



An Exploratory Analysis of U.S. Health System Workforce Trends

Deborah Odihi, MHS; Tyler Malone, PhD

KEY FINDINGS

We used an observational study design with 2018 and 2020 – 2023 data from the Agency for Healthcare Research and Quality (AHRQ) Compendium of U.S. Health Systems to identify hospital system membership and changes in system workforce over time.

- The average number of physicians, primary care physicians, nurse practitioners (NPs), and physician assistants (PAs) per system bed all increased, with NPs and PAs showing the largest percentage increases. The findings suggest health systems are increasingly reliant on NPs and PAs.
- In linear regression models, we found that hospital Census region, ownership, FTEs, net patient revenue, operating margin, percent Medicare days, and percent outpatient revenue were significantly associated with system workforce profiles, including overall staffing levels, staffing intensity, and clinician mix, adjusting for other covariates.

INTRODUCTION

Mergers and acquisitions (M&As) of hospitals across the United States have been rising rapidly since 2000 and even more so since 2010.¹ These M&As are changing the health care landscape in the U.S. and may have implications for access and care seeking behavior.² Economic theory suggests that mergers can increase market concentration, potentially leading to higher prices and lower quality as health systems grow larger.³ Many studies on hospital M&As have focused on changes in quality of care, prices of health care services offered, and hospital costs resulting from M&As.¹⁻⁴

Evidence from the literature suggests that the impact of M&As is mixed. Some studies have found that M&As are associated with declines in patient experience and quality-of-care measures, while others have reported reductions in patient mortality.^{1,5} Similarly, findings related to financial performance vary. Some studies have observed decreases in operating margins despite lower labor costs, whereas others have found that M&As are associated with higher per-patient revenue, improved operating margins, and increased prices.²⁻⁴ These varying findings suggest that the effects of M&As differ across hospitals and may have distinct implications for system-affiliated and non-affiliated hospitals.

New Contribution

The increasing prevalence of hospital mergers and system affiliations underscores the importance of understanding health systems and their workforce dynamics. As health systems expand, it is unclear whether workforce growth keeps pace with system growth. To better understand this issue, we used recently released national data and longitudinal analyses to examine how workforce availability (e.g., clinicians per system bed) has changed over time. Additional insight into this topic can contextualize a health care landscape increasingly populated by large, multi-provider systems.

METHODS

We used an observational study design with 2018 and 2020 – 2023 data from the Agency for Healthcare Research and Quality (AHRQ) Compendium of U.S. Health Systems to identify hospital system membership and system workforce attributes. No Compendium dataset was produced by AHRQ for year 2019.⁶ The technical documentation for the Compendium describes the following definition for health system: “A health system includes at least one hospital and at least one group of physicians that provides comprehensive care (including primary and specialty care) who are connected with each other and with the hospital through common ownership or joint management.” The Compendium documentation further explains that a defined health system must include at least one nonfederal acute care hospital, at least 50 physicians, and at least 10 primary care physicians.

Descriptive Analysis

We first evaluated changes in average system workforce characteristics over time, weighting by system size (total number of hospitals) and using data from the study period endpoints (2018 and 2023). We examined the following system characteristics: total physicians, total primary care physicians, total NPs, total PAs, workforce per system bed, and total hospitals. Each workforce measure reflects total workforce across the *system*, not necessarily the workforce at any one particular care site. Full details for each measure are provided with the technical documentation available at the Compendium of U.S. Health Systems website.⁶ For each year of observation, the descriptive analysis focused on systems with complete data across all measures of interest.

Regression Analysis

Next, we used linear regression modeling to evaluate whether changes in system-level workforce attributes were associated with characteristics of the system's member hospitals (e.g., hospital location, payment type, ownership, payer mix, financial performance). The regression analysis focused on short-term general hospitals and workforce per system bed and used observations from the full study period (2018, 2020 - 2023).

Independent variables in each regression model included hospital Census division, Critical Access Hospital (CAH) status, ownership type, rurality, full-time equivalents (FTEs), net patient revenue, operating margin, percent of inpatient days covered by Medicaid, percent of inpatient days covered by Medicare, percent of patient revenue from outpatient care, and percent uncompensated care (relative to operating expenses). To identify rural versus urban hospitals, we applied criteria established by the Federal Office of Rural Health Policy in the Health Resources and Services Administration for fiscal year 2025. Specifically, hospitals were designated as rural if located in a nonmetropolitan county OR metropolitan Census tract with a Rural-Urban Commuting Area (RUCA) code between 4 – 10, OR a large area metropolitan Census tract of at least 400 square miles in area with a population density of 35 or less per square mile and a RUCA code between 2 – 3, OR an outlying metropolitan county without an urbanized area, OR a metropolitan Census tract with a Road Ruggedness Scale value of 5 and RUCA code between 2 – 3 that is at least 20 square miles in area. The remaining hospitals were designated as urban. We sourced additional hospital characteristics from the Centers for Medicare & Medicaid Services (CMS) Healthcare Cost Report Information System (HCRIS).

