

Alternative Approaches to Ensuring Adequate Nurse Staffing

The Effect of State Legislation on Hospital Nurse Staffing

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Objective: The objective of this study was to address the basic question of whether alternative legislative approaches are effective in encouraging hospitals to increase nurse staffing.

Methods: Using 16 years of nationally representative hospital-level data from the American Hospital Association (AHA) annual survey, we employed a difference-in-difference design to compare changes in productive hours per patient day for registered nurses (RNs), licensed practical/vocational nurses (LPNs), and nursing assistive personnel (NAP) in the state that mandated staffing ratios, states that legislated staffing committees, and states that legislated public reporting, to changes in states that did not implement any nurse staffing legislation before and after the legislation was implemented. We constructed multivariate linear regression models to assess the effects with hospital and year fixed effects, controlling for hospital-level characteristics and state-level factors.

Results: Compared with states with no legislation, the state that legislated minimum staffing ratios had an 0.996 ($P < 0.01$) increase in RN hours per patient day and 0.224 ($P < 0.01$) increase in NAP hours after the legislation was implemented, but no statistically significant changes in RN or NAP hours were found in states that legislated a staffing committee or public reporting. The staffing committee approach had a negative effect on LPN hours (difference-

in-difference = -0.076 , $P < 0.01$), while the public reporting approach had a positive effect on LPN hours (difference-in-difference = 0.115 , $P < 0.01$). There was no statistically significant effect of staffing mandate on LPN hours.

Conclusions: When we included California in the comparison, our model suggests that neither the staffing committee nor the public reporting approach alone are effective in increasing hospital RN staffing, although the public reporting approach appeared to have a positive effect on LPN staffing. When we excluded California from the model, public reporting also had a positive effect on RN staffing. Future research should examine patient outcomes associated with these policies, as well as potential cost savings for hospitals from reduced nurse turnover rates.

Key Words: hospital staffing, nurse staffing legislation, nurse staffing mandate, staffing committee, public reporting

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Improving quality and patient safety in hospitals have long been foci in the United States.¹ Empirical studies have shown that adequate nurse staffing is essential for the delivery of quality care and safe nurse working conditions, which in turn are associated with better patient outcomes.^{2–6} As of 2020, 14 states had implemented some form of legislation to increase nurse staffing in hospitals.⁷ The legislation includes 3 main approaches: (1) mandating minimum nurse staffing ratios in hospitals; (2) mandating a staffing committee substantially comprised of registered nurses (RNs); and (3) mandating public reporting of nurse staffing levels. Table 1 provides details of the current state nurse staffing legislation for all 3 approaches.

The staffing mandate approach establishes minimum nurse-to-patient staffing ratios for hospitals. So far, California is the only state that has mandated minimum staffing ratios for licensed nurses [RNs plus licensed practical/vocational nurses (LPNs)] in all hospital units (eg, critical care unit, general care unit, emergency department, transitional inpatient care unit), and the ratios are set specifically by type of patient care unit to reflect patient acuity.⁷ The law allows hospitals in areas with low RN staffing to hire LPNs who provide basic nursing care and work under the supervision of RNs; 50% of the nurses can be LPNs for compliance with the law.⁸ In 2014, Massachusetts became the second state to mandate nurse staffing ratios in hospital units, but the mandate only targeted RNs in intensive care units (ICUs).⁷

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TABLE 1. Details of Current State Nurse Staffing Legislation, as of 2020

