social Work HPRD includes: Qualified Social Worker, Other Social Worker, and Mental Health Social Worker. Activites HPRD includes: Qualified Activities Staff, Other Activities Staff, and Therapeutic Recreation Specialists. Medical HPRD includes Medical Director, Other Physician, Physician Assistant, Nurse Practitioner, Clinical Nurse Specialist, and Pharmacist.

Figure A6: Event Study Estimates of the Effect of Florida's Minimum Staffing Reductions on Staffing Hours per Resident Day (HPRD) Using an Extended Time Horizon (2021Q2 to 2023Q1)

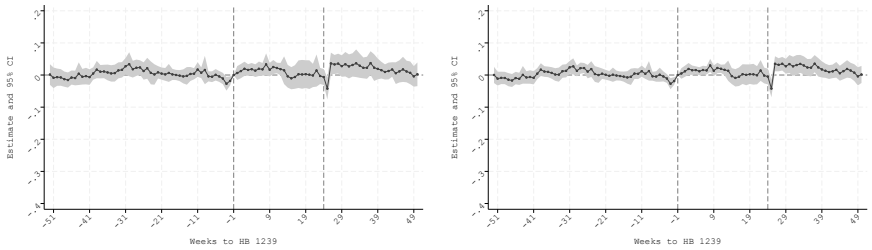
(a) Licensed HPRD (Unweighted)

(b) Licensed HPRD (Entropy Weighted)



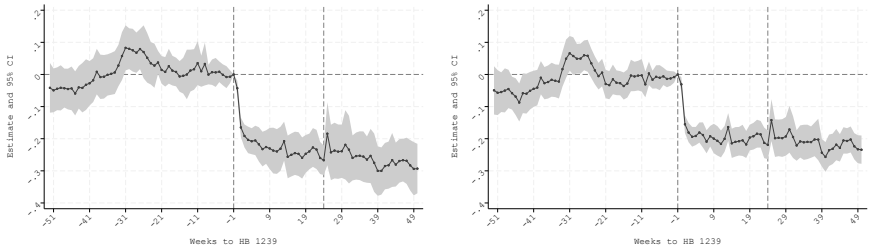
(c) Non-Nursing Direct Care Employee HPRD (Unweighted)

(d) Non-Nursing Direct Care Employee HPRD (Entropy Weighted)



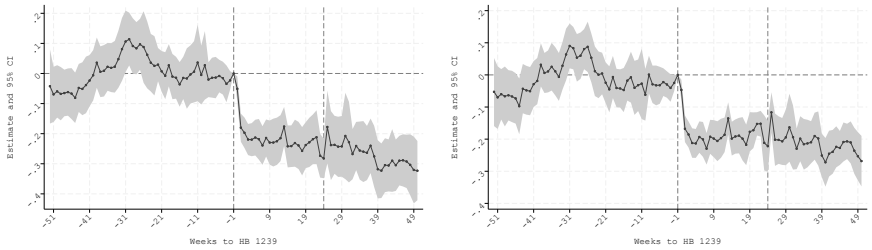
(e) NA HPRD (Unweighted)

(f) NA HPRD (Entropy Weighted)



(g) Total Nurse Staffing HPRD (Unweighted)

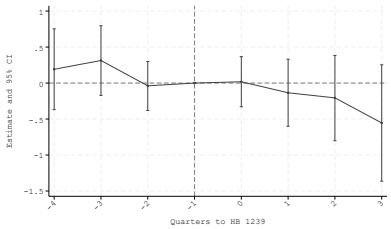
(h) Total Nurse Staffing HPRD (Entropy Weighted)



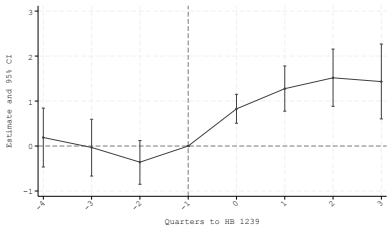
Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). All samples exclude non-contiguous states (Alaska and Hawaii), Puerto Rico, and several states/territories with less than 50 nursing homes (Delaware, District of Columbia, Nevada, Vermont, and Wyoming).

