

# Regional Market Factors and Patient Experience in Primary Care

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Hospitals must balance a trade-off between access to care and quality of care when holding cost constant, a dilemma described by Kissick in 1994<sup>1</sup> and often referred to as the “iron triangle” of health care. When patients’ demand for care increases, hospitals are pressured to provide more services while maintaining reasonable patient waiting time. However, when health care providers are pressured to do more with the same resources (ie, time and staff), quality of care typically will decrease.<sup>2</sup> In this paper, we examine factors that affect patients’ demand for care, especially at resource-constrained safety net hospitals that serve patients who are less affluent and rely on public health services. Our aim is to evaluate how a shift in these demand factors affects quality of care.

We focus on quality metrics that reflect stressed and time-constrained health care providers: patient-provider communication questions in patient experience surveys.<sup>3,4</sup> Patient experience measures are used to rate hospitals in Medicare Hospital Compare and other programs that often employ financial incentives, such as value-based payment programs.<sup>5</sup> Although patient-provider communication accounts for a small section of the overall survey, it constitutes an essential component of patient experience. Previous research has demonstrated that strong verbal and nonverbal communication between a physician and a patient is associated with overall satisfaction and favorable patient behaviors such as adherence to medical regimens and cancer screenings.<sup>4,6</sup> Safety net hospitals are more likely to receive lower quality of care scores, including patient experience measures, and incur greater financial penalties compared with non-safety net hospitals even after patient-level risk adjustments are applied.<sup>7,8</sup> Perhaps factors outside the control of hospital managers contribute to lower quality at these safety net hospitals. If such factors increase demand for care at safety net hospitals and negatively affect hospital quality measures, they could be considered risk factors, like patient health status, and incentives could be adjusted accordingly.

The Veterans Health Administration (VHA) is a safety net hospital network for veterans that serves a population that is disproportionately older, male, less affluent, and in poor health.<sup>9</sup> VHA has a fixed budget and its hospitals are understaffed, especially in primary care

## ABSTRACT

**OBJECTIVES:** To evaluate the association between regional market factors and experience with patient-provider communication in primary care services of safety net hospitals.

**STUDY DESIGN:** A retrospective cohort study with 933,407 patient experience survey respondents from 128 Veterans Health Administration (VHA) hospitals between fiscal years 2013 and 2016.

**METHODS:** Patient responses on 5 patient-provider communication questions were used to evaluate quality of care. Six regional market factors were used to characterize veterans’ health care insurance coverage and affluence. A logistic regression was used to examine changes in individual-level patient-provider communication experience when regional market factors increase or decrease the demand for VHA primary care services.

**RESULTS:** Our findings supported our hypothesis that changes in regional market factors shift patient demand for VHA care and affect patient-provider communication measured by patient experience surveys. The adjusted odds ratio (AOR) of positive patient-provider communication was associated with a regional increase (first to third quartile) of employer-sponsored insurance (AOR, 1.028; 95% CI, 1.001-1.055) and a decrease (third to first quartile) in the veterans’ unemployment rate (AOR, 0.966; 95% CI, 0.944-0.990). Higher primary care capacity (first to third quartile) was also associated with positive patient-provider communication (AOR, 1.050; 95% CI, 1.018-1.082).

**CONCLUSIONS:** Findings from this study raise concerns that safety net hospitals could be unfairly penalized by value-based payment programs and Medicare Hospital Compare. Such policies and programs could improve resource allocation by accounting for regional market factors before acting on quality of care measures.

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services.<sup>10</sup> Hanchate and colleagues<sup>11</sup> found an increase in VHA utilization when regional market factors pointed to a decrease in health care insurance coverage and affluence in the community. We also know from other VHA studies that older patients who qualify for Medicare use less VHA care and higher-income veterans use more private-sector care.<sup>9,12-14</sup>

Building from prior literature and economic theory, we hypothesize that changes in regional market factors can shift demand for care at VHA and affect quality of care measures, specifically those that reflect patient-provider communication. Demand for care at VHA hospitals can be expected to increase following downturns in regional or broader economic factors that negatively affect health care insurance coverage and the financial status of veterans. Because resource-constrained VHA hospitals cannot readily add providers (in a short time frame) and hospital managers will worry about increasing waiting times (ie, access), existing providers will come under pressure to increase their productivity. Ultimately, stressed and time-pressured providers will spend less time with patients, leading to degradation in patient experience, particularly communication with a provider.<sup>15-17</sup>

To explore the relationship between changes in regional market factors and patient-provider communication, we capitalized on our access to data from VHA primary care outpatient patient experience surveys. We linked these surveys with publicly available market data. The implications of our findings extend beyond VHA hospitals, as patient demand for care at private safety net hospitals may also be affected by the regional economy. Accordingly, it is important to understand whether and to what degree shifts in regional economic conditions affect patients' quality of care.

