Association Between Physician Supply, Local Practice Norms, and Outpatient Visit Rates

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Background: There is considerable regional variation in Medicare outpatient visit rates; such variations may be the consequence of patient health, race/ethnicity differences, patient preferences, or physician supply and beliefs about the efficacy of frequently scheduled visits.

Objective: The objective of the study was to test associations between varying regional Medicare outpatient visit rates and beneficiaries' health, race/ethnicity, preferences, and physician practice norms and supply.

Methods: We used Medicare claims from 2006 and 2007 and data from national surveys of 3 different groups in 2005—Medicare beneficiaries, cardiologists, and primary care physicians. Regression analysis tested explanations for outpatient visit rates: patient health (self-reported and hierarchical condition category score), self-reported race/ethnicity, preferences for care, and local physician practice norms and supply in beneficiaries' Hospital Referral Regions (HRRs) of residence.

Results: Beneficiaries in the highest quintile of the hierarchical condition category scores experienced 4.99 more visits than those in the lowest. Beneficiaries who were black experienced 2.14 fewer visits than others with similar health and preferences. Higher care-seeking preferences were marginally significantly associated with more visits, whereas education and poverty were insignificant. HRRs with high physician supply and high-frequency practice norms were associated with 2.04 additional visits per year, whereas HRRs with high supply but low-frequency norms were associated with 1.45 additional visits. Adjusting for all individual beneficiary covariates explained <20% of the original associations between visit rates and physician supply and practice norms.

Conclusions: Medicare beneficiaries' health status, race, and preferences help explain individual office visit frequency; in particular, African-American patients appear to experience lower access to care. Yet, these factors explain a small fraction of the observed regional differences associated with physician supply and beliefs about the appropriate frequency of office visits.

Key Words: health care utilization, physician visits, geographic variation, physician supply, patient preferences

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Physician visit rates for Medicare beneficiaries vary widely across the United States, ranging from <3 visits per beneficiary per year in Grand Forks, ND, to >12 in East Long Island, NY.[1] These variations may represent inefficiency in health care utilization[2]; yet, such variations could be the consequence of several different factors. High-visit regions may be associated with greater physician supply, as would be implied by the classic "supplier-induced demand" hypothesis.[3] This association has not been supported by empirical evidence, with only modest associations found between physician supply and Medicare spending.[4] Alternatively, regional differences in practice norms—how often physicians feel that they should see their patients—could also help explain visit-rate variations.

Moreover, physician supply and practice norms could vary in response to regional differences in patient populations. There may be systematic differences in health status across regions; physician visits (and physician supply) may be appropriately higher where patients are sicker. Apparent associations between physician practice patterns and health care utilization may disappear after controlling for the demographic characteristics of patient populations.[5] Visit rates in some regions may be higher because Medicare enrollees there *prefer* to see their doctors more often, even conditional on health status. For example, physician visits could be viewed as a marker for patient demand, given how often patients initiate visits.[6] In recent studies, patients' preferences are mentioned as a possible explanation for observed variation; however, they have not been explicitly included in national analyses.[7,8]

In this paper, we consider these hypotheses for the wide variation in physician visits, focusing on outpatient physician visits for 2 reasons. First, physician visits are a relatively straightforward measure of utilization; the bundle of services provided in a single visit is likely to vary less than for a hospitalization. Second, outpatient visits are more likely to reflect patient demand and preferences, for example when the patient

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initiates an appointment.[6] Thus outpatient visits are a particularly valuable measure to better understand the roles of providers and patients in explaining regional health care variations.