Figure A7: Event Study Estimates of the Effect of Florida's Nurse Aide Minimum Staffing Reduction on the Risk-Adjusted Hospitalizations and Emergency Department Visits Using an Extended Time Horizon (2021Q2 to 2023Q1)

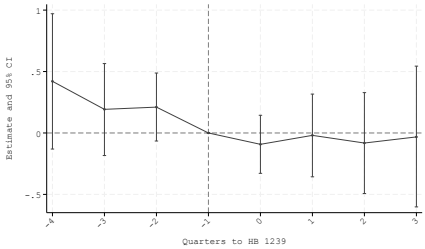
(a) Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission (Unweighted)



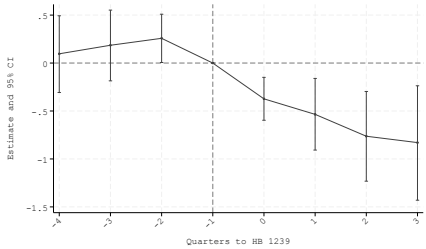
(b) Risk-Adjusted Percentage of Short-stay Residents Who were Rehospitalized After A Nursing Home Admission (Full Weighting)



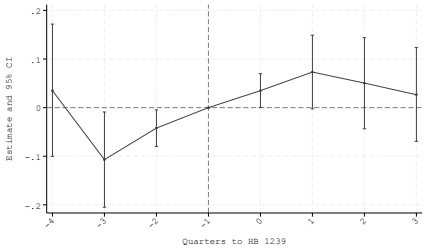
(c) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit (Unweighted)



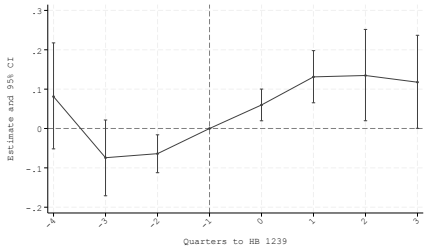
(d) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit (Entropy Weighted)



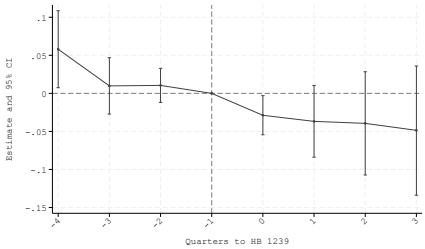
(e) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days (Unweighted)



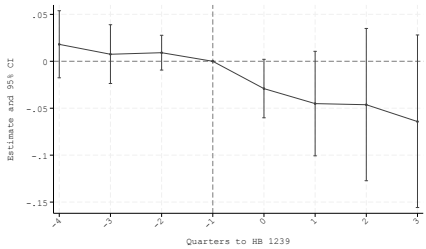
(f) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days (Entropy Weighted)



(g) Risk-Adjusted Long-Stay ED Visits per 1,000 Resident Days (Unweighted)



(h) Risk-Adjusted Long-Stay ED Visits per 1,000 Resident Days (Entropy Weighted)



Notes: 95% confidence intervals are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level. Estimates are obtained from full event study specifications estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity).

Table A8: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Outcomes Using an Extended Time Horizon (2021Q2 to 2023Q1)

