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Surgical Patients' Hospital Experience Scores: Neighborhood Context Conceptual Framework

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Objective: Through geocoding the physical residential address included in the electronic medical record to the census tract level, we present a novel model for concomitant examination of individual patient-related and residential context-related factors that are associated with patient-reported experience scores.

Summary Background Data: When assessing patient experience in the surgical setting, researchers need to examine the potential influence of neighborhood-level characteristics on patient experience-of-care ratings.

Methods: We geocoded the residential address included in the electronic medical record (EMR) from a tertiary care facility to the census tract level of Orange County, CA. We then linked each individual record to the matching census tract and use hierarchical regression analyses to test the impact of distinct neighborhood conditions on patient experience. This approach allows us to estimate how each neighborhood characteristic uniquely influences Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores.

Results: Individuals residing in communities characterized by high levels of socioeconomic disadvantage have the highest experience ratings. Accounting for individual patient's characteristics such as age, gender, race/ethnicity, primary language spoken at home, length of stay, and average pain levels during their hospital stay, neighborhood-level characteristics such as proportions of people receiving public assistance influence the ratings of hospital experience (0.01, $P<0.05$) independent of, and beyond, these individual-level factors.

Conclusions: This manuscript is an example of how geocoding could be used to analyze surgical patient experience scores. In this analysis, we have shown that neighborhood-level characteristics influence the ratings of hospital experience independent of, and beyond, individual-level factors

Keywords: HCAHPS, patient experience, surgery, neighborhoods, geocoding

Hospital and healthcare providers such as surgeons understand that patient experience measures are indicators of care quality and that improving patient experience leads to improved health outcomes.[1,2] To measure and interpret hospital patient feedback, health organizations commonly use the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) questionnaire.[3] This survey instrument gathers patient-reported aspects of care quality.[2,4] Despite criticism of patient-reported experience measures as an objective assessment of the level of service provided by an organization, hospitals use these data to identify likely factors that influence patient experience of health services.[5] Indeed, innovative models such as value-based care are emphasizing the importance of patient experience.[6] The Centers for Medicare & Medicaid Services (CMS), for example, as well as other insurance providers, use HCAHPS data to decide on level of payments to facilities and providers.[6] Moreover, recently, CMS made public a patient experience hospital star rating, allowing individuals to make a more informed decision about their location of care.[7]

The rapid growth in publications about patient experience provides evidence that many factors affect ratings of care.[8,9] It is noteworthy that, to date, researchers studying the HCAHPS survey mostly emphasize individual (eg, demographic characteristics, socioeconomic status) factors that associate with patient-reported experience ratings.[8,9] There is one notable exception, where researchers examine the relationship between county-level factors (eg, general practice, family medicine and physician specialist prevalence, percent living in poverty, percent minority population, median income, percent without insurance) and HCAHPS scores.[10] However, to the best of our knowledge, researchers seemingly neglect the potential influence of neighborhood-level characteristics on patient experience ratings. Relevant to our study, it has been suggested that social determinants of health and neighborhood features influence clinical outcomes[11] (eg, depressive disorder child's health),[12] as well as behaviors (eg, intimate partner violence).[13] We now propose that this new approach should also be adopted to patient

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experience ratings and that patients' *residential* environment (ie, neighborhood conditions) affect the scores independent of, and beyond, the individual-level factors.

Based on the previously well-described influence of different patient profiles on patient experience of care,[8,9] in our current study, we integrate patient *residential* profiles to systematically explore how neighborhood-level characteristics influence patient self-reported hospital experience in the surgical setting. Given that the connections between patients and their residential conditions are complex and interdependent,[11–13] we propose that neighborhood factors impact HCAHPS ratings above and beyond individual-level characteristics. Moreover, our objective is to propose a framework on how to integrate neighborhood-based, population-specific data into the study of patient experience and systematically assess the potential benefits of adopting this new paradigm as the industry standard. Although major challenges remain, we base our opinion on the promises of several ongoing initiatives in precision public health that represent a paradigm shift in health care.[14]