## METHODS

### Data Sources

Our data collection period ranged between fiscal years (FYs) 2013 and 2016. VHA hospital-level data were compiled from 128 hospitals across the United States. VHA's workforce and nurse database provides physician full-time equivalent (FTE) values, registered nurse tenure, and registered nurse quit rate. VHA enrollment files indicate veterans' assignments to VHA hospitals. County- and state-level regional market variables were extracted from various public data sources: employer-sponsored insurance (ESI; from the Medical Expenditure Panel Survey), health insurance coverage of working-age (between 16 and 64 years) males (Small Area Income and Poverty Estimates), household median income (American Community Survey [ACS]), housing price index (HPI; Federal Housing Finance Agency), and veterans' unemployment rate (ACS).

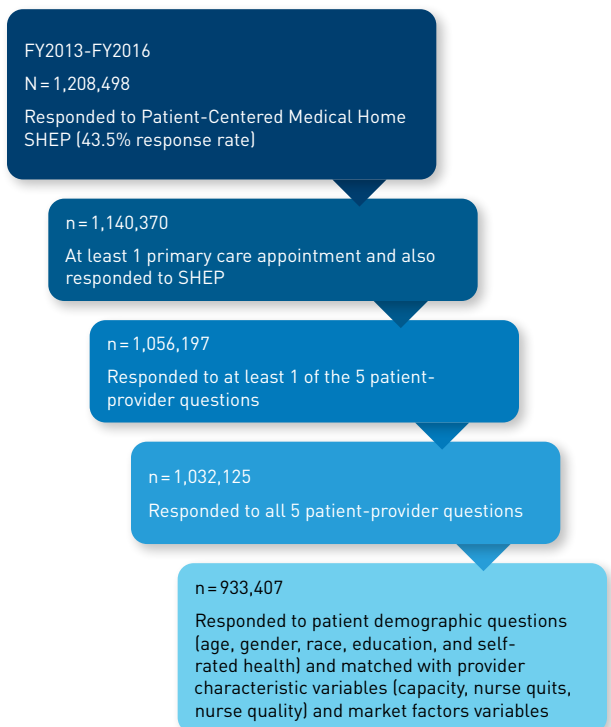
### Cohort

Among VHA patients with at least 1 primary care appointment between FY2013 and FY2016, a random sample of 2,780,874 patients

## TAKEAWAY POINTS

- ▶ During economic downturns, changes in regional health insurance coverage and affluence are associated with lower quality patient experience, as demand for care increases in Veterans Health Administration hospitals and clinics.
- ▶ Hospital system leadership should be cautioned that when the regional economy changes, multiple market factors will be affected simultaneously, shifting patients' demand for care. Thus, an increase in staffing may not be sufficient to offset the changes in patient experience.
- ▶ Not accounting for changes in regional market factors may unfairly penalize safety net hospitals in value-based payment programs.

**FIGURE.** Sample Selection of Cohort



FY, fiscal year; SHEP, Survey of Healthcare Experiences of Patients.

received a voluntary mail-in patient experiences survey called the Survey of Healthcare Experiences of Patients (SHEP). These surveys were collected from patients visiting 128 VHA hospitals throughout the United States. A total of 1,208,498 surveys (43.5%) were returned via mail. Of those, we excluded survey responses that did not answer all 5 questions related to patient-provider interaction or were missing any of the questions related to patient characteristics. The final survey count was 933,407 (Figure).

### Outcomes

In the outpatient SHEP, 5 questions were related to the patient's communication experience with their providers. The 5 survey questions started with "In the last 12 months how often did this

provider..." and were completed with the following: (1) explain things in a way that was easy to understand, (2) listen carefully to you, (3) show respect for what you had to say, (4) spend enough time with you, and (5) seem to know the important information about your medical history. These were selected as the primary outcome variables to measure patient-provider communication.<sup>7,8</sup> The question responses were collected on a 4-point Likert scale of "never," "sometimes," "usually," and "always." The survey responses were dichotomized into 1 or 0, where "usually" and "always" were coded as 1. We created a composite measure in which patients who responded with "always" or "usually" to all 5 of the survey questions were coded as 1, and any other response patterns were coded as 0.

### Covariates

VHA facility-month-level primary care capacity was measured using the number of FTEs assigned to internal medicine or geriatrics per enrolled veteran at each VHA facility. The proportion of registered nurses with more than 20 years of experience and the registered nurse quit rate were included to measure staff quality and staff satisfaction, respectively. From the SHEP, patient-level information including age, sex, race, education, and self-reported health status was collected.