Type of Regulation	State	Year of Implementation	Statute	How Each State Requires Nurse Staffing	Link to Statute
Staffing mandate	California	2004	California Health and Safety Code Section 1276.4	Registered nurse and/or licensed practical nurse-to-patient ratio in all hospital units	http://law.onecle.com/california/health/1276.4.html
	Massachusetts	2014	Massachusetts General Law Section 111.231	Registered nurse-to-patient ratio in intensive care units	https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section231
Staffing committee	Oregon	2001	Oregon Revised Statutes Public Health, Housing, Environment Section 609.2	The committee consist entirely of direct-care registered nurses	www.oregonlaws.org/ors/441.162
	Ohio	2008	Ohio Revised Statutes Health-Safety-Morals Section 3727.51	At least 50% of the committee members must be direct-care registered nurses	http://codes.ohio.gov/orc/3727.51
	Washington	2008	Washington State Legislature Section 70.41.420	At least 50% of the committee members must be direct-care registered nurses	https://app.leg.wa.gov/rcw/default.aspx?cite=70.41.420
	Texas	2009	Texas Health and Safety Code Section 257.001	At least 60% of the committee members must be registered nurses	www.statutes.legis.state.tx.us/Docs/HS/htm/HS.257.htm
	Connecticut	2009	Connecticut Code Public Health and Well-Being Section 19a-89e	At least 50% of the committee members must be direct-care registered nurses	www.cga.ct.gov/current/pub/chap_368a.htm#sec_19a-89d
	Nevada	2009	Statutes of Nevada Section 449.242	At least 50% of the committee members must be licensed nursing staff and certified nursing assistant	www.leg.state.nv.us/nrs/nrs-449.htm#NRS449Sec.242
	Illinois	2009	Illinois Compiled Statutes Chapter 210 ILCS 85/Section 10.10	At least 50% of the committee members must be registered nurses	www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=021000850K10.10
Public reporting*	New Jersey	2004	State of New Jersey 211th Legislature c.136 (C.26:2H-1 et seq.)	The ratio of patients to number of registered nurses, licensed practical nurses, and certified nurse aides	ftp://www.njleg.state.nj.us/20042005/S1000/689_U1.HTM
	Rhode Island	2005	Rhode Island Health and Safety Code 23-17.17-8	The number of registered nurses, licensed practical nurses and/or certified nursing assistants and the average number of patients upon which such staffing levels are based	http://webserver.rilin.state.ri.us/Statutes/title23/23-17.17/23-17.17-8.HTM
	Vermont	2005	The Vermont Statutes Health § 1854	The number of registered nurse, licensed practical nurse, and licensed nursing assistant full-time equivalent (either every 8 or 12 h worked during the shift as 1 full-time equivalent)	http://legislature.vermont.gov/statutes/fullchapter/18/042
	Illinois	2009	Illinois Compiled Statutes Chapter 210 ILCS 86/Section 25	The number of registered professional nurses, licensed practical nurses, and other nursing personnel assigned to each patient care unit and nursing hours per patient day	www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2466&ChapterID=21
	New York	2010	New York Public Health Law Section 2805-T	The ratio of patients per registered nurse full-time equivalents; the number of licensed practical nurses, nursing hours per patient, and as a percentage of patient care staff; the number of unlicensed personnel and as a percent of patient care staff	https://newyork.public.law/laws/n.y._public_health_law_section_2805-t

*Massachusetts, Washington, and Minnesota also publicly reported nurse staffing but this is not mandated by the legislation. Washington amended the legislation to include public reporting in 2017 and enacted on January 1, 2019 to require hospitals to submit and post nurse staffing plans annually (Washington State Department of Health, Hospital policies, available at: www.doh.wa.gov/DataandStatisticalReports/HealthcareinWashington/HospitalandPatientData/HospitalPolicies).

The staffing committee approach requires hospitals to establish a committee that is composed of at least 50% RNs providing direct patient care and develop a nurse staffing plan that includes skill mix (usually measured as the ratio of RNs to total licensed nurse staffing, that is, RNs and LPNs) based on patient needs.⁹ Unlike the staffing mandate approach that assumes all hospital settings are the same, this staffing committee approach, in theory, addresses staffing levels more appropriately by having frontline RNs participate in the planning process and taking into consideration skill mix as well as patient needs in a variety of settings.¹⁰ As of 2020, 7 states, Illinois (2009), Oregon (2001), Washington (2008), Ohio (2008), Connecticut (2009), Nevada (2009), and Texas (2009), have legislated this approach.⁷

