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**Letter**

**There's no place like home: an analysis of migration patterns of dermatology residents prior to, during, and after their training**

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**Abstract**

Previous studies have established migration patterns between the geographic location of physicians' residency programs and their first post-training job. Our study explores the patterns of migration of pre-residency education locations with residency and post-residency geography. We analyzed responses to an annual survey administered between 2008 and 2013 to participants of the board examination review courses organized by Galderma Laboratories. Geography of high school (HS), medical school (MS), residency, and first job location were highly correlated. The Midwest and South retained the most residents from HS (70% each), whereas the West retained the lowest percent of residents from HS (33%). The West and Northeast exported about half of their HS graduates to the South and MW for residency. The South retained the largest proportion of its trainees post-residency (75%). Our data revealed that both HS and MS locations are closely related to residents' ultimate employment locations. This information may be useful to training program directors and chairpersons as they manage recruitment and retention of trainees and faculty and may inform plans to address geographic workforce imbalances.

**Introduction**

Although previous studies have demonstrated a strong correlation between residency training location and future practice location and have illustrated important factors in deciding first job choice, there has been little to no investigation on the impact of pre-residency locations on future practice locations [1-8]. Multiple surveys have shown that despite the popularity of a residency in dermatology, the United States (US) dermatology workforce has been challenged by shortages; a low density of dermatologists has been reported in certain geographic areas, which has produced imbalances in supply and demand [9-11]. To this end, our study seeks to characterize the association between pre-residency geographic locations (i.e. medical school location, high school location) and future residency and first practice location. Medical school graduates are generally choice constrained in terms of

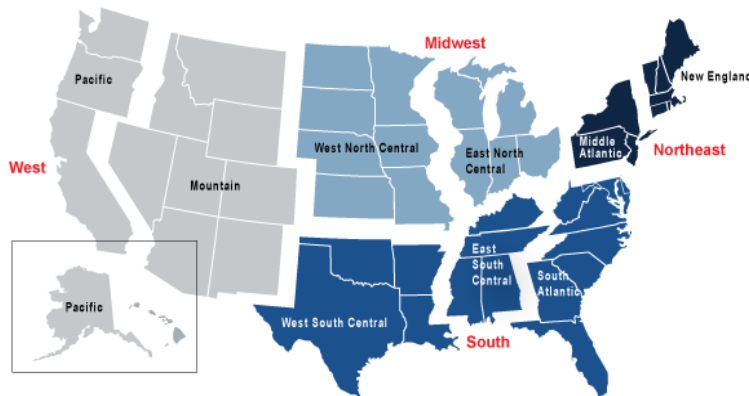
dermatology residency but have substantial choices in terms of where they practice after their residency training. This information may be useful to training program directors and chairpersons as they manage recruitment and retention of trainees and faculty. It may also be of benefit to policy makers who may be facing geographic imbalances in the physician workforce both within states and on a national level.

## Methods

An annual survey was administered between 2008 and 2013 to participants of the board examination review courses organized by Galderma Laboratories in August or September of each year. The anonymous survey instrument is exempt from institutional review board monitoring under Federal Register regulation 56 FR 28012, 28021, Subpart A, Section 97.101(b)(2).

## Statistical analysis

A total of 428 US dermatology senior residents were included in the statistical analysis. After obtaining survey data, reported geographic states were classified into five regions: the four Census Bureau-designated areas (NE, MW, South, and West) and Puerto Rico (Figure 1).



**Figure 1.** US census regions and divisions map. Provided courtesy of the Federal Bureau of Investigation, accessed at [www.fbi.gov](http://www.fbi.gov) August 2013.

