

Family Medicine Residencies: How Rural Training Exposure in GME Is Associated With Subsequent Rural Practice

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ABSTRACT

Background Rural US populations face a chronic shortage of physicians and an increasing gap in life expectancy compared to urban US populations, creating a need to understand how to increase residency graduates' desire to practice in such areas.

Objective This study quantifies associations between the amount of rural training during family medicine (FM) residencies and subsequent rural work.

Methods American Medical Association (AMA) Masterfile, AMA graduate medical education (GME) supplement, American Board of Family Medicine certification, Accreditation Council for Graduate Medical Education (ACGME), and Centers for Medicare and Medicaid Services hospital costs data were merged and analyzed. Multiple logistic regression measured associations between rural training and rural or urban practice in 2018 by all 12 162 clinically active physicians who completed a US FM residency accredited by the ACGME between 2008 and 2012. Analyses adjusted for key potential confounders (age, sex, program size, region, and medical school location and type) and clustering by resident program.

Results Most (91%, 11 011 of 12 162) residents had no rural training. A minority (14%, 1721 of 12 162) practiced in a rural location in 2018. Residents with no rural training comprised 80% (1373 of 1721) of those in rural practice in 2018. Spending more than half of residency training months in rural areas was associated with substantially increased odds of rural practice (OR 5.3-6.3). Only 4% (424 of 12 162) of residents spent more than half their training in rural locations, and only 5% (26 of 436) of FM training programs had residents training mostly in rural settings or community-based clinics.

Conclusions There is a linear gradient between increasing levels of rural exposure in FM GME and subsequent rural work.

Introduction

Nearly 20% of US residents live in rural communities and often experience poorer health.¹⁻⁷ Family physicians, because of their breadth of practice, broad distribution, and role in providing primary care for all segments of the population, are key to ensuring equitable health care for rural populations.⁸ However, models forecast continuing primary care shortages⁹ and maldistribution.^{10,11} In rural United States, the per capita supply of family physicians is higher than for any other type of physician, making rural areas particularly reliant on them.¹² It is therefore important to attract family physicians to practice in rural areas.

A range of interacting individual, professional, and educational factors influence family physicians' rural practice location choices.^{13,14} The role of some of these factors, particularly rural background¹⁵⁻²³ and rural exposures during medical school,^{15,23-29} is well known. Less is known about the role of rural

exposures during graduate medical education (GME). A study by Chen et al reported 60% of physicians who completed rural family medicine (FM) residencies were in rural practice, with a nearly threefold increased odds of rural practice compared to graduates of non-rural residency programs.³⁰ In the United States, Rural Track Programs (RTPs, previously referred to as "RTTs or rural training tracks, in the '1-2 format'") are accredited residency programs that provide over 50% of residents' training in rural locations.^{31,32} These are distinct from rural-centric programs, which provide less than 50% but at least 8 weeks (5%) of residents' training in rural locations. Between 40% and 45% of graduates of FM RTPs enter rural practice compared to only 4.8% of graduates across GME (all specialties).^{30,33-42} However, in 2020, accredited FM RTPs were small in number (99 out of 682 total programs) and scale (429 out of 3848 active FM training positions, or approximately 11%).⁴³ Most were in locations designated as a Rural-Urban Commuting Area (RUCA) 4 (population size 10 000 to 49 999).^{43,44}

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Equally lacking is evidence on the amount of rural exposure during residency training associated with subsequent rural workforce outcomes. A study by Patterson et al examining early career outcomes and rural residency program models included only 29 out of 583 (5%) FM residency programs.⁴⁵ Bowman and Penrod found that more rural training months were associated with rural practice uptake.⁴⁶ Although Canadian and Australian studies have reported associations between duration of rural FM GME and subsequent rural practice, contemporary peer-reviewed US evidence is lacking.^{47,48}

Therefore, we aimed to quantify associations between the amount of rural training exposure during FM residency training and (1) subsequent rural work by family physicians and (2) level of rurality of family physicians' subsequent work locations.

Methods

Included were any physicians completing their most recent US FM residency training between 2008 and 2012 in an Accreditation Council for Graduate Medical Education (ACGME)-accredited program who were actively practicing in 2018.

