

# Geographical variation in physician supply and its relationship to utilization of care across older adults in the United States

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## Abstract

**Introduction:** Scholars express concern that general practitioner shortages and specialist surpluses induce overspecialization, with overuse of costly specialist services and underuse of cost-effective primary care services. Yet few studies directly assess the relationship between physician supply and patient utilization. Given this gap, this paper examines the associations between physician supply, care utilization, and patient need and whether patients use more specialists in areas with lower primary care supply.

**Methods:** Using a 20% sample of 2018 Medicare fee-for-service claims, this paper first assessed the correlation between county physician densities and county physician visits. It then modeled individual patient consumption of primary and specialty care services in relation to physician supply through linear regression, adjusting for health and demographics.

**Results:** While county supplies of primary care practitioners (PCPs) and specialists were positively correlated, we found no correlation between local PCP supply and local primary care visits. We also found no evidence that patients substitute specialist care for primary care, even in areas with PCP shortages.

**Conclusion:** These findings suggest that factors other than PCP supply play an important role in primary care underuse. Scholars should also consider how care models, limited gatekeeping, and excess consumption among well-resourced populations influence the distribution of primary care utilization.

**Key words:** health access; primary care; healthcare utilization; geographic distribution of health resources.

## Key points

- Although specialists outnumber primary care practitioners (PCPs) in the United States, the distribution of specialists around the country is actually more unequal than the distribution of PCPs.
- Yet the inefficient allocation of PCPs and specialists is not associated with strong differences in local primary care or specialist utilization.
- Individual patients that use more primary care, on average, also use more specialty care, even after controlling for underlying health and local physician supply, suggesting that the overuse of specialty care and the underuse of primary care is likely related to many factors beyond the relative supply of PCPs to specialists.

## Introduction

Primary care is crucial to a well-functioning healthcare system. By attending to patients first, primary care practitioners (PCPs) not only lower expenditures and prevent unnecessary care but also help promote better, long-term outcomes.<sup>1-6</sup> A wide array of studies across a diverse set of patients link visits to PCPs and PCP availability with improvements in mortality, efficiency, and cost control.<sup>1-8</sup> Internationally, countries with robust primary care systems report better overall health.<sup>9</sup>

Yet recent evidence suggests that Americans make less use of primary care services now than in the past.<sup>10-14</sup> Both commercially insured adults and children show declines in visits to primary care providers from 2008 to 2016,<sup>10,11</sup> and Medicare patient samples and national health surveys display similar declines in PCP utilization over a 20-year period.<sup>15</sup> Despite the robust research that primary care improves both individual and population health outcomes, Americans consistently make greater use of specialist visits relative to primary care visits than patients in other developed nations,<sup>16-18</sup> and such underuse likely contributes to the United States' consistently

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worse health outcomes.<sup>19-22</sup> More empirical research is thus needed to better understand what factors inform the utilization of primary care in the United States.

Overspecialization and supplier-induced demand are often cited as potential contributors to primary care underuse. American medical schools produce far more specialists than generalists, and more primary care physicians are expected to retire than to enter the workforce over the next decade, with the proportion of spending going to primary care also diminishing.<sup>14,23</sup> Recent evidence further demonstrates a simultaneous rise in visits to emergency departments, urgent care clinics, and specialist physicians among both publicly and privately insured.<sup>10-12,24</sup> Scholars have long linked these trends, suggesting that inadequate access to PCPs is a major contributor to inadequate primary care utilization.<sup>25-28</sup> American health policy efforts aimed at bolstering primary care utilization, such as the National Health Service Corps and the Health Professional Shortage Area (HPSA) Bonus Program, consequently focus on identifying areas with primary care shortages and improving the local supply of PCPs.<sup>22,29</sup>