We analyzed a nationally representative 2005 survey of Medicare beneficiaries, matched with outpatient visits in 2006 and 2007. Data on regional medical specialist physician supply from the Dartmouth Atlas classified regions as either high or low supply. In addition, we used companion 2005 national surveys of primary care physicians (PCPs) and cardiologists to capture a key behavioral factor: how long the physician would wait before scheduling a specific patient for the next visit. Thus, we described 2 dimensions of supply: the number of practicing physicians, and physician norms as measured by beliefs about how often a given patient should be seen. We used multiple regression analysis to test possible explanations for varying visit rates: individuals' sociodemographic factors, health status, preferences for care, and regional physician supply and practice norms. We assessed how much of the apparent effect of regional supply and practice norms may be due to differences in patient populations.

METHODS

Beneficiary Survey Data

We conducted secondary analysis of 3 different surveys. The first was a national survey of Medicare beneficiaries, conducted in 2005. A national probability sample of 4000 individuals was drawn from a sampling frame of all beneficiaries in 2003. The survey was conducted by telephone, with follow-up by mail. Responses were collected between March and October 2005; 2515 beneficiaries responded, and 160 were ineligible, giving an overall response rate of 65%.[9]

Preferences for care seeking were elicited regarding 2 different hypothetical outpatient care scenarios: a lingering cough after the flu and chest pain upon walking up stairs. Other questions elicited broader preferences about specialist vs. generalist care, and beneficiaries' stated avoidance of seeing a physician. Over 97% of beneficiary respondents, on average, answered these questions. Age, sex, race, educational history, self-reported financial difficulty in paying for care, and self-rated health were also assessed. Table 1 includes the text for all relevant questions.

Physician Survey Data

The second and third surveys consisted of 2 national physician surveys, whose data we used to summarize varying practice norms across regions. These 2 surveys—of PCPs and cardiologists—were part of the same survey program; they included similar questions, structure, and administration. Both of these surveys have been described in detail elsewhere.[7,10]

For the cardiologists, a national random sample of 1340 cardiologists was contacted and assessed for eligibility. Of those initially eligible, 999 were randomly selected to receive the survey; 5 additional physicians were found ineligible and 614 responded, giving a response rate of 62%. Respondents did not differ from nonrespondents in sex, practice type, or number of years in practice.[10] We analyzed responses to a question that asked physicians how many

TABLE 1. Questions Used in Our Survey Instruments

Patient survey questions:	
In general, do you think it is better for a patient to have one general doctor who manages most of their medical problems, or to have each problem cared for by a specialist?	Preference for specialists
Are you someone who tries to avoid going to the doctor?	Care-seeking preferences
Suppose you noticed a mild but definite chest pain when walking up stairs. Do you think you'd be more likely to try to see a doctor right away or wait to see if the pain would go away?	Care-seeking preferences
Suppose you noticed this pain for a week. Would you be more likely to go to see a doctor or wait to see if the pain would go away?	Care-seeking preferences
Suppose you went to your regular doctor for that chest pain and your doctor did not think you needed any special tests but said you could have some tests if you wanted. If the tests did not have any health risks, do you think you would probably have the tests or probably not have them?	Preference for specialists
Suppose your doctor told you he or she did not think you needed to see a heart specialist, but you could see one if you wanted. Do you think you would probably ask to see a specialist, or probably not see a specialist?	Preference for specialists
Suppose you had had the flu and after the other symptoms were gone, you still had a severe cough. If the cough lasted 2 days after your flu seemed to be over, would you be more likely to go see a doctor or wait longer to see if the cough went away?	Care-seeking preferences
If the cough lasted a week, do you think you'd be more likely to go see a doctor or wait longer to see if it went away?	Care-seeking preferences
Suppose you went to your regular doctor for that cough. If he or she said you probably did not need a chest x-ray, but you could have one if you wanted, would you be more likely to have the x-ray or not have the x-ray?	Preference for specialists
If your regular doctor said you probably did not need to see a lung specialist, but you could if you wanted to, would you be more likely to go see a specialist or not to see the specialist?	Preference for specialists
How important are financial issues for you when you decide whether or not to get any medical care?	SES/demographic
In general, how would you rate your overall health?	SES/demographic
Are you male or female?	SES/demographic
What is the highest grade or level of school that you have completed?	SES/demographic
Are you of Hispanic or Latino origin or descent?	SES/demographic
(In addition to being Hispanic or Latino) What is your race? Please choose one or more of the following… White? Black? Asian? Native Hawaiian/Pacific Islander? American Indian/ Alaskan Indian/Alaska Native? Other (specify)?	SES/demographic
How old were you on your last birthday?	SES/demographic
Physician survey questions	
For this question, think about a patient with stable angina whose symptoms and cardiac risk factors are now well controlled on current medical therapy. In general, how frequently do you schedule routine follow-up visits for a patient like this?	Cardiologists
In general, how frequently do you schedule routine follow-up visits for a patient with well-controlled hypertension?	Primary care physicians

