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The Association between Organizational Market Factors and Agency Labor Utilization in U.S. Hospitals

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Abstract: Objectives: To address urgent staffing shortages, hospitals increasingly rely on agency labor. Given that staffing can significantly impact hospital performance, the aim of this study was to understand the organizational and market factors associated with agency labor utilization in US hospitals. **Methods**: Utilizing concepts from the Resource Dependence Theory (RDT), data for the calendar year 2022 for short-term acute care in United States hospitals (n = 2756) were analyzed with logistic regression analysis. We explored total agency labor expense (operationalized as a dichotomous variable at the 75th and 90th percentiles) in the presence of numerous organizational and market independent variables. **Results**: The results revealed that as markets become less complex (as measured by market concentration), the level of agency labor expense increases (β: 0.843, $p < 0.001$), while our chosen variables related to munificence (rural location; β: −1.634, $p < 0.001$) and dynamism (Medicare payor mix; β: −0.025, $p < 0.001$) were negatively associated with an increase in total agency labor expense. **Conclusions**: In general, our results appear to support the tenets of the RDT. We find that increased use of agency labor in hospitals is predicated on the hospital having the financial resources and flexibility to be able to afford the higher cost of agency labor.

Keywords: labor; agency labor; resource dependence theory; healthcare staffing

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1. Introduction

1.1. Background

Healthcare delivery in the hospital setting is a labor-intensive process. Without sufficient skilled labor, hospitals are incapable of serving the needs of the patients entrusted to their care, compromising quality and access to care. Unfortunately, in recent years, hospitals have been confronted with a severe staffing shortage, a crisis further intensified by the unprecedented challenges posed by the COVID-19 pandemic and an aging population that requires more supportive clinical care. According to a study released by the National Council of State Boards of Nursing, about 100,000 registered nurses (RNs) left the workforce during the past two years due to various factors such as stress, burnout, and retirement, and another 610,388 RNs reported an intent to leave by 2027 (Martin et al. 2023). This aligns with a recent Bureau of Labor Statistics (BLS) report that indicated that the number of job openings for all healthcare occupations is expected to grow faster than the average for all other occupations from 2022 to 2032, with an average of 1.8 million job openings forecast for each year (US Bureau of Labor Statistics 2024). Other factors that have contributed to the staffing shortage include high turnover rates fueled by demanding work environments, limited career advancement opportunities, and inadequate workplace support (Halter et al. 2017).

The intersection of staffing shortages, workforce attrition, and the increased demand for healthcare has compelled hospitals to hire agencies or agency labor at unprecedented rates to temporarily fill staffing shortages (American Hospital Association 2022c). From 2019 to 2022, agency labor expenses for hospitals and health systems surged by 258%, with the number of agency labor full-time equivalents (FTEs) increasing by 139%, and the median wage rate paid to agency staffing firms rising by 57% (Syntellis Corporation 2023).

Nursing labor comprises the largest segment of agency staffing. In 2022, agency nurses accounted for 40% of the nursing labor expenses while providing only 23.4% of the total nursing hours (American Hospital Association 2022c). However, personnel shortages are not restricted to nurses, but extend to other healthcare professions as well. For instance, physician shortages in rural areas remain severe, and many communities are designated as Health Profession Shortage Areas, prompting incentive programs like medical school loan repayments (Arredondo et al. 2023). A survey by a large healthcare staffing agency has indicated that respiratory therapists were the most requested agency employees (American Hospital Association 2022b). The American Academy of Physical Therapists anticipates the national shortage of physical therapists to continue past 2025 (Popowitz 2023).

Although agency staff can assist in meeting short-term staffing needs, this increasing dependence can adversely impact hospital performance. Increased utilization of agency labor may be associated with hospital-acquired pressure ulcers (bedsores) and an increased likelihood of inpatient mortality (Ferguson et al. 2020; Dall'Ora et al. 2020). In a recent study, Beauvais and colleagues reported that the employment of agency labor was negatively associated with multiple hospital quality measures, including the HCAHPS star rating and the Hospital Value-Based Purchasing Total Performance Score (Beauvais et al. 2024).

The skilled healthcare workforce is inherently expensive, with employee wages and benefits often constituting more than two-thirds of acute care hospitals' operating expenses. Industry reports indicate that clinical labor costs rose by almost 40% between 2019 and early 2022 as hospitals struggled to recruit and retain staff (Kaufman Hall 2022). A significant factor contributing to this increased cost may be the higher utilization of agency staff. While agency staffing is sometimes necessary to meet short-term staffing needs, such labor is significantly more expensive than regular FTE staff, typically adding 50% or more to an employee's hourly rate (American Hospital Association 2022b). Considering the intense human resource requirements in the hospital setting, an increase in labor costs of this magnitude can have a disproportionate effect on hospital expenses, to the point where economic survivability is in question (American Hospital Association 2022c). One could argue that this is already a prevalent financial issue in the hospital industry. In 2023 alone, 79 health systems filed for bankruptcy protection, the highest number in the last five years. Among the most significant reasons cited for healthcare bankruptcies was the increasing pressure from labor costs (Payerchin 2024; Gibbons Advisors 2023).

Given the potential impact on hospital quality and financial viability, it is important to understand the factors that may be associated with agency labor utilization in hospitals. Extant research is limited, but it suggests that organizational and market factors may be determinants of hospitals' staffing-decision-making processes (Shin et al. 2020; Blegen et al. 2008). However, the specific influence of organizational/market dynamics on agency labor utilization has not been adequately explored. These factors may include the type of hospital ownership, staffing, and competition.

1.2. Aim of the Study

Exploring a national sample of U.S. (United States) hospitals, and using recent data for the year 2022, this study was intended to bridge the existing research gap related to the association of organizational and market factors with agency labor utilization in hospitals. To our knowledge, this study is the first to explore the organizational and market predictors of agency labor in a large sample of US hospitals. Policymakers and healthcare leaders may benefit from understanding the structural drivers of agency staff use.

2. Material and Methods

2.1. Conceptual Framework and Hypotheses

This study draws on the tenets of resource dependence theory (RDT), pioneered by (Pfeffer and Salancik 1978; Nienhüser 2008). RDT has been frequently used in health services research to explain organizations' strategic or managerial decisions and human resources strategies. Pfeffer and Salancik posited that an organization's survival and power over its competitors depend on its access to and control of key resources from the external environment. In this regard, all organizations act to acquire and control key resources to survive, increase power, and reduce dependency on those who control key resources. Key resources or critical resources refer to resources that organizations need to function, which may include raw materials, financial resources, real estate, equipment, technologies, information, and human resources (Boxall et al. [2007] 2021).