Yet evidence supporting these explanations and policy programs is mixed.<sup>22,29-31</sup> While the United States faces national shortages of general practitioners and maintains an abundance of specialists, the ratio of generalists to specialists varies significantly around the country, and specialist shortages also regularly occur, particularly outside metropolitan areas.<sup>31-39</sup> International comparisons likewise complicate the overspecialization narrative. The United States pays its physicians more and has a larger share of specialists than the OECD average,<sup>40,41</sup> but the percentage of specialists in the United States is still smaller than that of Denmark and Sweden and is comparable to that of Japan—countries lacking the United States' reputation for specialist overuse.<sup>40</sup> Given the ambiguous evidence supporting the presumption that primary care shortages are primarily responsible for insufficient primary care utilization, this paper aims to deepen our understanding of how the supply of primary and specialty care physicians relates to the utilization of primary and specialty care in the United States.

Using national Medicare fee-for-service (FFS) and Area Health Resources File (AHRF) data, this study explores primary and specialty care utilization patterns around the country and the relationship between them. It answers 3 questions. First, how do local supplies of specialists and primary care doctors vary with one another and with the burden of illness? Second, how does local utilization of specialty and primary care vary with the local supply of specialty and primary care physicians? Do counties with an abundance of specialists also exhibit comparatively lower use of primary care services? Third, do patients that see a high number of specialists see fewer PCPs, controlling for health need and local physician supply?

## Data and methods

### Data

We use a 20% national sample of Medicare FFS enrollees from 2018 to identify patient demographics, individual chronic conditions, and outpatient visits with primary care and specialty care physicians. We define physician visits using Current Procedural Terminology Codes for all Evaluation and Management (E&M) utilization and exclude other forms of care that do not require seeing a doctor, such as testing (see [Table S1](#) in the [Supplement](#) for a list of the top 100 most common codes in our data). We also exclude a limited number of E&M visits

associated with physical therapists, cardiac rehab, psychotherapy, and occupational therapy, so as to not overcount specialist care. We identify the physician specialties seen during a visit by linking our Medicare FFS claims data with physician Medicare files and then classify visits based on physician specialties accordingly. Using only Medicare FFS data helps us control for other factors that might inform care use, such as differences in insurance design and coverage. These data are anonymized and accessed in compliance with the Center for Medicare and Medicaid Services' security and privacy requirements.

We also use county-level data from the AHRF from 2018 to identify local primary care and specialist physician densities. Primary care practitioners are defined as those with a physician specialty as general practitioners, geriatricians, family medicine clinicians, and internal medicine physicians, as done elsewhere.<sup>42</sup> We define specialists as all other licensed and practicing physicians. As our study is focused on the adult population, we exclude pediatricians from our analysis. Although we can use Medicare claims to identify the number of physicians in a county, these claims exclude physicians that do not see Medicare patients and thus may give biased representations of physician distributions.

County-level characteristics, such as rurality and demographics, are obtained from the American Community Survey. A small number of counties (24 counties; 0.76% of the total counties in the United States) are excluded from our analyses due to missing data.

This study was reviewed by the IRB Board of the Harvard T.H. Chan School of Public Health and deemed exempt. Data for the study were accessed from March 2022 to May 2025.

### Variables of interest

Our main outcomes of interest are visits to primary care and specialty physicians per Medicare enrollee. We use visits as a measure of utilization, and we exclude non-physician visits to better approximate sensitivities to physician supply. Our main inputs are the county-level supplies of primary care and specialist physicians per 100 000 adult population, measured as individuals over 18 years.

We also use several variables to approximate the health risk of our sample: race, ethnicity, age, gender, dual Medicaid–Medicare status, HCC (Hierarchical Condition Categories) score, and CCW (Chronic Conditions Data Warehouse) chronic conditions. As individuals qualifying for dual Medicaid–Medicare status must meet the needs of both programs, dual status suggests greater health needs, typically due to a combination of age, low income, and living with disability. HCC scores are included to control for the overall health risk of individuals in our sample. CCW conditions are likewise included to control for the burden of chronic conditions within our sample. We use the HCC score from 2017, the year prior to our year of analysis. Using the prior year prevents current utilization from biasing our estimates. The HCC score is further averaged at the county level to identify county burdens of sickness.