We used the 2018 American Medical Association (AMA) Physician Masterfile to identify participants' 2018 practice status, primary practice location, medical education numbers (unique identifier), age, medical school type, sex, and degree type. We identified residency end year, institution, and specialty using the AMA's GME historical supplement. We merged American Board of Family Medicine (ABFM) 2013 certification survey data linking participants to a residency program using physician medical education numbers. Then, we merged in 2012 ACGME data using the GME program identity codes obtained from the ABFM database as the linkage key. ACGME-accredited programs report information about all training sites for which residents have rotations of 1 month or longer. We combined these data with 2010 Centers for Medicare and Medicaid Services (CMS) hospital cost reports detailing residency program site locations.

The main outcome measures were the rurality levels of 2018 practice locations. We determined these by mapping reported ZIP codes of primary practice locations recorded in the 2018 AMA Masterfile to the 2010 RUCA classification.⁴⁹ We defined 4 levels: urban (primary RUCA codes 1-3, population size $\geq 50\,000$, and secondary RUCA codes 4.1, 5.1, 7.1, 8.1, and 10.1); large rural (primary RUCA codes for micropolitan communities 4-6, population size 10 000-49 999, excluding 4.1 and 5.1 and including 7.2, 8.2, and 10.2); small rural (primary RUCA codes

Objectives

To quantify associations between the amount of rural training during family medicine (FM) residencies and subsequent rural work

Findings

Rural exposure during FM residency training is associated with a 5- to 6-fold increase in subsequent rural practice, with a positive dose effect for greater degrees of exposure, yet less than 10% of graduates experience any rural training during their residencies.

Limitations

Limitations of the study include absence of data on residencies accredited only by the American Osteopathic Association and an inability to measure rural residency training rotations shorter than 1 month.

Bottom Line

A linear gradient between increasing levels of rural exposure in FM graduate medical education and subsequent rural work, together with the low proportion of graduates experiencing any rural training, points to the potential to increase the amount of rural exposure during FM residencies to strengthen future rural primary care workforce supply.

7-9, population size $<10\,000$, including 10.3 excluding 7.1, 7.2, 8.1, and 8.2) and isolated rural (primary RUCA code 10, population size <2500 , excluding 10.1, 10.2, and 10.3). Coding thereby accounted not only for population size, but proximity to larger centers, as inferred by RUCA codes indicating substantial secondary commuter flows.

Level of rural exposure during FM residency training was calculated from combined ACGME and CMS residency training rotation site data. We coded these data using the RUCA classification to classify the census tract of training sites as urban (codes 1-3, 4.1, 5.1, 7.1, 8.1, and 10.1) or rural (codes 4-10, except 4.1, 5.1, 7.1, 8.1, and 10.1). We then calculated and categorized the percentage of training months that FM residents spent in rural sites (0%, 1-9%, 10-50%, 51-90%, 91-100%). We chose these categories based on the distribution of the data and also in consideration of how rural tracks are defined by the CMS, which requires residents to spend at least 50% of their residency time in rural settings to be eligible for rural track designation.

Independent variables included number of trainees per year per program, training region, age at residency completion, sex, medical school location, and medical school type. Multiple logistic regression measured associations between levels of rural training exposure during FM residencies and rural or urban practice in 2018, adjusting for key potential confounders and clustering by resident program. We used descriptive statistics and simple logistic regression models to measure associations between levels of rural training exposure during FM residencies and practice in rural locations (large rural versus small

TABLE 1

Characteristics of US Family Medicine Residency Programs and Graduates (2008-2012)

Characteristics	Category	Programs, n (%)	Residents, n (%)
Total		436 (100)	12 162 (100)
Rural training exposure (% of residency training)	0	390 (90)	11 011 (91)
	1-9	16 (4)	454 (4)
	10-50	7 (2)	273 (2)
	51-90	10 (2)	100 (1)
	91-100	13 (3)	324 (3)
Number of residents (per year of training)	1-6	184 (42)	3828 (32)
	7-9	176 (40)	5107 (42)
	10+	76 (17)	3227 (27)
Training region	Midwest	126 (29)	3485 (29)
	Northeast	79 (18)	2059 (17)
	South	143 (33)	4071 (34)
	West	88 (20)	2547 (21)
Age at residency completion (years)	25-31		5224 (43)
	32-34		3069 (25)
	35+		3869 (32)
Sex	Male		5440 (45)
	Female		6722 (55)
Medical school location	Domestic		7322 (60)
	International		4840 (40)
Medical school type	Allopathic		10 517 (87)
	Osteopathic		1645 (14)

and isolated rural practice) in 2018. We undertook sensitivity analyses testing the effect on study outcomes of excluding family physicians practicing as hospitalists. Hospitalists were defined as physicians with FM specialty training who were working primarily in hospitals.