As the external environment is the major source of key resources, its characteristics or dimensions may affect the availability of these resources. According to RDT, the three major dimensions of the external environment include (1) environmental munificence, (2) environmental dynamism, and (3) environmental complexity (Dess and Beard 1984).

Environmental munificence refers to the abundance of resources or the capacity of the environment to meet organizations' need for growth (Dess and Beard 1984). When key resources are plentiful, all organizations in the environment can easily access these resources, eliminating the need for strategic moves to secure them. In other words, when there is no labor shortage, hospitals do not need to make strategic or organizational changes to acquire labor.

Hospitals located in rural areas may experience a less munificent environment due to limited financial resources and limited availability of skilled healthcare personnel (Yeager et al. 2014). Research indicates that rural hospitals report a significant shortage of skilled labor, but these facilities may not have the financial resources to afford more expensive labor options (MacDowell et al. 2010; Winter et al. 2020). Due to prevailing financial challenges between 2010 and 2021, 136 rural hospitals closed, and numerous others remain in critical financial positions (American Hospital Association 2022a). Due to their financial constraints, rural hospitals are generally less likely to afford the cost of agency labor, even in the face of staffing shortages. Therefore, we hypothesize that the following:

Hypothesis 1. *Hospitals located in rural areas are less likely to utilize agency labor.*

Environmental dynamism refers to the extent to which changes in the environment are unpredictable and breed unexpected consequences. Therefore, a dynamic environment may lead to the depletion of resources, and as a result, organizations need to make quick strategic or organizational decisions to facilitate access to scarce resources. For instance, the unexpected COVID-19 pandemic created environmental turbulence that caused unforeseen shortages of resources such as nurses, medications, and personal protective equipment, among others.

A hospital's payer mix may fluctuate from commercial insurance to government insurance programs, such as Medicare and/or Medicaid patients (Definitive Healthcare 2024b). Heish and colleagues have argued that hospitals that are highly dependent on government insurance programs may experience uncertainty, especially as the government focuses on reducing healthcare spending (Hsieh et al. 2010). Faced with increased uncertainty, such hospitals may reduce their dependence on more expensive staffing options, including agency labor. Therefore, we hypothesize the following:

Hypothesis 2. *Higher dependence on public insurance programs (Medicare and Medicaid) is negatively associated with the use of agency labor.*

Environmental complexity is defined as the diversity of the activities, interactions, or transactions that organizations competing within the same industry need to perform

to stay competitive (Dess and Beard 1984). In this regard, environmental complexity can be resource-intensive because organizations need more resources to meet market demands and remain competitive. Higher competition increases the variety and frequency of challenges organizations must address, resulting in a more complex environment (Zinn et al. 1997). As a result, hospitals in more competitive markets are more likely to use more agency nurses to quickly adapt to the changing environmental demands, including staffing variations, without the long-term commitment of permanent hires. Therefore, we hypothesize the following:

Hypothesis 3. *Hospitals in more competitive markets are more likely to use agency labor.*

2.2. Data and Sample

The quantitative data for this study were from Definitive Healthcare, which compiles data from multiple public access databases pertaining to U.S. hospitals, such as the American Hospital Association (AHA) Annual Survey (hospital profile), Medicare Cost Reports (financial data), and the Hospital Value-Based Purchasing Program (quality data) (Definitive Healthcare 2024c). The original data set consisted of 3873 acute care hospitals in the U.S. All federal hospitals, including 172 Veterans Affairs, 26 Indian Health Service, and 31 Military Health System facilities, were excluded from our study sample due to a lack of numerous relevant data elements. We removed an additional 888 facilities because of significant data absence across the robust panel of control factors considered in our analysis. The final sample dataset encompassed 2756 hospital observations, or roughly 71.1% of the total active short-term acute care facility population in the U.S.

2.3. Dependent Variable

The dependent variable was agency labor, operationalized as total agency labor costs. In other words, it represented the total amount a hospital pays for agency services (versus services from full-time/part-time permanent employees) to provide direct patient care, which includes nursing, physician, laboratory, and diagnostic agency labor for the year 2022 (Definitive Healthcare 2024a).

2.4. Independent Variables of Interest

We selected several independent variables to operationalize RDT dimensions of environmental munificence, environmental dynamism, and environmental complexity. Environmental munificence was operationalized via the location of the hospital (rural: 1, urban: 0) (Shin et al. 2020). Environmental dynamism is associated with the extent to which changes in the environment are unpredictable and foster unexpected consequences. We operationalized this dimension of RDT via two variable factors, including (1) the percentage of the hospital payer mix attributed to Medicare patients (Medicare Days) and (2) the percentage of the hospital payer mix attributed to Medicaid patients (Medicaid Days). Finally, we operationalized environmental complexity via market concentration based on the Herfindahl–Hirschman Index (HHI) (Shin et al. 2020; Rhoades 1993). The HHI is a common measure of market concentration, and it is used to determine market competitiveness. Higher HHI values mean the market is less competitive and market power is held by few competitors. Lower HHI values mean the market is more competitive and several organizations compete within the same market. As such, market power is spread among competing organizations. Within our data, HHI summarizes the distribution of inpatient admissions within a core-based statistical area (CBSA) among inpatient facilities.

2.5. Controls

Several variables were included in this study as control variables to account for the variation in the agency labor utilization and expense associated with individual hospital and hospital market characteristics. Organization-level variables included whether the hospital was an academic medical center (No: 0, Yes: 1), whether the hospital was affiliated

with an accountable care organization designation (No: 0, Yes: 1), number of staffed beds, employees per staffed bed, aspects of hospital ownership (owned: 0, managed/leased: 1), sole community hospital status (No: 0, Yes: 1), government-operated (No: 0, Yes: 1), for-profit ownership (No: 0, Yes: 1), the average length of stay, and the case mix index (CMI). The CMI is a metric that reflects the severity and complexity of the health conditions of patients treated in the hospital setting, and it is used by CMS to determine hospital reimbursement rates for Medicare and Medicaid patients (US Department of Health and Human Services 2024).

Because a hospital's financial strength may affect its staffing decisions, and to gain some perspective on each hospital's service levels, we assessed the level of uncompensated care (in millions), and we explored several organizational financial factors from the prior year (2021), including net patient revenue (NPR) per bed (in millions), net operating profit margin (percentage), net income margin (percentage), and the labor compensation ratio. The practice of replacing an explanatory variable with its lagged value to counteract endogeneity is prevalent across a wide variety of disciplines in Economics and Finance (Beauvais et al. 2019; Stiebale 2011; Buch et al. 2013).