### Market Factors

We created 6 measures that characterize regional health care insurance coverage and affluence surrounding VHA hospitals (hereafter referred to as market factors). A higher proportion of enrollees who are 65 years and older reduces demand for VHA care, as those enrollees qualify for Medicare.<sup>12-14</sup> For those younger than 65, higher health care insurance coverage among working-age males reduces demand for VHA care.<sup>11,18</sup> To complement the latter, we also included ESI.<sup>11</sup>

Regional affluence was measured using household median income, HPI, and veteran unemployment rate. Studies have found that veterans with higher household median income tended to have private insurance and were less likely to use VHA care.<sup>9,18</sup> The HPI measures changes in housing prices since 1991, representing financial gains for homeowners but increased financial pressure for renters.<sup>11</sup> The veterans' unemployment rate was associated with higher demand for VHA care, as people could lose both income and ESI.<sup>11,19</sup>

These annual market variables were reported at the county or state level and aggregated to the VHA hospital level by calculating weighted average values. Enrollees' residential information was used to create county-level weights (ie, the proportion of VHA hospital-level enrollees from each county). Finally, we used linear interpolation to create VHA hospital-month-level variables. Capacity and market variables for 128 hospitals were created for 45 months between FY2013 and FY2016.

### Analysis

We used logistic regression to evaluate the relationship between time-varying regional market factors and individual-level patient-provider

communication. The unit of analysis was the person-month. The VHA hospital-month-level variables, including VHA primary care capacity and regional market variables, were linked to individual patient-month based on the VHA hospital that the patient used for primary care visits. VHA hospital fixed effects, patient characteristics, fiscal year, and month were included in the analysis. The association between provider characteristics and regional market factors were reported as odds ratios (ORs) using the first quartile as the reference.

### Sensitivity Analysis

Top-coding is an alternative method of dichotomizing patient responses that focuses on the most positive response on the survey questions.<sup>20,21</sup> Only the highest response (ie, "always") is coded as 1, and all other responses as 0. We reestimated our logistic regression models to test whether the relationships between provider characteristics and regional market factors were sensitive to the coding method (results of sensitivity analysis are presented in the [eAppendix Text Box](#) [eAppendix available at [ajmc.com](#)]).

## RESULTS

A total of 933,407 patients responded to all 5 questions on patient-provider communication, responded to patient characteristics information, and matched with the covariates. Of those, 85.3% responded positively to all 5 questions: Providers explained, listened, showed respect, spent enough time, and were aware of their medical history ([Table 1](#)). The Cronbach's  $\alpha$  for the 5 questions is 0.89 ([eAppendix Table 1](#)). Therefore, this Results section focuses on the composite measure, and we present the individual question results in [eAppendix Table 2](#).

Descriptive statistics of individual patient characteristics, provider characteristics, and market factors are presented in [Table 1](#). VHA primary care patients who responded to all 5 questions were typically elderly, male, White, and in poor health. On average, each VHA hospital had 0.66 primary care physicians per 1000 enrollees, 17% of registered nurses had more than 20 years of experience, and there was a low nurse quit rate of 0.1%. Half of the enrolled veterans were 65 years or older and qualified for Medicare. More than 80% of working-age males had health insurance coverage in areas where VHA enrollees reside and 76% of working adults were eligible for health insurance through their employers (ie, ESI). On average, housing prices increased by 114% since 1991, the average household median income was approximately \$54,600, and the average veterans' unemployment rate was 6% in the regional markets of VHA hospitals.

In estimating the association between individual-level patient-provider communication, provider characteristics, and regional market factors, our preferred model specification is a logistic regression with VHA hospital fixed effects ([Table 2](#)). We found associations between regional changes in ESI, HPI, and veterans' unemployment rate with the OR (95% CI) of patients' response to the patient-provider communication questions in SHEP at a

statistical significance level of 0.05, controlling for patient and provider characteristics. The baseline experience rate of patient-provider communication ranged between 84% and 86% in the first quartile. The third and fourth quartiles of primary care physician FTE to enrollees increased the odds of a positive response by 5.0% (1.018-1.082) and 8.0% (1.048-1.131), respectively. Similarly, higher ESI increased the odds of a positive response for the third and fourth quartiles by 2.8% (1.001-1.055) and 4.4% (1.014-1.074), respectively. The second and third quartiles of HPI increased the odds of a positive response but nonmonotonically. The odds of positive patient experience increased by 5.1% (1.025-1.078) in the second quartile and 4.2% (1.006-1.078) in the third. A higher veterans' unemployment rate decreased the odds of positive patient experience by 2.5% (0.955-0.995), 3.4% (0.944-0.990), and 3.0% (0.942-0.999) for the second, third, and fourth quartiles, respectively. The logistic regression results of the individual questions were consistent, except that all 5 questions had a negative and monotonic relationship with the veterans' unemployment rate (eAppendix Table 2).

