

ORIGINAL RESEARCH

Regional Variation in Scope of Practice by Family Physicians

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Introduction: Geographic variation in physician scope of practice (SOP) has been documented but the causes remain unknown. We examined whether geographic variation in family physician (FP) SOP is explained by differences in the characteristics of the FPs, their practices, practice environment, or health care market.

Methods: We utilized 2 datasets from the American Board of Family Medicine (ABFM) from 2017 to 2022. The National Graduate Survey captures early career FPs while the Continuous Certification Questionnaire is administered to mid to late career FPs. We used a SOP score that ranges from 0 to 30 with a larger score reflecting a broader SOP. Bivariate analyses assessed for differences by Census division in clinician, practice, community, and health care market characteristics. A series of multilevel linear regression analyses tested if geographic differences in SOP were attenuated by the aforementioned characteristics.

Results: Our analytic included 9,378 early career FPs and 28,832 mid to late career FPs in the unadjusted regression model. We found significant differences in clinician characteristics by division and cohort. In unadjusted results, SOP score differed by division and career stage within division (range 11.49 to 14.95 for later career FPs and 15.22 to 17.51 for early career FPs). Adjusting for clinician, practice, community, and health care market characteristics did not attenuate divisional variation in SOP.

Discussion: Significant geographic variation in FP SOP was not explainable by adjustment for clinician, practice, community, and health care market characteristics. This suggests that health care variation is multifactorial and will require more multifaceted interventions to ameliorate. (J Am Board Fam Med 2025;38:28–45.)

Keywords: Delivery of Health Care, Family Medicine, Family Physicians, Health Workforce, Primary Health Care, Scope of Practice, Secondary Data Analysis

Introduction

Family physicians (FPs) made up 39.8% of the primary care physician workforce in 2019, and have been shown to provide the broadest scope of services among not only primary care, but all physician specialties.^{1–3} They often provide essential services

that would not otherwise be available in areas with fewer resources.⁴ The value of broad scope family medicine has been well-documented,⁵ and includes lower health care costs,⁶ fewer hospitalizations,⁶ and decreased rate of burnout for FPs.⁷ Despite these personal and system level benefits, a declining number of FPs are practicing women's health care,^{8,9} caring for children,^{10,11} delivering babies,¹² and performing endoscopies.¹³ In addition, newly graduated FPs feel more prepared and intend to practice more broadly but have a narrower scope of practice (SOP) than

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their predecessors.¹⁴ As FPs often provide care to those in medically underserved areas,⁴ declining SOP may reduce equitable access to health care and compound existing concerns over primary care shortage and maldistribution.^{14–16}

There is broad variation in the utilization and costs of health care services in the United States.¹⁷ For example, Medicare reimbursements yearly per enrollee are around \$3,000 more in the West South Central and East South Central divisions than in the Mountain and Pacific divisions.¹⁷ Similarly, FP scope has been shown to geographically vary. Rural FPs have a wider SOP than urban physicians,^{18–20} but regional variation also exists. FPs practicing in the West and Midwest have higher odds of practicing obstetric²¹ and pediatric care.²² FPs have greater odds of practicing HIV care in the Northeast and West.²³ These differences likely start in residency as those trained in a rural residency, or in the West or Midwest, have a broader SOP.^{19,24}

Two recent articles built conceptual models to understand the ways in which FP SOP is influenced by multiple domains. Russell et al described influence across 4 areas – personal, workplace, environment, and population.²⁵ Personal factors affected desired SOP for FPs while workplace, environment, and population influenced actual SOP.²⁵ This article built on the concepts put forth by Reitz et al, that SOP is influenced by both contextual and developmental factors.²⁶ Contextual factors consist of workplace, health care landscape, and personal factors and developmental factors pertained to the FP's stage in life and career.²⁶ Noted in both these studies was the tendency for FPs to narrow their scope as they progressed in their career.²⁶ Possible drivers of declining SOP from these articles include lack of employer support or job opportunities,²⁷ loss or lack of skills, and desire to narrow scope as one gets closer to retirement.^{25,26} Past work supports that specific characteristics within these conceptual domains drive SOP. For instance, graduating residents indicate the wish to practice in a broader scope than current FPs are practicing,^{19,28,29} which supports changing SOP with career stage. In addition, working in a rural health center or academic practice type has the highest SOP³⁰ and working with a Physician Assistant increases SOP.³¹ This suggests that practice organization and infrastructure have an impact on SOP. Community characteristics may also affect SOP as FPs in disadvantaged communities tend to have a more narrow SOP.^{4,32}

What remains unknown is whether geographic variation in SOP exists because of differences in the distribution of clinicians, practice, community, and health care market characteristics between divisions. Our objective is to test whether geographic variation in FP scope can be explained by differences in these aforementioned characteristics.

Methods

We utilized 2 datasets from the American Board of Family Medicine (ABFM) from 2017 to 2022. First, the National Graduate Survey (NGS) is administered to early career FPs 3 years after residency graduation throughout a calendar year. The pooled response rate during our study period was 57.42% and respondents are representative of all eligible graduates.³³ Second, the Continuing Certification Questionnaire (CCQ) is mandatory component, achieving a 100% response rate, of the examination registration process for mid to late career physicians seeking to continue their ABFM certification and is completed 3 to 4 months before the examination date.³⁴ Both these instruments have common items on SOP, ownership of the practice, practice type, size, and composition of health care team at the practice. We limited our sample to FPs in the United States and those primarily in continuity settings. Demographic information was obtained from ABFM administrative data sets.

Data on community characteristics were obtained at the county level from different sources. First, division was determined by linking state of practice to its respective US Census regional classification. In the past, studies have used the 4 census regions to control for geographic variation,^{8–11} but we used the 8 divisions to achieve a more granular geographic perspective on possible drivers of large area variation. Second, we used the 2019 Social Deprivation Index (SDI) to measure county level socioeconomic status across a broad array of indicators.³⁵ Third, we used variables from the 2021 Area Health Resources File on the availability of general community hospital beds and Medicare expenditures per capita, and physician supply. Fourth, we used premature death data from the 2021 County Health Rankings as an indicator of health status at the community level, which has been done using mortality in previous studies.³⁶

Our main outcome was the SOP score which is scored from 0 to 30 with a larger score reflecting a

Table 1. Divisional Variation of Clinician, Practice, Community, and Healthcare Market Characteristics of Early Career Family Physicians, 2017 to 2022