We further considered two quality measures as control variables, the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Summary Star rating, and the Hospital Value-Based Purchasing (HVBP) Total Performance Score for 2021. The HCAHPS survey is a national standardized survey for assessing discharged patients' perspectives on the quality of their hospital care (Centers for Medicare and Medicaid Service 2023; Centers for Medicare and Medicaid Services 2024b). Results from the HCAHPS survey are publicly available on the Centers for Medicare and Medicaid Hospital Compare website. The high visibility of the HCAHPS scores establishes accountability for hospitals on healthcare quality, which provides an incentive for hospitals to improve their patient care (Press Ganey 2022).

The Patient Protection and Affordable Care Act (PPACA) of 2010 included quality measures for Value-Based Purchasing (VBP), which increases or reduces a hospitals' reimbursements based on the quality of their inpatient healthcare services (CMS 2024). One VBP measure is the Total Performance Score, calculated from 4 domains (1) the clinical outcomes domain, (2) the person and community engagement domain, (3) the safety domain, and (4) the efficiency and cost reduction domain (CMS 2024). For example, hospitals are rated for mortality and complications, healthcare-associated infections, patient safety, patient experience, efficiency, and cost reduction (CMS 2024).

Lastly, we also included each hospital's geographic region in the United States. The geographic region is defined by the AHA (Regions 1–9), and it is included in the study to account for regional variations in resource availability that may be associated with agency labor resource usage. Region 1 (CT, ME, MA, NH, RI, VT) was the reference group for our analysis (American Hospital Association 2024a).

2.6. Analysis

We conducted descriptive statistics and logistic regressions. The Shapiro–Wilk normality tests for the dependent variable revealed non-normal distributions ($p < 0.001$). Due to this skewness, the dependent variable distribution was shifted with min-max scaling, and a natural log transformation was attempted, but still yielded non-normal distribution (Shapiro-Wilk; $p < 0.001$). With this result, we opted to dichotomize the dependent variable at the 75th and 90th percentiles of agency labor expense. We chose these thresholds as they represent significant cutoffs for identifying hospitals with high utilization of agency labor. By focusing on these upper percentiles, we aimed to capture hospitals that face the most significant impact from their reliance on agency labor, allowing for a more targeted analysis.

Logistic regressions with listwise deletion were conducted with IBM (International Business Machines) SPSS (Statistical Package for Social Sciences) Statistics Package 28 (IBM Corp 2024). In each regression analysis, the null hypotheses pertaining to relationship between the independent variables and the dependent variable were rejected at an $\alpha = 0.05$.

Model fit was assessed using Nagelkerke pseudo-R^2. Multicollinearity was evaluated with the variance inflation factor (VIF), and all variables with a VIF under 5 were retained in the analysis.

3. Results

3.1. Primary Findings

The descriptive analysis of all the variables is available in Table 1. The mean level of agency labor expense in our sample was USD 13.24 million (SD = 19.24). Our sample comprised only 25% rural hospitals (SD = 0.44), and the highest proportion of hospitals studied are found in American Hospital Association (AHA) Regions 4 and 7 (16%; SD = 0.36 for each region). The mean level of Medicare days was 28% (SD = 0.11), the mean level of Medicaid days was 9% (SD = 0.09), and the average HHI was 0.34 (SD = 0.31).

Table 1. Descriptive Statistics.

	Min	Max	Mean	Std Dev
DEPENDENT VARIABLE				
Total Agency Labor (in millions)—2022	0.00	124.92	13.24	19.24
INDEPENDENT VARIABLES				
Munificence Factor				
Rural Geographic Location	0	1	0.25	0.44
Dynamism Factors				
Payor Mix: Medicare Days	0.10%	88.70%	0.28	0.11
Payor Mix: Medicaid Days	0.00%	99.80%	0.09	0.09
Complexity Factor				
Market Concentration Index	0	1	0.34	0.31
CONTROL VARIABLES				
Academic Medical Center	0	1	0.06	0.23
ACO Affiliations	0	1	0.63	0.48
Number of Staffed Beds—2021	1.00	1893.00	198.00	188.10
Employees Per Staffed Bed—2021	0.02	360.83	7.03	9.46
Managed/Leased/Owned	0	1	0.07	0.25
Sole Community Hospital	0	1	0.16	0.36
Government-Operated	0	1	0.14	0.35
For-Profit	0	1	0.22	0.42
Average Length of Stay—2021	0.50	6459.00	8.21	134.90
Case Mix Index	0.84	5.15	1.76	0.40
Uncompensated Care (in millions)—2021	0.00	716.66	24.89	50.04
Net Patient Revenue per Bed (in millions)—2021	0.10	100.69	1.81	2.31
Net Operating Profit Margin—2021	−499.60%	87.90%	−6.72%	26.48%
Net Income Margin—2021	−389.40%	88.10%	0.86%	20.23%
Labor Compensation Ratio—2021	4.60%	203.80%	46.27%	16.23%
HCAHPS Summary Star Rating—2021	0	1	0.31	0.46
HVBP Total Performance Score—2021	2.33	81.33	22.17	9.11
Region 1 (CT, ME, MA, NH, RI, VT)	0	1	0.06	0.33
Region 2 (NJ, NY, PA)	0	1	0.12	0.33
Region 3 (DE, KY, MD, NC, VA, WV, DC)	0	1	0.08	0.27
Region 4 (AL, FL, GA, MS, SC, TN, PR)	0	1	0.16	0.36
Region 5 (IL, MI, IN, OH, WI)	0	1	0.15	0.36
Region 6 (IA, KS, MN, MO, NE, ND, SD)	0	1	0.08	0.27
Region 7 (AR, LA, OK, TX)	0	1	0.16	0.36
Region 8 (AZ, CO, ID, MT, NM, UT, WY)	0	1	0.07	0.26
Region 9 (AK, CA, HI, NV, OR, WA)	0	1	0.12	0.32

Within our sample, 6% of the hospitals are Academic Medical Centers (SD = 0.23), 63% of our sample had at least one ACO affiliation (SD = 0.48), the mean number of staffed beds was 198 (SD = 188.10), the mean CMI was 1.76 (SD = 0.40), and 14% are government-

operated (SD = 0.35). Additional control variables shown in Table 1 indicate 22% of our sample was composed of hospitals that are for-profit (SD = 0.42), that the hospitals in the sample employed 7.03 FTEs per staffed bed (SD = 9.46), and that they expended 46% of net patient revenue on labor compensation (SD = 0.16).

Table 2 presents the logistic regression results for the agency labor analysis for the dependent variable of total agency labor in millions. Overall, our models generally indicated that our included variables explain 52.1% of the variation in agency labor expense at the 75th percentile and 54.9% of the variation at the 90th percentile.

In our first set of independent variables of interest pertaining to environmental munificence, we considered Hypothesis 1 to be generally supported because we observed that rural hospitals are 80.5% less likely to be in the 75th percentile of agency labor expenditure when compared to urban facilities (OR = 0.195, 95% CI = 0.119–0.321, $p < 0.001$) and 92.7% less likely to be in the 90th percentile (OR = 0.073, 95% CI = 0.020–0.265, $p < 0.001$).