All analyses used Stata/MP version 14.0 (Stata-Corp, College Station, TX), and statistical significance was reported at $\alpha=0.01$, $\alpha=0.05$, and $\alpha=0.10$ levels.

This study was approved by the Institutional Review Board at George Washington University.

Results

We identified 15 209 residents who graduated from one of the 436 ACGME-accredited FM residency programs between 2008 and 2012. Among these, we determined there to be 12 162 clinically active family physicians in 2018 (TABLE 1). Of these, 87% (10 517) were allopathic physicians, and 13% (1645) were osteopathic physicians. More than 90% (11 011) of residents had no rural training during their residencies. That is, these residents were from programs having no monthlong rotations in rural areas, nor were their programs located in a rural region (as defined by RUCA coding).

Some 14% (1721 of 12 162) of study participants were practicing in a rural location in 2018 (TABLE 2). The percentage of training time that FM residents spent in rural locations had a positive association with likelihood of working in a rural location in 2018. Almost half of FM residents who spent more than 50% of their training time in rural areas (48%, 205 of 424) were working rurally in 2018. Conversely, a much smaller percentage (12%, 1373 of 11 011) of FM residents who had no rural exposures during their residency were working in

TABLE 2

Distribution by 2018 Practice Location of Family Medicine Residency Graduates (2008-2012)

Percent of Family Medicine Residency Training in Rural Location	2018 Practice Location		
	Urban, n (%)	Rural, n (%)	Total, n (%)
0	9638 (88)	1373 (13)	11 011 (100)
1-9	363 (80)	91 (20)	454 (100)
10-50	221 (81)	52 (19)	273 (100)
51-90	60 (60)	40 (40)	100 (100)
91-100	159 (49)	165 (51)	324 (100)
Total	10 441 (86)	1721 (14)	12 162 (100)

TABLE 3

Multiple Logistic Regression Predicting Rural Practice in 2018 by Graduates of US Family Medicine Residencies (2008-2012)

Variable	Category	OR	95% CI (Lower)	95% CI (Upper)
Rural training exposure (% of residency training)	0	(Reference)		
	1-9	1.71 ^a	1.26	2.32
	10-50	1.48	0.76	2.86
	51-90	5.29 ^a	2.79	10.04
	91-100	6.25 ^a	4.50	8.68
No. of residents (per year of training)	1-6	(Reference)		
	7-9	0.75 ^b	0.60	0.94
	10+	0.87	0.66	1.14
Training region	Northeast	(Reference)		
	Midwest	1.75 ^a	1.28	2.40
	South	1.21	0.90	1.64
	West	0.97	0.68	1.40
Age at residency completion (years)	25-31	(Reference)		
	32-34	0.94	0.82	1.08
	35+	0.93	0.80	1.08
Sex	Male	(Reference)		
	Female	0.66 ^a	0.59	0.74
Medical school location	Domestic	(Reference)		
	International	0.49 ^a	0.41	0.58
Medical school type	Allopathic	(Reference)		
	Osteopathic	1.17 ^c	0.99	1.40

^a $P < .01$.^b $P < .05$.^c $P < .10$.

rural locations in 2018, while a slightly higher percentage (20%, 143 of 727) of those who had at least some—though 50% or less—rural exposure during residency were working rurally in 2018. Nevertheless, residents with no rural training comprised the majority (80%, 1373 of 1721) of the 2018 rural workforce, while residents who had at least some rural training comprised only about one-fifth (20%, 348 of 1721).