## DISCUSSION

Our findings support our hypothesis that changes in regional market factors are associated with patients' quality of care as indicated by patient-provider communication scores. Specifically, we found a positive association between changes in regional ESI and patient-provider communication, suggesting that an increase in regional ESI leads to lower utilization of public health care systems such as the VHA. This puts less pressure on health care providers at the VHA and improves patient-provider communication. The proportion of ESI was stable across regions and over time, ranging between 68% and 83% over the study period. A small change in ESI (first quartile, 73.6%, to fourth quartile, 77.0%) increased the odds of positive patient experience by 2.8%, from the baseline experience rate of 86.0%. Hanchate and colleagues<sup>11</sup> found a 1.4% decrease in VHA utilization when ESI increased by 10%, again consistent with our findings and suggesting that lower utilization of VHA care increases time for patients.

Increases in veterans' unemployment rates were negatively associated with positive reports of patient-provider communication. An increase in the veteran unemployment rate from 4.0% (first quartile) to 6.6% (third quartile) was associated with lower odds of positive patient-provider communication, from the baseline experience of 86%. Similarly to ESI, Hanchate and colleagues<sup>11</sup> found that a 20% increase in unemployment rate was associated with a 1.0% to 1.3%

increase in VHA outpatient visits. We hypothesized that when the unemployment rate increases, veterans lose income and health insurance from their employers, leading to higher demand for VHA care. Note that the relationship between veterans' unemployment and patient-provider communication was not monotonic, where the odds for the second quartile were slightly higher than for the fourth quartile. We speculate that this could be because when people become unemployed, there is an overall reduction in spending, including for health care.<sup>22,23</sup>

The association between HPI and patient-provider communication was also supportive of our hypothesis, but the nonmonotonic relationship suggests that HPI has different effects on homeowners and renters. A higher HPI suggests higher equity for homeowners but higher rents for tenants. Thus, depending on patients' housing ownership status, this variable could have an opposite effect on patient-provider communication. An increase of HPI from 178 to 216 was associated with higher odds of positive patient-provider communication from the baseline experience of 85% and seemed to be more consistent with the expected effect on homeowners.

Higher primary care capacity was also associated with a positive patient-provider communication measure. When VHA hospitals

**TABLE 1.** Descriptive Statistics of Outcome Measures and Covariates (N = 933,407)

Variable type	Variable	Mean or %	SD
<b>Outcome</b>			
Percentage of survey responses indicating positive patient experience with their providers	Explain	92.9	25.8
	Listen	92.2	26.8
	Show respect	93.5	24.7
	Enough time	92.4	26.5
	Medical history	89.8	30.3
	Composite measure of 5 questions	85.3	35.4
<b>Covariates</b>			
Individual-level patient characteristics	Age	67.9	11.8
	≥ 65 years	0.67	0.47
	Male	0.95	0.22
	Race: White	0.85	0.36
	Race: African American	0.11	0.31
	Race: other	0.04	0.20
	Education: some college or higher degree	0.57	0.50
	Self-rated health status: good or excellent	0.26	0.44
Provider characteristics at the VHA medical centers	Primary care physicians per 1000 enrollees	0.66	0.17
	Registered nurse quit rate, %	0.01	0.00
	Registered nurses with > 20 years of service, %	17.4	6.4
Regional market factors and health insurance coverage	Veterans ≥ 65 years, %	52.9	7.6
	Males aged 16-64 years with health insurance, %	82.5	6.2
	Employer-sponsored insurance, %	76.4	2.1
	Housing price index (100 in 1991)	214	359
	Household median income (in \$10,000s)	5.46	0.94
	Unemployed veterans, %	6.27	2.00

VHA, Veterans Health Administration.

**TABLE 2.** Adjusted OR and CI of Provider Characteristics and Regional Market Factors on the Composite Measure of Patient-Provider Communication Experience in the SHEP Surveys, Fiscal Years 2013-2016<sup>a</sup>

Variable	Quartiles	OR (95% CI)
Primary care physicians per 1000 enrollees	2	1.019 (0.996-1.042)
	3	1.050 (1.018-1.082)**
	4	1.080 (1.048-1.131)**
Registered nurse quit rate, %	2	0.987 (0.969-1.004)
	3	0.994 (0.976-1.012)
	4	0.990 (0.972-1.008)
Registered nurses with > 20 years of service, %	2	1.028 (1.001-1.055)*
	3	1.025 (0.989-1.062)
	4	1.012 (0.962-1.064)
Veterans ≥ 65 years, %	2	1.021 (0.992-1.051)
	3	0.978 (0.937-1.021)
	4	0.966 (0.915-1.019)
Employer-sponsored insurance, %	2	1.011 (0.989-1.034)
	3	1.028 (1.001-1.055)*
	4	1.044 (1.014-1.074)**
Males aged 16-64 years with health insurance, %	2	0.980 (0.956-1.005)
	3	1.000 (0.966-1.035)
	4	1.037 (0.988-1.088)
Housing price index (100 in 1991)	2	1.051 (1.025-1.078)**
	3	1.042 (1.006-1.078)*
	4	1.030 (0.983-1.079)
Household median income (in \$10,000s)	2	0.974 (0.946-1.004)
	3	0.980 (0.936-1.026)
	4	0.960 (0.901-1.023)
Unemployed veterans, %	2	0.975 (0.955-0.995)*
	3	0.966 (0.944-0.990)**
	4	0.970 (0.942-0.999)*