	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central	Full Population
Scope of practice score	15.99 (2.68)	15.53 (2.91)	15.22 (2.84)	17.10 (2.81)	16.05 (2.76)	16.23 (2.81)	15.40 (2.88)	17.51 (2.56)	15.43 (3.09)	16.04 (2.90)
Mean (SD)										
Domain 1: Clinician										
Age	34.74 (4.07)	35.43 (4.67)	34.92 (4.26)	35.19 (3.86)	35.51 (4.43)	35.68 (3.95)	35.48 (4.76)	34.48 (3.97)	35.38 (4.63)	35.23 (4.30)
Mean (SD)										
Gender (percent)										
Woman	860 (54.0%)	258 (49.1%)	624 (58.3%)	506 (51.6%)	296 (64.9%)	1,353 (59.7%)	1,106 (55.7%)	606 (57.6%)	681 (52.3%)	6,290 (56.0%)
Race (percent)										
American Indian or Alaska Native	8 (0.5%)	5 (1.0%)	4 (0.4%)	12 (1.2%)	2 (0.5%)	29 (1.3%)	14 (0.7%)	9 (0.9%)	18 (1.4%)	101 (0.9%)
Asian	298 (19.3%)	70 (13.6%)	317 (30.0%)	132 (13.7%)	72 (16.6%)	700 (31.5%)	327 (16.7%)	105 (10.1%)	295 (23.2%)	2,316 (21.1%)
Black or African American	92 (5.9%)	50 (9.7%)	82 (7.8%)	17 (1.8%)	25 (5.8%)	90 (4.1%)	288 (14.7%)	32 (3.1%)	120 (9.4%)	796 (7.2%)
Native Hawaiian or Pacific Islander	6 (0.4%)	0 (0%)	1 (0.1%)	4 (0.4%)	2 (0.5%)	22 (1.0%)	10 (0.5%)	1 (0.1%)	6 (0.5%)	52 (0.5%)
White	1,110 (71.7%)	381 (74.0%)	610 (57.7%)	771 (80.1%)	320 (73.9%)	1,264 (56.9%)	1,265 (64.8%)	875 (84.5%)	800 (62.9%)	7,396 (67.3%)
Other	34 (2.2%)	9 (1.7%)	43 (4.1%)	27 (2.8%)	12 (2.8%)	116 (5.2%)	49 (2.5%)	14 (1.4%)	32 (2.5%)	336 (3.1%)
Ethnicity (percent)										
Hispanic or Latino	60 (3.9%)	14 (2.7%)	69 (6.5%)	84 (8.7%)	17 (3.9%)	272 (12.2%)	213 (10.9%)	31 (3.0%)	201 (15.8%)	961 (8.7%)
International medical graduate status (percent)										
International medical graduate	507 (31.8%)	149 (28.4%)	448 (41.8%)	194 (19.8%)	127 (27.9%)	622 (27.4%)	726 (36.6%)	181 (17.2%)	480 (36.9%)	3,434 (30.6%)
Degree type, MD versus DO (percent)										
DO degree	323 (20.3%)	109 (20.8%)	220 (20.5%)	221 (22.5%)	73 (16.0%)	486 (21.4%)	330 (16.6%)	277 (26.3%)	205 (15.7%)	2,244 (20.0%)
Residency location (percent)										
Small rural	1 (0.1%)	12 (2.4%)	2 (0.2%)	0 (0%)	1 (0.2%)	4 (0.2%)	2 (0.1%)	0 (0%)	11 (1.0%)	33 (0.3%)
Large rural	65 (4.4%)	55 (11.0%)	21 (2.0%)	22 (2.4%)	30 (6.7%)	64 (3.0%)	80 (4.4%)	48 (4.8%)	38 (3.3%)	423 (4.0%)
Urban	1,419 (95.6%)	431 (86.5%)	1,020 (97.8%)	879 (97.6%)	416 (93.1%)	2,097 (96.9%)	1,755 (95.5%)	952 (95.2%)	1,099 (95.7%)	10,068 (95.7%)
Domain 2: Practice										
Practice type (percent)										
Academic health center	230 (16.7%)	42 (10.1%)	148 (17.1%)	88 (10.4%)	57 (14.5%)	182 (9.1%)	207 (13.1%)	91 (9.9%)	128 (12.4%)	1,173 (12.4%)
Federally qualified health center	130 (9.4%)	43 (10.3%)	120 (13.8%)	141 (17.0%)	66 (24.5%)	73 (18.7%)	151 (9.6%)	45 (4.9%)	73 (7.0%)	1,175 (12.5%)
Federal military	14 (1.0%)	29 (7.0%)	16 (1.8%)	15 (6.0%)	7 (1.8%)	80 (1.5%)	55 (9.8%)	23 (2.5%)	57 (5.5%)	460 (4.9%)
Rural health center	50 (3.6%)	28 (6.7%)	10 (1.2%)	45 (6.4%)	5 (1.3%)	73 (3.7%)	37 (2.3%)	120 (13.0%)	60 (5.8%)	437 (4.6%)
Independently owned	133 (9.7%)	83 (19.9%)	128 (14.7%)	119 (14.0%)	36 (9.2%)	192 (9.6%)	243 (15.4%)	104 (11.3%)	193 (18.6%)	1,231 (13.1%)
Managed care/HMO	32 (2.3%)	8 (1.9%)	15 (1.7%)	50 (5.9%)	12 (3.1%)	364 (18.2%)	128 (8.1%)	10 (1.1%)	39 (3.8%)	658 (7.0%)

Continued

Table 1. Continued

	East North Central		East South Central		Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central	Full Population
Hospital/Health system	732 (53.2%)	56 (4.1%)	163 (39.1%)	21 (5.0%)	394 (45.4%)	277 (32.7%)	165 (42.1%)	524 (26.2%)	570 (36.2%)	482 (52.3%)	408 (39.4%)	3,715 (39.4%)
Other					37 (4.3%)	65 (7.7%)	14 (3.6%)	181 (9.1%)	85 (5.4%)	46 (5.0%)	78 (7.5%)	583 (6.2%)
Principal practice ownership (percent)												
Not owner	1,042 (92.5%)		240 (81.1%)		636 (92.8%)	459 (86.0%)	258 (95.6%)	962 (76.2%)	1,000 (87.1%)	608 (88.5%)	671 (87.4%)	5,876 (86.7%)
Owner	85 (7.5%)		56 (18.9%)		49 (7.2%)	75 (14.0%)	12 (4.4%)	300 (23.8%)	148 (12.9%)	79 (11.5%)	97 (12.6%)	901 (13.3%)
Practice size (percent)												
Group	1,335 (96.9%)		393 (94.2%)		834 (96.1%)	830 (97.9%)	387 (98.7%)	1,964 (98.3%)	1,518 (96.3%)	906 (98.4%)	978 (94.4%)	9,145 (97.0%)
Solo	42 (3.1%)		24 (5.8%)		34 (3.9%)	18 (2.1%)	5 (1.3%)	33 (1.7%)	58 (3.7%)	15 (1.6%)	58 (5.6%)	287 (3.0%)
Practice specialty mix (percent)												
Family medicine only	690 (50.1%)		197 (47.2%)		411 (47.4%)	378 (44.6%)	159 (40.6%)	566 (28.3%)	741 (47.0%)	475 (51.6%)	434 (41.9%)	4,051 (42.9%)
Multiple specialties (Not only primary care)	321 (23.3%)		88 (21.1%)		195 (22.5%)	182 (21.5%)	81 (20.7%)	577 (28.9%)	316 (20.1%)	219 (23.8%)	266 (25.7%)	2,245 (23.8%)
Primary care specialty mix	366 (26.6%)		132 (31.7%)		262 (30.2%)	288 (34.0%)	152 (38.8%)	854 (42.8%)	519 (32.9%)	227 (24.6%)	337 (32.5%)	3,137 (33.3%)
Domain 3: Community												
Social deprivation index (SD)	46.13 (28.70)		56.67 (22.49)		43.16 (30.91)	47.76 (26.57)	35.46 (27.24)	60.48 (24.61)	52.60 (26.94)	27.73 (21.56)	59.51 (24.74)	49.91 (28.04)
Rurality (percent)												
Isolated	25 (1.6%)		16 (3.1%)		13 (1.2%)	33 (3.4%)	15 (3.3%)	29 (1.3%)	24 (1.2%)	77 (7.3%)	11 (0.8%)	243 (2.2%)
Small rural	142 (9.0%)		77 (14.8%)		57 (5.3%)	97 (9.9%)	39 (8.6%)	144 (6.4%)	124 (6.3%)	187 (17.8%)	118 (9.1%)	985 (8.8%)
Large rural	93 (5.9%)		59 (11.3%)		16 (1.5%)	87 (8.9%)	31 (6.8%)	83 (3.7%)	43 (2.2%)	160 (15.2%)	80 (6.2%)	652 (5.8%)
Urban	1,323 (83.6%)		370 (70.9%)		980 (91.9%)	758 (77.7%)	370 (81.3%)	2,003 (88.7%)	1,790 (90.4%)	626 (59.6%)	1,090 (83.9%)	9,310 (83.2%)
Premature death rate (percent)												
High	22 (1.4%)		129 (24.9%)		2 (0.2%)	52 (5.3%)	0 (0%)	9 (0.4%)	204 (10.3%)	27 (2.6%)	96 (7.4%)	541 (4.8%)
Medium	787 (49.6%)		348 (67.1%)		469 (44.0%)	234 (24.0%)	96 (21.1%)	219 (9.7%)	785 (39.6%)	454 (43.2%)	488 (37.5%)	3,880 (34.7%)
Low	778 (49.0%)		42 (8.1%)		595 (55.8%)	690 (70.7%)	360 (78.9%)	2,028 (89.9%)	991 (50.1%)	570 (54.2%)	716 (55.1%)	6,770 (60.5%)
Domain 4: Healthcare market												
Beds per hospital (percent)												
High	1,128 (71.1%)		332 (64.0%)		919 (86.2%)	918 (63.3%)	353 (77.4%)	1,359 (82.3%)	1,550 (78.3%)	517 (49.2%)	881 (67.8%)	8,157 (72.9%)
Medium	387 (24.4%)		159 (30.6%)		123 (11.5%)	298 (30.5%)	66 (21.7%)	193 (16.0%)	336 (17.0%)	392 (37.3%)	323 (24.8%)	2,478 (22.1%)
Low	72 (4.5%)		28 (5.4%)		24 (2.3%)	60 (6.1%)	4 (0.9%)	39 (1.7%)	94 (4.7%)	142 (13.5%)	96 (7.4%)	559 (5.0%)
Medicare cost per capita (percent)												
High	491 (29.0%)		113 (21.8%)		507 (47.6%)	83 (8.5%)	246 (53.9%)	1,305 (57.8%)	664 (33.5%)	164 (15.6%)	748 (57.5%)	4,291 (38.3%)