METHODS

Data Sources

For this new approach, our main dataset was a compilation of EMR records from a single center study of all consecutive inpatient adult elective surgical patients admitted between January 2014 and April 2019 (N=2,062), combined with HCAHPS questionnaire administered by Press Ganey (Boston, MA) to the same population of patients. The survey was administered in both English and Spanish by phone or email within 72 hours of the visit. Each surgical patient data was geocoded based on the physical residential address and was then linked to the matching census tract, or neighborhood-level, social and economic housing unit indicators that were generated using the 2014–2018 American Community Survey (ACS) data.[15] We excluded records for surgical patients living outside of Orange County, California (n=6) and Census tracts with fewer than four patients (n=99), resulting in a total sample size of 1,957 patients nested within 483 Census tracts or neighborhoods. Protocols were reviewed by the hospital's Institutional Review Board, which concluded this study was exempt and does not qualify as human subject research.

Variables

The primary outcome of interest is a patient-reported experience HCAHPS composite score. For the purpose of this analysis, we used 14 equally weighted dimensions of patient experience, including overall hospital care (1–5), cleanliness (1–5), willingness to recommend the hospital to a family member or friend (1–4), amount of time physician spent with the patient (1–5), level of physician concern for the patient (1–5), whether the physician kept the patient informed (1–5), physician friendliness (1–5), physician skill level (1–5), level of nurse courtesy (1–4), whether the nurse listened to patient concerns (1–4), nurse attitude (1–5), whether the nurse kept the patient informed (1–5), nurse friendliness (1–5), and nurse skill level (1–5). We generated standardized scores ranging from 0 to 10 for each of the 14-questions. We then calculated the HCAHPS patient composite experience score by dividing the sum of all standardized scores by the total number of questions. The result is a composite patient experience measure with a mean of 9.26 (SD = 1.08), with higher values indicating higher rating. We also calculated a binary composite score, grouping answers 9–10 (highest ratings) to one group and answer 1–8 (lowest ratings) to a second group. This "top box" method indicates the proportion of people that answered 9 or 10 is derived from the HCAHPS standard methodology for hospitals. We found that our continuous composite measure is highly correlated with the binary composite measure (r = 0.80, P < 0.001) and as such have decided to use the continuous variable in our analyses. Still, in an effort to isolate the differences in ratings by patient- and neighborhood-level characteristics, and for ease of interpretation, in Figure 1 and Tables 1 and 2, we present results using the "top box" binary measure (ie, 0–8 and 9–10).

We included in the analysis covariates such as age at time of visit, gender, race/ethnicity, primary language spoken at home, educational attainment, and insurance type. We also included patient-reported length of stay and pain levels during the hospital stay. Social and economic indicators of the patient's neighborhood of residence come from the ACS data and include population density, community-level education, unemployment rate, percent of female-headed households, percent receiving public assistance, percent in poverty, percent of homes in the tract that are rented, and racial and ethnic composition measured by percent of major racialized categories.[15]

Statistical Analysis

To test the impact of distinct neighborhood conditions on surgical patients' experience ratings, we estimated multilevel linear regression models[16,17] with Stata 16 software.[18] We performed a series of conditional models that first include the covariates of individual patient sociodemographic and health characteristics at level-1 (age, gender, race/ethnicity, primary language spoken at home, educational attainment, insurance type, physical and mental health status, length of stay, and average pain levels) followed by models that add the neighborhood conditions at level-2 (population density, community-level education, unemployment rate, percent of female-headed households, percent receiving public assistance, percent in poverty, percent of homes in the tract that are rented, and racial and ethnic composition). The models treat level-1 individual patients as nested within level-2 neighborhood measures. All models use maximum likelihood estimation with adaptive quadrature.[16] This approach controls for the lack of independence of data within higher level groups and adjusts for problems that otherwise downwardly bias estimated standard errors including individual clustering within neighborhoods, different sample sizes for level-1 and level-2 units, heteroscedastic error terms, and variable numbers of cases within level-2 units.[17] We first estimated a model with only individual-level predictors included to test the influence of individual social determinants on the scores of patient experience. Then, in our fully specified model, we included the neighborhood conditions (and a neighborhood-level error component) along with the individual-level predictors and an individual error term. Model 1 includes age, gender, race/ethnicity, primary language spoken at home, educational attainment, insurance type, physical and mental health status, length of stay, and average pain levels at level-1. Model 2 adds the neighborhood-level characteristics, including median income, community-level education, unemployment rate, percent of female-headed households, percent receiving public assistance, percent in poverty, percent of rented homes in the tract, and racial/ethnic composition at level-2. All models control for logged population density.