OR, odds ratio; SHEP, Survey of Healthcare Experiences of Patients; VHA, Veterans Health Administration.

\* $P < .05$ ; \*\* $P < .01$ .

<sup>a</sup>The first quartile is the reference group. The model controlled for age 65 years or older, sex, race, education, self-rated health status, fiscal year, month, and VHA medical center fixed effects.

were in the highest quartile of primary care capacity, their odds of a satisfied response were higher compared with the lowest quartile of capacity. We expected these results from prior literature, in which lower staffing in primary care was associated with lower patient quality.<sup>15-17</sup>

Overall, the impact of provider characteristics and regional market factors on patient-provider communication appears to be fairly modest, ranging between 2.8% and 5.0% in accordance with change from first to third quartiles. Relatively speaking, primary care capacity has the largest effect, where the change between first and third quartiles increased the odds by 5.0%. For the VHA, SHEP responses are critical metrics for hospitals and leadership evaluations. In general, VHA patients seemed satisfied with their

providers, as the majority of patients responded positively to the survey. However, VHA leadership should be cautioned that when the regional economy changes, multiple market factors will be affected simultaneously, shifting veterans' demand for VHA care and affecting patient experience. Hypothetically, if managers seek to improve patient experience by increasing primary care capacity from the average to the third quartile, our estimates indicate that expected patient experience would improve by 0.12 percentage points (from 86.68% to 86.80%). However, if regional economic conditions deteriorate at the same time, with ESI falling from the third quartile to the mean and with unemployment growing from the first quartile to the mean, expected patient experience would fall by 0.21 percentage points, substantially offsetting the gain from increasing capacity. Consequently, typical increases in staffing may not be enough to maintain or improve patient experience when patients' desire to use VHA care responds to regional market factors. As economic conditions improve, the reverse is possible.

### Limitations

There are several limitations to our study. The regional market variables used in our analysis were aggregated and extrapolated to the monthly VHA hospital level. Therefore, any short-term spikes in the data have been smoothed over the time period. Reverse causality between patient experience measures and capacity is possible in principle if survey responses indicating patient dissatisfaction pressured VHA hospitals to increase capacity. However, hiring is a lengthy process within the VHA<sup>10</sup> and response time to increase capacity at VHA hospitals would be much slower than a month, reducing the practical likelihood of reverse causality affecting our estimates. We also note that patient-provider communication is strongly correlated with overall patient satisfaction. In light of this observation, one could argue that patient-provider communication is a strong determinant of overall patient satisfaction, but other factors may also influence positive responses to both patient-provider communication and overall patient satisfaction. Finally, this is a VHA study, and generalizability to other health care services may be limited. Patients are predominantly older White men, and although several patient characteristics are controlled for in our analysis, there still may be omitted variables.

Regional market factors are indirect measures of veterans' demand, and we are not able to make any definitive statements to link regional market conditions. However, other studies have shown an association between regional market factors and VHA utilization,<sup>9,11-14</sup> and our findings extend that research to patient experience. More research is needed to explore the association between changes in market factors and physicians' time and stress. Our study demonstrated that patient-provider communication can be managed by adjusting staffing, but when staffing is held constant, physicians' productivity may vary depending on unobserved factors such as how much slack resources they have.<sup>24</sup> It should also be noted that in recent years, VHA has faced significant challenges to ensuring that veterans receive timely access to care. In some settings,

veterans have reportedly waited for several weeks to receive primary care appointments<sup>25,26</sup>; such problems highlight the need for more studies that examine the trade-offs between ensuring patients' access to care and maintaining their quality of care.