Continued

Table 1. Continued

	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central	Full Population
Medium	864 (54.4%)	357 (68.8%)	443 (41.6%)	459 (47.0%)	130 (28.5%)	448 (19.8%)	1,098 (55.5%)	619 (58.9%)	521 (40.1%)	4,939 (44.1%)
Low	262 (16.5%)	49 (9.4%)	116 (10.9%)	434 (44.5%)	80 (17.5%)	506 (22.4%)	218 (11.0%)	268 (25.5%)	31 (2.4%)	1,964 (17.5%)
External reasons for not practicing OB or inpatient medicine (percent)										
No	1,204 (75.6%)	368 (70.1%)	712 (66.5%)	684 (69.7%)	311 (68.2%)	1,546 (68.2%)	1,265 (63.7%)	790 (75.1%)	893 (68.6%)	7,773 (69.2%)
Yes	388 (24.4%)	157 (29.9%)	359 (33.5%)	297 (30.3%)	145 (31.8%)	720 (31.8%)	721 (36.3%)	262 (24.9%)	409 (31.4%)	3,458 (30.8%)
Ratio of primary care physicians										
High	50 (3.2%)	47 (9.1%)	0 (0%)	43 (4.4%)	0 (0%)	34 (1.5%)	39 (2.0%)	162 (15.4%)	69 (5.3%)	444 (4.0%)
Medium	517 (32.6%)	212 (40.8%)	242 (22.7%)	326 (33.4%)	120 (26.3%)	743 (32.9%)	595 (30.1%)	492 (46.8%)	559 (43.0%)	3,806 (34.0%)
Low	1,020 (64.3%)	260 (50.1%)	824 (77.3%)	607 (62.2%)	336 (73.7%)	1,482 (65.6%)	1,346 (68.0%)	397 (37.8%)	672 (51.7%)	6,944 (62.0%)

*External reasons for not practicing OB and Internal Medicine includes selecting either “challenges with privileging” or “not available in the practice I joined”, as reasons for not practicing either inpatient medicine or obstetric care.
‡ All tests have P-values of < 0.0001.
Abbreviation: SD, Standard deviation.

broader SOP.³⁷ The SOP score was developed using the Rasch Model, which creates a measurement of a latent trait based observed data. In this case, the latent trait is SOP and is based on how many clinical services, or activities, and sites where FPs provide care. While there are different items from the NGS and CCQ used to calculate SOP, the scores are on the same scale for each group, allowing the scores to be directly compared.

To account for clinician characteristics, we used ABFM data on FP gender, age, race and ethnicity, medical degree, location of undergraduate medical, and residency training. To account for practice characteristics, we used variables on practice type, size, and specialty mix. To account for community characteristics, we used the SDI, rurality of the practice using rural urban commuting area, and the premature death rate. Finally, we used variables on short term community hospital beds and Medicare costs per capita and the percentage of physicians in primary care (family medicine, general internal medicine, pediatrics) to reflect the health care market. County level variables on premature death rate, hospital beds, and Medicare costs were categorized into tertiles with low being >1 standard deviation below the mean, medium \pm 1 standard deviation from the mean, and high >1 standard deviation above the mean. In addition, we calculated the percentage of FPs who were interested in doing so but, reported not providing deliveries or inpatient care because it was not available in the job they took or due to challenges with privileging to reflect the ease of FPs practicing broadly in the community.

We conducted parallel analyses for the early career FPs in the NGS data and the mid to late career FPs from the CCQ due to the hypothesized differences in forces shaping SOP early in a career versus later in practice^{25,26} and data on working with a Physician Assistant only being available on the CCQ. We described the characteristics of the NGS and CCQ cohorts and their practices and communities. We then assessed for differences by division for the personal, practice, community, and health care market characteristics for both the NGS and CCQ cohorts using χ^2 and ANOVA tests. Finally, we performed a series of multilevel linear regression analyses with SOP score as the outcome, for both NGS and CCQ cohorts, to test the association of division with SOP. All models accounted for clustering at the state and county level due to variation in health policy and regulation. Model 1 only

Table 2. Divisional Variation of Clinician, Practice, Community, and Healthcare Market Characteristics of Mid to Late Career Family Physicians, 2017 to 2022

	East North Central		East South Central		Middle Atlantic		Mountain		New England		Pacific		South Atlantic		West North Central		West South Central		Full Population	
	Central		Central		Central		Central		Central		Central		Central		Central		Central		Central	
Scope of practice score	13.68 (3.51)		12.63 (3.81)		12.59 (3.54)		13.42 (3.86)		13.20 (3.44)		12.26 (3.75)		11.49 (3.62)		14.95 (3.98)		12.20 (3.82)		12.77 (3.83)	
Mean (SD)																				
Domain 1: Clinician																				
Age	50.08 (9.39)		50.37 (9.65)		50.54 (9.72)		50.04 (8.94)		51.04 (9.45)		49.45 (9.06)		50.56 (9.39)		50.22 (9.29)		49.46 (9.09)		50.09 (9.31)	
Mean (SD)																				
Gender (percent)																				
Female	2,588 (45.2%)		711 (37.1%)		1,683 (48.5%)		1,251 (42.2%)		832 (52.5%)		3,464 (50.5%)		3,002 (44.1%)		1,432 (43.0%)		1596 (38.8%)		16,559 (45.0%)	
Race (percent)																				
American Indian or Alaska Native	31 (0.5%)		12 (0.6%)		12 (0.3%)		44 (1.5%)		8 (0.5%)		62 (0.9%)		48 (0.7%)		35 (1.1%)		59 (1.4%)		311 (0.8%)	
Asian	881 (15.4%)		179 (9.3%)		657 (19.0%)		277 (9.3%)		201 (12.7%)		1,867 (27.2%)		1,028 (15.1%)		261 (7.8%)		775 (18.8%)		6,126 (16.7%)	
Black or African American	277 (4.8%)		188 (9.8%)		225 (6.5%)		66 (2.2%)		51 (3.2%)		223 (3.3%)		854 (12.6%)		93 (2.8%)		320 (7.8%)		2,297 (6.2%)	
Native Hawaiian or Pacific Islander	20 (0.3%)		1 (0.1%)		12 (0.3%)		17 (0.6%)		5 (0.3%)		85 (1.2%)		28 (0.4%)		9 (0.3%)		17 (0.4%)		194 (0.5%)	
White	4,222 (73.7%)		1,464 (76.4%)		2,347 (67.7%)		2,388 (80.5%)		1,254 (79.1%)		3,943 (57.5%)		4,423 (65.0%)		2,823 (84.8%)		2,696 (65.5%)		25,560 (69.5%)	
Other	298 (5.2%)		71 (3.7%)		214 (6.2%)		174 (5.9%)		66 (4.2%)		673 (9.8%)		419 (6.2%)		109 (3.3%)		248 (6.0%)		2,272 (6.2%)	
Ethnicity (percent)																				
Hispanic or Latino	239 (4.2%)		39 (2.0%)		180 (5.2%)		232 (7.8%)		61 (3.8%)		641 (9.4%)		642 (9.4%)		92 (2.8%)		542 (13.2%)		2,668 (7.3%)	
International medical graduate status (percent)																				
International medical graduate	1,367 (24.2%)		331 (17.4%)		1,056 (31.1%)		439 (14.9%)		303 (19.3%)		1,721 (25.4%)		1,926 (28.7%)		401 (12.1%)		1,112 (27.3%)		8,656 (23.8%)	
Degree type, MD versus DO (percent)																				
DO degree	610 (10.6%)		188 (9.8%)		480 (13.8%)		447 (15.1%)		191 (12.1%)		740 (10.8%)		559 (8.2%)		466 (14.0%)		412 (10.0%)		4,093 (11.1%)	
Residency location (percent)																				
Small rural	2 (0.0%)		27 (1.5%)		3 (0.1%)		1 (0.0%)		0 (0%)		1 (0.0%)		8 (0.1%)		0 (0%)		8 (0.2%)		50 (0.2%)	
Large rural	161 (3.1%)		175 (9.8%)		51 (1.6%)		78 (3.0%)		110 (7.4%)		123 (1.9%)		219 (3.6%)		153 (5.2%)		105 (3.0%)		1,175 (3.5%)	
Urban	5,026 (96.9%)		1,580 (88.7%)		3,191 (98.3%)		2,524 (97.0%)		1,368 (92.6%)		6,202 (98.0%)		5,839 (96.3%)		2,803 (94.8%)		3,382 (96.7%)		31,915 (96.3%)	
Domain 2: Practice																				
Practice type (percent)																				
Academic health center	426 (8.7%)		106 (7.0%)		292 (9.7%)		186 (7.3%)		101 (7.4%)		351 (5.9%)		405 (7.1%)		226 (8.2%)		280 (8.3%)		2,373 (7.6%)	
Federally qualified health center	254 (5.2%)		141 (7.2%)		121 (7.0%)		122 (8.7%)		102 (4.6%)		905 (6.0%)		172 (4.8%)		16 (3.3%)		241 (3.7%)		2,027 (6.5%)	
Federal military	86 (1.8%)		33 (5.5%)		69 (2.3%)		112 (4.4%)		24 (1.7%)		223 (3.7%)		111 (7.2%)		83 (3.0%)		171 (5.2%)		2,265 (4.1%)	
Rural health center	123 (2.5%)		57 (3.8%)		19 (0.6%)		82 (3.2%)		28 (2.0%)		101 (1.7%)		19 (1.1%)		148 (5.4%)		97 (2.9%)		716 (2.3%)	
Independently owned	1,231 (25.2%)		596 (39.4%)		993 (32.8%)		829 (32.6%)		329 (23.9%)		1,418 (23.7%)		1,987 (35.0%)		606 (22.0%)		1,295 (38.4%)		9,284 (29.8%)	
Managed care/HMO	83 (1.7%)		8 (0.5%)		23 (0.8%)		139 (5.5%)		14 (1.0%)		1,239 (20.7%)		278 (4.9%)		64 (2.3%)		81 (2.4%)		1,929 (6.2%)	