### Statistical analysis

We first present descriptive data on the distribution of primary care and specialist physician supply quartiles across US counties. We then calculate the Pearson correlation coefficient between county physician supply and county physician utilization. We also plot the county-level supply of primary care physicians against the county-level supply of specialty physicians (in the

main text), and we plot the county-level utilization of primary care against the county-level utilization of specialty care (in the [Supplement](#)). Both the supply plot and the utilization plot are color-coded by HCC quintile to illustrate how the relationships between primary care and specialist supply and primary care and specialist utilization vary with each county's burden of sickness. Given the presence of extreme outliers, we winsorize the top 1% of primary and specialty care visits, replacing their values with that of the closest observation in the 99th percentile.

Finally, to better adjust for the underlying severity of populations, we carry out regression analysis at the individual level, modeling the relationship between county physician supply and individual primary and secondary care utilization. Specifically, we conduct 2 parallel linear regression analyses to control for individual-level predictors of primary and secondary care utilization, and we then examine the correlation between their residuals to assess whether there is indicative evidence of substitution between the 2 types of visits. The model residuals offer insight into unexplained variance in primary and specialty care utilization after accounting for our predictors (ie, the distance between actual and predicted utilization), and thus, the correlation between residuals offers insight into how an individual's above-average use of primary care is related to their use of specialty care.

Our first analysis predicts the annual number of primary care visits for individual patients relative to the local county supply of physicians, controlling for age, gender, race/ethnicity, HCC risk score, and chronic conditions (according to CCW). Rather than including a coefficient for county PCP supply, we use county-level fixed effects to compare utilization among patients with the same local access to physicians. Our second analysis repeats the same regression but predicts the number of specialty visits rather than the number of primary care visits. We then take the residuals from each model and plot them against one another to examine the relationship between them. A negative relationship between the residuals in our 2 models would suggest a substitution effect: Patients with higher-than-average use of 1 type of visit, on average, also make less use of the other. A positive relationship, in contrast, would suggest an additive effect: Patients who use more of 1 type of care also make greater use of the other.

We conduct the above analysis of our models' residuals for the entire sample in the main text and, in the [Supplement](#), for 4 specific county subgroups where we might be more likely to see greater use of 1 type of care: counties with low PCP supply and low specialty supply, counties with low PCP supply and high specialty supply, counties with high PCP supply and low specialty supply, and counties with high PCP and high specialty supply. We define high and low supply as above and below the median counties.

## Sensitivity analyses

We also conduct multiple sensitivity analyses to assess whether our results change given different definitions of primary and specialty care visits or given different measures of care utilization. First, we use the same exclusions above but further exclude rural counties, as low population densities may skew results. Second, we run the models including primary care utilization that can be identified using Berenson-Eggers Type of Service (BETOS) codes M1A and M1B, which specifically identify office visits. Third, we include only office visits identified in BETOS codes M1A and M1B, but we also include visits to nurse practitioners and

physician assistants, as these practitioners often function in primary care roles.<sup>43</sup> Fourth, we run the same correlations between physician supply and utilization but substitute alternate utilization measures for the number of visits. Specifically, we use the proportion of beneficiaries with any primary care visits, the proportion of beneficiaries with any E&M visits (excluding rehab/therapy), and the CDC PLACES database's county-level measure of the proportion of adults receiving an annual checkup ([Table S2](#) in the [Supplement](#)). Lastly, we also ran the correlations using Spearman's correlation coefficients to assess whether non-linear relationships may exist in the data ([Table S3](#)). Our results do not meaningfully shift when using any alternate definitions of primary and specialty care visits or when using alternate measures of preventive care use.

## Role of the funding source and conflicts of interest

No funding sources supported this research, and the authors independently made all decisions regarding the design, conduct, analysis, writing, and publication of this study. All authors declare that they have no conflicts of interest.