Environmental dynamism was operationalized via two organizational factors, including (1) the percentage of Medicare Days and (2) the percentage of Medicaid Days. After a review of the outcomes of these variables, we perceived that Hypothesis 2 was partially supported because our results related to the percentage of Medicare Days indicated that for each percentage increase in Medicare Days, there was an associated 2.4% decrease in the likelihood of the hospital being in the 75th percentile of agency labor expense (OR = 0.98, 95% CI = 0.96–0.989, $p < 0.001$) and a 5.3% decrease in the likelihood that the hospital would be in the 90th percentile of agency labor expense (OR = 0.95, 95% CI = 0.93–0.97, $p < 0.001$). The results pertaining to the percentage of Medicaid Days were not significant.

Lastly, we considered that Hypothesis 3 was not supported, as we reviewed the results of measures associated with environmental complexity (HHI). Our results showed that for each full point increase in HHI, indicating that the market is less competitive, the hospital was 132.4% more likely to be in the top 75th percentile of agency labor expense (OR = 2.32, 95% CI = 1.41–3.83, $p < 0.001$).

3.2. Secondary Findings

The results pertaining to several of the control variables in our analysis are worth reviewing and discussing, as they may offer insights for healthcare leaders and those with an interest in agency labor utilization. For example, we observed that for each additional staff member, the likelihood of the hospital being in the 75th percentile for agency labor expense increased by 0.6% (OR = 1.006, 95% CI = 1.005–1.007, $p < 0.001$), and the likelihood of each bed being in the 90th percentile increased by 0.4% (OR = 1.004, 95% CI = 1.003–1.005, $p < 0.001$). This finding may indicate that hospitals resort to the utilization of agency labor to meet the increased need for labor as the number of staffed beds increases. We also noted that for each point increase in the hospital's case mix index, the likelihood of agency expense being in the 75th percentile increased by 164.9% (OR = 2.650, 95% CI = 1.744–4.025, $p < 0.001$), and the likelihood of being in the 90th percentile of expense increased by 378.8% (OR = 4.788, 95% CI = 2.541–9.023, $p < 0.001$). This may be because, as the complexity of patients' health conditions increases, hospitals may choose to utilize agency labor rather than hiring permanent staff, because the complexity of health conditions fluctuates, giving hospitals more flexibility in their use of labor. Lastly, we observed that for each percentage increase in prior-year labor compensation, the hospitals were 3.03% more likely to be in the 75th percentile (OR = 1.030, 95% CI = 1.017–1.044, $p < 0.001$) and 3.40% more likely to be in the 90th percentile (OR = 1.034, 95% CI = 1.016–1.052, $p < 0.001$). This could be because hospitals with a history of spending more on labor costs may continue to do so in order to meet staffing needs. In some instances, and in some locations, it may simply be too difficult to hire full-time staff and/or the agency staffing relationship may be firmly established, meaning that changing staffing sources would require significant changes in institutional operating procedures.

Table 2. Logistic Regression Results for Agency Labor Analysis.

Analysis of the Determinants of Agency Labor Utilization	Agency Labor Utilization 75th Percentile						Agency Labor Utilization 90th Percentile					
	Nagelkerke R^2 = 52.1% X^2 = 1194.11, df = 29, N = 2756, $p < 0.001$						Nagelkerke R^2 = 54.9% X^2 = 838.93, df = 29, N = 2756, $p < 0.001$					
	β	Exp(β) Odds Ratio	S.E.	95% CI for Exp(β)		Sig	β	Exp(β) Odds Ratio	S.E.	95% CI for Exp(β)		Sig
INDEPENDENT VARIABLES												
Munificence Factor												
Rural Geographic Location	−1.634	0.195	0.253	0.119	0.321	***	−2.612	0.073	0.656	0.020	0.265	***
Dynamism Factors												
ayor Mix: Medicare Days—2021	−0.025	0.976	0.007	0.963	0.989	***	−0.055	0.947	0.011	0.926	0.967	***
Payor Mix: Medicaid Days—2021	−0.002	0.998	0.008	0.983	1.013	–	−0.009	0.991	0.011	0.970	1.012	–
Complexity Factor												
Market Concentration Index	0.843	2.324	0.254	1.412	3.827	***	0.713	2.041	0.408	0.917	4.543	+
CONTROL VARIABLES												
Academic Medical Center	0.253	1.288	0.265	0.767	2.164	–	0.754	2.125	0.268	1.257	3.591	**
ACO Affiliations	0.149	1.160	0.131	0.897	1.500	–	−0.341	0.711	0.194	0.486	1.039	+
Number of Staffed Beds—2021	0.006	1.006	0.001	1.005	1.007	***	0.004	1.004	0.001	1.003	1.005	***
Employees Per Staffed Bed—2021	−0.017	0.983	0.028	0.931	1.037	–	−0.095	0.910	0.037	0.846	0.978	**
Managed/Leased/Owned	−0.077	0.926	0.298	0.517	1.661	–	−0.955	0.385	0.653	0.107	1.384	–
Sole Community Hospital	0.712	2.039	0.252	1.245	3.340	**	0.677	1.969	0.408	0.885	4.377	+
Government-Operated	−0.097	0.908	0.201	0.612	1.347	–	0.349	1.417	0.255	0.860	2.335	–
For-Profit	−1.480	0.228	0.200	0.154	0.337	***	−2.523	0.080	0.504	0.030	0.215	***
Average Length of Stay—2021	−0.001	0.999	0.004	0.991	1.008	–	−0.006	0.994	0.030	0.937	1.053	–
Case Mix Index	0.974	2.650	0.213	1.744	4.025	***	1.566	4.788	0.323	2.541	9.023	***
Uncompensated Care (in millions)—2021	0.006	1.006	0.002	1.002	1.010	**	0.005	1.005	0.002	1.002	1.008	**
Net Patient Revenue per Bed (in millions)—2021	0.070	1.073	0.063	0.949	1.213	–	0.252	1.286	0.082	1.095	1.510	**
Net Operating Profit Margin—2021	0.009	1.009	0.004	1.000	1.017	*	0.006	1.006	0.005	0.996	1.017	–
Net Income Margin—2021	−0.004	0.996	0.004	0.988	1.003	–	−0.005	0.995	0.006	0.982	1.007	–
Labor Compensation Ratio—2021	0.030	1.030	0.007	1.017	1.044	***	0.033	1.034	0.009	1.016	1.052	***
HCAHPS Summary Star Rating—2021	−0.177	0.838	0.154	0.619	1.133	–	−0.568	0.567	0.249	0.348	0.923	*
HVBP Total Performance Score—2021	−0.022	0.978	0.008	0.964	0.993	**	−0.019	0.981	0.012	0.959	1.004	–
Region 2 (NJ, NY, PA)	−1.056	0.348	0.281	0.200	0.604	***	−1.732	0.177	0.439	0.075	0.419	***
Region 3 (DE, KY, MD, NC, VA, WV, DC)	0.272	1.313	0.311	0.713	2.416	–	−0.191	0.826	0.463	0.333	2.047	–
Region 4 (AL, FL, GA, MS, SC, TN, PR)	−0.934	0.393	0.290	0.222	0.693	***	−0.972	0.378	0.432	0.162	0.883	*
Region 5 (IL, MI, IN, OH, WI)	−0.859	0.424	0.277	0.246	0.730	**	−1.454	0.234	0.442	0.098	0.555	***
Region 6 (IA, KS, MN, MO, NE, ND, SD)	−0.536	0.585	0.314	0.316	1.082	+	−1.069	0.343	0.484	0.133	0.887	*
Region 7 (AR, LA, OK, TX)	−1.266	0.282	0.306	0.155	0.514	***	−2.101	0.122	0.501	0.046	0.326	***
Region 8 (AZ, CO, ID, MT, NM, UT, WY)	−0.677	0.508	0.328	0.267	0.967	*	−0.902	0.406	0.495	0.154	1.071	+
Region 9 (AK, CA, HI, NV, OR, WA)	0.430	1.537	0.276	0.895	2.640	–	−0.123	0.884	0.412	0.395	1.980	–