## CONCLUSIONS

To our knowledge, this is the first study to associate patient experience—measured by patient-provider communication—with regional market factors that characterize health insurance coverage and affluence. Association between these market factors and quality measures in non-safety net hospitals is unknown. With more resources available in non-safety net hospitals, they may be less affected by regional economic downturn compared with safety net hospitals. This has significant policy implications as the differential response in quality measures unfairly penalizes safety net hospitals even more. More research is needed to understand the impact of regional market factors on quality of care within and outside the VHA. ■

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**eAppendix Table 1.** Cronbach's Alpha for the 5 Patient-Physician Interaction Questions

Survey Question Item	Item-test correlation	alpha
Explain	0.83	0.87
Listen	0.88	0.86
Respect	0.85	0.86
Time	0.83	0.87
Medical History	0.81	0.88
		0.89

**eAppendix Table 2.** Adjusted Odds Ratio and Confidence Interval of Provider Characteristics and Regional Market Factors on Individual Questions of Patient-Provider Communication Experience in the Survey of Healthcare Experiences of Patients Surveys Fiscal Year 2013-2016

Variable	Quartiles	Odds Ratio (95% Confidence Interval)				
		Explain	Listen	Respect	Time	Medical History
Primary care physicians per 1,000 enrollees	2	1.019 (0.996-1.042)	1.027 * (1.000-1.055)	1.027 * (1.000-1.055)	1.027 * (1.000-1.055)	1.027 * (1.000-1.055)
	3	1.05 ** (1.018-1.082)	1.054 ** (1.017-1.091)	1.054 ** (1.017-1.091)	1.054 ** (1.017-1.091)	1.054 ** (1.017-1.091)
	4	1.089 ** (1.048-1.131)	1.093 ** (1.046-1.143)	1.093 ** (1.046-1.143)	1.093 ** (1.046-1.143)	1.093 ** (1.046-1.143)
Registered nurse quit rate	2	0.987 (0.969-1.004)	0.994 (0.974-1.015)	0.994 (0.974-1.015)	0.994 (0.974-1.015)	0.994 (0.974-1.015)
	3	0.994 (0.976-1.012)	0.997 (0.976-1.018)	0.997 (0.976-1.018)	0.997 (0.976-1.018)	0.997 (0.976-1.018)
	4	0.99 (0.972-1.008)	0.987 (0.967-1.008)	0.987 (0.967-1.008)	0.987 (0.967-1.008)	0.987 (0.967-1.008)
% of Registered nurses with >20yrs of service	2	1.028 * (1.001-1.055)	1.037 * (1.006-1.07)	1.037 * (1.006-1.07)	1.037 * (1.006-1.07)	1.037 * (1.006-1.07)
	3	1.025 (0.989-1.062)	1.044 * (1.002-1.089)	1.044 * (1.002-1.089)	1.044 * (1.002-1.089)	1.044 * (1.002-1.089)
	4	1.012 (0.962-1.064)	1.054 (0.993-1.118)	1.054 (0.993-1.118)	1.054 (0.993-1.118)	1.054 (0.993-1.118)
% of Veterans 65 years or greater	2	1.021 (0.992-1.051)	1.015 (0.981-1.05)	1.015 (0.981-1.05)	1.015 (0.981-1.05)	1.015 (0.981-1.05)
	3	0.978 (0.937-1.021)	0.98 (0.933-1.03)	0.98 (0.933-1.03)	0.98 (0.933-1.03)	0.98 (0.933-1.03)
	4	0.966 (0.915-1.019)	0.982 (0.922-1.046)	0.982 (0.922-1.046)	0.982 (0.922-1.046)	0.982 (0.922-1.046)



% with Employer-sponsored insurance	2	1.011 (0.989-1.034)	1.021 (0.995-1.048)	1.021 (0.995-1.048)	1.021 (0.995-1.048)	1.021 (0.995-1.048)
	3	1.028 * (1.001-1.055)	1.035 * (1.004-1.067)	1.035 * (1.004-1.067)	1.035 * (1.004-1.067)	1.035 * (1.004-1.067)
	4	1.044 ** (1.014-1.074)	1.05 ** (1.015-1.086)	1.05 ** (1.015-1.086)	1.05 ** (1.015-1.086)	1.05 ** (1.015-1.086)
% of Males 16-64 yrs old with health insurance	2	0.98 (0.956-1.005)	0.978 (0.95-1.007)	0.978 (0.95-1.007)	0.978 (0.95-1.007)	0.978 (0.95-1.007)
	3	1 (0.966-1.035)	1.001 (0.961-1.042)	1.001 (0.961-1.042)	1.001 (0.961-1.042)	1.001 (0.961-1.042)
	4	1.037 (0.988-1.088)	1.035 (0.979-1.096)	1.035 (0.979-1.096)	1.035 (0.979-1.096)	1.035 (0.979-1.096)
Housing price index	2	1.051 ** (1.025-1.078)	1.051 ** (1.02-1.082)	1.051 ** (1.02-1.082)	1.051 ** (1.02-1.082)	1.051 ** (1.02-1.082)
	3	1.042 * (1.006-1.078)	1.039 (0.998-1.082)	1.039 (0.998-1.082)	1.039 (0.998-1.082)	1.039 (0.998-1.082)
	4	1.03 (0.983-1.079)	1.038 (0.983-1.096)	1.038 (0.983-1.096)	1.038 (0.983-1.096)	1.038 (0.983-1.096)
Household median income (\$10,000)	2	0.974 (0.946-1.004)	0.989 (0.955-1.024)	0.989 (0.955-1.024)	0.989 (0.955-1.024)	0.989 (0.955-1.024)
	3	0.98 (0.936-1.026)	1.01 (0.957-1.065)	1.01 (0.957-1.065)	1.01 (0.957-1.065)	1.01 (0.957-1.065)
	4	0.96 (0.901-1.023)	1.027 (0.953-1.106)	1.027 (0.953-1.106)	1.027 (0.953-1.106)	1.027 (0.953-1.106)
% of Unemployed Veterans	2	0.975 * (0.955-0.995)	0.967 ** (0.944-0.99)	0.967 ** (0.944-0.99)	0.967 ** (0.944-0.99)	0.967 ** (0.944-0.99)
	3	0.966 ** (0.944-0.99)	0.947 ** (0.921-0.974)	0.947 ** (0.921-0.974)	0.947 ** (0.921-0.974)	0.947 ** (0.921-0.974)
	4	0.97 * (0.942-0.999)	0.934 ** (0.902-0.966)	0.934 ** (0.902-0.966)	0.934 ** (0.902-0.966)	0.934 ** (0.902-0.966)
** p < 0.01, * p < 0.05						