The public reporting approach provides staffing transparency to the public, which, in theory, allows consumers to choose higher staffed hospitals and puts market pressure on understaffed hospitals to improve their staffing ratios.¹¹ The premise of this approach is that consumers will seek out the information on nurse staffing and will use it when making decisions about where to seek care.¹² Five states, Illinois (2009), New Jersey (2004), Rhode Island (2005), Vermont (2005), and New York (2010), have legislated public reporting or disclosure of hospital nursing staffing for RNs, LPNs, and nursing assistive personnel (NAP, certified nursing assistant or equivalent unlicensed staff assigned to patient care units and reporting to nurses),⁷ but there is variation in how these states require data to be presented. For example, Vermont, Illinois, and New Jersey specifically require hospitals to post the information in a place that is accessible to patients, and New York allows hospitals to provide information to the public upon request. There is also no consensus on how nurse staffing is measured both within and across states; the current staffing measures include hours per patient day, the nurse-to-patient ratio, the ratio of patient per nurse full-time equivalent (FTE), and the percent of total patient care staff. This absence of standardization may make communication to the public more complex. Although not legislated, 3 states, Massachusetts (2006), Washington (2019), and Minnesota (2014), also publicly reported hospital nurse staffing.¹²

The debate over whether and how to regulate nurse staffing in hospitals was a dominant concern during the last major nurse shortage (2000–2008). The argument against staffing mandates centered on whether the benefits, in terms of quality outcomes, outweigh the costs of complying with the standards.¹³ As pockets of nursing shortages reemerge, the debate is once again front and center, and alternatives to staffing mandates continue to be considered.^{14,15} The central policy question to date is whether there is an effective alternative to mandating staffing ratios in terms of increasing hospital nurse staffing. Understanding the effects of these laws on nurse staffing lays the foundation for future research on more long-term outcomes, including patient outcomes, costs, and possible trade-offs.

Literature on the effects of California's minimum nurse-to-patient ratio mandate is well established. A number of studies on California's mandates revealed a positive effect of the staffing mandates on RN staffing,^{8,16–26} as well as on

LPN staffing in hospitals with low nurse staffing at baseline,^{20–25} although one study found no evidence of changes in the skill mix.⁸ A recent study that evaluated Massachusetts' RN staffing ratio mandate found no evidence of an association of the mandate with increased RN staffing in ICUs.²⁷ In contrast, empirical evidence is very limited on the effect of the other 2 approaches—staffing committee and public reporting—on hospital nurse staffing. A descriptive study of Texas's staffing committee legislation found an increased trend in RN hours per patient day and a decreased trend in LPN hours per patient day following the implementation of the legislation.⁹ Another descriptive study, of New Jersey's public reporting legislation, found a slight increase in the number of RNs assigned to patients during the postimplementation period.²⁸ Nonetheless, these descriptive studies only examined trends over time in nurse staffing before and after the legislation within a specific state; neither did they control for confounding factors nor compare staffing changes to other states.

In this study, we employed a quasi-experimental design with 16 years (2003–2018) of nationally representative hospital-level data from the American Hospital Association (AHA) annual survey to compare the effects of 3 types of staffing laws on different levels of nurse staffing in hospitals: mandates, staffing committees, and public reporting legislation. We included in this analysis not only RNs, but LPNs and NAP as well. LPN's education programs provide a certificate after about 1 year of community college, as opposed to the RNs which require at least an associate degree to sit for the licensure test. Despite the lesser training, a more restricted scope of practice, and being paid less, in some settings, LPNs have been used as low-wage substitutes for RNs.²⁹ However, studies have shown that a lower skill mix (ie, higher proportion of LPNs) in hospitals was associated with worse patient outcomes, suggesting that they are not exact substitutes.^{30–32} Although the use of LPNs has been declining over time in hospitals,³³ in California, studies show the downward trend was moderated under the nurse staffing mandate.^{20–25} It is, therefore, important to ascertain what happened with LPNs in states that legislated the other 2 policies. In states with public reporting, the law explicitly requires hospitals to report LPN staffing, although the public may not be aware of differences between RNs and LPNs.