Dependent Variable	Unweighted Control	Entropy Weighted Control
Licensed HPRD	0.000	-0.004
	[-0.029, 0.030]	[-0.026, 0.018]
	p=0.990	p=0.724
N	956,561	956,561
Other Non-Nursing Direct Care HPRD	0.011	0.012
	[-0.011, 0.032]	[-0.004, 0.029]
	p=0.313	p=0.137
N	956,561	956,561
NA HPRD	-0.249***	-0.187***
	[-0.303, -0.195]	[-0.222, -0.151]
	p<0.001	p<0.001
N	956,561	956,561
Total Nurse Staffing HPRD	-0.249***	-0.187***
	[-0.313, -0.185]	[-0.243, -0.132]
	p<0.001	p<0.001
N	956,561	956,561
RA Short-Stay Rehospitalizations	-0.334	1.307***
	[-0.928, 0.257]	[0.783, 1.833]
	p=0.258	p<0.001
N	69,170	68,784
RA Short-Stay ED Visits	-0.262	-0.755***
	[-0.599, 0.071]	[-1.176, -0.331]
	p=0.118	p=0.001
N	69,170	68,784
RA Long-Stay Hospitalizations	0.075	0.124**
	[-0.020, 0.170]	[0.023, 0.226]
	p=0.115	p=0.020
N	67,477	67,249
RA Long-Stay ED Visits	-0.058*	-0.055
	[-0.126, 0.010]	[-0.127, 0.017]
	p=0.092	p=0.132
N	67,477	67,249

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated for the Staffing (Quality) measure using high dimensional fixed effects OLS with fixed effects for the nursing home, week (quarter) of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A9: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Outcomes By Pre Staffing Reduction NA Staffing Levels

		Pre-Treatment Mean NA HPRD		One-sided WCB tests of equality:		Entropy
Model	Dependent Variable	High (i.e. ≥ 2.6)	Moderate/Low (<2.6)	Alternative	P-Value	Weighting?
1	NA HPRD	-0.106***	-0.262***	Moderate/Low < High	p<.001	No
		[-0.155, -0.056]	[-0.310, -0.213]			
		p<0.001	p<0.001			
	N	101,948	636,251			
2	NA HPRD	-0.144***	-0.208***	Moderate/Low < High	0.020	Yes
		[-0.198, -0.090]	[-0.248, -0.166]			
		p<0.001	p<0.001			
	N	101,948	636,251			

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) from Equation 12 that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, week of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Table A10: Difference-in-Differences Estimates for the Effect of Florida's Minimum Staffing Reductions on Quality Outcomes By Pre-Treatment Nurse Aide Staffing Levels