RESULTS

In Figure 1, we illustrate the distribution of experience ratings across neighborhoods in Orange County, California. In Tables 1 and 2, we show descriptive information for neighborhood- and patient-level characteristics. The most disadvantaged communities make up the northern and western parts of the county and have the highest ratings on nearly every indicator. Patients residing in areas with higher proportions of residents receiving public assistance have a larger percentage of high ratings (9–10: 9.6% vs 1–8: 8.3%, P < 0.01), and communities with higher proportions of residents in poverty also have a larger percentage of

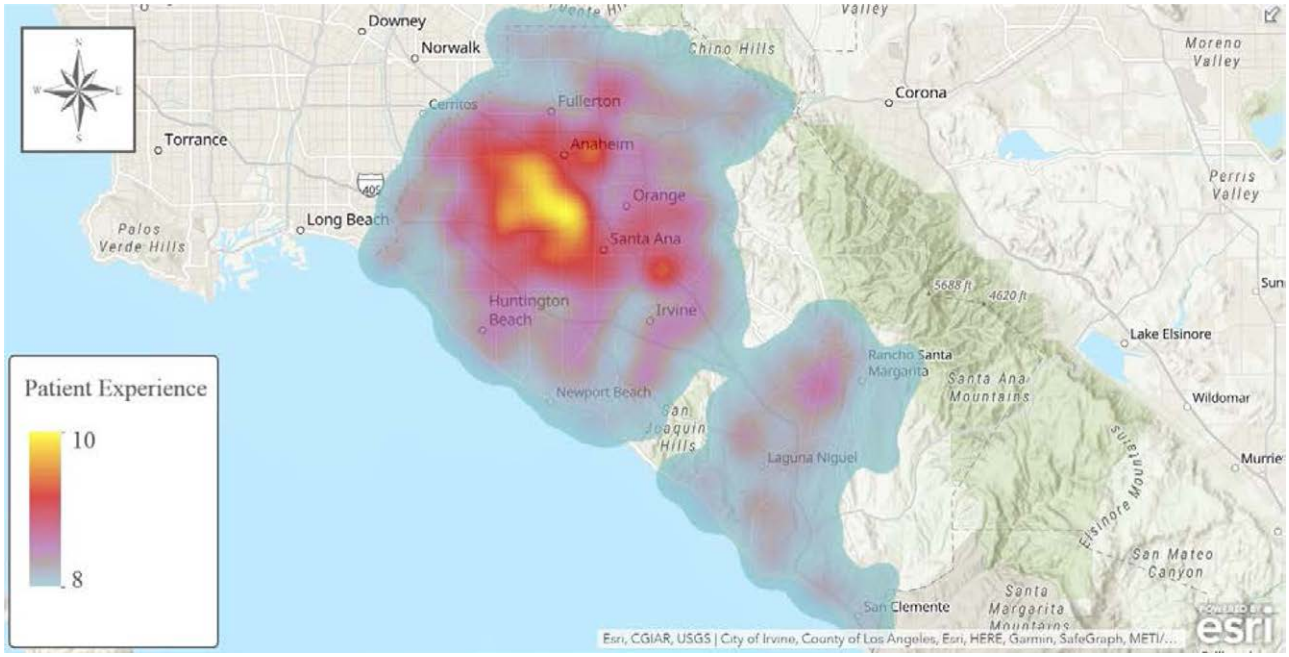

FIGURE 1. Top box patient experience scores by census tract, Orange country, CA. SOURCE: Data are from UC Irvine Medical Center Records & 2014–2018 American Community Survey Data.

TABLE 1.