Questions included in each preference factor are indicated in the second column; those used to characterize individual respondents socioeconomic status (SES) or demographic features are also indicated as such in this column. For the physician survey questions, this column indicates which physician population was asked each question.

months they would suggest a patient with well-controlled, stable angina wait before follow-up (Table 1).

In the PCP survey, a national random sample of 1775 physicians self-identified as family practice, general practice, or internal medicine were contacted and assessed for eligibility. Of those initially eligible, 1333 were randomly selected to receive the survey; 38 additional physicians were found ineligible and 801 responded, giving an overall response rate of 63%. Respondents did not differ from nonrespondents in sex, primary specialty, practice type, or number of years in practice.[7] We analyzed responses to a question that asked physicians how many months they would suggest a patient with well-controlled hypertension wait before follow-up (Table 1).

Medicare Claims Data

Each beneficiary's outpatient visits in 2006 and 2007 were counted from Carrier file data. We limited our count to valid physician visits, defined by an approved charge >$0, with codes indicating a physician provider. We further limited the claims to identify only outpatient physician visits.

We determined beneficiaries' hierarchical condition category (HCC) scores using claims from 2004. Designed to predict utilization based on past medical diagnoses, these scores combine patients' age and information across many diagnostic categories and are used by Medicare to risk-adjust capitated payments to Medicare Advantage plans.[11]

To characterize physician supply, we downloaded publicly available Dartmouth Atlas data derived from Medicare claims, aggregated to the Hospital Referral Region (HRR) level.[1] These data included the number of medical specialists per 100,000 residents of each of the 306 HRRs in the United States.

Outcome and Independent Variables

The dependent variable in all regression analysis was the beneficiary's annual number of outpatient Medicare physician visits, averaged across 2006 and 2007. Independent variables included sociodemographic characteristics, health status, preferences for care, and measures of regional physician supply and practice norms.

To represent health status, we included indicators for whether beneficiaries' self-rated health was either "fair" or "poor," "good," or "very good" (relative to "excellent"); self-reported measures of health are strong predictors of Medicare expenditures and mortality.[12] We also included beneficiaries' HCC scores, allowing for nonlinear relationships between HCC scores and utilization by including indicators for each quintile of HCC score (the lowest quintile was the reference). Some have argued that these are biased measures of health status because they are based on billing data (one needs to enter a diagnosis to bill Medicare) and would therefore tend to be higher in regions with greater physician practice intensity.[13] Thus, our use of HCC scores for risk adjustment is likely to bias downward any estimates of association between individual visits and regional physician supply and practice norms.

To represent beneficiaries' preferences for care, we created 2 summary measures, the first representing preferences for care seeking and the second preferences for specialist care. Several questions were asked in each category, and a summary statistic was created from the average of each set of variables. In general, a simple average is not as efficient a summary statistic as principle components analysis. Initially, we performed principle components analysis using tetrachoric correlation methods to estimate the underlying relationship between each set of dichotomous responses.[14] However, the results were nearly identical to the simple average, so the simple average of individual responses was used.

Respondents' preference scores were rescaled to a standard normal distribution for all summary statistics. In regression analyses, preference scores were rescaled such that the 25th percentile had a value of 0 and the 75th percentile a value of 1, allowing a more meaningful interpretation of the corresponding regression coefficients.