Descriptive statistics, such as frequencies and percentages, were used to describe the geographical distribution of the residents' educational locations prior to and during residency. Chi-square tests were used to test the null hypothesis that regional preferences of residency and first post-training practice locations are independent of previous educational locations. Then, to estimate the level of geographic similarity among high school (HS), medical school (MS), residency, and first post-training locations, intraclass correlation coefficients (ICCs) were used to measure the correlation between the geographic locations of HS, MS, residency, and post-training placements. ICCs were computed separately for the following pairs of locations: Post-training Region and Residency, Post-training Region and MS, Post-training Region and HS, residency & MS, residency and HS, and MS and HS. Lastly, an ICC was computed for HS, MS, residency, and post-training regions together. The level of statistical significance was set at  $P < 0.05$ . Value interpretation for ICCs is as follows: very good  $> 0.80$ ,  $0.80 \geq$  good  $\geq 0.61$ ,  $0.60 \geq$  moderate  $\geq 0.41$ ,  $0.40 \geq$  fair  $\geq 0.21$ , and  $0.20 \geq$  poor [12]. During ICC calculations, all non-US/PR areas were excluded from the analysis (the percent of foreign locations ranged from 0.95% in residency program regions to 3.6% in HS regions). Missing data were ignored, ranging from 1.4% in residency data to 3.5% in HS data.

## Results

The response rates from 2008 to 2013 ranged from 34% to 66%. Females comprised 72.3% (308/426) of respondents. The median age of respondents was 31 years, with respondent ages ranging from 26 to 52. The geographical distribution of resident's HS, MS, residency, and first practice locations are illustrated in Table 1.

**Table 1.** Education levels by geographic region.

Geographic Region	High School n(%)	Medical School n(%)	Residency n(%)	First post-training job location n(%)	Available residency spots (n=407)
Northeast	73 (18%)	72 (17%)	64 (15%)	52 (14%)	114 (28%)
Midwest	94 (23)	106 (25)	129 (31)	85 (23)	108 (27%)
South	154 (37)	177 (42)	168 (40)	149 (40)	122 (30%)
West	68 (16)	49 (12)	45 (11)	75 (20)	60 (15%)
Puerto Rico	9 (2.2)	10 (2.4)	9 (2.2)	6 (1.6)	3 (0.7)
Other	15 (3.6)	8 (1.9)	4 (0.95)	1 (0.3)	-
Total <sup>a</sup>	413 (100)	422 (100)	419 (100)	368 (100)	407 (100)

<sup>a</sup>Percentages may not equal 100 because of rounding

The South contained the largest percent of residents during HS (37%), MS (42%), and residency (40%) followed by the MW, which had the second largest percent of residents during HS (23%), MS (25%), and residency (31%). Of the four regions, the West contained the fewest residents in all three educational levels.

Table 2 demonstrates the relationship between dermatologists' first post-training practice location and their three previous educational sites: residency site ( $X^2=236.3$ ,  $p<.0001$ ), MS region ( $X^2=236.3$ ,  $p<.0001$ ), and HS region ( $X^2=251.1$ ,  $p<.0001$ ).

**Table 2.** Distribution of First Post-training Job Location by Residency, Medical School, and High School Region.<sup>a</sup>

		First Job Location, % (No.) Distribution by Residency, Med School, High School Regions			
Regions <sup>b</sup>		Northeast	Midwest	South	West
Residency	Northeast	<b>62 (34)</b>	7 (4)	22 (12)	9 (5)
	Midwest	4 (5)	<b>55 (63)</b>	21 (24)	20 (23)
	South	5 (7)	8 (11)	<b>75 (106)</b>	13 (18)
	West	5 (2)	15 (6)	10 (4)	<b>69 (27)</b>
		$X^2=295.1$			$p<.0001$
Medical School	Northeast	<b>51 (32)</b>	11 (7)	18 (11)	19 (12)
	Midwest	6 (5)	<b>59 (53)</b>	20 (18)	16 (14)
	South	7 (11)	11 (16)	<b>70 (106)</b>	12 (18)
	West	7 (3)	16 (7)	14 (6)	<b>64 (28)</b>
		$X^2=236.3$			$p<.0001$
High School	Northeast	<b>47 (30)</b>	11 (7)	30 (19)	13 (8)
	Midwest	6 (5)	<b>60 (48)</b>	16 (13)	18 (14)
	South	6 (8)	8 (11)	<b>78 (102)</b>	8 (10)
	West	8 (5)	20 (13)	13 (8)	<b>59 (38)</b>
		$X^2=251.1$			$p<.0001$

<sup>a</sup>Graduates from Puerto Rico or foreign schools were not included in this regional analysis. Percentage may not equal 100 because of rounding.