Means and SD for Neighborhood-level Characteristics Overall and by Top Box Patient Experience Scores

	Full Sample		1–8		9–10		
Race/ethnicity proportions	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Diff.**
% Non-Latino White	64.49	18.01	66.33	17.37	63.97	18.16	
% Non-Latino Black	2.23	1.06	2.29	1.08	2.22	1.05	
% Latino	29.71	21.84	26.41	19.31	30.63	22.42	**
% Asian	20.88	14.47	20.70	14.04	20.93	14.60	
Socioeconomic proportions							
Population density	61.15	27.61	59.26	26.74	61.68	27.84	
Median income	34369.16	14222.46	35824.42	14372.19	33960.01	14160.15	*
% Adults <12 yrs education	18.06	14.90	15.37	13.07	18.81	15.30	***
% Adults = 12 yrs education	19.00	6.72	18.50	7.13	19.14	6.60	
% Adults >12 and <16 yrs education	28.34	6.50	29.04	6.00	28.15	6.63	*
% Adults = 16 yrs education	22.76	9.97	24.28	9.77	22.33	9.99	**
% Adults = 18 yrs education	11.84	9.60	12.81	9.49	11.57	9.62	*
% Unemployed	3.37	2.49	3.60	2.67	3.14	2.44	
% Receiving public assistance	9.33	7.57	8.34	7.00	9.61	7.71	**
% Female-headed households	17.94	7.02	17.66	7.04	18.02	7.01	
% of Residents in poverty	12.81	8.33	11.72	7.76	13.12	8.46	**
% of Rental homes	43.07	22.35	41.13	22.62	43.62	22.26	

N = 483 Census Tracts.

Data are from the American Community Survey.

Asterisks indicate significant difference evaluated using two-tailed independent means t-test.

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

high ratings (9–10: 13.1% vs 1–8: 11.7%, $P < 0.01$). As shown in Table 1, communities with a higher proportion of Latinos have a significantly larger percentage of high scores (1–8: 26.4% vs 9–10: 30.6%, $P < 0.01$). Higher overall levels of education correspond with significantly lower scores, and communities with higher proportions of adults earning a Bachelor's degree (16 years of education) have a significantly smaller percentage of high scores (9–10: 22.3% vs 1–8: 24.3%, $P < 0.001$). This variation is most pronounced for the highest and lowest overall levels of education. Communities with the lowest education levels have significantly larger percentages of high scores (9–10: 18.8% vs 1–8: 15.4%, $P < 0.001$); neighborhoods with the highest proportion of graduate degree holders have the lowest percentage of high scores (9–10: 9.5%, $P < 0.05$).

Table 2 displays means and standard deviations for patient sociodemographic, health, length of stay, and pain indicators overall and by top box patient experience scores. Ratings vary significantly by age, such that younger individuals have lower scores (55 vs 57 years old, $P < 0.05$). The racial/ethnic and socioeconomic measures show considerable patient-level variation in ratings. Latinos, relative to non-Latino whites, have higher ratings ($P < 0.01$), and English (72%) and Spanish (15%) speakers, relative to all other languages, also have higher ratings (both $P < 0.001$). Similar to findings at the neighborhood-level,

TABLE 2.

Means and SD for Patient-level Characteristics Overall and by Top Box Patient Experience Scores