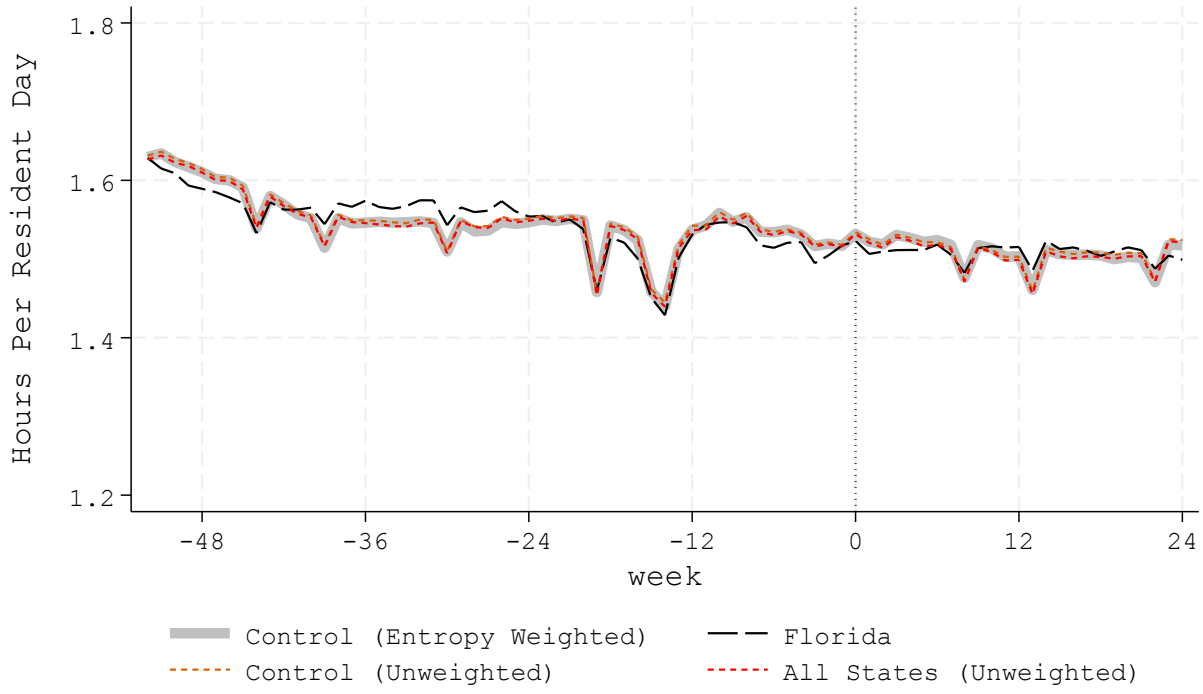
		Pre-Treatment Mean NA HPRD		One-sided WCB tests of equality:		Entropy
Model	Dependent Variable	High (i.e. ≥ 2.6)	Moderate/Low (<2.6)	Alternative	P-Value	Weighting?
1	RA Short-Stay Rehospitalizations	-0.161	-0.198	Moderate/Low > High	0.5327	No
		[-1.077, 0.754]	[-0.770, 0.372]			
		p=0.715	p=0.472			
	N	6,665	42,351			
2	RA Short-Stay Rehospitalizations	0.929*	1.110***	Moderate/Low > High	0.3999	Yes
		[-0.090, 2.009]	[0.340, 1.896]			
		p=0.073	p=0.009			
	N	6,653	42,279			
3	RA Short-Stay ED Visits	-0.223	-0.251	Moderate/Low < High	0.4643	No
		[-0.769, 0.322]	[-0.677, 0.177]			
		p=0.400	p=0.237			
	N	6,665	42,351			
4	RA Short-Stay ED Visits	-0.460*	-0.655**	Moderate/Low < High	0.2847	Yes
		[-0.964, 0.039]	[-1.282, -0.037]			
		p=0.067	p=0.037			
	N	6,653	42,279			
5	RA Long-Stay Hospitalizations	0.073	0.089*	Moderate/Low > High	0.4378	No
		[-0.081, 0.228]	[-0.015, 0.194]			
		p=0.322	p=0.091			
	N	6,357	41,858			
6	RA Long-Stay Hospitalizations	0.038	0.119**	Moderate/Low > High	0.2172	Yes
		[-0.144, 0.220]	[0.010, 0.225]			
		p=0.662	p=0.036			
	N	6,351	41,824			
7	RA Long-Stay ED Visits	-0.018	-0.057*	Moderate/Low < High	0.0618	No
		[-0.077, 0.040]	[-0.115, 0.000]			
		p=0.523	p=0.051			
	N	6,357	41,858			
8	RA Long-Stay ED Visits	-0.019	-0.057*	Moderate/Low < High	0.1333	Yes
		[-0.085, 0.047]	[-0.117, 0.003]			
		p=0.548	p=0.061			
	N	6,351	41,824			

Notes: * p<0.10, ** p<0.05, *** p<0.01. Each row reports the difference-in-differences coefficient estimates (i.e., $FL \times Post$) that are estimated using high dimensional fixed effects OLS with fixed effects for the nursing home, quarter of observation, and controls for chain affiliation, an indicator for whether the nursing home changed ownership in the last year, payer mix (% Medicare, % Medicaid), ownership type (Government and Not-for-Profit), whether the facility is part of a continuing care retirement community, the quarterly national percentile for total nurse staffing case-mix hours (to proxy for acuity). 95% Confidence Intervals and p-values are constructed using sub-cluster wild bootstrap (MacKinnon and Webb, 2018). Errors clustered at the state, resampling at the facility level.