For each regression model, we used a dataset that contained only the hospitals with complete data on the dependent variable for all available years. We added year fixed effects to each model and clustered standard errors at the hospital level to account for hospital similarities over time. We used R 4.5.1 and Stata/SE 18.0 to complete analysis.

Limitations

The methodology has several potential limitations worth noting. The initial descriptive analysis focused on systems with complete data in a given year. In 2018, 88.7% of systems included in the AHRQ Compendium had complete data; in 2023, 79.0% of systems had complete data. The trends from our descriptive analysis may not fully generalize to the 10 – 20% of excluded systems. Furthermore, our regression analysis of system workforce attributes and their association with member hospital characteristics is not sufficient to determine causality. Findings could reflect bi-directional relationships or relationships with no direct causal link. In addition, the regression models explained a modest proportion of variation in workforce measures, suggesting that unobserved organizational, market, or system-level factors may also influence workforce composition.

RESULTS

Descriptive Analysis

The 2018 AHRQ Compendium of U.S. Health Systems identified 565 unique health systems with complete data on all system characteristics of interest, and the 2023 AHRQ Compendium identified 505 unique health systems with complete data on all system characteristics of interest. Weighting by system size, we observed the following changes in average system workforce characteristics from 2018 to 2023: total physicians increased from 3,833 to 4,155 (8.4% increase), total primary care physicians increased from 1,267 to 1,408 (11.1% increase), total NPs increased from 773 to 1,328 (71.8% increase), total PAs increased from 391 to 703 (79.8% increase), physicians per system bed increased from 0.89 to 0.93 (4.5% increase), primary care physicians per system bed increased from 0.28 to 0.31 (10.7% increase), NPs per system bed increased from 0.18 to 0.30 (66.7% increase), PAs per system bed increased from 0.09 to 0.15 (66.7% increase), and total hospitals increased from 45 to 47 (4.4% increase) (Table 1).

Table 1. Changes in Average System Workforce Characteristics from 2018 (n = 565) to 2023 (n = 505), Weighted by System Size^a

System Characteristic	2018 Value Mean	2023 Value Mean	Change 2023 Value – 2018 Value (Percentage Change)
Total Physicians	3,833	4,155	322 (8.4%)
Total Primary Care Physicians	1,267	1,408	141 (11.1%)
Total Nurse Practitioners	773	1,328	555 (71.8%)
Total Physician Assistants	391	703	312 (79.8%)
Physicians per System Bed	0.89	0.93	0.04 (4.5%)
Primary Care Physicians per System Bed	0.28	0.31	0.03 (10.7%)
Nurse Practitioners per System Bed	0.18	0.30	0.12 (66.7%)
Physician Assistants per System Bed	0.09	0.15	0.06 (66.7%)
Total Hospitals	45	47	2 (4.4%)

^a System size determined by number of affiliated hospitals in system.

Regression Analysis

Table 2 presents regression coefficients (including standard errors) for each variable. The coefficient tells us how much the workforce-per-bed measure changes when a hospital characteristic changes, holding all other variables constant. The standard error, also presented, reflects the uncertainty around the estimate; a smaller standard error generally indicates a more precise estimate. We found that hospital Census region, ownership, FTEs, net patient revenue, operating margin, percent Medicare days, and percent outpatient revenue were significantly associated with system workforce, adjusting for other covariates.

Census region

Relative to hospitals in the Northeast, hospitals in the Midwest were members of systems with 0.26 fewer physicians per system bed ($p < .001$), 0.06 fewer primary care physicians per system bed ($p < .001$), and 0.08 fewer PAs per system bed ($p < .001$); hospitals in the South were members of systems with 0.52 fewer physicians per system bed ($p < .001$), 0.15 fewer primary care physicians per system bed ($p < .001$), 0.06 fewer NPs per system bed ($p < .001$), and 0.10 fewer PAs per system bed ($p < .001$); hospitals in the West were members of systems with 0.06 fewer NPs per system bed ($p < .001$) and 0.06 fewer PAs per system bed ($p < .001$).

Ownership

Relative to for-profit hospitals, government-owned hospitals had 0.42 additional physicians per system bed ($p < .001$), 0.15 additional primary care physicians per system bed ($p < .001$), 0.08 additional NPs per system bed ($p < .001$), and 0.04 additional PAs per system bed ($p < .001$); nonprofit hospitals had 0.20 additional physicians ($p < .01$), 0.09 additional primary care physicians ($p < .001$), 0.07 additional NPs ($p < .001$), and 0.04 additional PAs ($p < .001$) per system bed.

FTEs

Each 1,000-FTE increase at a member hospital was associated with 0.05 fewer primary care physicians per system bed ($p < .05$).