Multiple logistic regression—with adjustment for potential confounders, including age, sex, international medical graduate status, and medical school type—confirmed a positive association between the proportion of FM residency training undertaken in a rural location and subsequent rural practice 6 to 10 years later, in 2018 (TABLE 3). As the proportion of residency training spent in rural locations increased, the odds of rural practice also tended to increase, such that spending more than half of residency training months in rural areas was associated with more than a 5-fold increase in the odds of rural practice (OR 5.29, 95% CI 2.79-10.04 for 51%-90% rural

training; and OR 6.25, 95% CI 4.50-8.68 for 91%-100% rural training).

Of the 1721 graduates who were practicing in a rural location in 2018, 54% (935) were practicing in large rural towns (10 000-49 999), 32% (558) in small rural towns (<10 000), and 13% (228) in isolated communities (TABLE 4). This compares with 55%, 26%, and 19%, respectively, of the US rural population living in large, small, and isolated rural towns.⁴⁷ Simple logistic regression revealed no association between the size of a rural town in which family physicians practiced and the amount of rural training exposure during residency (TABLE 5). Older FM residents and international graduates were less likely to practice in small and isolated rural towns.

The results of sensitivity analyses (not shown) testing the effect of excluding family physicians practicing primarily as hospitalists were consistent with the above-reported results.

Discussion

We found the odds of rural practice among FM residents experiencing at least 50% rural training

TABLE 4

Level of Rurality of 2018 Rural Practice Location by Level of Rural Exposure During Training of Graduates of US Family Medicine Residencies (2008-2012)

Percent of Family Medicine Residency Training in Rural Location	2018 Practice Location Rurality			Total
	Large, n (%)	Small, n (%)	Isolated, n (%)	
0	741 (54)	448 (33)	184 (13)	1373 (100)
1-9	48 (53)	32 (35)	11 (12)	91 (100)
10-50	23 (44)	19 (37)	10 (19)	52 (100)
51-90	26 (65)	14 (35)	0 (0)	40 (100)
91-100	97 (59)	45 (27)	23 (14)	165 (100)
Total	935 (54)	558 (32)	228 (13)	1721 (100)

time were at least 5-fold higher than those who did no rural training. Equally important, even spending only a small fraction (1%-9%) of FM residency training in rural areas was associated with substantially increased odds of being in rural practice (OR 1.7, 95% CI 1.3-2.3). Only 5% of FM training programs had residents training mostly in rural settings or community-based clinics, and less than 10% of FM residents in the study cohort had any rural training (of at least 1 months' duration) during their residencies. Only 3.5% spent more than half their training in rural

locations. Of all FM residents subsequently in rural practice, 80% had little or no rural practice experience during their residencies.

Our findings, which suggest that increasing the length of time FM residents spend training in rural locations may lead them to be more likely to subsequently choose rural practice, are consistent with several US and Canadian studies and suggests a possible dose-response association with subsequent rural practice.^{26,30,35,36} The proportion of FM residents who undertake any rural training during their

TABLE 5

Simple Logistic Regression Predicting Small or Isolated Rural Practice in 2018 by Graduates of US Family Medicine Residencies (2008-2012)

Variable	Category	OR	95% CI (Lower)	95% CI (Upper)
Rural training exposure (% of residency training)	0	(Reference)		
	1-9	1.05	0.64	1.73
	10-50	1.48	0.65	3.35
	51-90	0.63	0.31	1.29
	91-100	0.82	0.58	1.17
No. of residents (per year of training)	1-6	(Reference)		
	7-9	0.88	0.68	1.15
	10+	1.15	0.87	1.52
Training region	Northeast	(Reference)		
	Midwest	1.36 ^a	0.97	1.90
	South	0.95	0.67	1.34
	West	1.08	0.73	1.60
Age at residency completion (years)	25-31	(Reference)		
	32-34	0.76 ^b	0.59	0.97
	35+	0.71 ^c	0.56	0.90
Sex	Male	(Reference)		
	Female	1.00	0.82	1.21
Medical school location	Domestic	(Reference)		
	International	0.64 ^c	0.50	0.81
Medical school type	Allopathic	(Reference)		
	Osteopathic	1.04	0.81	1.34

^a $P < .10$.

^b $P < .05$.