Appendix B

Figure B1: Mean Staffing Levels in Hours Per Resident Day (HPRD) for Florida and the Nation (Licensed HPRD, Other Non-Nursing Direct Care HPRD)

(a) Licensed HPRD



(b) Other Non-Nursing Direct Care HPRD

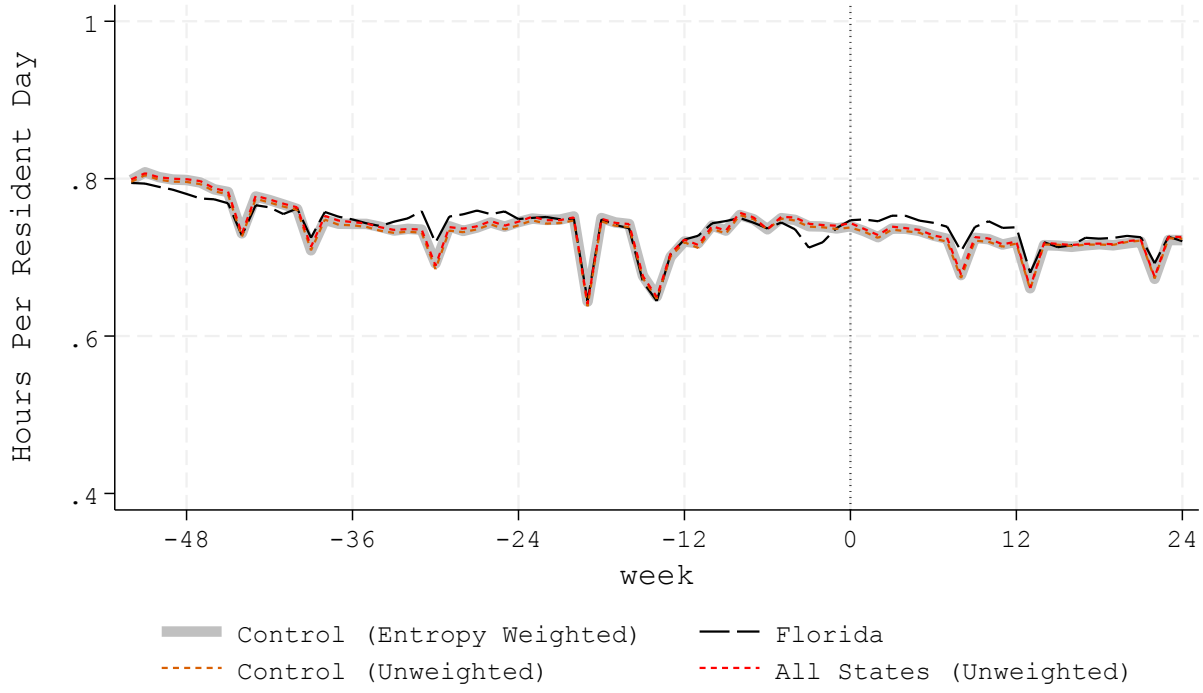
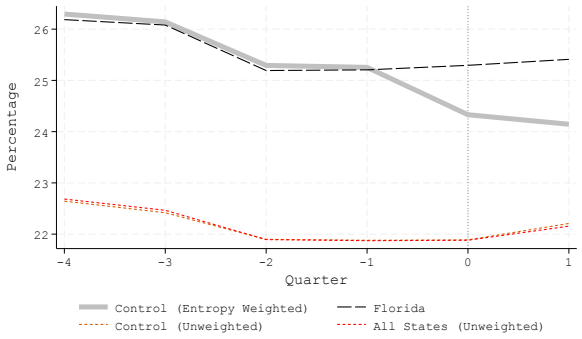
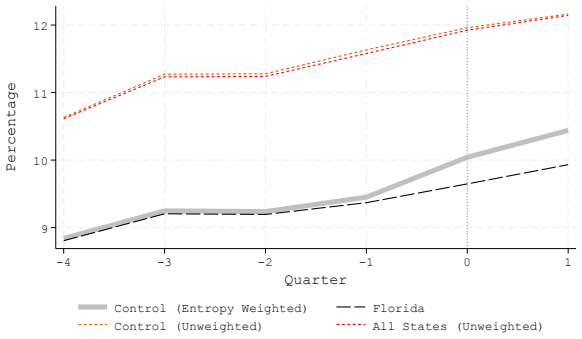