NAP assist RNs in patient care, which, in theory, allows nurses to delegate less skilled tasks and focus on more complex situations. However, studies in California have found that the number of nurse aides and orderlies in hospitals was slightly reduced after the mandate.^{22,23} Hospitals in California may have cut NAP staffing as a cost-containment strategy to meet staffing requirements, essentially revealing another unintended consequence of the mandate.^{34,35} While the effect is small, it is of concern because having more nurses on staff could lose meaning if their workload is expanded to cover the reduced support staff. Therefore, we also examined the effects of different types of nurse staffing laws on NAP staffing.

The objective of this study is to examine the effect of the alternative nurse staffing laws—mandating a staffing committee substantially comprised of RNs and mandating

public reporting of nurse staffing levels—on increasing hospital RN, LPN, and NAP staffing (measured as productive hours per patient day) in the United States. Our findings can inform the ongoing debates over how to regulate nurse staffing in hospitals and the effectiveness of these legislative alternatives to a mandate.

METHODS

Data Sources

Our primary data source was the 2003–2018 AHA annual survey. The AHA survey has been conducted every year since 1980, with a 75% response rate in recent years.³⁶ The AHA data provide information from responding hospitals on hospital-wide staff FTEs for various occupations, including RNs, LPNs, and NAP, as well as hospital characteristics such as ownership, number of beds, and teaching status. The database is one of the most reliable national longitudinal hospital data sources and has been widely used in prior nurse staffing studies.^{8,20,21,24,25}

We obtained state-level data from the Bureau of Labor Statistics Occupational Employment Statistics Program³⁷ for the number of employed nurses and nursing assistants. We also obtained state right-to-work law implementation status from the National Conference of State Legislatures Web site; there are 27 states that implemented laws to prohibit union security agreements between employers and labor unions.³⁸ We used state identification to link the state-level data to the AHA data.

Staffing Measures

We measured staffing levels using productive hours per patient day. Hospitals reported the number of FTEs and the number of fulltime (≥ 35 h) and part-time (< 3 h) personnel who were on the payroll at the end of the reporting period. For missing data, the AHA provides estimated FTEs per hospital for nurses based on data in previous years and imputed values. We used the combined (reported and estimated) values for RNs and LPNs, as was done in a prior nursing study that used the AHA data.⁸ Because the AHA data do not provide estimated FTEs for NAP, we followed the AHA's formula to calculate the number of FTEs for NAP (full-time +0.5×related part-time personnel), using the number of full-time and part-time personnel.³⁶

We calculated labor hours using a standard conversion, where 1 FTE equals hours divided by 1768, representing productive hours for 1 FTE position per year.³⁹ We then divided the number of hours by adjusted patient days. Because the AHA data include both inpatient and outpatient staff, we also followed prior studies^{8,25,39} and used the “adjusted patient days” measure, which adjusts outpatient visits using the ratio of gross outpatient and inpatient revenues.

Treatment and Comparison Groups

We defined “treatment” as the implementation of 1 of the 3 types of nurse staffing laws. We retrieved the legislation information from the American Nurse Association Web site⁷ and reviewed relevant statutes for all treatment states. We

divided treatment states into 3 groups: the state with mandated staffing ratios, which included only California; states that legislated staffing committees, Washington, Ohio, Connecticut, Nevada, and Texas; and states that legislated public reporting, New York, New Jersey, Rhode Island, and Vermont. A total of 35 states that did not legislate nurse staffing laws were allocated to the comparison group.

Five states (Massachusetts, Oregon, Illinois, Minnesota, and Maine) and the District of Columbia were excluded from this analysis because they either used > 1 policy option or made modifications to the model that were unique. The Massachusetts' legislation mandated staffing ratios, but only in ICUs. In addition, Massachusetts has a public reporting mechanism, although it is voluntary. Oregon enacted the staffing committee legislation in 2001, which is before our study period, and it then amended it in 2015 to grant additional authority to nurses on the committee.⁴⁰ Illinois legislated both staffing committees and public reporting.⁷ In Minnesota, public reporting of staffing levels is voluntary, and our study examines mandatory public reporting. It is worth noting that we did not exclude Washington because it started public reporting in 2019.¹² Finally, the District of Columbia and Maine implemented staffing mandates in 2004 but later removed them.⁷ Each of these cases undoubtedly has lessons in and of themselves, but they do not conform to our 4 comparison groups. Details of the legislation for each treatment state are provided in Table 1.