Net patient revenue

Each \$10M increase in net patient revenue at a member hospital was associated with 0.02 additional physicians ($p < .01$), 0.005 additional primary care physicians ($p < .001$), 0.002 additional NPs ($p < .001$), and 0.001 additional PAs ($p < .001$) per system bed.

Operating margin

Each 10 percentage-point increase in member hospital operating margin was associated with 0.03 fewer primary care physicians per system bed ($p < .05$).

Percent Medicare days

Each 10 percentage-point increase in member hospital Medicare days was associated with 0.01 fewer primary care physicians per system bed ($p < .05$).

Percent outpatient revenue

Each 10 percentage-point increase in member hospital outpatient revenue (as a share of total patient revenue) was associated with 0.13 additional total physicians ($p < .01$), 0.04 additional primary care physicians ($p < .001$), 0.03 additional NPs ($p < .001$), and 0.01 additional PAs ($p < .001$) per system bed.

Table 2. Linear Regression Models of System Workforce as a Function of Member Hospital Characteristics (2018, 2020 - 2023)

Hospital Characteristic	Physicians per Bed Coefficient (Std. Error)	Primary Care Physicians per Bed Coefficient (Std. Error)	NPs per Bed Coefficient (Std. Error)	PAs per Bed Coefficient (Std. Error)
Census Region (Ref. Northeast)				
Midwest	-0.26*** (0.05)	-0.06*** (0.01)	0.00 (0.01)	-0.08*** (0.01)
South	-0.52*** (0.12)	-0.15*** (0.03)	-0.06*** (0.01)	-0.10*** (0.01)
West	-0.05 (0.08)	0.01 (0.02)	-0.06*** (0.02)	-0.06*** (0.01)
Critical Access Hospital	0.08 (0.09)	0.03 (0.02)	0.00 (0.01)	0.01 (0.01)
Ownership (Ref. For-profit)				
Government	0.42*** (0.08)	0.15*** (0.02)	0.08*** (0.01)	0.04*** (0.01)
Nonprofit	0.20** (0.07)	0.09*** (0.02)	0.07*** (0.01)	0.04*** (0.00)
Rural	-0.22 (0.13)	-0.04 (0.03)	0.01 (0.01)	0.01 (0.01)
FTEs (1,000-FTE Units)	-0.16 (0.09)	-0.05* (0.02)	0.00 (0.01)	-0.00 (0.01)
Net Patient Revenue (\$10M Units)	0.02** (0.01)	0.005*** (0.001)	0.002** (0.001)	0.001*** (0.000)
Operating Margin (10 Pct. Point Units)	-0.12 (0.07)	-0.03* (0.01)	-0.00 (0.00)	-0.00 (0.00)
Percent Medicaid Days (10 Pct. Point Units)	-0.02 (0.03)	-0.01 (0.01)	0.01 (0.00)	0.00 (0.00)

Hospital Characteristic	Physicians per Bed Coefficient (Std. Error)	Primary Care Physicians per Bed Coefficient (Std. Error)	NPs per Bed Coefficient (Std. Error)	PAs per Bed Coefficient (Std. Error)
Percent Medicare Days (10 Pct. Point Units)	−0.02 (0.02)	−0.01* (0.00)	0.00 (0.00)	−0.00 (0.00)
Percent Outpatient Revenue (10 Pct. Point Units)	0.13** (0.04)	0.04*** (0.01)	0.03*** (0.00)	0.01*** (0.00)
Percent Uncompensated Care (10 Pct. Point Units)	0.36 (0.38)	0.08 (0.09)	0.00 (0.02)	−0.01 (0.01)
R^2	0.11	0.16	0.28	0.30
Observations	10,975	10,940	10,765	10,765

Note: Models included year fixed effects and clustered standard errors by hospital.

Abbreviations: NP = nurse practitioner; PA = physician assistant; FTE = full-time equivalent

* $p < .05$; ** $p < .01$; *** $p < .001$

DISCUSSION

The findings from this study indicate that the average number of physicians, primary care physicians, NPs, and PAs per system and per system bed increased between 2018 and 2023, with NPs and PAs experiencing the largest percentage growth. These trends suggest that workforce composition within health systems is evolving as consolidation continues across the U.S. health care sector.

Previous research has shown that NPs and PAs play an important role in addressing workforce shortages, particularly in rural areas, and often provide care of comparable quality while potentially reducing health care utilization.⁷⁻⁹ The substantial growth of these clinician groups may therefore reflect increasing demand for cost-effective workforce models that maintain access to care. The expanding role of NPs and PAs in healthcare delivery may create opportunities to evaluate how scope-of-practice regulations affect access, workforce flexibility, and system performance.

As health systems continue to expand, understanding changes in workforce composition will be important for evaluating the implications of consolidation for access to care, workforce availability, and system performance. Continued monitoring of these trends may also provide insight into how workforce composition, scope-of-practice regulations,¹⁰ and health system performance evolve over time.

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