## Results

### Descriptive data

Primary care and specialty physician supply varied significantly across the United States in 2018 ([Table 1](#)). While the supplies of both PCPs and specialists were disproportionately allocated around the country, the supply of specialists displayed a much wider range (0-3575 physicians per 100 000 adults) than that of PCPs (0-650 physicians per 100 000 adults) at the county level. Over 50% of counties in the top quartile of PCP supply were in metro/urban areas (Urban-Rural Codes 1-3), and over 72% of counties in the top quartile of specialty supply were in metro/urban areas. The average median household income in counties in the top quartile of PCP supply was \$57 146, and the average median household income in counties in the top quartile of specialty supply was \$59 711. Average median incomes in counties in the bottom quartiles of PCP supply (\$47 283) and specialty supply (\$46 900) were about \$10 000 lower than their top quartile counterparts.

There were also substantial regional disparities in physician supply ([Table 1](#)). Over 57% of counties in the bottom quartile of PCP supply were in the South (as defined by Census region) compared to only 29% of counties in the top quartile. Similar geographic disparities were present in specialty supply, with counties in the top quartile of specialty supply disproportionately found in the Northeast and the West and counties in the bottom quartile disproportionately found in the South and the Midwest. These regional variations were mapped at the county level in the [Supplement](#) ([Figures S1](#) and [S2](#)). Counties in the top quartiles of PCP and specialty supply also maintained lower (healthier) average HCC scores (0.82 and 0.81) than counties in the other 3 quartiles (ranged from 0.83 to 0.85).

### Correlations

Although the data displayed strong, positive correlations between the county-level supplies of PCPs and specialists (Pearson  $r = 0.662$ ; [Table 2](#); [Figure 1](#)), the data showed negligible correlations between the county-level supply of PCPs and the number of visits to those PCPs (Pearson  $r = 0.121$ ; [Table 2](#)) and weak, positive correlations between the county-level supply of specialists and visits to those specialists

**Table 1.** County characteristics by PCP and specialty supply quartile.

	PCP supply Q1 (Lowest supply)	PCP supply Q2	PCP supply Q3	PCP supply Q4 (Highest supply)	Specialty supply Q1 (Lowest supply)	Specialty supply Q2	Specialty supply Q3	Specialty supply Q4 (Highest supply)
Range of MDs per 100k adult pop.	0.0-35.7	35.7-55.2	55.2-84.0	84.1-649.9	0.0-13.4	13.5-40.6	40.6-109.6	109.7-3574.6
Number of counties ( <i>n</i> = 3118)	779	780	780	779	779	780	780	779
Region								
Midwest	242 (31%)	254 (33%)	272 (35%)	285 (37%)	315 (40%)	281 (36%)	262 (34%)	195 (25%)
Northeast	17 (2%)	48 (6%)	55 (7%)	97 (12%)	7 (1%)	20 (3%)	63 (8%)	127 (16%)
South	449 (58%)	408 (52%)	334 (43%)	225 (29%)	375 (48%)	394 (51%)	338 (43%)	309 (40%)
West	71 (9%)	70 (9%)	119 (15%)	172 (22%)	82 (11%)	85 (11%)	117 (15%)	148 (19%)
Rurality								
Metro/urban	241 (31%)	241 (31%)	285 (37%)	395 (51%)	157 (20%)	197 (25%)	243 (31%)	565 (73%)
(Based on USDA rural urban								
continuum codes)	237 (30%)	400 (51%)	407 (52%)	285 (37%)	235 (30%)	421 (54%)	472 (61%)	201 (26%)
Suburban/town								
(RUCC 4-7)	301 (39%)	139 (18%)	88 (11%)	99 (13%)	387 (50%)	162 (21%)	65 (8%)	13 (2%)
Rural								
(RUCC 8-9)								
Average median household income	\$47 283	\$49 428	\$51 924	\$57 146	\$46 900	\$47 767	\$51 399	\$59 711
Average HCC score (2017)	0.84	0.84	0.83	0.82	0.85	0.84	0.84	0.81

<sup>a</sup>Percentages may not sum to 100% due to rounding.