Continued

Table 2. Continued

	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central	Full Population
Hospital/Health system	2,354 (48.2%)	470 (31.1%)	1,189 (39.3%)	699 (27.5%)	582 (42.4%)	1,363 (22.7%)	1,734 (30.5%)	1,369 (49.6%)	964 (28.6%)	10,724 (34.4%)
Other	324 (6.6%)	128 (8.5%)	228 (7.5%)	276 (10.8%)	95 (6.9%)	710 (11.8%)	529 (9.3%)	172 (6.2%)	356 (10.6%)	2,818 (9.1%)
Principal practice ownership (percent)										
Not owner	3,807 (78.0%)	970 (64.2%)	2,249 (74.4%)	1,809 (71.1%)	1,113 (81.0%)	3,766 (62.8%)	4,064 (71.6%)	2,202 (79.8%)	2,266 (67.2%)	22,246 (71.4%)
Owner	1,074 (22.0%)	542 (35.8%)	775 (25.6%)	735 (28.9%)	261 (19.0%)	2,229 (37.2%)	1,612 (28.4%)	557 (20.2%)	1,105 (32.8%)	8,890 (28.6%)
Practice size (percent)										
Group	4,369 (89.5%)	1,296 (85.7%)	2,601 (86.0%)	2,341 (92.0%)	1,263 (91.9%)	5,480 (91.4%)	4,923 (86.7%)	2,614 (94.7%)	2,804 (83.2%)	27,691 (88.9%)
Solo	512 (10.5%)	216 (14.3%)	423 (14.0%)	203 (8.0%)	111 (8.1%)	515 (8.6%)	753 (13.3%)	145 (5.3%)	567 (16.8%)	3,445 (11.1%)
Practice specialty mix (percent)										
Family medicine only	2,488 (54.3%)	790 (55.9%)	1,590 (56.8%)	1,162 (49.4%)	621 (49.7%)	1,914 (34.6%)	2,774 (53.1%)	1,344 (52.1%)	1,623 (51.5%)	14,306 (49.5%)
Multiple specialties (Not only primary care)	958 (20.9%)	245 (17.3%)	486 (17.4%)	505 (21.5%)	222 (17.8%)	1,728 (31.2%)	931 (17.8%)	690 (26.7%)	643 (20.4%)	9,408 (22.2%)
Primary care specialty mix	1,136 (24.8%)	379 (26.8%)	721 (25.8%)	684 (29.1%)	406 (32.5%)	1,888 (34.1%)	1,522 (29.1%)	546 (21.2%)	883 (28.0%)	8,165 (28.3%)
Health care professional collaboration in practice										
Physician assistant	2,183 (38.1%)	629 (32.8%)	1,575 (45.4%)	1,769 (59.6%)	786 (49.6%)	3,645 (53.2%)	3,139 (46.2%)	1,907 (57.3%)	1,588 (38.6%)	17,221 (46.8%)
Domain 3: Community	41.88 (28.14)	53.47 (22.74)	38.71 (29.35)	44.58 (26.76)	31.01 (24.59)	58.82 (24.23)	49.09 (27.09)	27.51 (20.89)	59.81 (25.15)	47.11 (27.83)
Social deprivation index (SD)										
Rurality (percent)										
Isolated	147 (2.6%)	52 (2.7%)	49 (1.4%)	91 (3.1%)	100 (6.3%)	73 (1.1%)	88 (1.3%)	180 (5.4%)	47 (1.1%)	827 (2.3%)
Small rural	414 (7.2%)	180 (9.4%)	89 (2.6%)	193 (6.5%)	103 (6.5%)	152 (2.2%)	162 (2.4%)	396 (11.9%)	210 (5.1%)	1,899 (5.2%)
Large rural	567 (9.9%)	317 (16.6%)	192 (5.5%)	295 (10.0%)	147 (9.3%)	337 (4.9%)	424 (6.2%)	518 (15.6%)	313 (7.6%)	3,110 (8.5%)
Urban	4,591 (80.3%)	1,364 (71.3%)	3,130 (90.5%)	2,381 (80.4%)	1,231 (77.9%)	6,280 (101.0%)	1,111 (90.1%)	2,228 (67.1%)	3,536 (86.1%)	30,852 (84.1%)
Premature death rate (percent)										
High	138 (2.5%)	479 (26.2%)	18 (0.5%)	117 (4.0%)	10 (0.6%)	37 (0.6%)	649 (9.9%)	89 (2.7%)	315 (7.9%)	1,852 (5.2%)
Medium	2,805 (49.9%)	1,145 (62.6%)	1,353 (40.5%)	631 (21.8%)	385 (25.0%)	515 (7.7%)	2,627 (40.0%)	1,174 (35.9%)	1,368 (34.3%)	12,003 (33.6%)
Low	2,676 (47.6%)	206 (11.1%)	1,908 (58.9%)	2,151 (74.2%)	1,146 (74.4%)	6,139 (101.0%)	3,288 (50.1%)	2,005 (61.4%)	2,309 (57.8%)	21,888 (61.2%)
Domain 4: Healthcare market										
Beds per hospital (percent)										
High	3,651 (65.0%)	1,175 (64.2%)	2,819 (84.4%)	1,681 (65.2%)	1,035 (67.2%)	1,555 (83.2%)	2,735 (77.3%)	1,766 (54.0%)	2,834 (71.0%)	25,815 (72.2%)
Medium	1,670 (29.7%)	555 (30.3%)	435 (13.0%)	874 (30.1%)	487 (31.6%)	1,031 (15.5%)	1,138 (17.3%)	1,152 (35.3%)	932 (23.3%)	8,278 (23.2%)
Low	298 (5.3%)	100 (5.5%)	85 (2.5%)	134 (4.6%)	19 (1.2%)	88 (1.3%)	353 (5.4%)	350 (10.7%)	226 (5.7%)	1,653 (4.6%)

Continued

Table 2. Continued

	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central	Full Population
Medicare cost per capita (percent)										
High	1,440 (25.6%)	316 (17.3%)	1,438 (43.1%)	220 (7.6%)	756 (49.1%)	3,847 (57.5%)	2,000 (30.5%)	365 (11.2%)	2,443 (61.2%)	12,825 (35.9%)
Medium	3,173 (56.5%)	1,280 (69.9%)	1,540 (46.1%)	1,339 (46.2%)	449 (29.1%)	1,430 (21.4%)	3,797 (57.8%)	2,074 (63.5%)	1,468 (36.8%)	16,550 (46.3%)
Low	1,006 (17.9%)	234 (12.8%)	361 (10.8%)	1,340 (46.2%)	336 (21.8%)	1,417 (21.2%)	767 (11.7%)	829 (25.4%)	81 (2.0%)	6,371 (17.8%)
External reasons for not practicing OB or Inpatient Medicine (percent)										
No	3,906 (68.2%)	1,290 (67.4%)	2,158 (62.2%)	1,870 (63.0%)	952 (60.1%)	4,136 (60.4%)	4,121 (60.6%)	2,292 (68.8%)	2,720 (66.1%)	23,445 (63.8%)
Yes	1,823 (31.8%)	625 (32.6%)	1,310 (37.8%)	1,096 (37.0%)	633 (39.9%)	2,717 (39.6%)	2,679 (39.4%)	1,039 (31.2%)	1,396 (33.9%)	13,318 (36.2%)

*All tests have *P*-values of <0.0001.
Abbreviation: SD, Standard deviation.

included division to test for differences in scope by division only. Model 2 adjusted for personal characteristics. Model 3 adjusted for only practice characteristics, Model 4 adjusted for community characteristics, and Model 5 accounted for health care market characteristics.