Physician supply and practice norms were aggregated to the HRR level. HRRs were split into groups of high-frequency or low-frequency practice norms on the basis of physicians' responses to the survey questions described above. As the mean number of months suggested before follow-up differed between the 2 physician populations, we standardized responses within each group nationally and then calculated the HRR-level average of this standardized response. HRRs were divided such that roughly half the beneficiary population resided in high-frequency areas, with the other half in low-frequency areas. We used a similar strategy to define cutoff points for high and low physician supply, yielding 4 mutually exclusive groups: high physician supply/high-frequency practice norms, high physician supply/low-frequency practice norms, low physician supply/high-frequency practice norms, and low physician supply/low-frequency practice norms.

Summary Statistics and Regression Analysis

We examined differences in respondents' health status, demographics, preferences, and socioeconomic characteristics across HRR categories using χ^2 tests and analyses of variance. We also calculated summary statistics of the ranges of medical specialist supply and average physician-preferred follow-up time for each group—cardiologists and PCPs—in each regional category.

We limited our analysis to HRRs that had at least 3 physician respondents (either PCPs or cardiologists) to the physician surveys. We recognize that there is considerable noise in constructing HRR averages from just 3 observations, so we weighted all regressions by the number of physicians who answered the survey in each HRR, giving greater influence to larger HRRs (with greater numbers of physician responses). Sensitivity analyses—limiting our sample to HRRs with at least 5, or 8, physician responses—had little impact on results.

In regression analyses, we first regressed beneficiaries' annual outpatient visits (averaged across 2006 and 2007) on indicators representing the physician supply/practice norm categories. Next, we added individual characteristics to create 3 subsequently more complete models. The first adjusted for care preferences and sociodemographic characteristics including age, sex, race/ethnicity, and self-reported financial strain. We then added health status, as represented by both HCC quintiles and self-reported health indicators. (In this model, age was omitted, as it was included in calculating HCC scores.) We also performed a sensitivity analysis using only self-rated health

levels instead of HCC quintiles to represent health status. Linear regression analysis results are reported; modeling the outcome as Poisson-distributed in a generalized linear model with a log link yielded nearly identical results. Further sensitivity analysis with regard to variable inclusion was performed, but again results were similar to those reported. Standard errors were calculated after adjusting for clustering of beneficiaries within HRRs. All analyses were performed using Stata 10.

RESULTS

Study Population and Regional Characteristics

A subset of the beneficiary respondents was included in our study. Of the 2515 survey respondents, 227 died before the end of 2007 (45 in 2005, 83 in 2006, 99 in 2007), 528 were enrolled in an HMO in 2006, and 550 in 2007. In addition, we included only those beneficiaries from HRRs with at least 3 physician survey respondents. In total, 1229 individuals were included.

Table 2 displays the beneficiaries' characteristics across categories defined by physician supply and practice norms. Beneficiaries living in high-supply/high-frequency areas reported significantly higher general care–seeking preferences ($P < 0.005$). Beneficiaries in these areas also tended to be slightly older ($P = 0.019$). There were marginally significant differences in the distribution of beneficiaries who said that finances were "important" or "very important" in health care decisions, with those living in low-supply/low-frequency areas appearing to express greater financial concerns ($P = 0.055$). There were no other significant differences.

Table 2 also summarizes several characteristics of physician supply across the HRRs included in our study. Of 306 HRRs in the United States, 168 had at least 3 physicians answering our surveys. Among these, the average number of physician respondents was just over 7 per HRR.