Figure B2: Mean Risk-Adjusted Quality Outcomes for Florida and the Nation

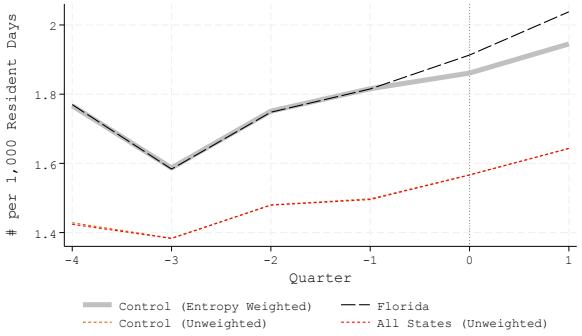
(a) Risk-Adjusted Percentage of Short-stay Residents Who Were Rehospitalized After A Nursing Home Admission



(b) Risk-Adjusted Percentage of Short-stay Residents Who had an Outpatient Emergency Department Visit



(c) Risk-Adjusted Number of Hospitalizations per 1,000 Long-stay Resident Days



(d) Risk-Adjusted Number of Outpatient Emergency Department Visits per 1,000 Long-stay Resident Days

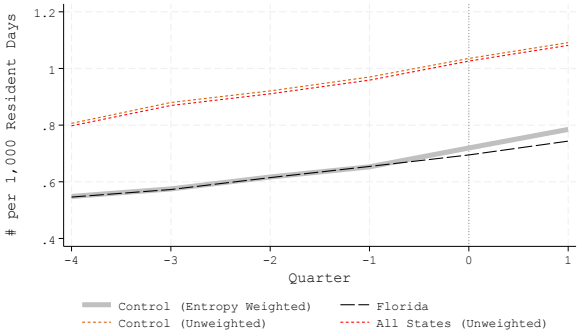


Table B1: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Licensed (RN+LPN) Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Licensed HPRD	1.55	1.55	1.55	1.51	1.51	1.51
% Medicaid	56.92	55.67	56.92	55.45	55.63	56.59
% Medicare	17.66	13.02	17.66	18.15	12.89	17.27
Acuity	43.58	50.91	43.59	43.39	50.77	43.67
Certified Beds	121.22	103.88	121.22	121.19	103.60	120.93
Chain Affliated	61.79	57.76	60.67	60.49	57.06	59.85
Change in Ownership	1.13	0.85	1.13	10.14	4.12	4.56
Government	1.52	4.91	1.72	1.64	4.91	1.89
Not-for-Profit	26.56	21.26	26.47	26.18	20.93	25.92
CCRC	10.53	12.05	10.51	10.83	12.02	10.59
Panel B: Other (Non-Entropy Balancing) Characteristics						
Total Nurse Staffing HPRD	4.16	3.71	3.72	3.92	3.70	3.71
Other Non-Nursing Direct Care HPRD	0.74	0.74	0.74	0.73	0.72	0.71
NA HPRD	2.62	2.16	2.18	2.41	2.19	2.20
RN HPRD	0.70	0.64	0.63	0.66	0.61	0.60
LPN HPRD	0.85	0.91	0.92	0.85	0.90	0.91

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B2: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Other Non-Nursing Direct Care HPRD Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Other Non-Nursing Direct Care HPRD	0.74	0.74	0.74	0.73	0.72	0.72
% Medicaid	56.92	55.67	56.92	55.45	55.63	56.57
% Medicare	17.66	13.02	17.66	18.15	12.89	17.28
Acuity	43.58	50.91	43.59	43.39	50.77	43.68
Certified Beds	121.22	103.88	121.22	121.19	103.60	120.93
Chain Affliated	61.79	57.76	60.69	60.49	57.06	59.89
Change in Ownership	1.13	0.85	1.13	10.14	4.12	4.55
Government	1.52	4.91	1.72	1.64	4.91	1.89
Not-for-Profit	26.56	21.26	26.48	26.18	20.93	25.93
CCRC	10.53	12.05	10.51	10.83	12.02	10.60
Panel B: Other (Non-Entropy Balancing) Characteristics						
Total Nurse Staffing HPRD	4.16	3.71	3.73	3.92	3.70	3.71
NA HPRD	2.62	2.16	2.18	2.41	2.19	2.20
RN HPRD	0.70	0.64	0.63	0.66	0.61	0.60
LPN HPRD	0.85	0.91	0.92	0.85	0.90	0.91
Licensed HPRD	1.55	1.55	1.55	1.51	1.51	1.51