We conducted all analyses using SAS v9.4 (Cary, NC). This study was approved by the American Academy of Family Physicians Institutional Review Board.

Results

We began with 11,975 FPs in the NGS cohort and 40,184 FPs in the CCQ cohort. After applying previously noted exclusion criteria, we were left with a final sample size of 9,378 early career FPs and 28,832 mid to late career FPs in the unadjusted regression model.

Significant differences were found in the clinician characteristics by division and cohort (Tables 1 and 2). SOP score not only differed by division, but by career stage within division, with early career FPs having an average SOP score of 16.04 compared with an average scope score of 12.77 for the later career FPs. The variation in SOP between the 2 career stage cohorts is shown in Table 3. Figure 1 depicts the deviation of the average SOP score from the reference division (West South Central), for both the NGS and CCQ cohort. Among early career FPs, the percentage of female FPs ranged from 64.9% in New England to 49.1% in East South Central. Less variation is seen in the percentage of females on the CCQ with the full population consisting of 45.0% females. In the East South Central division, 13.4% of NGS and 11.3% of CCQ respondents attended residency in a small or large rural area which is the highest percentage for both cohorts.

Practice types varied between the 2 cohorts and by division. Academic health centers (AHC) made up 16.7% of practice types for early career FPs in the East North Central division, while rural health centers (RHC) made up 13.0% of practice types in the West North Central division. Overall, the percentages of FPs practicing in either AHCs and RHCs was much smaller on the CCQ, 7.6% and 2.3%, respectively. This pattern persisted with the CCQ cohort: 34.6% of FPs in the Pacific division practiced in a Family Medicine only clinics and 34.1% practiced in clinics of mixed primary care specialties.

Table 3. Scope of Practice Score by Clinician, Practice, Community, and Healthcare Market Characteristics for Early Career (NGS) and Mid to Late Career (CCQ) Family Physicians, 2017 to 2022

	Scope of Practice Score	
	NGS Mean (SD)	CCQ Mean (SD)
Clinician		
Gender		
Female	15.79 (2.87)	12.56 (3.76)
Male	15.86 (2.76)	13.04 (3.87)
Race		
American Indian or Alaska Native	15.85 (2.43)	13.15 (3.67)
Asian	14.88 (2.86)	11.28 (3.43)
Black or African American	15.01 (2.81)	11.47 (3.62)
Native Hawaiian or other Pacific Islander	16.32 (2.57)	11.87 (3.42)
Other	15.25 (2.86)	13.38 (3.79)
White	16.20 (2.73)	11.94 (3.80)
Ethnicity		
Hispanic or Latino	15.25 (3.24)	11.40 (3.77)
Not Hispanic or Latino	15.87 (2.78)	12.93 (3.81)
International medical graduates		
US medical graduate	16.12 (2.70)	13.29 (3.79)
International medical graduate	15.07 (2.98)	11.29 (3.53)
Degree type		
DO	15.96 (2.56)	13.00 (3.82)
MD	15.79 (2.89)	12.79 (3.82)
Residency location		
Small rural residency	16.09 (3.00)	12.71 (4.57)
Large rural residency	14.33 (4.39)	13.59 (4.29)
Urban residency	15.82 (2.81)	12.79 (3.80)
Practice		
Practice type		
Academic health center	17.67 (2.76)	15.52 (4.05)
FQHC	^	13.31 (3.52)
Federal military	^	8.86 (3.80)
Hospital/health system	15.52 (2.64)	13.11 (3.39)
Independently owned	15.59 (2.82)	12.85 (3.48)
Medical practice		
Managed care/HMO	14.81 (2.66)	10.52 (3.35)
RHC	^	16.22 (3.75)
Other practice type	^	10.67 (3.86)
Practice ownership		
Owns practice	15.16 (2.93)	12.78 (3.94)
Does not own practice	15.85 (2.82)	12.91 (3.53)
Practice size		
Group practice	15.85 (2.82)	12.87 (3.85)
Solo practice	15.16 (2.93)	12.38 (3.54)

*Continued***Table 3. Continued**

	Scope of Practice Score	
	NGS Mean (SD)	CCQ Mean (SD)
Practice specialties		
Family medicine only	16.36 (2.76)	13.49 (3.74)
Multiple specialties (not just primary care)	15.30 (2.87)	12.18 (3.85)
Primary care specialty mix	15.38 (2.73)	12.13 (3.74)
Collaboration		
Collaborates with PA	#	13.12 (3.87)
Does not collaborate with PA	#	12.58 (3.77)
Community		
Rurality		
Isolated	18.00 (2.26)	16.08 (3.66)
Small rural	16.83 (2.54)	16.15 (3.88)
Large rural	18.02 (2.53)	14.38 (3.88)
Urban	15.58 (2.79)	12.36 (3.62)
Premature death rate		
High premature death	16.10 (2.25)	16.08 (3.66)
Medium premature death	16.04 (2.79)	16.15 (3.88)
Low premature death	15.69 (2.87)	14.38 (3.88)
Healthcare market		
Beds per hospital		
Beds per hospital - High	15.58 (2.81)	12.22 (3.66)
Beds per hospital - Medium	16.48 (2.75)	14.27 (3.83)
Beds per hospital - Low	16.92 (2.77)	14.82 (3.74)
Medicare cost per capita		
Medicare cost per capita - High	15.24 (2.91)	11.85 (3.80)
Medicare cost per capita - Medium	15.92 (2.69)	13.06 (3.70)
Medicare cost per capita - Low	16.78 (2.70)	14.19 (3.69)
Reasons for not practicing OB or Inpatient Medicine		
Yes	15.49 (2.46)	13.26 (3.97)
No	15.96 (2.95)	12.05 (3.42)
Ratio of primary care physicians		
High	18.5 (2.7)	16.7 (3.9)
Medium	16.4 (2.9)	13.5 (3.7)
Low	15.7 (2.9)	12.2 (3.7)

*Scope score ranges from 0–30.

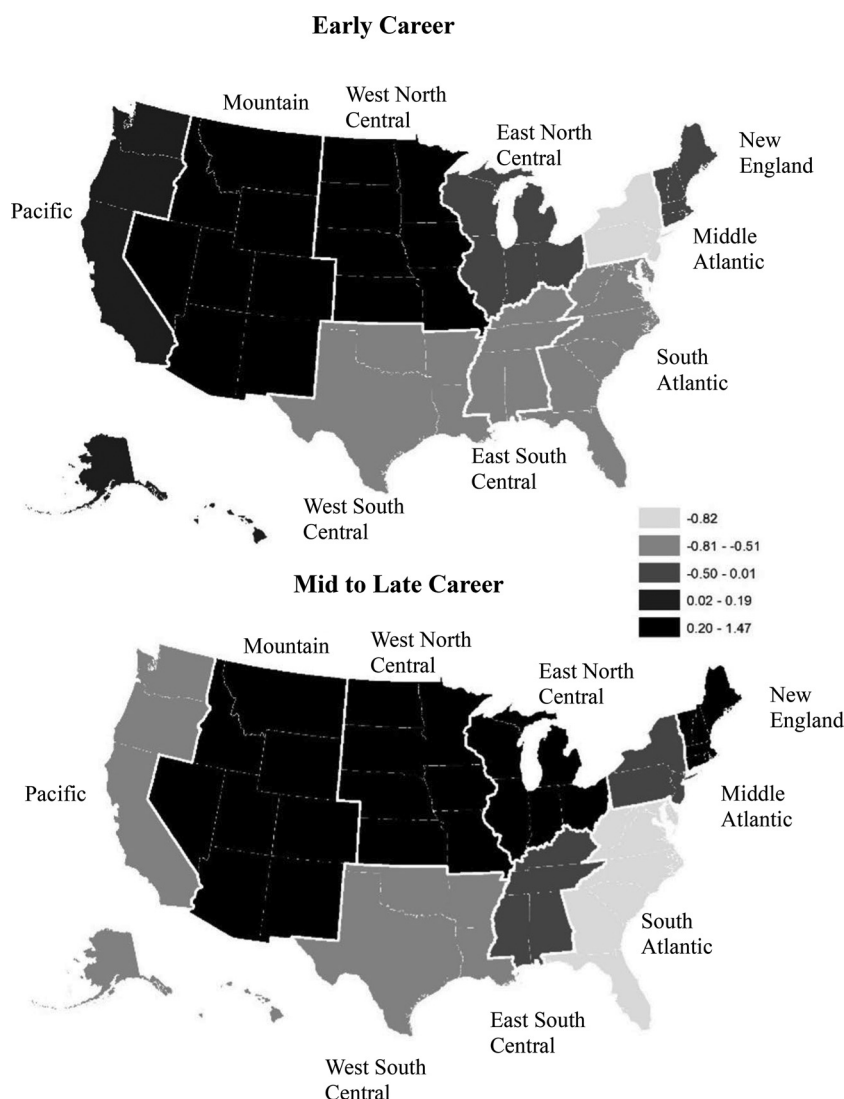
^Sample sizes were too small to produce a reliable regression model.