	Full Sample		1–8		9–10		
Independent Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Diff.**
Sociodemographic							
Age	56.71	17.42	55.07	18.27	57.15	17.16	*
Gender							
Female	0.53	0.50	0.56	0.50	0.52	0.50	
Male	0.47	0.50	0.44	0.50	0.48	0.50	
Race/ Ethnicity							
Non-Latino White	0.49	0.50	0.54	0.50	0.48	0.50	
Non-Latino Black	0.03	0.16	0.02	0.15	0.03	0.17	
Latino	0.24	0.43	0.18	0.39	0.26	0.44	**
Asian	0.20	0.40	0.22	0.41	0.19	0.39	
Other Race	0.04	0.20	0.04	0.20	0.04	0.20	
Primary Language							
English	0.74	0.44	0.82	0.39	0.72	0.45	***
Spanish	0.13	0.34	0.05	0.21	0.15	0.36	***
Asian	0.08	0.08	0.10	0.30	0.36	0.27	
Other	0.05	0.05	0.04	0.20	0.05	0.22	
Education							
<High School	0.12	0.33	0.06	0.24	0.14	0.35	***
High School Graduate	0.18	0.39	0.15	0.36	0.19	0.39	
Some College	0.52	0.50	0.59	0.49	0.50	0.50	**
College Graduate	0.17	0.17	0.20	0.40	0.17	0.37	
Health Insurance							
Private Provider	0.37	0.09	0.44	0.50	0.35	0.48	**
Medicaid	0.23	0.42	0.19	0.39	0.24	0.42	
Medicare	0.40	0.49	0.37	0.48	0.41	0.49	
Health Indicators							
Physical Health							
Poor	0.05	0.22	0.10	0.30	0.04	0.19	***
Fair	0.18	0.38	0.23	0.42	0.17	0.37	**
Good	0.34	0.47	0.36	0.48	0.33	0.47	
Very Good	0.28	0.45	0.22	0.42	0.30	0.46	**
Excellent	0.15	0.36	0.08	0.27	0.17	0.38	***
Mental Health							
Poor	0.02	0.14	0.04	0.20	0.01	0.12	***
Fair	0.09	0.29	0.13	0.33	0.08	0.27	**
Good	0.26	0.44	0.33	0.47	0.25	0.43	**
Very Good	0.31	0.46	0.28	0.45	0.32	0.47	
Excellent	0.32	0.32	0.22	0.41	0.35	0.48	***
Length of Stay	4.26	4.81	4.57	5.30	4.18	4.67	
Pain Levels	2.57	2.01	2.78	2.04	2.51	2.00	**

N = 1,957.

Data are from UC Irvine Medical Center Records.

Asterisks indicate significant difference evaluated using two-tailed independent means t-test.

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

TABLE 3.

Hierarchical Linear Regression Models Predicting Patient Experience Scores

	Model 1		Model 2	
	Coeff	**SE**	**Coeff**	**SE**
Intercept	9.74***	0.14	9.67***	0.28
Patient-level				
Sociodemographic				
Age	0.01**	0.00	0.01**	0.00
Gender (Female, ref)				
Male	0.09	0.06	0.09	0.06
Race/Ethnicity (non-Latino White, ref)				
Non-Latino Black	0.34	0.23	0.37	0.23
Latino	–0.03	0.11	–0.05	0.11
Asian	0.05	0.12	0.04	0.12
Other Race	–0.06	0.16	–0.07	0.16
Primary Language (English, ref)				
Spanish	0.29*	0.14	0.29*	0.14
Asian	–0.08	0.15	–0.07	0.15
Other	–0.16	0.16	–0.19	0.16
Education (College Graduate, ref)				
<High School	–0.12	0.14	–0.13	0.14
High School Graduate	0.06	0.11	0.04	0.11
Some College	–0.14	0.09	–0.15	0.09
Health Insurance (Private Provider, ref)				
Medicaid	0.07	0.09	0.07	0.09
Medicare	–0.04	0.09	–0.03	0.09
Health indicators				
Physical health (Excellent, ref)				
Poor	–0.40	0.18	–0.42	0.18
Fair	–0.30*	0.12	–0.30*	0.12
Good	–0.19	0.11	–0.19	0.11
Very Good	–0.13	0.10	–0.13	0.10
Mental Health (Excellent, ref)				
Poor	–1.07***	0.24	–1.07***	0.24
Fair	–0.38**	0.13	–0.38**	0.13
Good	–0.43***	0.09	–0.42***	0.09
Very Good	–0.15	0.08	–0.15	0.08
Length of Stay	–0.00	0.00	0.00	0.00
Pain Levels	–0.04*	0.02	–0.04*	0.02
Neighborhood-level				
Race/ethnicity proportions (% Non-Latino White, ref)				
% Non-Latino Black			0.01	0.00
% Latino			0.00	0.00
% Asian			0.00	0.00
Socioeconomic proportions				
Population density	–0.00	0.00	–0.00	0.00
Median income			–0.00	0.00
Community-level education (% adults = 18 yrs, ref)				
% Adults <12 yrs education			0.01*	0.00
% Adults = 12 yrs education			–0.00	0.00
% Adults >12 and <16 yrs education			–0.00	0.00
% Adults = 16 yrs education			0.01	0.00
% Unemployed			–0.00	0.00
% Receiving public assistance			0.01*	0.00
% Female-headed households			–0.00	0.00
% of residents in poverty			–0.00	0.00
% of rental homes			0.00	0.00
Random effects				
Intercept	0.04***	0.01	0.03***	0.00

Data are from UC Irvine Medical Center Records & the American Community Survey.