Note: + $p < 0.1$, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; Region 1 is the referent region for analysis purposes.

In contrast, we observed that for-profit hospitals are 77.2% less likely to be in the 75th percentile of agency labor expense (OR = 0.228, 95% CI = 0.154–0.337, $p < 0.001$) and 92% less likely to be in the 90th percentile (OR = 0.08, 95% CI = 0.030–0.215, $p < 0.001$) when compared with their not-for-profit counterparts. This may be a result of for-profit hospitals maintaining more stringent control of expenses to achieve and sustain profitability to meet investors' expectations. Compared with not-for-profit hospitals, they may be less likely to hire agency staff, who are more expensive than permanent staff. We also noted that for each point increase in the Hospital Value-Based Purchasing Total Performance Score in the prior reporting period, the likelihood of the hospital being in the 75th percentile decreased by 3.03% (OR = 0.978, 95% CI = 0.964–0.993, $p < 0.01$). This finding is supported by Beauvais at al. 2024, who found a negative relationship between the use of agency labor and quality of care. Therefore, hospitals may prefer to hire permanent staff if they want to increase or maintain healthcare quality (Beauvais et al. 2023).

4. Discussion

Using principles from the RDT, the primary purpose of this study was to investigate the association of organizational and market factors with agency labor utilization in hospitals. To our knowledge, this is the first study to explore the organizational and market determinants of agency labor for a large sample of US hospitals. Our results suggest the multifaceted impact of several factors on agency staff utilization.

As expected, our study indicated that hospitals in rural areas were less likely to utilize high levels of agency labor (Hypothesis 1). Our results also suggested that the uncertainty associated with government insurance programs (the percentage of the Medicare/Medicaid payer mix) was negatively associated with the likelihood of higher levels of agency labor (Hypothesis 2). However, contrary to our expectations, market concentration (HHI) was negatively associated with agency labor utilization.

Regarding our first hypothesis, related to environmental munificence and rural hospitals, we recognize that these facilities face a conundrum. On one hand, they are more likely to be financially distressed compared to their urban counterparts, but on the other hand, they also face acute staffing shortages (MacDowell et al. 2010). Based on our results, it appears that, on average, their financial limitations preclude them from relying on contractual labor to address staffing gaps. Given that agency labor is considerably more expensive than regular FTE staffing, it may appear to be a financially prudent choice to avoid it. However, if rural hospitals are unable to hire regular staff to fill existing gaps, this approach can lead to overworked regular staff, decreased quality of care, and, ultimately, higher costs associated with poor patient outcomes and higher staff turnover (Winter et al. 2020). Consequently, we suggest that rural hospital leaders carefully examine proven recruitment and retention strategies that have been shown to be effective in rural settings (RHI Hub 2024; Hines et al. 2020). For example, rural hospital leaders may be able to increase FTE retention via advancing innovative staffing solutions like weekend shifts, employee self-scheduling, and flexible employee scheduling (Dawson et al. 2014; Preston 2023). To improve the employee experience, they could offer meal tickets, free snacks, gym membership discounts, and uniform stipends (Indeed 2024). Rural hospitals may also consider aggressive recruitment strategies, such as offering benefits like signing bonuses, relocation assistance, retention bonuses, college loan repayment, competitive salaries, college tuition reimbursement for students from the local area, overtime pay, reimbursement of license certification classes, and payment of license renewal fees (Dawson et al. 2014; Preston 2023; Indeed 2024; Nurse Retention Strategies: How to Combat Nurse Turnover 2023; Bland 2019). Onboarding programs for new hires, active mentorship sessions, and advancement opportunities (e.g., nurse practitioner certifications) for current employees have all been cited as leading practices (Dawson et al. 2014; American Organization of Nursing Leadership 2024; Schroyer et al. 2016; De Vries et al. 2023). Hospital recruiters might also consider engaging educators on college healthcare programs (nursing, medical school, PT, etc.) and offer to provide clinical internships and residencies or onsite training

for entry-level positions (Arora et al. 2017; Tseng et al. 2013). Current employees could be offered stipends for referring clinical workers to their human resource departments (Indeed 2024).

Rural hospitals may wish to seek government financial support and guidance to address these challenges. There are some options for small rural hospitals in financial distress, including the formation of Accountable Care Organizations and applications for HHS federal grants. Alternatively, rural hospital leaders can request designation as a Rural Emergency Hospital, which qualifies hospitals for federal assistance (Centers for Medicare and Medicaid Services 2024a). Several other federal and state measures are also offered to assist rural hospitals in need of support, including monetary grants and other forms of in-kind and administrative support (Kemp 2024; Miller 2024; Abbott 2024; American Hospital Association 2024b). As an example, CMS will assist rural hospitals to automate and/or establish telehealth programs by providing infrastructure funding, as well as technical assistance and guidance (Bland 2019). Establishing a robust telehealth disease-monitoring system could improve patient outcomes via chronic disease monitoring, reduce the number of office visits, and provide opportunities for healthcare workers to work remotely. Rural healthcare administrators interested in these and other opportunities should contact the CDC's Office of Rural Health, which addresses rural health workforce needs (US Department of Health and Human Services 2023).