^c $P < .01$.

residencies is substantially lower than both the proportion of the US population who live in rural areas and the proportion of all family physicians who work in rural United States.^{11,50} This may be insufficient to sustain the existing rural workforce and meet future rural population health needs.^{45,51} Also of concern is that the majority of FM residents subsequently in the rural family physician workforce have had no or little rural training during their residencies. As noted in other countries, the range of clinical and procedural services provided by family physicians trained in the United States may increase with increasing rurality, and graduating FM residents who train in rural programs self-report significantly greater procedural experience and competence levels compared to their urban-trained counterparts.^{52,53} This suggests that urban-trained FM residents may be underprepared for future rural work.

These findings support greater investment in rural residency programs through redistribution of existing funds to expand RTP positions and public financing targeting gaps in rural training. The United States invested \$30 million in the Rural Residency Planning and Development (RRPD) initiative in 2019, providing 3 years of funding to develop 42 new rural residency programs or rural training tracks, a 10% (or approximately 3% per annum) increase over baseline.^{54,55} However, the RRPD initiative's small scale and lack of sustainable financing limit program sustainability and impact. Also absent is further scaling and integration with Medicare and Medicaid, which contribute over \$12.5 billion and \$4.2 billion in public GME financing per year, respectively.^{56,57} Rural residency programs are disadvantaged by eligibility criteria and formulae used for disbursing Medicare and Medicaid funds, which favor larger hospitals in urban locations and require reform if they are to better target these investments to expand and support rural residency programs. Greater attention is also needed to better coordinate GME spending and align with broader workforce policy.⁵⁸ As GME outcomes and metrics are developed—as is occurring now with the Children's Hospital GME Quality Bonus System—subsequent rural practice will be an important GME outcome measure.⁵⁹ In addition to the RRPD, the Teaching Health Center (THC) program provides GME payments to support community-based primary care residency programs.⁶⁰ Since 20% of THCs are located in rural areas, expanding the THC program in a targeted way, so that a greater proportion of residents training in THCs train in rural locations, could also further support scaling up of rural residency training and enhance rural residency program sustainability.⁶¹ Expanding FM residency training opportunities in small community hospitals (critical access hospitals)

has also been suggested as an opportunity to boost rural physician recruitment and retention.^{38,62,63} Eligibility for current financing of rural GME generally requires 50% of trainee time be spent in rural communities, excluding smaller rural communities as viable training sites, despite the fact that shorter exposures there could lead to important gains for the rural workforce. Not only do FM residents immediately bolster the existing medical workforce, their training in rural areas may also provide additional longer-term recruitment, retention, and quality-of-care benefits. State and federal workforce development programs, such as the Health Resources and Services Administration's Primary Care Training and Enhancement program, could potentially increase investments to support rural training and broaden existing eligibility criteria.⁶⁴

Limitations of the study include absence of data on residencies accredited only by the American Osteopathic Association. However, given that DO-qualified physicians are 22% more likely than MDs to locate in rural areas as family physicians, its inclusion should only increase our estimates of the overall odds of newly qualified family physicians practicing rurally.⁶⁵ Additionally, ACGME data reflect only rotations of 1 month or longer and what was reported to them, limiting our capture of shorter rural experiences and the possibility of inaccurate reported locations where residents worked. Rural upbringing, a known predictor of rural practice, was also not captured in available data. The pairing of cross-sectional ACGME program data (from 2012) with a multiyear resident cohort (training completed between 2008 and 2012) presents the possibility that program changes during that time period could have introduced erroneous estimates of rural exposure. Our associations should not be confused with causation; we could not account for the natural preferences of residents for rural practice prior to commencing their FM RTP residencies. Such limitations notwithstanding, the recent national data, multivariate analyses, and measurement of different levels of rurality and rural exposure during FM residencies sets our study apart from any previous investigations.

Future research could investigate a broader range of factors (in addition to rural background, rural basic medical education, and rural residency training) that lead to subsequent rural practice location selection, so that policymakers can better understand how to increase the proportion of graduating FM residents choosing rural practice.

Conclusions

Rural exposure during FM residency training is associated with a 5- to 6-fold increase in subsequent

rural practice, with a positive dose effect for greater degrees of exposure, yet less than 10% of graduates experience any rural training during their residencies.

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