Model 1 includes age, gender, race/ethnicity, primary language spoken at home, educational attainment, insurance type, physical and mental health status, length of stay, and average pain levels at level-1. Model 2 adds the neighborhood-level characteristics, including median income, community-level education, unemployment rate, percent of female-headed households, percent receiving public assistance, percent in poverty, percent of rented homes in the tract, and racial/ethnic composition at level-2.

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

individuals with the least education have a larger percentage of high scores (9–10: 14% vs 1–8: 6%, $P < 0.001$), and those who have attended some college have a larger percentage of low scores (1–8: 59% vs 9–10: 50%, $P < 0.01$). Private insurance holders have a higher percentage of low scores (1–8: 44% vs 9–10: 35%, $P < 0.01$). Ratings vary significantly by physical health, such that those of "poor" health have the lowest percentage of high scores (9–10: 4% vs 1–8: 10%, $P < 0.001$); a similar pattern is observed for those of "fair" health. However, percentage of high, relative to low, ratings is larger in those of better physical and mental health. Finally, ratings vary significantly by pain level, and those presenting with lower levels of pain have a larger percentage of high scores ($P < 0.01$).

Next, as per the new conceptual framework, we constructed hierarchical linear regression models predicting the surgical experience. In model 1 of Table 3, we see that older patients, Spanish speakers, and those with better physical and mental health reported higher experience ratings. In model 2, we add the neighborhood conditions at level-2 to examine the influence of distinct neighborhood conditions on patient-reported experience ratings. Patient-level estimates in model 2 of Table 3, including neighborhood conditions, attenuates health indicator differences in the ratings, indicating that some of the

lower coefficients for patients of "good," relative to "excellent," mental health is due to neighborhood context. Patients living in areas with greater proportions of residents with low levels of education, and larger proportions of people receiving public assistance, associate with significantly higher ratings ($P < 0.05$).

DISCUSSION

There is an overwhelming consensus among scholars that patient experience scores vary by individual-level factors.[8] Importantly, however, there is an absence of evidence on the contextual dimensions of residential environments that potentially have far-reaching consequences for experience-of-care ratings. Thus, we need to better understand how *residential* places influence patient-reported experience of care in surgical settings. Given the above, this study provides support for a new approach to understanding surgical patient experience. We find that above and beyond individual patient/family factors, if we include a focus on neighborhood factors, we can better understand patient experience scores. It is clear that communities are stratified by dimensions of socioeconomic status [eg, poverty, educational attainment, unemployment rates, family structure (female-headed households), and racial/ethnic composition (racial segregation)].[19,20] This means that central features of the environment are dictated by variation in social and economic conditions.[21,22] For example, population density is patterned by socioeconomic characteristics, which ultimately may lead to disparities in patient experience across different geographic areas.[9,23] With this in mind, here we provide a framework on how to integrate patient address data into the study of patient experience. More specifically, we propose a geocoding model for surgical patient experience that can be adapted by providers and hospitals trying to enhance the care provided to patients. Indeed, using EMR, hospitals can adjust for the neighborhood-level factors, in addition to using previous diagnoses and mental health screening, to identify patients that will likely have lower patient experience scores. Given that the residential context influences experience-of-care ratings, attention to surgical patients' community-level conditions may help to maximize the hospital experience. In this respect, our analysis is an example of a precision public health intervention.[14] Indeed, our model aligns with several ongoing initiatives in precision public health that represent a paradigm shift in health care.[14] Further, other researchers have taken a similar approach and argue that hospitals should account for social risk factors such as poverty, disability, housing instability, and residence in a disadvantaged neighborhood in order to reduce readmission rates.[24] Taken together, because neighborhood context influences patient experience outcomes, to optimize the care experience, providers should consider patients' *residential* profiles, in addition to the patient profiles.