<sup>b</sup>Values in this column served as denominators for calculation of percentages.  
Distribution of Residency Region by Medical School and High School Region.<sup>a</sup>

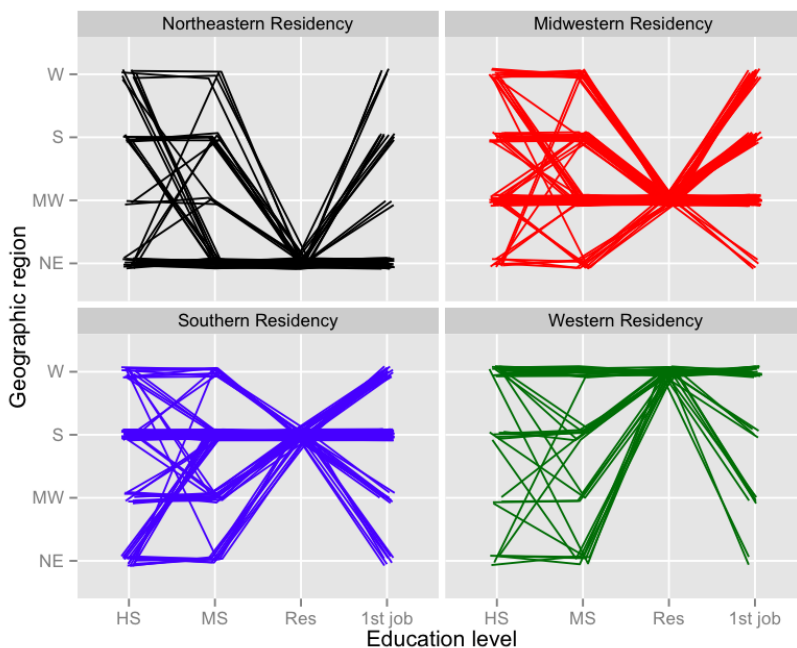
		Residency			
		Northeast	Midwest	South	West
Medical School	Northeast	<b>56 (39)</b>	17 (12)	16 (11)	10 (7)
	Midwest	5 (5)	<b>68 (71)</b>	23 (24)	5 (5)
	South	6 (11)	17 (29)	<b>68 (117)</b>	8 (14)
	West	8 (4)	27 (13)	27 (13)	<b>39 (19)</b>
				X <sup>2</sup> =245.5	p<.0001
High School	Northeast	<b>45 (32)</b>	14 (10)	31 (22)	10 (7)
	Midwest	5 (5)	<b>71 (66)</b>	19 (18)	4 (4)
	South	9 (13)	15 (23)	<b>70 (106)</b>	6 (9)
	West	14 (9)	29 (19)	24 (16)	<b>33 (22)</b>
				X <sup>2</sup> =201.3	p<.0001

<sup>a</sup>Graduates from Puerto Rico or foreign schools were not included in this regional analysis. Percentage may not equal 100 because of rounding.

<sup>b</sup>Values in this column served as denominators for calculation of percentages.

Our data suggest that residency sites are associated with medical school locations (X<sup>2</sup>=245.5, p<.0001) and HS locations (X<sup>2</sup>=201.3, p<.0001). The large majority of dermatologists had their first post-training placement in the same geographic region as their regions for residency, medical school, or high school. The South retained the largest proportion of its trainees (75%) followed by the West (69%). In addition, the South had the highest retention with respect to MS and HS locations: 70% of Southern medical school graduates and 78% of Southern HS graduates had their first post-training placement in the South.

Regarding geographic retention into training locations, the MW and South had the highest MS and HS retention rate: 68% of MW and Southern MS graduates placed into the same region for training, and 70-71% of MW and Southern HS graduates placed into the same region for training. The Western region retained the lowest percent of trainees from MS (39%) and HS (33%). Those who relocated from a Western MS generally went to the South (27%) or the MW (27%). Figure 2 demonstrates resident migration over time, stratified by residency locations.



Abbreviations: HS = High School, MS = Medical School, Res = Residency, 1<sup>st</sup> job = 1<sup>st</sup> post training job

**Figure 2.** Geographical migration patterns of dermatologists by region and education level.

The ICC calculations for the following pairs of educational levels are as follows: first job location & residency (ICC=0.68), first job location & MS (0.57), first job location & HS (0.59), residency and MS locations (ICC=0.65), residency & HS locations (ICC

= 0.55). The ICC for all four educational levels was 0.77. These scores are considered “good” for almost all categories. 95% CI for ICCs are displayed in Table 3.