Analytical Approach

A total of 7389 hospitals (100,310 hospital-year observations) from 2003 to 2018 were included for the analysis. We first excluded 10,553 observations from the states (Massachusetts, Oregon, Illinois, Minnesota, Maine), the District of Columbia, and the US territories. We then excluded 27,935 observations for which the average daily census was < 20 or the reporting period was < 360 days, as these hospitals could operate differently. Last, we excluded 12,367 observations for hospitals operating nursing homes, identified as hospitals having at least 1 nursing home staffed bed because nurse staffing levels and patterns of these hospitals could be different.

After exclusion, our final sample contained a total of 5188 hospitals (49,455 hospital-year observations), including 427 hospitals (3810 observations) in the state that mandated staffing ratios, 1020 hospitals (10,230 observations) in states that legislated staffing committees, 324 hospitals (3045 observations) in states that legislated public reporting, and 3417 hospitals (32,370 observations) in states that did not have any nurse staffing legislation from 2003 to 2018. Details on hospital characteristics are provided in the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>).

We employed a difference-in-difference (DID) approach to compare changes in hospital staffing in the state that mandated staffing ratios, states that legislated staffing committees and states that legislated public reporting to changes in states that did not implement any staffing legislation before and after the legislation was implemented. The DID approach allows us to disentangle the differences in outcomes between treatment and comparison states before the laws were

implemented and control for unobserved time-invariant factors that could have affected the outcomes.⁴¹ For a description of DID approaches and the assumptions underlying them, see the studies by Wing et al⁴² and Khandker et al.⁴³ The Columbia University School of Public Health summarizes the assumptions underlying DID as: treatment/intervention and control groups have parallel trends in the outcome; composition of intervention and comparison groups is stable for repeated cross-sectional design; and no spillover effects.⁴⁴

We constructed multivariate linear regression models to assess the effects of the laws. Because states implemented staffing legislation in different years, we defined the pre-treatment period for each treatment state as the period from 2003 to the year before the implementation. In the model, the dependent variable was hours per patient day. The key independent variables were 3 dummy variables that represent 3 interaction terms of the dummy variables indicating the state that mandated ratios, hospitals in states that legislated committees, and hospitals in states that legislated public reporting with the dummy indicating when the law was in effect. We ran models separately for a total licensed nurse (RN plus LPN), RN, LPN, and NAP hours. The regression coefficients of the dummy variables represent the DID estimates of staffing changes in treatment hospitals compared with hospitals in states that did not implement any staffing law before and after the legislation was implemented. See the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>) for details about the model specification.

We controlled for observable hospital characteristics that are likely to affect hospital staffing, including hospital size, ownership status, teaching status, location in a metropolitan area, percent Medicare days, and percent Medicaid days. We also included the Saidin Index, a measure of hospital technological sophistication that was derived from the AHA data, calculated based on a list of services available each year,⁴⁵ and the Herfindahl-Hirschman Index, a measure of hospital referral region-level competitiveness based on hospitals' market share in their service areas⁴⁶; both were derived from the AHA data and available for each hospital each year. In addition, we controlled for the state-level number of employed RNs, LPNs, and NAP to population ratios as a proxy for market supply (lagged 1 y to account for endogeneity) and state right-to-work status as a proxy for controlling the impact of unionization.⁴⁷ We included fixed effects for time to adjust for secular changes in outcomes and hospital fixed effects to account for all unmeasured differences across hospitals that do not vary in time (eg, organizational structure, culture). SEs were clustered by the hospital. We considered a P -value < 0.05 from 2-tailed tests to be statistically significant. All analyses were performed using Stata 15 (StataCorp). The Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>) provides more details about the analysis and model specification.