The first quartile is the reference group.

The model controlled for age, 65 years or greater, sex, race, education, self-rated health status, fiscal year, month, and VHA medical center fixed effects.

**eAppendix Table 3.** Adjusted Odds Ratio and Confidence Interval of Provider Characteristics and Regional Market Factors on the Composite Measure of Patient-Provider Communication Experience in the Survey of Healthcare Experiences of Patients Surveys Fiscal Year 2013-2016.  
 – Top Code

Variable	Quartiles	Odds Ratio (95% Confidence Interval)					
		All 5 Qs	Explain	Listen	Respect	Time	Medical History
Primary care physicians per 1,000 enrollees	2	1.019 * (1.002-1.036)	1.011 (0.992-1.03)	1.006 (0.987-1.026)	1.016 (0.995-1.037)	1.009 (0.99-1.029)	1.018 * (1-1.035)
	3	1.033 ** (1.011-1.056)	1.03 * (1.005-1.057)	1.033 * (1.007-1.06)	1.022 (0.995-1.051)	1.031 * (1.005-1.057)	1.032 ** (1.009-1.056)
	4	1.045 ** (1.017-1.073)	1.045 ** (1.012-1.078)	1.052 ** (1.018-1.086)	1.037 * (1.003-1.074)	1.044 ** (1.012-1.077)	1.048 ** (1.019-1.078)
Registered nurse quit rate	2	0.985 * (0.972-0.997)	0.984 * (0.97-0.998)	0.986 (0.972-1.001)	0.98 * (0.965-0.996)	0.985 * (0.97-0.999)	0.987 * (0.974-1)
	3	0.99 (0.977-1.002)	0.99 (0.976-1.005)	0.99 (0.975-1.005)	0.988 (0.972-1.004)	0.989 (0.975-1.004)	0.991 (0.978-1.004)
	4	0.99 (0.977-1.003)	0.996 (0.981-1.011)	0.995 (0.98-1.01)	0.991 (0.975-1.007)	0.997 (0.982-1.012)	0.994 (0.981-1.008)
% of Registered nurses with >20yrs of service	2	1.021 * (1.001-1.04)	1.022 (1-1.044)	1.02 (0.998-1.043)	1.021 (0.997-1.046)	1.026 * (1.004-1.049)	1.028 ** (1.008-1.049)
	3	1.015 (0.989-1.041)	1.014 (0.985-1.045)	1.014 (0.984-1.045)	1.023 (0.991-1.057)	1.016 (0.987-1.047)	1.034 * (1.007-1.062)
	4	1.002 (0.967-1.039)	1.003 (0.962-1.046)	1.008 (0.966-1.052)	1.006 (0.961-1.053)	1.002 (0.961-1.045)	1.018 (0.981-1.057)
% of Veterans 65 years or greater	2	1.008 (0.986-1.03)	1.029 * (1.004-1.055)	1.002 (0.977-1.028)	1.003 (0.976-1.03)	1.002 (0.978-1.027)	1.01 (0.987-1.033)
	3	0.996 (0.965-1.027)	1.023 (0.987-1.06)	0.996 (0.961-1.033)	0.984 (0.946-1.023)	0.995 (0.961-1.031)	0.994 (0.962-1.027)
	4	0.986 (0.949-1.024)	1.016 (0.972-1.062)	0.994 (0.95-1.04)	0.97 (0.924-1.019)	0.981 (0.939-1.026)	1.002 (0.962-1.043)