With respect to our second hypothesis, related to environmental dynamism and government third-party-payer programs, our study's results indicate that hospitals that rely more on programs such as Medicare are less likely to rely on agency labor. Medicare and Medicaid payments are often lower than those of private insurance companies, yet they provide a growing proportion of hospital payor mixes. Therefore, any fluctuations in these programs will significantly affect hospitals' long-term financial viability. Hospitals overly reliant on Medicare/Medicaid may struggle to adequately address short-term staffing gaps with expensive agency labor, leading to potential financial distress, increased strain on existing staff, and declining healthcare quality (Beauvais and Wells 2006; Akinleye et al. 2019). A more certain government reimbursement environment coupled with investments in long-term permanent staffing may be required to ensure that the patient care needs of aging and socioeconomically challenged populations are fully met (Bland 2019).

With respect to our third hypothesis, pertaining to environmental complexity, future research should examine why hospitals in less competitive markets (higher HHI) rely on higher levels of agency labor. First, it is possible that in less competitive markets, the available labor pool of skilled healthcare workers is not as abundant, or it may be more difficult to attract full time workers into an environment where the potential for labor market competition is not as robust. Second, hospitals located in less competitive markets may not face the same imperatives of cost control found in more competitive markets. As a result, such hospitals may be more willing to pay the higher costs associated with agency labor, especially if there is uncertainty associated with their patient census. Finally, the lack of competition may reduce the urgency of investing in long-term staffing solutions, with agency labor appearing as an attractive, quick-fix solution. However, while the overt reliance on agency labor addresses immediate staffing needs, it can lead to higher overall costs and lower quality (Beauvais et al. 2023). Nevertheless, our conjectures on this aspect of the study are sufficient to warrant further research in the future.

Practical Implications

The use of agency labor to augment the capabilities of the skilled workforce is neither new nor unique to the healthcare industry. Labor shortages have always been a concern, and temporary staff are an expedient remedy to implement as circumstances dictate. The availability of healthcare services and hospitals' ability to respond to patients' needs depends on the available labor force. When skilled labor is unavailable or outpaced by local market demand for patient care services, the hiring of agency labor becomes a necessity. With the hiring of agency staff, clinical congestion may be relieved and the waiting times

for access to healthcare services may be significantly reduced. However, in recent years, the use of agency workers has reached a point where many hospital and health systems leaders are finding it financially untenable.

Our research findings may assist health policy and hospital leaders to better identify the organizations that may be the highest consumers of agency labor. This may offer insights and offer useful support in improving clinical staff education, labor force growth initiatives, and health policy developers' reimbursement modeling. Furthermore, for agency labor staffing firms, these results may be useful in clarifying which types of hospitals—defined both geographically and by structural capability—are to be the most likely consumers of agency labor.

5. Limitations and Recommendations for Future Research

As with all research, this study had some limitations. First, this study analyzed Definitive Healthcare data from a single calendar year (2022), with lagged independent and control variables (2021) to address endogeneity and reverse causality. Future research, using several years of data, or a more complete or more comprehensive data set, could provide new insights into the hypothesized relationships in this study.

Second, there may be other factors affecting agency labor utilization that were not included in this study due to data limitations. Future studies should consider incorporating variables such as the service mix, patient demographics, the age of the workforce, ages of hospitals, workplace culture, and clinical staff composition, which may reveal new variations in the use of agency labor within hospital settings (Beauvais et al. 2023).

Third, there are potential limitations because 75% of our hospitals were in non-rural areas, most were in AHA Regions 4 and 7 (32% total), and there were only 9% Medicaid days and 28% Medicare days. Future researchers might consider gaining access to a broader sample of short-term acute care hospitals, and they may gain additional insights into the nuances of the determinants of the utilization of agency labor,

Fourth, there could have been interactions between the predictors that were not considered in this study, which could be made a facet of future research efforts. Finally, while a cross-sectional study can identify associations between factors and hospital agency labor utilization, it cannot establish causality. Future studies could review the studied relationship on a longitudinal basis.

6. Conclusions

Persistent healthcare staffing shortages have driven US hospitals to hire hospital agency labor for patient care (American Hospital Association 2022c). Given the high cost of agency labor, this use of agency staff significantly reduces hospitals' profit margins, threatening the economic stability of hospitals, and it may negatively impact the quality of care. The relevant research on the effects of the market and organizational determinants of agency labor use in U.S. hospitals is scarce, creating a knowledge gap. Our study utilized a national sample of U.S. hospitals to explore the determinants of hospital agency labor utilization. Our results appear to support the Resource Dependency Theory and indicate that factors associated with environmental munificence (rural versus urban settings) and environmental dynamism (Medicare-dominated payer mix) are associated with decreased use of agency labor, as measured by agency labor expense. In contrast, the factor linked to environmental complexity (HHI index) was associated with a higher level of agency labor use. These findings may provide guidance for healthcare leaders that emphasize the importance of understanding the determinants of agency labor use to fuel strategic planning for optimal hospital organizational efficacy and financial health.

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Institutional Review Board Statement: Prior research of this type has been reviewed by the Texas State University Research Integrity and Compliance (RIC). According to the provisions in 45 CFR § 46.102 pertaining to "human subject" research, the RIC has previously determined that studies of this type must exclusively involve the examination of data originally collected and created by Definitive Healthcare, which provides data that are anonymous and publicly available. Therefore, the RIC has concluded that this type of research does not use human subjects and is not regulated by the provisions in 45 CFR § 46.102. Consequently, an IRB review of this study was not required.

Informed Consent Statement: Not applicable.

Data Availability Statement: All analyses were conducted in SPSS, Version 28, and all tables were constructed in Microsoft Excel 365. Source data for the study are drawn from publicly available databases and consolidated for the purposes of this study.

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References

Abbott, Greg. 2024. Governor Abbott Announces $17 Million Grant for Rural Hospitals. Available online: https://gov.texas.gov/news/post/governor-abbott-announces-17-million-grant-for-rural-hospitals (accessed on 24 June 2024).

Akinleye, Dean D., Louise-Anne McNutt, Victoria Lazariu, and Colleen C. McLaughlin. 2019. Correlation between hospital finances and quality and safety of patient care. *PLoS ONE* 14: e0219124. [CrossRef] [PubMed]

American Hospital Association. 2022a. AHA Report: Rural Hospital Closures Threaten Patient Access to Care. Available online: https://www.aha.org/news/headline/2022-09-08-aha-report-rural-hospital-closures-threaten-patient-access-care (accessed on 20 June 2024).

American Hospital Association. 2022b. Data Brief: Workforce Issues Remain at the Forefront of Pandemic-Related Challenges for Hospitals. Available online: https://www.aha.org/issue-brief/2022-01-25-data-brief-workforce-issues-remain-forefront-pandemic-related-challenges (accessed on 20 June 2024).