Per suggestions by reviewers, we conducted 2 sensitivity analyses. First, we included in the model the dummy variable indicating the state of Oregon interacting with the dummy indicating when Oregon implemented the enhancement law to see whether the enhancement law has any effect on hospital nurse and NAP staffing. We did find an effect of

the enhancement on LPN and NAP staffing, but not on RNs (Appendix Table 3, Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>). Second, we conducted a robustness check by omitting California from our sample since California may be seen as an "outlier" with its mandated ratios. Because we have no way of knowing whether the state has unique characteristics that would merit its exclusion from the model, we report both findings (excluding California and including California) in our findings.

RESULTS

Table 2 presents the adjusted DID estimates from the multivariate regression models. Full regression results with controlling variables are provided in the Appendix (Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>). After controlling for hospital characteristics, state-level factors, and year and hospital fixed effects, there was no statistically significant change in total licensed nurse (RN plus LPN) hours in states that legislated a staffing committee, while there was a positive effect in states that legislated public reporting (DID = 0.277, $P < 0.01$). In states that mandated staffing ratio (California), there was also an increase in total licensed nurse hours compared with states that did not have staffing legislation after the legislation was implemented (DID = 1.022, $P < 0.001$).

When looking at RNs separately, we found that the DID estimates in RN hours were positive in states that legislated staffing committee or public reporting, although they were not statistically significant. In California, compared with states with no nurse staffing legislation, RN hours per patient day increased by about 0.996 ($P < 0.001$) after the mandate was implemented. However, in the analysis that omitted California, we found an enhanced effect of public reporting on RN staffing, making it not just positive but also statistically significant (DID = 0.260, $P < 0.01$). There were no other differences in the results that omitted California as compared with the results that included California.

For states that adopted public reporting, there was a small decrease in LPN hours following the implementation of the legislation, compared with states with no staffing legislation, yielding a positive effect on LPN staffing (DID = 0.115, $P < 0.001$). In contrast, we found a relatively larger effect of the law on LPN hours in states that implemented the staffing committee legislation, as compared with states with no legislation (DID = -0.076, $P < 0.001$). In California, we found no evidence of an implementation effect of the staffing mandate on LPN hours per patient day.

For NAP staffing, we found no statistically significant changes in states that legislated staffing committee or public reporting when compared with states with no staffing legislation. We found an increase of 0.224 ($P < 0.01$) hours per patient day in California following the mandate.

DISCUSSION

This is the first national study that we are aware of to use a comparative research design to assess the effects of alternative policy approaches to increasing hospital nurse staffing. Our results, when we included California in the

TABLE 2. Difference-in-difference Estimates of the Effect of Nurse Staffing Legislation on Hospital Staffing Hours Per Patient Day

Difference-in-difference Estimates	Model 1					Model 2						
	Total Licensed Nurse	Registered Nurse	Licensed Practical Nurse	Nurse Assistive Personnel	Total Licensed Nurses	Registered Nurse	Licensed Practical Nurse	Nurse Assistive Personnel	Total Licensed Nurses	Registered Nurse	Licensed Practical Nurse	Nurse Assistive Personnel
Staffing mandate (CA)	1.022*** (0.123)	0.996*** (0.114)	0.024 (0.030)	0.224** (0.070)	—	—	—	—	—	—	—	—
Staffing committee (CT, NV, OH, TX, WA)	-0.060 (0.065)	0.003 (0.059)	-0.076*** (0.022)	-0.070 (0.037)	0.027 (0.065)	0.086 (0.059)	-0.073*** (0.022)	-0.037 (0.038)	0.027 (0.065)	0.086 (0.059)	-0.073*** (0.022)	-0.037 (0.038)
Public reporting (NJ, NY, RI, VT)	0.277** (0.102)	0.150 (0.094)	0.115*** (0.025)	0.095 (0.061)	0.366*** (0.103)	0.260** (0.094)	0.117*** (0.025)	0.119 (0.061)	0.366*** (0.103)	0.260** (0.094)	0.117*** (0.025)	0.119 (0.061)

Coefficients and the corresponding SEs are presented. Coefficients represent the difference-in-difference estimates in staffing between treatment and comparison hospitals before and after implementation of staffing legislation. Model 1 includes the state that legislated staffing mandate (ie, the state of California). Model 2 excluded the state of California. All models controlled for hospital size, ownership status, teaching status, metropolitan location, percent inpatient days covered by Medicare, percent inpatient days covered by Medicaid, state-level employment, state right-to-work status, market competition, technology index, and year and hospital fixed effects. SEs were clustered at the hospital level. Total licensed nurse is the sum of registered nurse and licensed practical/vocational nurse, excluding nurse assistive personnel. See the Appendix Table 2 (Supplemental Digital Content 1, <http://links.lww.com/MLR/C315>) for full regression results.