When asked how long they would wait before scheduling follow-up for a patient with well-controlled hypertension, PCPs in low-frequency areas would wait nearly 6 months,

TABLE 2. Characteristics of Patient Survey Respondents and Hospital Referral Region (HRR) Exposure Variables Across Categories Defined by Physician Supply and Practice Norms

	HRR Categorization Based on Medical Specialist Supply and Physicians' Self-reported Practice Norms					
	Low Supply/ Low Frequency	Low Supply/ High Frequency	High Supply/ Low Frequency	High Supply/ High Frequency	Overall	*P*
No. respondents	444	171	176	438	1229	—
No. HRRs	64	31	27	46	168	—
MD respondents/HRR	7.72	5.61	7.22	12.24	7.19	—
Age (mean)	75.62	75.40	74.63	76.37	75.71	0.019
Male (%)	40.77	42.69	40.91	38.58	40.28	0.799
Race						
Black (%)	3.38	5.26	6.25	6.85	5.29	—
Hispanic (%)	2.03	5.26	3.41	4.11	3.42	—
Other (%)	3.41	3.53	4.02	4.81	4.01	—
NH white (%)	91.14	85.88	86.21	84.21	87.22	0.184
HS grad (%)	78.83	80.12	78.98	80.82	79.74	0.891
Finances important*	55.18	48.54	47.73	46.35	50.04	0.055
Hierarchical condition category (HCC) quintile (%)						
1	22.8	23.4	19.9	18.3	20.8	—
2	19.1	18.7	22.7	18.0	19.2	—
3	21.2	17.0	19.9	21.0	20.3	—
4	20.1	18.7	20.5	19.4	19.7	—
5	16.9	22.2	17.1	23.3	19.9	0.497
Self-rated health (%)						
Poor	3.83	4.68	2.84	2.97	3.5	—
Fair	24.32	22.22	24.43	24.43	24.08	—
Good	41.22	41.52	41.48	38.58	40.36	—
Very good	22.52	22.22	25.57	25.8	24.08	—
Excellent	8.11	9.36	5.68	8.22	7.97	0.95
Preferences for health care†						
General care–seeking preferences†	−0.093	0.025	0.0032	0.083	0.00	0.0063
Preferences for specialists†	−0.046	0.037	0.022	0.023	0.00	0.4265
No. months before physicians would suggest follow-up‡						
Primary care physicians	5.87	4.34	5.99	4.17	5.07	—
Cardiologists	7.52	5.17	7.11	4.87	6.02	—
Medical specialist physician supply (physicians per 100,000 residents)						
Median	38.8	38.4	49.5	50.2	42.85	—
Range	26.6–44.5	29.5–44.6	44.9–71.2	44.7–79.9	26.6–79.9	—

*"Finances important" includes all those individuals who answered that financial considerations were either "important" or "very important" in decisions about medical care.
†Survey responses to several different questions in each category were averaged, and then rescaled to a standard normal distribution for interpretation.
‡These variables indicate the mean response to a survey question in which physicians were asked how many months they would wait before scheduling a follow-up visit for a relatively common medical condition: either well-controlled hypertension (PCPs) or stable angina (cardiologists).

whereas those in high-frequency areas would wait just over 4 months. Similarly, cardiologists in high-frequency areas would wait about 5 months before asking a patient with stable angina to follow-up, whereas those in low-frequency areas would wait >7 months. The medical specialist supply in the median HRR among low-supply areas was about 38 per 100,000 residents, whereas that of the median HRR in high-supply areas was about 50 per 100,000 residents.

Explaining Visit Rates

Table 3 contains full regression results across all models. HCC scores were the strongest predictor of visits; those in the highest quintile experienced 4.99 more visits [95% confidence interval (CI), 3.60–6.39] than those in the lowest quintile. Black respondents experienced fewer visits than otherwise similar respondents, with a point estimate of −2.14 (95% CI, −3.92 to −0.37). Preferences for general care seeking were marginally significantly associated with visits; those at the 75th percentile of preferences experienced 0.91 (95% CI, −0.02 to 1.84) more visits than those at the 25th percentile.