American Hospital Association. 2022c. Massive Growth in Expenses and Rising Inflation Fuel Continued Financial Challenges for America's Hospitals and Health Systems. Available online: https://www.aha.org/guidesreports/2023-04-20-2022-costs-caring (accessed on 20 June 2024).

American Hospital Association. 2024a. American Hospital Association Regions. Available online: https://trustees.aha.org/system/files/media/file/2020/12/American%20Hospital%20Association%20Regions.pdf (accessed on 20 June 2024).

American Hospital Association. 2024b. Rural Grants. Available online: https://www.aha.org/rural-grants (accessed on 24 June 2024).

American Organization of Nursing Leadership. 2024. Nursing Leadership Workforce Compendium. Available online: https://www.aonl.org/system/files/media/file/2023/08/AONL_WorkforceCompendium.pdf (accessed on 24 June 2024).

Arora, Rajin, Parinya Chamnan, Achara Nitiapinyasakul, and Suwat Lertsukprasert. 2017. Retention of doctors in rural health services in Thailand: Impact of a national collaborative approach. *Rural and Remote Health* 17: 1–10. [CrossRef] [PubMed]

Arredondo, Kelley, Hilary N. Touchett, Sundas Khan, Matthew Vincenti, and Bradley V. Watts. 2023. Current programs and incentives to overcome rural physician shortages in the United States: A narrative review. *Journal of General Internal Medicine* 38(S3): 916–22.

Beauvais, Bradley, and Rebecca Wells. 2006. Does money really matter? A review of the literature on the relationships between healthcare organization finances and quality. *Hospital Topics* 84: 20–29. [CrossRef] [PubMed]

Beauvais, Bradley, Clemens Scott Kruse, Zo Ramamonjiarivelo, Rohit Pradhan, Keya Sen, and Lawrence Fulton. 2023. An exploratory analysis of the association between hospital labor costs and the quality of care. *Risk Management and Healthcare Policy* 16: 1075–91. [CrossRef]

Beauvais, Bradley, Jason P. Richter, and Forrest S. Kim. 2019. Doing well by doing good: Evaluating the influence of patient safety performance on hospital financial outcomes. *Health Care Management Review* 44: 2–9. [CrossRef]

Beauvais, Bradley, Rohit Pradhan, Zo Ramamonjiarivelo, Michael Mileski, and Ramalingam Shanmugam. 2024. When Agency Fails: An Analysis of the Association Between Hospital Agency Staffing and Quality Outcomes. *Risk Management and Healthcare Policy* 17: 1361–72. [CrossRef]

Bland, Denise. 2019. 20 Strategies for Rural Hospitals to Attract and Retain Staff. Available online: https://www.clinicallab.com/20-strategies-for-rural-hospitals-to-attract-and-retain-staff-350 (accessed on 24 June 2024).

Blegen, Mary A., Thomas Vaughn, and Carol P. Vojir. 2008. Nurse staffing levels: Impact of organizational characteristics and registered nurse supply. *Health Services Research* 43: 154–73. [CrossRef]

Boxall, Peter F., John Purcell, and Patrick W. Wright, eds. 2021. *The Oxford Handbook of Human Resource Management*. Oxford: Oxford University Press. First published 2007.
Buch, Claudia M., Catherine T. Koch, and Michael Koetter. 2013. Do banks benefit from internationalization? Revisiting the market power–risk nexus. *Review of Finance* 17: 1401–35. [CrossRef]
Centers for Medicare and Medicaid Service. 2023. HCAHPS: Patients' Perspectives of Care Survey. Available online: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalHCAHPS (accessed on 29 May 2024).
Centers for Medicare and Medicaid Services. 2024a. Rural Emergency Hospitals. Available online: https://www.cms.gov/medicare/health-safety-standards/guidance-for-laws-regulations/hospitals/rural-emergency-hospitals (accessed on 24 June 2024).
Centers for Medicare and Medicaid Services. 2024b. Survey of Patients' Experiences (HCAHPS). Available online: https://data.cms.gov/provider-data/topics/hospitals/hcahps/ (accessed on 29 May 2024).
CMS. 2024. Hospital Value-Based Purchasing. Available online: https://www.cms.gov/medicare/quality/value-based-programs/hospital-purchasing (accessed on 29 May 2024).
Dall'Ora, Chiara, Antonello Maruotti, and Peter Griffiths. 2020. Temporary staffing and patient death in acute care hospitals: A retrospective longitudinal study. *Journal of Nursing Scholarship* 52: 210–16. [CrossRef]
Dawson, Angela J., Helen Stasa, Michael A. Roche, Caroline S. Homer, and Christine Duffield. 2014. Nursing churn and turnover in Australian hospitals: Nurses perceptions and suggestions for supportive strategies. *BMC Nursing* 13: 11. [CrossRef]
De Vries, Neeltje, Olivia Lavreysen, Anke Boone, José Bouman, Szymon Szemik, Kamil Baranski, Lode Godderis, and Peter De Winter. 2023. Retaining healthcare workers: A systematic review of strategies for sustaining power in the workplace. *Healthcare* 11: 1887. [CrossRef]
Definitive Healthcare. 2024a. Average Contract Labor Expenses at U.S. Hospitals. Available online: https://www.definitivehc.com/resources/healthcare-insights/average-contract-labor-spend-us-hospital (accessed on 29 May 2024).
Definitive Healthcare. 2024b. Breaking Down U.S. Hospital Payor Mixes. Available online: https://www.definitivehc.com/resources/healthcare-insights/breaking-down-us-hospital-payor-mixes (accessed on 20 June 2024).
Definitive Healthcare. 2024c. Hospital View. Available online: https://www.definitivehc.com (accessed on 15 May 2024).
Dess, Gregory G., and Donald W. Beard. 1984. Dimensions of organizational task environments. *Administrative Science Quarterly* 29: 52–73. [CrossRef]
Ferguson, Alice, Alison Bradywood, Barbara Williams, and C. Craig Blackmore. 2020. Association of use of contract nurses with hospitalized patient pressure injuries and falls. *Journal of Nursing Scholarship* 52: 527–35. [CrossRef] [PubMed]
Gibbons Advisors. 2023. Record Bankruptcy Filings in the Healthcare Sector in 2023. Available online: https://gibbinsadvisors.com/record-bankruptcy-filings-in-the-healthcare-sector-in-2023/ (accessed on 20 June 2024).
Halter, Mary, Olga Boiko, Ferruccio Pelone, Carole Beighton, Ruth Harris, Julia Gale, Stephen Gourlay, and Vari Drennan. 2017. The determinants and consequences of adult nursing staff turnover: A systematic review of systematic reviews. *BMC Health Services Research* 17: 824. [CrossRef]
Hines, Sonia, John Wakerman, Timothy A. Carey, Deborah Russell, and John Humphreys. 2020. Retention strategies and interventions for health workers in rural and remote areas: A systematic review protocol. *JBI Evidence Synthesis* 18: 87–96. [CrossRef]
Hsieh, Hui-Min, Dolores G. Clement, and Gloria J. Bazzoli. 2010. Impacts of market and organizational characteristics on hospital efficiency and uncompensated care. *Health Care Management Review* 35: 77–87. [CrossRef]
IBM Corp. 2024. *IBM SPSS Statistics for Windows (Version 28.0) [Computer Software]*. Armonk: IBM Corp.
Indeed. 2024. Top 30 Most Commonly Offered Employee Benefits. Available online: https://www.indeed.com/hire/c/info/most-commonly-offered-employee-benefits?gad_source=1&gclid=EAIaIQobChMIwNnFg8L0hgMV6SCzAB2ahgGqEAAYAiAAEgISwfD_BwE&hl=en&aceid=&gclsrc=aw.ds (accessed on 24 June 2024).
Kaufman Hall. 2022. The Financial Effects of Hospital Workforce Dislocation. Available online: https://www.kaufmanhall.com/sites/default/files/2022-05/KH-NHFR-Special-Report-2.pdf (accessed on 24 June 2024).
Kemp, Brian. 2024. Gov Kemp Announces $6 Million in Grants for 13 Rural Hospitals. Available online: https://gov.georgia.gov/press-releases/2024-06-18/gov-kemp-announces-6-million-grants-13-rural-hospitals (accessed on 24 June 2024).
MacDowell, Martin, Michael Glasser, Mike Fitts, Kimberly Nielsen, and Matthew Hunsaker. 2010. A national view of rural health workforce issues in the USA. *Rural and Remote Health* 10: 1531. [CrossRef] [PubMed]
Martin, Brendan, Nicole Kaminski-Ozturk, Charlie O'Hara, and Richard Smiley. 2023. Examining the impact of the COVID-19 pandemic on burnout and stress among US nurses. *Journal of Nursing Regulation* 14: 4–12. [CrossRef]
Miller, Sid. 2024. Program Overview. Available online: https://texasagriculture.gov/Grants-Services/Rural-Economic-Development/State-Office-of-Rural-Health/Rural-Health-Programs (accessed on 24 June 2024).
Nienhüser, Werner. 2008. Resource dependence theory-how well does it explain behavior of organizations? *Management Revue* 19: 9–32. [CrossRef]
Nurse Retention Strategies: How to Combat Nurse Turnover. 2023. Available online: https://www.nursingworld.org/content-hub/resources/nursing-leadership/nurse-retention-strategies/ (accessed on 25 June 2024).
Payerchin, Richard. 2024. Health Care Bankruptcies in 2023 Reach Highest Level in Five Years. Available online: https://www.medicaleconomics.com/view/health-care-bankruptcies-in-2023-reach-highest-level-in-five-years (accessed on 20 June 2024).