(Pearson  $r = 0.296$ ; Table 2). The data also showed weak, positive correlations between the number of visits to primary care physicians and the number of visits to specialist physicians (Pearson  $r = 0.295$ ; Table 2; Figure S3, in Supplement). The correlations between local PCP supply and the proportion of adults utilizing any care and the proportion of adults receiving a routine annual checkup from the CDC PLACES database were also negligible (Pearson  $r = 0.048$ ; Pearson  $r = -0.016$ ; Table S2). When using Spearman's correlation coefficients, the data displayed similarly strong correlations between county-level supplies of PCPs and specialists (Spearman  $r = 0.620$ ; Table S3) and similarly weak correlations between the county-level supplies of PCPs and the number of visits to those PCPs (Spearman  $r = 0.109$ ; Table S3).

### Regression analysis and correlation between primary care and specialty care residuals

To further investigate the relationship between primary care physician supply and specialist visits, Figure 2 displayed a map of the county-level correlation between the residuals of our 2 individual-level models for primary care visits and specialist visits, when controlling for underlying patient health and socioeconomic status. It showed a weak positive correlation between the residuals of the 2 types of visits at the national level (Pearson  $r = 0.185$ ), with little variation across counties. The full model results and additional scatterplots were presented in the online Supplement (Tables S4 and S5; Figures S4-S8). Weak positive correlations were also present when the data were segmented into 4 subgroups of specialist and primary care supply where we might expect greater use of 1 type of care given the relative abundance or the relative shortage of another type of care: high PCP and high specialist supply, high PCP and low specialist supply, low PCP and high specialist supply, and low PCP and low specialist supply (Figures S4-S8).

### Discussion

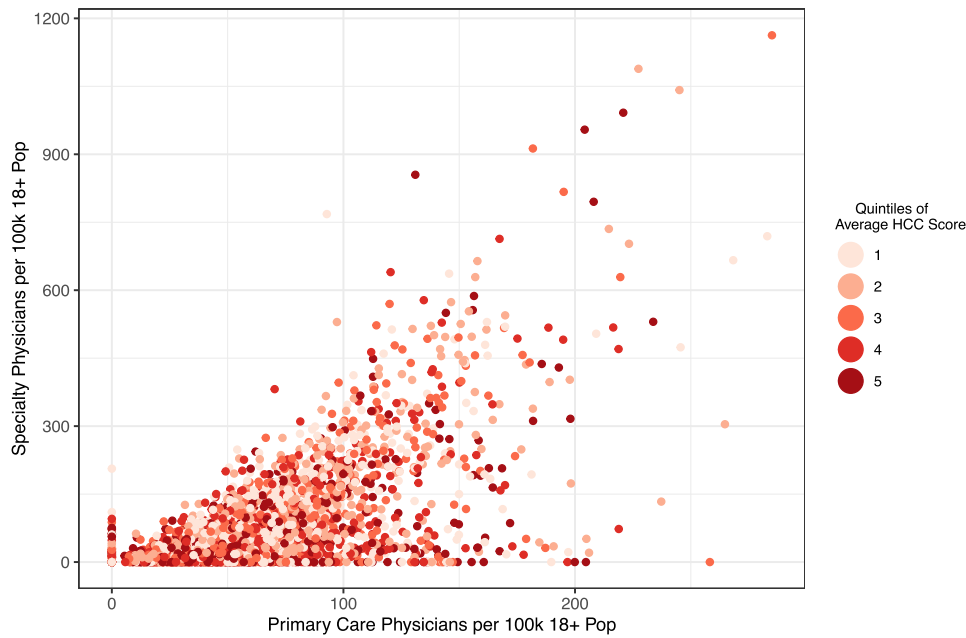
This national study of Medicare beneficiaries nuances our understanding of the relationship between physician supply and patient utilization. First, it shows significant inequity in the distribution of primary and specialty care physicians. Both PCPs and specialists concentrate in comparatively healthy, affluent, urban areas and, regionally, in the Northeast and the West. Second, it finds only weak associations between the local supply of primary care physicians and the number of visits made to those physicians and between the local supply of primary care physicians and whether individuals visited any physician in the past year. Moreover, the association between utilization and supply is consistently weaker for primary care physicians than it is for specialists. Third, it shows that patients do not commonly substitute specialty care for primary care. Rather, even when controlling for underlying health and local physician supply, patients using one form of care are more likely to utilize more of the other. Together, these results suggest that the United States' overuse of specialty care and underuse of primary care is likely related to many factors beyond the relative supply of PCPs to specialists.