#Data not available in NGS.

NGS is National Graduate Survey. CCQ is Continuous Certification Questionnaire.

Abbreviations: SD, Service delivery; MD, Doctor of Medicine; DO, Doctor of Osteopathic Medicine; FQHC, Federally qualified health center; HMO, Health maintenance organization; RHC, Rural health clinic; OB, Obstetrics; PA, Physician assistant.

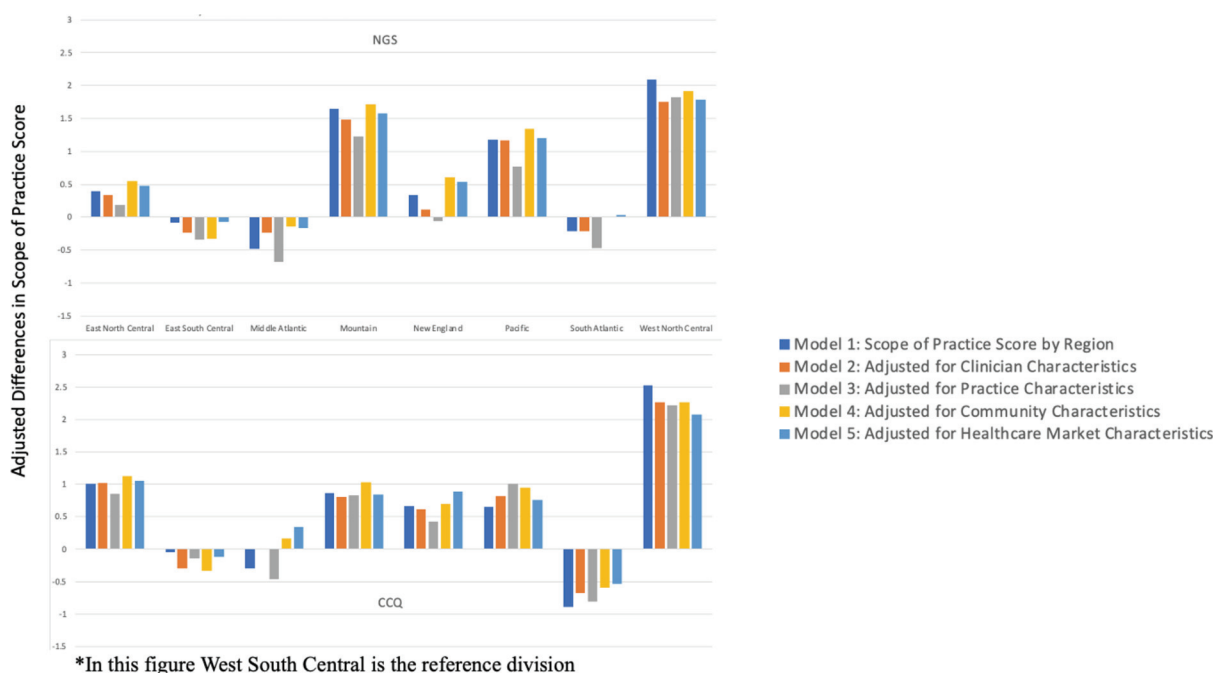
Figure 1. Divisional variation from mean scope of practice score for early career and mid to late career family physicians.



Community characteristics also varied by division. West North Central division has the largest percentage of FPs practicing in an isolated, small rural or large rural area (40.4% and 32.9% for the NGS and CCQ, respectively) and has the highest SOP score in both cohorts. East South Central has the second highest percentage of FPs practicing in large and small rural areas but has one of the lower SOP scores on the NGS. The highest percentage of FPs worked in high SDI communities in the Pacific division for the NGS and the West South Central division for the CCQ. The highest premature death rate was in the East South Central division for both cohorts at 24.9% and 26.2%. The lowest premature death rate was found in the Pacific with 89.9% and 98.1% of that division having a low premature death rate.

Health care markets also varied widely with hospital beds per capita in the NGS cohort in the Middle Atlantic division having 86.2% of a high number of hospital beds per capita compared with only 49.2% in the West North Central division. The CCQ cohort displays a similar level of variation with the Middle Atlantic having 84.4% high hospital beds per capita and West North Central division having only 54.0%. Medicare costs per capita were highest in the Pacific and West South Central divisions and lowest in Mountain division for both cohorts. Around 30% of early career FPs and 36% of mid to late career FPs responded that they experienced either difficulty with privileging or lack of opportunity at the job they took in terms of practicing inpatient medicine or obstetric care.

Figure 2. Adjusted associations between scope of practice score and division controlling for clinician, practice, community, and health care market characteristics for early career and mid to late career family physicians.



In a series of 5 regression models controlling for variables representing each of our domains, the variation in SOP at the division level was not eliminated in either cohort in any of the models (Figure 2). See Appendix Tables 2 and 3 for the full results of each model. Model 1 only investigated the association between division and SOP score controlling for state to establish the baseline. The highest SOP score was in the West North Central division for both cohorts and the lowest SOP score was in the Middle Atlantic division and the South Atlantic division for the NGS and CCQ cohorts, respectively. Adjusting for FP characteristics (Model 2) had a small impact overall but resulted in the most attenuation of variation compared with our other models. Controlling for practice characteristics (Model 3) attenuated the associations in both cohorts, but again did not fully eliminate the variation. Adjusting for either community (Model 4) or health care market (Model 5) characteristics did not affect the associations in a uniform way, increasing the association in some and decreasing it in others.

Discussion

Despite access to national data on over 40,000 FPs and data across multiple conceptually associated

domains, our analyses did not fully explain geographic variation in FP SOP (Figure 1). We did, importantly, identify that controlling for differences in clinician, practice, community, and health care market characteristics does reduce the variation in SOP, and that the differences were minimal and varied between cohorts. These findings suggest that this variation is a complex topic that may not be explained solely by quantifiable variables.

Demographics such as age, race, and international medical graduate status have been linked with SOP,^{26,29,32} and our analyses redemonstrated these findings in the personal characteristics model. This model attenuated variation in SOP at the division level for early career FPs, suggesting that some of the geographic variation in this cohort may be explained by the variation in physician characteristics in different divisions.

Model 3, adjusting for practice factors, attenuated the variation in the CCQ cohort to the greatest degree. This suggests that to some degree the geographic variation in SOP among mid to late career FPs is accounted for by distribution of practice types and factors. This may also suggest as an FP moves further in their career, practice level factors have an increased impact on their SOP. This would be supported by both studies on drivers of

scope of practice which put forth that as physicians advance in their career, they often desire to narrow their SOP and may find less support for a broad SOP. This variation may also be due to an increasing number of hospital-owned practices³⁸ that are influencing the scope of FPs in ways that are difficult to operationalize.^{25,26}

Studies have found that rural FPs have a broader SOP than urban FPs.^{4,20} The most rural division, West North Central, had the highest SOP score in both cohorts, yet the second most rural division, East South Central, having one of the lowest SOP scores in both cohorts. In Table 3, FPs in all rural areas have higher SOP scores than the urban FPs, but do not show a consistent pattern with FPs in Isolated settings having the highest SOP in the NGS cohort and those in Small Rural having the highest SOP in the CCQ cohort. Our study also redemonstrated an earlier finding that a higher SOP is associated with lower Medicare costs.⁶

SOP is a multidimensional construct, viewed differently across varying specialty and conceptual lenses.^{1,39} Our main outcome only captures the range of services FPs perform while other domains include involvement in patient conditions and new problem management. Prior work has shown measures of these different constructs are not associated but are all associated with lower costs and utilization.³⁹ Given these findings, we hypothesize that we would also fail to explain geographic variation using other SOP measures.