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B3: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Total Nurse Staffing Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Total Nurse Staffing HPRD	4.16	3.71	4.16	3.92	3.70	4.09
% Medicaid	56.92	55.67	56.91	55.45	55.63	56.21
% Medicare	17.66	13.02	17.66	18.15	12.89	17.39
Acuity	43.58	50.91	43.60	43.39	50.77	43.54
Certified Beds	121.22	103.88	121.22	121.19	103.60	120.98
Chain Affliated	61.79	57.76	60.56	60.49	57.06	60.07
Change in Ownership	1.13	0.85	1.13	10.14	4.12	4.27
Government	1.52	4.91	1.86	1.64	4.91	2.02
Not-for-Profit	26.56	21.26	26.85	26.18	20.93	26.48
CCRC	10.53	12.05	10.54	10.83	12.02	10.83
Panel B: Other (Non-Entropy Balancing) Characteristics						
Other Non-Nursing Direct Care HPRD	0.74	0.74	0.82	0.73	0.72	0.78
NA HPRD	2.62	2.16	2.42	2.41	2.19	2.41
RN HPRD	0.70	0.64	0.75	0.66	0.61	0.70
LPN HPRD	0.85	0.91	0.99	0.85	0.90	0.98
Licensed HPRD	1.55	1.55	1.74	1.51	1.51	1.68

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B4: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Risk-Adjusted Short-Stay Rehospitalization Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Adjusted Score	25.67	22.22	25.41	25.36	22.05	23.98
Total Nurse Staffing HPRD	4.11	3.69	4.12	3.91	3.70	4.08
% Medicaid	56.94	54.76	56.56	55.40	54.72	55.56
% Medicare	17.96	14.28	18.27	18.46	14.30	18.58
Acuity	43.91	53.20	44.55	43.60	53.07	44.53
Certified Beds	121.86	109.89	123.30	121.79	109.44	123.27
Chain Affliated	61.45	60.56	61.40	60.52	59.83	60.59
Change in Ownership	1.13	0.97	1.11	10.09	4.58	4.40
Government	0.78	4.19	1.08	0.52	4.13	1.25
Not-for-Profit	27.06	20.35	27.38	26.61	19.94	26.64
CCRC	10.62	12.70	10.59	11.04	12.76	10.90
Panel B: Other (Non-Entropy Balancing) Characteristics						
Licensed HPRD	1.52	1.55	1.74	1.51	1.52	1.69
Other Non-Nursing Direct Care HPRD	0.74	0.75	0.82	0.73	0.73	0.79
RN HPRD	0.67	0.62	0.71	0.66	0.60	0.68
LPN HPRD	0.85	0.93	1.02	0.85	0.92	1.01
NA HPRD	2.60	2.14	2.39	2.40	2.18	2.39

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B5: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Risk-Adjusted Short-Stay ED Visit Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Adjusted Score	9.14	11.20	9.17	9.79	12.06	10.39
Total Nurse Staffing HPRD	4.11	3.69	4.13	3.91	3.70	4.08
% Medicaid	56.94	54.76	56.63	55.40	54.72	55.37
% Medicare	17.96	14.28	18.30	18.46	14.30	18.68
Acuity	43.91	53.20	44.46	43.60	53.07	44.46
Certified Beds	121.86	109.89	123.30	121.79	109.44	123.14
Chain Affliated	61.45	60.56	61.30	60.52	59.83	60.40
Change in Ownership	1.13	0.97	1.11	10.09	4.58	4.30
Government	0.78	4.19	1.12	0.52	4.13	1.28
Not-for-Profit	27.06	20.35	27.07	26.61	19.94	26.18
CCRC	10.62	12.70	10.70	11.04	12.76	11.01
Panel B: Other (Non-Entropy Balancing) Characteristics						
Licensed HPRD	1.52	1.55	1.73	1.51	1.52	1.67
Other Non-Nursing Direct Care HPRD	0.74	0.75	0.82	0.73	0.73	0.79
RN HPRD	0.67	0.62	0.73	0.66	0.60	0.69
LPN HPRD	0.85	0.93	0.99	0.85	0.92	0.98
NA HPRD	2.60	2.14	2.40	2.40	2.18	2.41