Our results bear important implications for two branches of health policy: efforts to address disparities in healthcare access and efforts to encourage effective use of primary and specialty care in the United States and in other countries. First, our results reinforce existing research showing wide disparity in the density of physicians, with both primary care and specialist



**Table 2.** National county-level correlations between physician supply and outpatient utilization.

	Prim care visits (E&M)	Spec care visits (E&M)	Prim phys per 100k (18+)	Spec phys per 100k (18+)
Prim care visits (E&M)	1	0.295	0.121	0.067
Spec care visits (E&M)		1	0.035	0.296
Prim Phys per 100k (18+)			1	0.662
Spec Phys per 100k (18+)				1



**Figure 1.** Average primary care supply vs specialty care supply, by HCC quintile. The figure compared county primary care supply with county specialty care supply. It further differentiated counties based on their average HCC score. The average HCC score was used to quantify a county’s overall burden of sickness, with counties in quintile 5 experiencing the highest illness burden. Eight outlier counties were excluded from this graph to better display the remaining data. Excluded counties were predominantly sparsely populated counties with academic medical centers.

physicians concentrated in urban, affluent, and comparatively healthy areas.<sup>29,33-38</sup> The endurance of these widely observed disparities casts doubt on the effectiveness of existing incentive-based policy efforts, such as those included in the Affordable Care Act (2011) and those offering bonuses for working in HPSAs, to sufficiently amend the drastic inequities in physician supply around the country.<sup>29,33,44</sup>