Our study is subject to limitations. First, our data are cross-sectional, and we cannot make causal inferences. Second, the variables we chose to operationalize the conceptual domains may not represent their influence on SOP. Finally, health care culture may be the ultimate driver of variation and qualitative methods and creating system level variables will likely be needed to fully understand these relationships.

Conclusion

These findings further articulate regional and divisional variation in SOP for FPs. And while also revealing that data from the most comprehensive national surveys of FPs still do not permit a definitive explanation of the sources of such variation, these findings still provide more context and support for previous works. Our models showed that personal and practice factors do attenuate this variation for early and mid to late career FPs, respectively.

More work is needed on this topic and would likely benefit from qualitative study to provide context for the results we have found.

To see this article online, please go to: <http://jabfm.org/content/38/1/28.full>.

References

1. Henry TL, Petterson S, Phillips RS, Phillips RL, Bazemore A. Comparing comprehensiveness in primary care specialties and their effects on healthcare costs and hospitalizations in Medicare beneficiaries. *J Gen Intern Med* 2019;34:2708–10.
2. Freeman J, Petterson S, Bazemore A. Accounting for complexity: aligning current payment models with the breadth of care by different specialties. *Am Fam Physician* 2014;190:790.
3. Petterson S, McNellis R, Klink K, Meyers DS, Bazemore AW. *The State of Primary Care in the United States: A Chartbook of Facts and Statistics*. Robert Graham Center Available at: <https://www.graham-center.org/content/dam/rgc/documents/publications-reports/reports/PrimaryCareChartbook>.
4. Nasim U, Morgan ZJ, Peterson LE. The declining scope of practice of family physicians is limited to urban areas. *J Rural Health* 2021;37:734–44.
5. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q* 2005;83:457–502.
6. Bazemore A, Petterson S, Peterson LE, Phillips RL. More comprehensive care among family physicians is associated with lower costs and fewer hospitalizations. *Ann Fam Med* 2015;13:206–13.
7. Weidner AKH, Phillips RL, Fang B, Peterson LE. Burnout and scope of practice in new family physicians. *Ann Fam Med* 2018;16:200–5.
8. Xierali IM, Puffer JC, Tong STC, Bazemore AW, Green LA. The percentage of family physicians attending to women's gender-specific health needs is declining. *J Am Board Fam Med* 2012;25:406–7.
9. Tong ST, Makaroff LA, Xierali IM, et al. Proportion of family physicians providing maternity care continues to decline. *J Am Board Fam Med* 2012;25:270–1.
10. Eden AR, Morgan ZJ, Jetty A, Peterson LE. Proportion of family physicians caring for children is declining. *J Am Board Fam Med* 2020;33:830–1.
11. Bazemore AW, Makaroff LA, Puffer JC, et al. Declining numbers of family physicians are caring for children. *J Am Board Fam Med* 2012;25:139–40.
12. Barreto T, Peterson LE, Petterson S, Bazemore AW. Family physicians practicing high-volume obstetric care have recently dropped by one-half. *Am Fam Physician* 2017;95:762–762.

13. Peterson LE, Nasim U, Madabhushi V. Declining endoscopic care by family physicians in both rural and urban areas. *J Am Board Fam Med* 2019; 32:460–1.
14. Larson EH, Andrilla CHA, Garberson LA. Supply and distribution of the primary care workforce in rural America: 2019. Policy Brief #167. WWAMI Rural Health Research Center, University of Washington; June 2020. Available at: <https://www.ruralhealthresearch.org/publications/1350>. Accessed October 30, 2023.
15. Primary Care Workforce Facts and Stats No. 3. Accessed October 30, 2023. Available at: <https://www.ahrq.gov/research/findings/factsheets/primary/pwork3/index.html>.
16. IHS Markit Ltd. The complexities of physician supply and demand: projections from 2019 to 2034. Washington, DC: AAMC; 2021.
17. Medicare Reimbursements. Dartmouth Atlas of Health Care. Accessed June 20, 2023. Available at: <https://www.dartmouthatlas.org/interactive-apps/medicare-reimbursements/>.
18. Weidner AKH, Chen FM. Changes in preparation and practice patterns among new family physicians. *Ann Fam Med* 2019;17:46–8.
19. Pollack SW, Andrilla CHA, Peterson L, et al. Rural versus urban family medicine residency scope of training and practice. *Fam Med* 2023;55:162–70.
20. Peterson LE, Fang B. Rural family physicians have a broader scope of practice than urban family physicians. Lexington, KY: Rural and Underserved Health Research Center; 2018.
21. Tong ST, Makaroff LA, Xierali IM, Puffer JC, Newton WP, Bazemore AW. Family physicians in the maternity care workforce: factors influencing declining trends. *Matern Child Health J* 2013;17:1576–81.
22. Jetty A, Romano MJ, Jabbarpour Y, Petterson S, Bazemore A. A cross-sectional study of factors associated with pediatric scope of care in family medicine. *J Am Board Fam Med* 2021;34:196–207.
23. Sonoda K, Morgan ZJ, Peterson LE. HIV care by early-career family physicians. *Fam Med* 2021;53: 760–5.
24. Coutinho AJ, Levin Z, Petterson S, Phillips RL, Peterson LE. Residency program characteristics and individual physician practice characteristics associated with family physician scope of practice. *Acad Med* 2019;94:1561–6.
25. Russell A, Fromewick J, Macdonald B, et al. Drivers of scope of practice in family medicine: a conceptual model. *Ann Fam Med* 2021;19:217–23.
26. Reitz R, Horst K, Davenport M, Klemmetsen S, Clark M. Factors influencing family physician scope of practice: a grounded theory study. *Fam Med* 2018;50:269–74.
27. Barreto TW, Eden AR, Hansen ER, Peterson LE. Barriers faced by family medicine graduates interested in performing obstetric deliveries. *J Am Board Fam Med* 2018;31:332–3.
28. Coutinho AJ, Cochrane A, Stelter K, Phillips RL, Peterson LE. Comparison of intended scope of practice for family medicine residents with reported scope of practice among practicing family physicians. *JAMA* 2015;314:2364–72.
29. Peterson LE, Fang B, Puffer JC, Bazemore AW. Wide gap between preparation and scope of practice of early career family physicians. *J Am Board Fam Med* 2018;31:181–2.
30. Killeen D, Jetty A, Peterson LE, Bazemore A, Jabbarpour Y. The association of practice type and the scope of care of family physicians. *J Am Board Fam Med* 2023;36:79–87.
31. Dai M, Ingham RC, Peterson LE. Scope of practice and patient panel size of family physicians who work with nurse practitioners or physician assistants. *Fam Med* 2019;51:311–8.
32. Wang T, Amechi C, Anderson AA, Eden AR, Bazemore A. Variation in scope and area of practice by family physician race and ethnicity. *J Am Board Fam Med* 2022;35:454–6.
33. Peterson LE. Using the family medicine national graduate survey to improve residency education by monitoring training outcomes. *Fam Med* 2021;53: 622–5.
34. Peterson LE, Fang B, Phillips RL, Avant R, Puffer JC. A certification board's tracking of their specialty: the American Board of Family Medicine's data collection strategy. *J Am Board Fam Med* 2019;32:89–95.
35. Butler DC, Petterson S, Phillips RL, Bazemore AW. Measures of social deprivation that predict health care access and need within a rational area of primary care service delivery. *Health Serv Res* 2013;48:539–59.
36. Shi L, Macinko J, Starfield B, Wulu J, Regan J, Politzer R. The relationship between primary care, income inequality, and mortality in US states, 1980–1995. *J Am Board Fam Pract* 2003;16:412–22.
37. O'Neill T, Peabody MR, Blackburn BE, Peterson LE. Creating the Individual Scope of Practice (I-SOP) scale. *J Appl Meas* 2014;15:227–39.
38. Policy Research Perspectives. Recent changes in physician practice arrangements: shifts away from private practice and towards larger practice size continue through 2022. Accessed September 6, 2024. Available at: <https://www.ama-assn.org/system/files/2022-prp-practice-arrangement.pdf>.
39. O'Malley AS, Rich EC, Shang L, et al. New approaches to measuring the comprehensiveness of primary care physicians. *Health Serv Res* 2019;54:356–66.

Appendix.