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B6: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Risk-Adjusted Long-Stay Hospitalization Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Adjusted Score	1.73	1.45	1.71	1.98	1.61	1.85
Total Nurse Staffing HPRD	4.09	3.63	4.00	3.88	3.64	3.96
% Medicaid	58.45	58.09	59.14	56.93	58.12	58.50
% Medicare	16.64	12.27	15.78	17.27	12.31	15.68
Acuity	42.53	49.17	42.34	42.30	49.03	42.27
Certified Beds	123.34	109.50	125.06	123.43	109.55	125.32
Chain Affliated	61.68	57.59	60.14	60.85	56.52	59.31
Change in Ownership	0.98	0.94	1.04	9.74	4.44	4.50
Government	1.51	5.41	1.95	1.59	5.37	2.16
Not-for-Profit	26.64	20.57	26.27	26.04	20.14	24.87
CCRC	9.86	11.10	10.10	9.83	11.08	10.17
Panel B: Other (Non-Entropy Balancing) Characteristics						
Licensed HPRD	1.49	1.48	1.61	1.48	1.46	1.57
Other Non-Nursing Direct Care HPRD	0.71	0.69	0.72	0.70	0.68	0.70
RN HPRD	0.65	0.59	0.61	0.64	0.57	0.59
LPN HPRD	0.84	0.90	1.00	0.84	0.89	0.98
NA HPRD	2.60	2.14	2.39	2.40	2.18	2.39

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.

Table B7: Summary Statistics for Pre-Treatment Period Florida and Control Group (With and Without Risk-Adjusted Long-Stay ED Visit Balanced Entropy Weights)

Variable	Pre-Treatment			Post-Treatment		
	Treatment	Control		Treatment	Control	
	Unweighted	Unweighted	Entropy Weighted	Unweighted	Unweighted	Entropy Weighted
	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)	Mean (SD.)
Panel A: Entropy Balancing Characteristics						
Adjusted Score	0.60	0.89	0.60	0.72	1.06	0.76
Total Nurse Staffing HPRD	4.09	3.63	4.05	3.88	3.64	4.03
% Medicaid	58.45	58.09	58.67	56.93	58.12	57.72
% Medicare	16.64	12.27	16.32	17.27	12.31	16.49
Acuity	42.53	49.17	42.47	42.30	49.03	42.55
Certified Beds	123.34	109.50	124.78	123.43	109.55	124.81
Chain Affliated	61.68	57.59	60.30	60.85	56.52	59.25
Change in Ownership	0.98	0.94	1.03	9.74	4.44	4.34
Government	1.51	5.41	1.90	1.59	5.37	2.10
Not-for-Profit	26.64	20.57	26.86	26.04	20.14	25.79
CCRC	9.86	11.10	10.05	9.83	11.08	9.94
Panel B: Other (Non-Entropy Balancing) Characteristics						
Licensed HPRD	1.49	1.48	1.64	1.48	1.46	1.60
Other Non-Nursing Direct Care HPRD	0.71	0.69	0.75	0.70	0.68	0.73
RN HPRD	0.65	0.59	0.66	0.64	0.57	0.63
LPN HPRD	0.84	0.90	0.98	0.84	0.89	0.97
NA HPRD	2.60	2.14	2.41	2.40	2.18	2.43

Entropy weighting is performed using Stata's ebalance command (Hainmueller and Xu, 2011) to implement first-moment entropy balancing of pre-treatment means and other nursing characteristics listed in Panel A.