CA indicates California; CT, Connecticut; NJ, New Jersey; NV, Nevada; NY, New York; OH, Ohio; RI, Rhode Island; TX, Texas; VT, Vermont; WA, Washington. ***P < 0.001. **P < 0.01. *P < 0.05.

model, neither the staffing committee nor the public reporting approaches were associated with statistically significant increases in hospital RN staffing, and, in fact, they significantly impacted LPN staffing levels and had no effect on NAP. Consistent with prior research, this model also showed that California’s mandate had a significant effect on RNs, while it had no effect on LPNs and a positive effect on NAP. When we excluded California from the model, the results revealed a small positive effect of public reporting on total licensed nurse (RN plus LPN) staffing in hospitals, while the staffing committee approach did not.

In interpreting the difference between the models that included and excluded California, our only staffing mandate state, it is important to acknowledge that there are likely characteristics of the state that are unique and arguably merit its omission. However, other states may also have unique characteristics affecting their nurse staffing and if we continued omitting key states, our DID approach, which provides greater rigor than individual regressions, would not be possible. As a result, we believe our design was responsive to the question of what the relative effectiveness of these 3 policy alternatives was, even as we point to the greater uncertainty around public reporting than the other 2 policy approaches.

One explanation of why staffing committee laws may not result in higher RN staffing relates to the likely variation in nurses’ power within hospitals.⁹ This type of legislation does not give staffing committees control over the hospital budget, and if there are limited resources available, committees may be forced to plan cuts, rather than increases. Our findings suggest that cutting LPNs, rather than RNs, may indeed be an area where committees have found the most palatability.

An historic point of reference, in this regard, were the reforms that occurred in Oregon. Oregon recognized that their original staffing committee legislation was too weak, and in 2015, they amended the legislation to enhance nurse engagement in the committee and increase transparency in decision-making and improving state oversight and enforcement.⁴⁰ In the sensitivity analysis, we did find a positive effect of Oregon’s enhanced law on increasing LPN and NAP staffing, although we still did not see a significant effect on RN staffing. While research with more details and larger a sample size is needed, in the meantime, states that are only able or willing to implement the staffing committee approach would do well to examine both our findings and the lessons of Oregon. How staffing committee are constituted, whether there is transparency in the way they function, and the degree of power they have within hospitals may make a difference.

Public reporting is a popular idea in health policy circles, and there is some evidence showing it can have a positive effect on quality and costs more generally.⁴⁸ The effects on nurse staffing, however, are far less clear. Our results only showed a significant, albeit small, effect when California was excluded, and the growth was primarily in LPNs. Prior research suggests that a higher ratio of RNs to LPNs improves quality.^{30–32} When California was included, there was a very small positive association of public reporting approach laws and RN staffing, but it was not statistically significant.

Therefore, while our findings show that public reporting is less effective than mandating staffing ratios, for states unable or unwilling to mandate ratios, it is possible that there could be a small benefit of public reporting.

The original assumptions underlying the public reporting rely on the idea that data would be accessed, understood, and used by the public to make decisions about where to seek care. The study on New Jersey's public reporting legislation reported that, even at the moment of the program's initial launch, the media hardly acknowledged its existence.²⁸ We know that reporting mechanisms vary across states with public reporting requirements, and there is no standardization of how states report their data, nor where consumers can access the information.¹² For example, New York does not provide a public Web site with the data, and information is only available upon request.⁴⁹ This likely further complicates the communication of data to the public. Thus, as with staffing committee laws, there may be ways to strengthen public reporting. Specifically, policy makers may wish to stipulate how the data is collected and where it is posted, such that the public can have greater access.