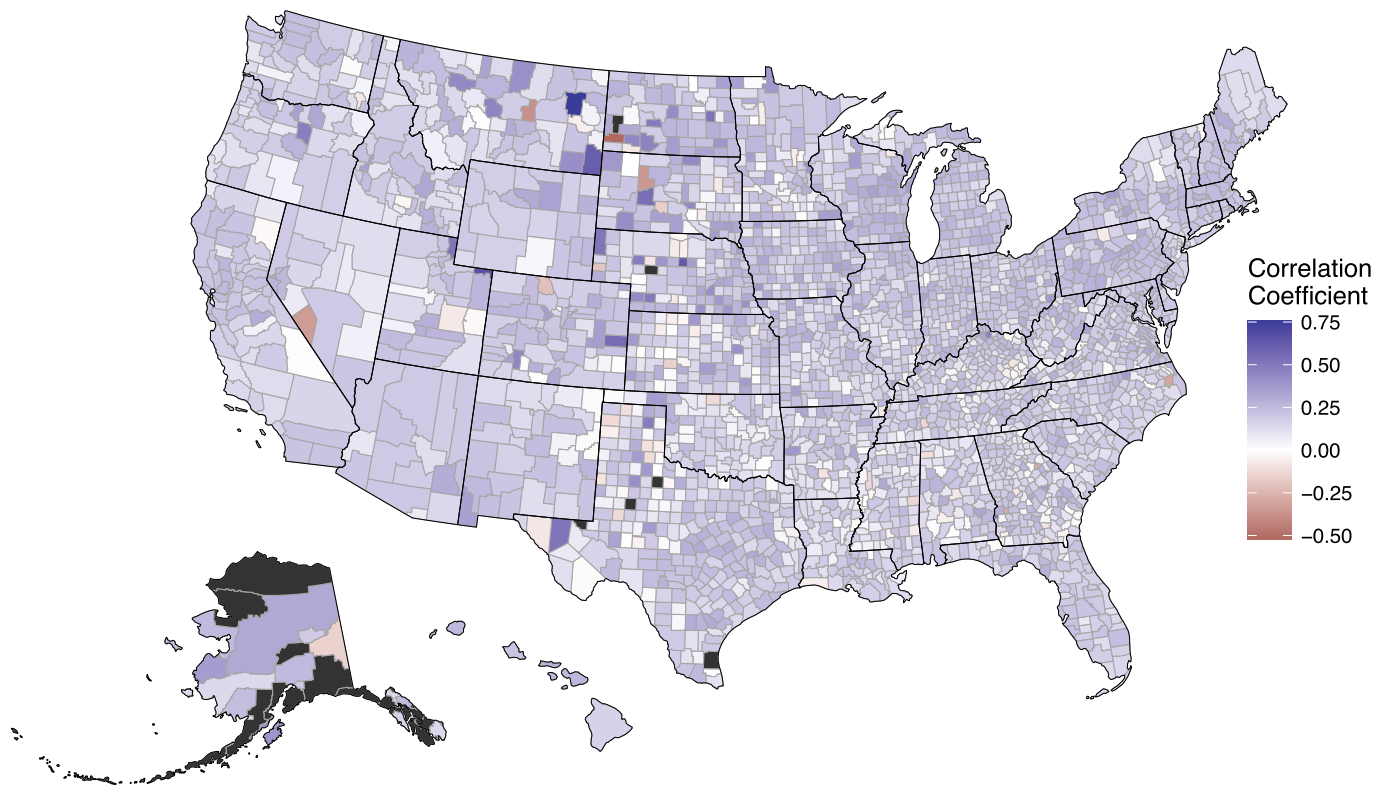
These incentive-based policy efforts appear insufficient both within individual states and across different regions of the country. Rural counties facing greater health burdens, on average, also face more significant physician shortages, and the South and Midwest—both regions with comparatively greater public health challenges—suffer from comparatively lower rates of primary and specialty care physicians per capita.<sup>45-47</sup> While these disparities could solely be a product of physician supply—areas with more physicians have better healthcare access and consequently better health outcomes<sup>5</sup>—our data’s lack of strong, positive relationships between the supply of physicians, particularly PCPs, and the use of physicians suggests a more complicated relationship.

It appears that physicians choose to practice in areas where they are less needed, potentially due to lifestyle factors, such as prestige and quality of life, and that the financial incentives currently offered are not sufficient to overcome these gaps.<sup>33,38,48,49</sup> Existing research supports these inferences: the physicians most likely to practice in medically underserved areas either tend to be from those areas or are those most likely to benefit from the

financial incentives offered, typically due to medical school debt.<sup>50-52</sup> More attention must be given to understanding how and where physicians decide to practice and how these decisions reflect or exacerbate existing inequities between communities.

Second, while our results confirm and deepen prior analyses of disparities in healthcare access, they also complicate the presumption that introducing more primary care physicians into an area will alone improve primary care utilization rates. Prior research documents the importance of local primary care access for population health, noting that PCPs play a crucial role in diagnosing, triaging, and centralizing patient care.<sup>1,8,22</sup> This research also informs significant health policy efforts: the designation of primary care HPSAs, the development of the National Health Service Corps incentivizing medical students to practice in areas with insufficient resources, and the creation of Federally Qualified Health Centers providing services for rural areas lacking alternative providers.<sup>29,33,44,53</sup> Yet the absence of any significant correlation between local primary care supply and local primary care utilization—whether in the number of visits made to physicians or in the use of any care at all—in this paper’s analyses suggests that, while adequate supply is a necessary prerequisite for effective primary care utilization, it is not sufficient to ensure patients adequately utilize primary care services.