In Figure 1, we further examined the change in the number of visits associated with regional physician supply and practice norms across each model. Unadjusted results show that beneficiaries residing in high-supply/high-frequency areas experienced 2.48 more visits and those in high-supply/low-frequency areas experienced 1.51 more visits than those living in low-supply/low-frequency areas (low/low). Those residing in areas characterized by low physician supply yet high-frequency practice norms had nearly identical visit rates as those in low/low areas.

Adjusting for preferences, age, sex, race, education, and financial constraints slightly decreased the initial associations to 2.37 and 1.46 additional visits for those in high-supply/high-frequency and high-supply/low-frequency areas, respectively. Including HCC quintiles and an indicator for self-rated "fair" or "poor" health reduced the corresponding associations to 2.04 and 1.45.

In a sensitivity analysis using levels of self-rated health alone rather than HCC quintiles, the additional visits associated with living in a high-supply/high-frequency region increased to 2.36, and additional visits associated with being in the 75th percentile of care-seeking preferences (relative to the 25th) increased to 1.08.

DISCUSSION

In this study, we found that, although individual beneficiaries' health, race, and preferences for care affected their

TABLE 3. Regression Results Across Different Models to Predict Individuals' Total Outpatient Visits

	Model 1	Model 2	Model 3	Model 4
Category of physician supply/practice patterns				
High supply/high frequency	2.48*** (0.67)	2.37*** (0.72)	2.36*** (0.68)	2.04** (0.63)
Low supply/high frequency	0.26 (0.64)	0.26 (0.70)	0.26 (0.65)	0.22 (0.69)
High supply/low frequency	1.51* (0.61)	1.46* (0.70)	1.44* (0.65)	1.45* (0.67)
Individual sociodemographic characteristics				
Male	—	−0.07 (0.37)	0.05 (0.37)	−0.17 (0.34)
Black	—	−1.75 (1.13)	−2.22* (1.05)	−2.14* (0.90)
Hispanic	—	−0.22 (1.27)	−0.48 (1.08)	−0.44 (1.23)
Age (10 y)	—	0.12 (0.38)	−0.02 (0.40)	
High school graduate	—	0.02 (0.77)	0.53 (0.71)	0.66 (0.69)
Finances important[†]	—	−0.25 (0.48)	−0.34 (0.47)	−0.49 (0.45)
Preferences for health care[‡]				
General care seeking	—	0.96 (0.58)	1.04 (0.56)	0.91 (0.47)
Preferences for specialists	—	0.46 (0.43)	0.54 (0.46)	0.49 (0.44)
Hierarchical condition category (HCC) quintile				
2	—	—	—	0.67 (0.60)
3	—	—	—	1.59** (0.57)
4	—	—	—	3.47*** (0.67)
5	—	—	—	4.99*** (0.71)
Self-rated health				
Poor/fair	—	—	3.03** (1.09)	1.22 (1.04)
Good	—	—	1.92** (0.58)	0.61 (0.54)
Very good	—	—	0.31 (0.85)	−0.22 (0.80)
Intercept	6.77*** (0.32)	6.31*** (0.60)	4.19** (1.25)	3.40*** (1.26)
R^2	0.032	0.047	0.075	0.150
No. observations	1229	1229	1229	1229

Standard errors in parentheses; *$P<0.05$, **$P<0.01$, ***$P<0.001$.

[†]Respondent answered that finances were either "important" or "very important" in decisions about medical care.

[‡]Responses across several questions in each category of health care preferences were averaged, and the scores rescaled; estimate reflects the difference between those at the 75th and 25th percentile of preferences.

All results reflect linear regression analyses, adjusted for clustering of beneficiaries within Hospital Referral Regions (HRR).

In Model 3, self-rated health indicators represent health; in Model 4, beneficiaries' HCC scores, derived from diagnoses recorded in the previous year, are used to adjust for differences in health. The self-rated health categories are also retained in this model to fully account for potential differences in care-seeking behavior.