Here, we show that individuals residing in the most impoverished communities, paradoxically, have the highest HCAHPS scores. We do recognize, however, that it is necessary to also weigh satisfaction ratings based on individual profiles. Indeed, previous research indicates that variation in patients' experience-of-care scores is associated with age, gender, race/ethnicity, educational attainment, health status, and physical comfort/pain management.[6,7] For example, and consistent with our findings, existing evidence indicates a positive association between respondents' age and patient-reported ratings of care quality in both nonsurgical and surgical settings.[25–28] Available surgical and medical care data also show that gender associates with the overall score of experience, but this relationship is contingent upon the dimension of experience evaluated.[28–31] In addition, educational attainment is a known determinant of patient experience, although data are inconsistent.[29] For example, in two separate studies, researchers show a negative[4] and positive[32] association between educational attainment and ratings of the overall hospital stay experience. Findings on self-reported health indicators are more consistent across studies. Indeed, our results are in line with previous findings,[33,34] and those with better physical/mental health report higher scores. Related, patients presenting with pain consistently rate their overall hospital-care experience lower than those without pain,[29,35] which is also the case in our sample. Finally, race/ethnicity further influences how nonsurgical and surgical patients experience, and report on, their quality of care,[8,9] although findings are inconsistent. Notably, findings vary substantially by the survey instrument used, survey response rate, mode of assessment, domain of experience measured, patient insurance status, primary language spoken at home, and inpatient/outpatient status.[36–38] In our sample, Latinos relative to Whites, as well as Spanish-speakers, relative to all other languages, report higher satisfaction with their quality of care. In Orange County, California, communities that are characterized by disadvantage tend to have higher proportions of Latino residents.[39] With this said, it is possible that the higher ratings among patients residing in communities characterized by high levels of social disadvantage may partially be driven by the same language concordant care, which generates higher scores at the individual level.[40] Nevertheless, we are confident in our results, and see evidence that variation in socioeconomic conditions across residential areas influences the self-reported satisfaction of hospital care, independent of the patients' individual profiles.

We are the first to illuminate how patients' neighborhood conditions influence self-reported experience of hospital care within a surgical setting. Despite that, this study is not without limitations. The cross-sectional nature of our single-source data and relatively small sample size limit the scope of our analysis. Consequently, power to identify complex relationships between patient experience scores and residential context is limited. Moreover, given the magnitude of our estimates and minor variation between models, our results indicate that neighborhood conditions matter comparatively less than expected for patient experience ratings. Rather, it is the difference in patient-level sociodemographic, economic, and overall health characteristics within distinctive neighborhood contexts that contributes comparatively more to the observed disparities in ratings. Further, published reports indicate that experience ratings vary substantially by the survey response rate and mode of assessment.[41–43] Still, in our sample, the survey response rate is average at 31.1%,[40] and the survey was administered in both English and Spanish by phone or email within 72 hours of the visit. Finally, although published findings are inconsistent,[44–48] we should mention that we do not have data on the type of procedures patients underwent, nor about postoperative complications and readmissions, which both may impact experience-of-care ratings. Related, surgical outcomes disparities by race/ethnicity, socioeconomic status, income, and insurance type have been reported.[49] Despite these limitations, our analysis of the neighborhood associations with patient experience in Orange County, California serves as a starting point for future researchers interested in parsing out the neighborhood factors that matter most for patient experience scores.

In conclusion, we underscore the need for health professionals to consider neighborhood-level factors when contextualizing surgical patient opinions on hospital experience. Such adjustments may help in the interpretation of patient feedback and add depth to our understanding of the patient's perspective. Additionally, health care providers could use residential profiles to identify patients early on in their care experience to isolate specific needs and provide direct assistance to these individuals. Since neighborhood is a variable that is easily identifiable in the EMR, this approach will enable providers to maximize the hospital experience by providing the providers *a priori* information on this variable.

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