Additional research is needed to understand why and how patients choose not to receive primary care even when providers are available, particularly in areas with severe health



**Figure 2.** Map of residual correlations between primary care visits model and specialty care visits model. The figure displayed the county-level correlation coefficients between the residuals of an individual model predicting primary care visits and the residuals of an individual model predicting specialist visits. Black counties had missing data. Each model predicted the number of visits for individual patients based on their age, gender, race/ethnicity, HCC risk score, and chronic conditions (according to CCW) while also using county-level fixed effects to compare utilization among patients with the same local access to physicians. A negative correlation between the 2 sets of residuals implied that patients with higher-than-average use of 1 type of visit did, on average, also make less use of the other, suggesting substitution of specialists for primary care providers within the county. The national correlation between the residuals across all counties was  $r = 0.185$  (Pearson).

burdens. Patients may, for example, misunderstand that they can access many primary healthcare services at little to no cost, and they may avoid utilizing any care as a result.<sup>54</sup> Mistrust of medical institutions may also chill utilization, even among individuals living with severe illness.<sup>55</sup> Policy efforts likewise need to develop additional strategies to encourage primary care utilization among patients. Some existing programs, such as Comprehensive Primary Care Plus and the Medicare Shared Savings Program, show initial promise but may need to be adapted to serve the needs of patients and providers in rural and medically underserved areas.<sup>56-59</sup>

Third, our results also suggest that there is no simple trade-off between primary care and specialty care visits and, correspondingly, between access to primary care and specialty care physicians. While robust research finds that primary care use reduces unnecessary specialty services,<sup>1,3</sup> this paper's analyses indicate that specialist use remains common even among those who regularly see primary care physicians regardless of their underlying health. Moreover, this paper shows that while the United States maintains significantly more specialists than PCPs—as many commentators note<sup>26,60</sup>—the distribution of specialists is more unequal than that of primary care physicians, with more counties lacking specialists of any kind than generalists. There may well be longer wait times to see a PCP, but the likelihood that individuals often cannot find a PCP but can find a specialist appears limited given our data.

Other factors, such as a lack of gatekeeping in insurance plans or socioeconomic variations in utilization, may be

associated with the relative use of primary care to specialist care in the United States as compared to other countries. These factors may also help explain wide disparities in healthcare outcomes between different groups and deserve greater attention from researchers.<sup>20,61</sup> If policymakers hope to encourage greater use of PCPs and reduced reliance on specialists, they may need to adapt care model design to incentivize primary care use, rather than solely relying on programs that attempt to bolster primary care physician supply.

Our study has several limitations. First, it only presents observational data comparing physician supply across counties and primary and secondary care. It is not able to draw any inferences about the causality of the relationship through this analysis. While it explores individual-level data and controls for patient comorbidity with the data available, there may be further confounding factors that affect this relationship, such as coding of comorbidity, income, or even insurance design. Second, our utilization data only reflect the Medicare FFS population. The results observed for this group of patients may not be generalizable to other populations. Third, our data do not include information on the volume of patients processed by individual physicians, and we cannot account for differences in capacity between different physician specialties or between full-time and part-time physicians. Fourth, we collate and analyze physician supply at the county level. County boundaries vary significantly around the country, with some patients, particularly those in metropolitan areas, easily crossing county lines to access medical care and others,

such as those in rural areas, unable to travel significant distances within their county to access care. These challenges may bias or obscure potential relationships between physician supply and utilization in our analysis.

## Conclusion

This paper explores the relationship between physician supply and utilization in the United States. Its major findings are 3-fold. First, it confirms prior research showing continued disparities in provider supply across the United States, despite numerous policy efforts aimed at reducing such disparities. Second, while it reinforces that PCPs are inefficiently allocated around the country, it does not find strong associations between local PCP supply and individual utilization. Third, it shows that individuals who use more primary care, on average, tend to use more specialty care, even after controlling for underlying health and local physician supply. These results suggest that the United States' overuse of specialty care and underuse of primary care is likely related to many factors beyond the relative supply of PCPs to specialists.

## Supplementary material

Supplementary material is available at *Health Affairs Scholar* online.

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This paper did not rely on any grants or outside funding.

## Conflicts of interest

Please see ICMJE form(s) for author conflicts of interest. These have been provided as supplementary materials.

## Notes

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