**Table 3.** Intraclass Correlation Coefficient (ICC).

Geographic locations	ICC	95% CI
First job location & Residency	0.68 <sup>a</sup>	0.61-0.74
First job location & Medical School	0.57	0.48-0.65
First job location & High School	0.59	0.50-0.66
Residency & Medical School	0.65	0.57-0.71
Residency & High School	0.55	0.46-0.63
HS, MS, Residency, & First job location	0.77	0.73-0.80

<sup>a</sup>ICC interpretation: very good > 0.80, 0.80 ≥ good ≥ 0.61, 0.60 ≥ moderate ≥ 0.41, 0.40 ≥ fair ≥ 0.21, 0.20 ≥ poor

Lastly, when asked about their single most important factor in job choice, the top choice among graduates of all four regions was “location.” The percentage of HS graduates noting location as their primary factor are as follows: Southern (44%), Midwestern (44%), Northeastern (36%), and Western (38%).

## Discussion

Our study explored the complex patterns of migration that recent training graduates from a specialty in shortage follow from childhood to post-residency employment. Unsurprisingly our data revealed clear geographical preferences, once again reinforcing the concept that location plays a crucial role in a physician’s choice of both residency and post-training assignments. In addition to validating previous studies that have shown that the majority of new physicians remain relatively close to their residency location for their first post-training jobs, our data also revealed both HS and MS locations were closely related to their ultimate employment locations in this group.

Primary care specialties have shown better retention of their Southern residency graduates than the other regions, a finding that was confirmed in this study as well [13]. Interestingly, our data revealed that the MW both retains a significant portion of their recent residency graduates and receives a significant portion of graduates from the NE and West, which is contrary to what has been reported in other studies both in and outside dermatology [2,13]. However, the study by Resneck and Kostecki, which demonstrated poor MW retention of trainees, only surveyed dermatologists that completed residency prior to 2005. Our study sampled graduates of dermatology residency from 2008 to 2013 and may be a more accurate reflection of current patterns of dermatologist migration.

Our study also draws a link to the importance of childhood home (via HS location data) to both the resident’s training location and first job location. We found that the large majority of Midwestern and Southern HS graduates matched into the same region for residency training. We also found that an extraordinarily high percentage (78%) of Southern HS graduates decided to choose a post-training job located in the South. Given that 44% of both Southern and Midwestern HS graduates chose “location” as their single most important factor in their job choice, these results suggest that those originally from the South and MW have a stronger inclination to return “home” when compared to their Northeastern and Western counterparts, of whom only 36% and 38% chose “location” as their single most important factor. When compared to those from the South and MW, Northeastern and Western HS

graduates comprised a higher proportion of those who chose income, autonomy, and research opportunities as the most important factor in their job choice. We also found an extremely low retention of Western HS graduates (33%) with respect to residency placement. This may be influenced by the fewer residency spots available in the West (60) when compared to the South (122), MW (108), and NE (114), although the percent of available residency positions in the West (15%) is similar to the percent of our sample's HS graduates in the West (16%) [14]. In addition, the West and NE exported about half of their HS graduates to the South and MW for residency. These results may alter the current preconception that those from the West and NE tend to interchange locations amongst themselves, as our data show they are more likely to migrate to the MW and South than to the other coast.

## Limitations

Our study has several limitations. First, we only examined new entrants to the field of dermatology. Dermatology is very competitive to enter but has ample post graduate employment opportunities [14]. As a result, choices and priorities for these specialty graduates may be different than for specialties where jobs are harder to find. Like many specialists, having an adequate population base to support full time staffing is also important and may make it challenging to establish practice in more rural areas. Additional limitations are that only those who chose to participate in a board review class were surveyed. We are also unable to validate respondents' self-reported educational locations, though we have no reason to believe this information would be misreported. Third, the survey response ranges of 34-66% may limit the generalizability of the results.

## Conclusion

Our findings suggest that there is strong correlation between dermatology residents' HS, MS, residency, and first post-training geographic regions. The broader implications of this data imply that expanding any kind of residency programs in certain regions such as the West may increase physician retention in those areas post-training. Further research on the impact of geography on both early and late education and training and post-training across specialties is warranted to provide further insight into improving physician placement in areas of clinical need.

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