All regressions are adjusted for clustering of beneficiaries at the Hospital Referral Region level.

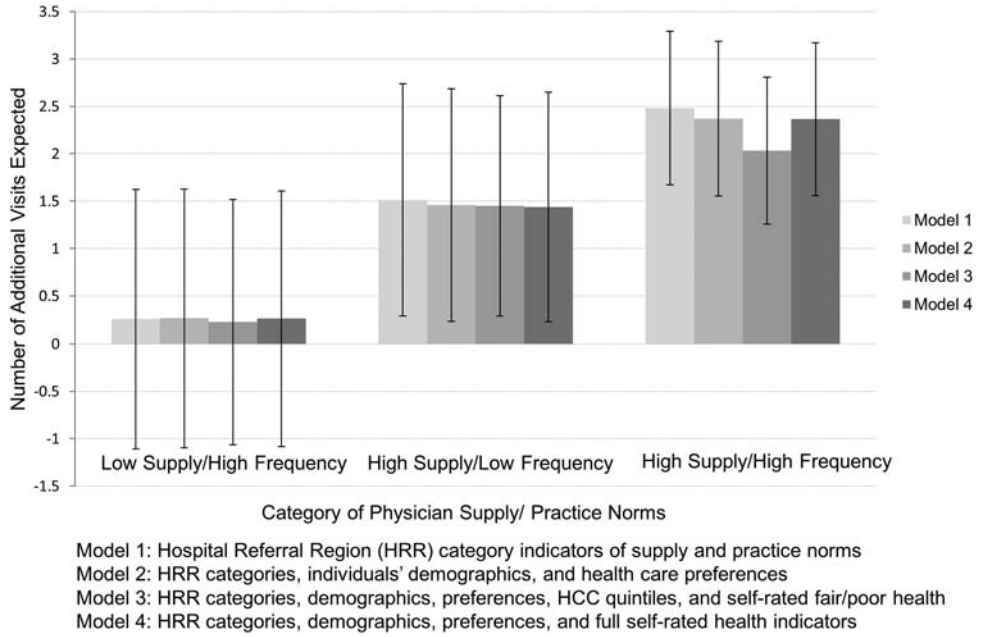

FIGURE 1. Additional visits associated with regional physician supply and practice norms, before and after adjusting for patients' individual characteristics. HCC indicates hierarchical condition category.

outpatient physician visit rates, adjusting for these factors explained little of the apparent effect of local physician supply and practice norms on visit rates. Beneficiaries from areas with both high physician supply and high-frequency practice norms experienced 2.04 more physician visits per year than those from low-supply/low-frequency areas. Those from high-supply/low-frequency areas experienced 1.45 additional visits than those in low/low areas. In the fully adjusted model, beneficiary characteristics explained $<20\%$ of initial associations between visit rates and local physician supply and practice norms. The presence of large residual regional effects is consistent with previous research, in which considerable variations in total regional spending remained after adjusting for patients' characteristics.[8,12]

A second finding in this study was that beneficiaries who are black experienced 2.14 fewer visits than the otherwise similar beneficiaries. Some previous work has suggested that black patients may receive fewer health care services, such as surgical intervention for osteoarthritis and renal transplantation for end-stage renal disease, because of differences in preferences.[15,16] Yet, we controlled for individuals' care-seeking preferences explicitly. Further study into the relationships between race, preferences, and receipt of health care services is warranted.

Although outpatient visit rates vary widely across the United States, previous studies have shown that demographics, health, and patients' preferences explained little of this geographic variation.[17,18] Here, we combined regional medical specialist supply with data from a national survey of physicians. Although these measures of physician supply and practice norms did not explain all of the observed geographic variation, the fact that we found significant differences across areas defined by these data suggests that both physician supply and practice norms are important predictors of beneficiaries' experience.