With regard to NAP and LPN staffing in California, our study was largely consistent with prior research on this topic.^{8,21,25} There were, however, 2 differences worth discussing. First, unlike prior studies,^{22,23} our findings suggest a statistically significant increase in NAP staffing in hospitals in California when compared with states that had no staffing legislation. The different results could be related to different definitions of unlicensed assistive personnel in the 2 data sources and/or the study design (no comparison states in prior studies). Prior national studies have found that unlicensed personnel are generally complementary, rather than substitutive, to RNs, and have no statistically significant substitutive relationship with LPNs in hospitals.⁵⁰ Thus, it is reasonable that hospitals would raise both RN and NAP staffing to comply with the mandate, as appears to have occurred in our study. Similarly, we did not observe statistically significant increases in NAP staffing in those states that did not increase their RN staffing. Nor did we observe a significant increase on NAP staffing in states that relied more on LPNs (slower rate of decline).

A second difference is that we did not find a significant effect of the mandate on LPN staffing. Prior research in California found that hospitals with low preregulation staffing levels significantly increased LPN staffing, while hospitals with high preregulation staffing levels did not.^{21,25} The insignificance of the LPN staffing increase could, therefore, be due to the heterogeneous hospital responses to the regulations based on their prelegislation staffing levels. It could also be a result of the different data sources and different comparison group used in prior research.

Our study has several limitations. Although the AHA survey is one of the most consistent and reliable national longitudinal data sources to study hospital staffing, there are some disadvantages to the data. First, the AHA measures FTEs with part-time nurses being 0.5 of full-time; however, if part-time nurse hours are changing over time, this measure may not accurately assess the change in nurse staffing. In addition, the data do not allow us to separate direct-care nurses from unit managers or nurses without direct-care roles,

which might result in overestimating of FTEs. Second, as indicated in prior studies,^{4,39} the standard measure, "adjusted patient days" that was used to adjust total hours of nursing care, may underestimate inpatient staffing while overestimating staffing for outpatient care. Third, the hospital-level data are unable to identify changes at the unit level, which could underestimate the effect in some units such as the medical/surgical units that are most sensitive to staffing requirements. Fourth, the AHA defined NAP as "certified nursing assistant or equivalent unlicensed staff assigned to patient care units and reporting to nursing,"³⁶ but there is no precise list of occupations included, so we were unable to further investigate the effect on this type of occupation in detail. Furthermore, although our approach can control for unobservable time-invariant factors that could have affected staffing, our estimates could be affected by omitted factors, such as patient case-mix, other staffing policies such as mandatory overtime and data collection, or reactions to publicity about quality problems at hospitals. Despite these limitations, our results are largely consistent with prior studies^{8,21,25} suggesting that the pattern we observed may not be attributable to bias in the data source or the study design.

CONCLUSIONS

Our study did not find evidence to support the 2 policy alternatives to mandated staffing ratios. Staffing committee laws had no effect, and public reporting laws only showed a small effect when California was omitted in our analysis, and it primarily benefitted LPNs. These findings, however, raise important questions to be pursued in future research, including ways that the 2 alternative approaches might be strengthened. It also lays the groundwork for research on patient outcomes associated with the implementation of these policies, including the direct costs of hiring more staff, as well as savings that could be incurred if nurse turnover is reduced as a result of better staffing ratios. While the primary purpose of increasing nurse staffing is to benefit patient outcomes, studies to date in California and Massachusetts show mixed results,^{16,17,23,25,27} suggesting more work is needed in this area.

In the wake of coronavirus disease 2019, increasing nurse staffing in hospitals remains the top demand of frontline nurses. We know that an inadequate level of staffing can result in burn-out, turnover, and high vacancy rates, as well as threats to patient safety.²⁻⁶ Given that the average turnover rates for US hospitals were rising even before coronavirus disease 2019,⁵¹ the issue of nurse staffing continues to be a priority, and more evidence on policies that work is urgently needed.

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