Pfeffer, Jeffrey, and Gerald Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper and Row.
Popowitz, Ethan. 2023. Addressing the Healthcare Staffing Shortage. Available online: https://www.definitivehc.com/sites/default/files/resources/pdfs/Addressing-the-healthcare-staffing-shortage-2023.pdf (accessed on 20 June 2024).
Press Ganey. 2022. HCAHPS 101: What HCAHPS Surveys Mean for Hospitals. Available online: https://info.pressganey.com/press-ganey-blog-healthcare-experience-insights/hcahps-101-what-hcahps-surveys-mean-for-hospitals (accessed on 24 June 2024).
Preston, Rob. 2023. 7 Strategies for Improving Healthcare Workforce Retention. Available online: https://www.oracle.com/human-capital-management/healthcare-workforce-retention/ (accessed on 24 June 2024).
RHI Hub. 2024. Recruitment and Retention Strategies for Rural Health Facilities. Available online: https://www.ruralhealthinfo.org/topics/rural-health-recruitment-retention (accessed on 24 June 2024).
Rhoades, Stephen A. 1993. The herfindahl-hirschman index. *Fed. Res. Bull.* 79: 188.
Schroyer, Coreena C., Rebecca Zellers, and Sam Abraham. 2016. Increasing registered nurse retention using mentors in critical care services. *The Health Care Manager* 35: 251–65. [CrossRef] [PubMed]
Shin, Dong Yeong, Robert Weech-Maldonado, and Jongwha Chang. 2020. The impact of market conditions on RN staffing in hospitals: Using resource dependence theory and information uncertainty perspective. *Risk Management and Healthcare Policy* 13: 2103–14. [CrossRef] [PubMed]
Stiebale, Joel. 2011. Do financial constraints matter for foreign market entry? A firm-level examination. *The World Economy* 34: 123–53. [CrossRef]
Syntellis Corporation. 2023. Hospital Vitals: Finacial and Operational Trends. Available online: https://www.syntellis.com/resources/report/hospital-vitals-financial-and-operational-trends-0 (accessed on 20 June 2024).
Tseng, Chien-Ning, Chia-Ju Hsieh, Kee-Hsin Chen, and Meei-Fang Lou. 2013. Comparative study of an externship program versus a corporate-academic cooperation program for enhancing nursing competence of graduating students. *BMC Medical Education* 13: 108. [CrossRef]
US Bureau of Labor Statistics. 2024. Occupational Outlook Handbook. Available online: https://www.bls.gov/ooh/ (accessed on 20 June 2024).
US Department of Health and Human Services. 2023. Biden-Harris Administration Actions on Rural Health. Available online: https://www.hhs.gov/about/news/2023/11/03/department-health-human-services-actions-support-rural-america-rural-health-care-providers.html (accessed on 24 June 2024).
US Department of Health and Human Services. 2024. Case Mix Index. Available online: https://healthdata.gov/State/Case-Mix-Index/gi5x-y67j/data (accessed on 20 June 2024).
Winter, Vera, Jonas Schreyögg, and Andrea Thiel. 2020. Hospital staff shortages: Environmental and organizational determinants and implications for patient satisfaction. *Health Policy* 124: 380–88. [CrossRef]
Yeager, Valerie A., Nir Menachemi, Grant T. Savage, Peter M. Ginter, Bisakha P. Sen, and Leslie M. Beitsch. 2014. Using resource dependency theory to measure the environment in health care organizational studies: A systematic review of the literature. *Health Care Management Review* 39: 50–65. [CrossRef]
Zinn, Jacqueline S., Jose Proenca, and Michael D. Rosko. 1997. Organizational and environmental factors in hospital alliance membership and contract management: A resource-dependence perspective. *Journal of Healthcare Management* 42: 67–86.