Several possible factors may drive physicians' practice norms. First, norms may be related to local physician supply. Previous work has suggested that physicians in high-supply areas may see patients more often to maintain a full schedule (and the accompanying income).[7] The overall costs to patients of seeing specialists may be lower in regions with more specialists because they are closer, thus reducing travel time, or because specialists are more easily available.[19] Recall that we divided our study population evenly on the basis of local physician supply, and then by physician practice norms. If physician behavior were uncorrelated with physician supply, each group should contain roughly one quarter of the study population. However, over two thirds of the beneficiaries were in areas defined as high supply/high frequency or low/low, with the remaining split between areas classified as high/low or low/high.

Still, there was not a perfect correlation between physician supply and practice norms. Across regions with lower supply, beneficiaries in areas where doctors reported high-frequency practice norms experienced no more visits than those in areas with low-frequency practice norms. In areas with lower supply, it seems that practice norms have less impact on patients' experiences. There appears to be an interactive effect between norms and supply that leads to disproportionately higher utilization of visits when both measures are above the median.

Regional variations in malpractice concerns may also influence physicians' decisions. Previous study of our cardiologist

survey data documented that differences in self-reported propensity to test and treat were significantly related to concerns about malpractice charges.[10] Yet, other studies linking information about physicians' malpractice risk to their actual practice suggest that malpractice concerns are responsible for a small proportion of practice variations.[20–22]

This study has several limitations. First, some illnesses may best be cared for by specialists and would therefore necessitate greater physician visits.[23] A single health status measure may not capture such information. To address this concern, we used HCC scores, which were designed to predict utilization on the basis of previous diagnoses, but even with the use of HCCs, we still found large and statistically significant associations between physician supply/norms and utilization. Second, physician beliefs leading to more intensive treatment and diagnosis norms may result in elevated HCC measures.[13] This would tend to bias downward estimates of provider norms on patient visits when conditioning on HCC measures. Thus, we view the fully specified model as providing a conservative estimate of how provider norms affect the frequency of physician visits. Third, the study was limited to beneficiaries in fee-for-service Medicare living in relatively large HRRs. However, the patient sample did not differ notably between fee-for-service and managed care patients, nor between those in larger and smaller HRRs.

Fourth, the beneficiary surveys only included a few preference questions, which did not match perfectly with the physician survey questions. Still, these questions all captured beliefs by both patients and physicians about the efficacy of more frequent office visits. In addition, the patient preference questions were predictive of utilization at the individual level, even controlling for health status, suggesting that they captured important dimensions of patient demand.

Fifth, we did not survey the Medicare beneficiaries' own physicians but random physicians practicing within their HRRs. Therefore, we were limited to comparing regional variables on the basis of a small number of physician respondents per region. In general, poorly measured independent measures lead to coefficient estimates that are biased toward the null hypothesis. Yet our estimates suggest that regional practice norms do differ, with measurable consequences. Greater study of differences in physicians' practice norms and their effects may help further elucidate these relationships.

Lastly, our evidence does not allow us to draw conclusions regarding the most appropriate level of physician supply or visit frequency. For example, then-current AHA/ACC guidelines for chronic stable angina treatment state no clear evidence on the optimal follow-up for such patients, with a consensus estimate suggesting 4–12 months as reasonable.[24] If anything, the range of mean physician-reported follow-up times across high-frequency and low-frequency practice norm regions—from 5–7 months—falls on the more frequent end of these guidelines. Without detailed health outcome data, we were unable to assess whether beneficiaries in low-rate areas may be missing out on needed care, or if those in high-rate areas may be receiving unnecessarily fragmented care.

In summary, after controlling for preferences, health status, and sociodemographics, regional physician supply and practice norms still significantly predict beneficiaries' outpatient physician visit rates. Differences in practice patterns appear to have more of an effect in areas with higher physician supply. In addition, we found strong evidence that black Medicare beneficiaries experienced access challenges, even after controlling for patient preferences. These factors provide at least a first step in better understanding possible explanations for the wide variation in physician visits across regions of the United States.

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