% with Employer-sponsored insurance	2	1.009 (0.994-1.025)	1.017 (0.999-1.036)	1.014 (0.996-1.033)	1.009 (0.989-1.029)	1.006 (0.988-1.024)	1.015 (0.998-1.031)
	3	1.012 (0.994-1.031)	1.018 (0.996-1.04)	1.02 (0.998-1.043)	1.014 (0.99-1.038)	1.01 (0.988-1.032)	1.015 (0.995-1.035)
	4	1.03 ** (1.008-1.051)	1.038 ** (1.013-1.063)	1.048 ** (1.023-1.074)	1.043 ** (1.016-1.07)	1.031 * (1.007-1.056)	1.028 * (1.006-1.051)
% of Males 16-64 yrs old with health insurance	2	0.98 * (0.963-0.999)	0.976 * (0.955-0.996)	0.989 (0.969-1.011)	0.98 (0.958-1.002)	0.987 (0.967-1.008)	0.982 (0.964-1.001)
	3	0.998 (0.973-1.023)	1.013 (0.984-1.043)	1.015 (0.985-1.045)	1.003 (0.972-1.036)	1.012 (0.984-1.042)	1 (0.974-1.027)
	4	1.032 (0.997-1.068)	1.051 * (1.01-1.094)	1.064 ** (1.022-1.109)	1.045 * (1-1.092)	1.05 * (1.008-1.092)	1.029 (0.993-1.067)
Housing price index	2	1.037 ** (1.019-1.056)	1.032 ** (1.011-1.053)	1.035 ** (1.013-1.057)	1.036 ** (1.013-1.06)	1.018 (0.997-1.039)	1.053 ** (1.033-1.073)
	3	1.037 ** (1.012-1.062)	1.025 (0.996-1.054)	1.022 (0.993-1.052)	1.025 (0.993-1.057)	1.008 (0.979-1.037)	1.05 ** (1.023-1.077)
	4	1.027 (0.993-1.062)	1.022 (0.983-1.062)	1.018 (0.979-1.059)	1.004 (0.962-1.047)	1.007 (0.969-1.046)	1.033 (0.997-1.07)
Household median income (\$10,000)	2	0.984 (0.963-1.005)	0.971 * (0.948-0.996)	0.971 * (0.946-0.995)	0.969 * (0.943-0.996)	0.995 (0.971-1.02)	0.982 (0.96-1.004)
	3	0.961 * (0.93-0.993)	0.961 * (0.926-0.998)	0.958 * (0.922-0.996)	0.957 * (0.919-0.998)	0.982 (0.945-1.019)	0.967 (0.934-1)
	4	0.952 * (0.91-0.996)	0.936 * (0.888-0.986)	0.951 (0.902-1.003)	0.943 * (0.891-0.999)	0.958 (0.909-1.009)	0.972 (0.927-1.019)
% of Unemployed Veterans	2	0.981 ** (0.966-0.995)	0.971 ** (0.954-0.987)	0.976 ** (0.959-0.992)	0.983 (0.965-1.001)	0.98 * (0.963-0.996)	0.984 * (0.969-0.999)
	3	0.973 ** (0.957-0.99)	0.969 ** (0.95-0.988)	0.969 ** (0.949-0.988)	0.97 ** (0.95-0.991)	0.968 ** (0.95-0.988)	0.979 * (0.962-0.996)
	4	0.984 (0.964-1.005)	0.977 (0.954-1.001)	0.98 (0.957-1.005)	0.982 (0.957-1.009)	0.977 (0.954-1.001)	0.992 (0.971-1.014)

\*\* p < 0.01, \* p < 0.05

The first quartile is the reference group.

The model controlled for age, 65 years or greater, sex, race, education, self-rated health status, fiscal year, month, and VHA medical center fixed effects.

**eAppendix Text Box.** Sensitivity Analysis

The top-coded survey responses were also highly correlated with a Cronbach's alpha of 0.89. The logistic regression of the top-coded composite measure generated results consistent with the main results for primary care capacity, HPI, and veterans' unemployment rate (eAppendix Table 3). ESI was associated with positive responses but statistically significant only in the 4<sup>th</sup> quartile. The odds of positive patient experience increased by 3% (1.008-1.051) compared to the 1<sup>st</sup> quartile with a baseline experience rate of 58% and the relationship was non-monotonic. Unexpectedly, household median income had a monotonic negative relationship with patient experience with their providers, where the 3<sup>rd</sup> and 4<sup>th</sup> quartiles decreased the odds of positive responses by 3.9% (0.930-0.993) and 4.8% (0.910-0.996), respectively,