Appendix Table 1. Adjusted Associations Between Scope of Practice Score and Division Controlling for Clinician, Practice, Community, and Healthcare Market Characteristics for Early Career and Mid to Late Career Family Physicians

Division	Model 1: Scope of Practice Score by Division	Model 2: Adjusted for Clinician Characteristics	Model 3: Adjusted for Practice Characteristics	Model 4: Adjusted for community Characteristics	Model 5: Adjusted for Healthcare Market Characteristics
Early Career (NGS)					
Intercept	15.86***	16.13***	15.67***	15.54***	16.04***
East North Central	0.19	0.18	0.08	0.33	0.26
East South Central	-0.14	-0.24	-0.41	-0.32	-0.09
Middle Atlantic	-0.74	-0.49	-0.86	-0.35	-0.37
Mountain	1.79**	1.63	1.28*	1.77***	1.68***
New England	0.15	0.00	-0.20	0.38	0.39
Pacific	1.18	1.21	0.71	1.22	1.10
South Atlantic	-0.39	-0.35	-0.61	-0.12	-0.13
West North Central	2.16***	1.85***	1.89***	1.97***	1.89***
West South Central	0	0	0	0	0
Mid to Late Career (CCQ)					
Division					
Intercept	13.70***	13.16***	14.29***	12.97***	14.18***
East North Central	0.61	0.62	0.52	0.69	0.73
East South Central	-0.46	-0.62	-0.49	-0.48	-0.19
Middle Atlantic	-0.63	-0.33	-0.76	-0.14	0.17
Mountain	0.71	0.68	0.79	0.84	0.75
New England	0.12	0.07	-0.05	0.26	0.62
Pacific	0.31	0.44	0.65	0.58	0.41
South Atlantic	-1.34	-1.14	-1.25	-0.97	-0.80
West North Central	2.39**	2.20**	2.19*	2.19**	2.09***
West South Central	0	0	0	0	0

Abbreviations: NGS, National graduate survey; CCQ, Continuing certification questionnaire.

Appendix Table 2. Adjusted Associations Between Scope of Practice Score and Division Controlling for Clinician, Practice, Community, and Healthcare Market Characteristics for Early Career Family Physicians

	Model 1: Scope of Practice Score by Division	Model 2: Adjusted for Clinician Characteristics	Model 3: Adjusted for Practice Characteristics	Model 4: Adjusted for community Characteristics	Model 5: Adjusted for Healthcare Market Characteristics
Division					
Intercept	15.61***	15.41***	15.53***	15.49***	16.01***
East North Central	0.39	0.34	0.19	0.55	0.48
East South Central	-0.08	-0.24	-0.34	-0.33	-0.07
Middle Atlantic	-0.48	-0.24	-0.68	-0.14	-0.17
Mountain	1.64*	1.48	1.23	1.71***	1.58**
New England	0.34	0.12	-0.06	0.61	0.53
Pacific	1.18	1.17	0.77	1.34*	1.20*
South Atlantic	-0.21	-0.21	-0.47	0.00	0.03
West North Central	2.09***	1.75***	1.82	1.92***	1.79***
West South Central	0	0	0	0	0
DOMAIN 1: Clinician Characteristics					
Age		-0.01			
Gender					
Male		0			
Female		-0.07			
Race					
American Indian or Alaska Native		0.03			
Asian		-0.91***			
Black or African American		-0.57***			
Native Hawaiian or Other Pacific Islander		0.21			
Other		-0.55*			
White		0			
Ethnicity					
Not Hispanic or Latino		0			
Hispanic or Latino		-0.39**			
International Medical Graduate Status					
IMG		0			
US/CAN Medical Graduate		0.63***			
Degree Type					
MD		0			
DO		-0.27**			
Residency Location					
Small Rural		-0.09			
Large Rural		0.26			
Urban		0			
DOMAIN 2: Practice Characteristics					
Practice Type					
Academic Health Center			2.23***		
Independently Owned			0.07		
Managed Care/HMO			-0.26		
Hospital/Health System			0		
Principal Practice Ownership					
Not Owner			-0.51***		
Owner			0		
Practice Size					
Solo Practice			-0.50*		
Group			0		
Practice Specialty Mix					
Family medicine only			0.65***		

Multiple specialties (not only primary care)			-0.19		
Primary care specialty mix			0		
DOMAIN 3: Community Characteristics					
Social Deprivation Index					
High				0.13	
Low				-0.12	
Medium				0	
Rurality					
Isolated				1.66***	
Large Rural				0.69***	
Small Rural				1.69***	
Urban				0	
Premature Death Rate					
High				0.02	
Low				-0.31*	
Medium				0	
DOMAIN 4: Healthcare Market Characteristics					
Hospital Beds per Capita					
High					-0.48***
Low					0.11*
Medium					0
Medicare cost per capita					
High					0.12
Low					0.35*
Medium					0
External Reasons for Not Performing OB or Inpatient					
Yes					-0.42***
No					0
Ratio of Primary Care Physicians					
High					1.21***
Low					-0.19***
Medium					0

*p-value<0.01, **p-value<0.001, ***p-value<0.0001.

Appendix Table 3. Adjusted Associations Between Scope of Practice Score and Division Controlling for Clinician, Practice, Community, and Healthcare Market Characteristics for Mid to Late Career Family Physicians

	Model 1: Scope of Practice Score by Division	Model 1: Adjusted for Clinician Characteristics	Model 2: Adjusted for Practice Characteristics	Model 3: Adjusted for Community Characteristics	Model 4: Adjusted for Healthcare Market Characteristics
Division					
Intercept	12.74***	12.33***	13.57***	12.50***	13.79***
East North Central	1.01	1.02	0.85	1.12	1.06
East South Central	-0.05	-0.30	-0.14	-0.33	-0.12
Middle Atlantic	-0.30	0.015	-0.46	0.17	0.34
Mountain	0.87	0.80	0.83	1.03	0.84
New England	0.66	0.61	0.42	0.70	0.89
Pacific	0.65	0.82	1.01	0.95	0.76
South Atlantic	-0.89	-0.68	-0.81	-0.59	-0.53
West North Central	2.52***	2.26***	2.22***	2.27***	2.07***
West South Central	0	0	0	0	0
DOMAIN 1: Clinician Characteristics					
Age					
<45		0.36***			
>60		-0.43***			
45-60		0			
Gender					
Male		0			
Female		-0.31***			
Race					
American Indian or Alaska Native		-0.12			
Asian		-1.05***			
Black or African American		-0.89***			
Native Hawaiian or Other Pacific Islander		-0.75			
Other		-0.39***			
White		0			
Ethnicity					
Not Hispanic or Latino		0			
Hispanic or Latino		-0.65***			
International Medical Graduate Status					
IMG		0			
US/CAN Medical Graduate		1.04***			
Degree Type					
MD		0			
DO		-0.56***			
Residency Location					
Small Rural		1.17			
Large Rural		0.28			
Urban		0			
DOMAIN 2: Practice Characteristics					
Practice Type					
Academic Health Center			2.91***		
FQHC			0.65***		
Federal military			-3.14***		
Independently Owned			-0.40***		
Managed Care/HMO			-1.68***		
Other			-1.85***		
Rural Health Center			1.87***		

Hospital/Health System			0		
Principal Practice Ownership					
Not Owner			-0.92***		
Owner			0		
Practice Size					
Solo Practice			-0.47***		
Group			0		
Practice Specialty Mix					
Family medicine only			0.75***		
Multiple specialties (not only primary care)			-0.11		
Primary care specialty mix			0		
Collaborates with Physician Assistant					
Yes			0		
No			-0.31***		
DOMAIN 3: Community Characteristics					
Social Deprivation Index					
High				-0.14	
Low				0.19	
Medium				0	
Rurality					
Isolated				2.28***	
Large Rural				1.00***	
Small Rural				2.42***	
Urban				0	
Premature Death Rate					
High				0.19	
Low				-0.52***	
Medium				0	
DOMAIN 4: Healthcare Market					
Hospital Beds per Capita					
High					-0.92***
Low					-0.18
Medium					0
Medicare cost per capita					
High					-0.11
Low					0.33*
Medium					0
External Reasons for Not Performing OB or Inpatient					
Yes					-0.89***
No					0
Ratio of Primary Care Physicians					
High					1.99***
Low					-0.68***
Medium					0

*p-value<0.01, **p-value<0.001, ***p-value<0.0001

Abbreviations: MD, Doctor of Medicine; DO, Doctor of Osteopathic Medicine; FQHC, Federally Qualified Health Center; HMO, Health Maintenance Organization; OB, Obstetrics.