

TRENDS

The Diffusion Of Physicians

Physicians tend to move to areas with low competition, but counties with the greatest need for physicians do not easily retain them.

by **Thomas C. Ricketts and Randy Randolph**

ABSTRACT: Physicians move from place to place over their careers; this is thought to reflect the economic theory that they seek better opportunities to practice. Using national data, this study tracked physician movement between counties classified by physician-to-population ratio and socioeconomic characteristics. Approximately one-quarter of practicing physicians moved in each of two ten-year periods, 1981–1991 and 1991–2001. The overall tendency of movers was to go to places with lower physician-to-population ratios but higher per capita incomes and lower unemployment. These trends, if they continue, may help decrease access to physician care in rural and urban underserved areas. [*Health Affairs* 27, no. 5 (2008): 1409–1415; 10.1377/hlthaff.27.5.1409]

HOW TO INFLUENCE the geographic distribution of physicians is an important policy issue and likely to become even more important in coming years if a widely predicted shortage of physicians emerges.¹ The federal government's most prominent advisory committee on medical education policy has taken the position that shortages will likely occur, given current physician training trends and the nation's changing demography.²

Beginning in the 1960s, government programs have attempted to influence physicians to practice in rural and underserved communities. The necessity of these programs has been questioned by some who suggest that economic forces will adequately distribute physicians as their services are demanded, because market forces are functioning, especially with regard to the urban-rural distribution of phy-

sicians.³ The administration and Congress have chosen to partially accept this argument and have reduced federal efforts to influence the specialty and diversity distribution of physicians in the Title VII programs that support training of primary care practitioners, promote diversity, and emphasize subsequent practice in underserved communities. In contrast, the National Health Service Corps (NHSC) continues to receive support and appropriations to address problems with the geographic distribution of primary care physicians.

This paper examines the movement of physicians from one place of practice to another over the two decades of 1981–2001 and explores the reasons why physicians leave one place and go to another. Seldom do analysts or policymakers who are concerned with practitioner distribution consider the very dynamic nature of supply. Concerns with physician lo-

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cation patterns have centered more on their relative supply in rural places.⁴ Prior research, however, has been cross-sectional in nature, and we do not know much about the patterns of individual physicians' location choices or the nature of the places they choose to leave or go to. The central questions being addressed here are, What is the size of the movement of physicians, who moves, and what are the relative characteristics of the places from which physicians depart compared to those of their destinations?

Study Data And Methods

■ **Data source.** This analysis drew on data gathered in prior studies of the retention of physicians, and the choice of the years was governed by those studies.⁵ The physician practice location data for all physicians under age seventy, not in federal employment, and in active clinical practice during 1981, 1991, and 2001 were drawn from multiple years of the American Medical Association (AMA) Physician Masterfile. Two analysis files were created, one including physicians active in practice in 1981 and 1991 and the other including physicians active in 1991 and 2001. The individual physician characteristics in the files included sex, birth year, medical school, medical school graduation year, residency start year, practice address, and specialty. To those files were added data that described the characteristics of the counties in which the physicians practiced, including per capita income, unemployment rate, physician-to-population ratios, and number of hospitals.⁶

■ **Data classification scheme.** Physicians were classified according to whether the move was their initial change of practice location after residency—that is, they were a resident in the initial year of the ten-year interval—or a subsequent move. The movers were then compared to physicians who remained in their practice-location county over the ten-year period. The number of physicians tracked between 1981 and 2001 included those reporting active clinical practice in both years of each ten-year period and excluded those over age seventy. This identified 297,466 physicians for

the 1981–1991 interval and 424,154 for 1991–2001 (including residents in training in the initial year of the decade). This compares to 389,369 patient care physicians of all ages, including residents in training, in 1981 and 535,220 in 1992 as reported by the AMA's *Physician Characteristics and Distribution in the U.S.*⁷

There were 82,293 physicians in residency training in 1991 and 51,230 in 1981; the movement of physicians in training was analyzed separately. The total number of postresident physicians included in the study of movement for the 1981–1991 cohort was 246,236, and for the 1991–2001 cohort, 341,861. We were unable to identify the county of practice for one or both years for less than 4 percent of physicians in the files; most exclusions from the AMA-reported total were attributable to age, inactive status, military status, location outside the United States, or other missing data.

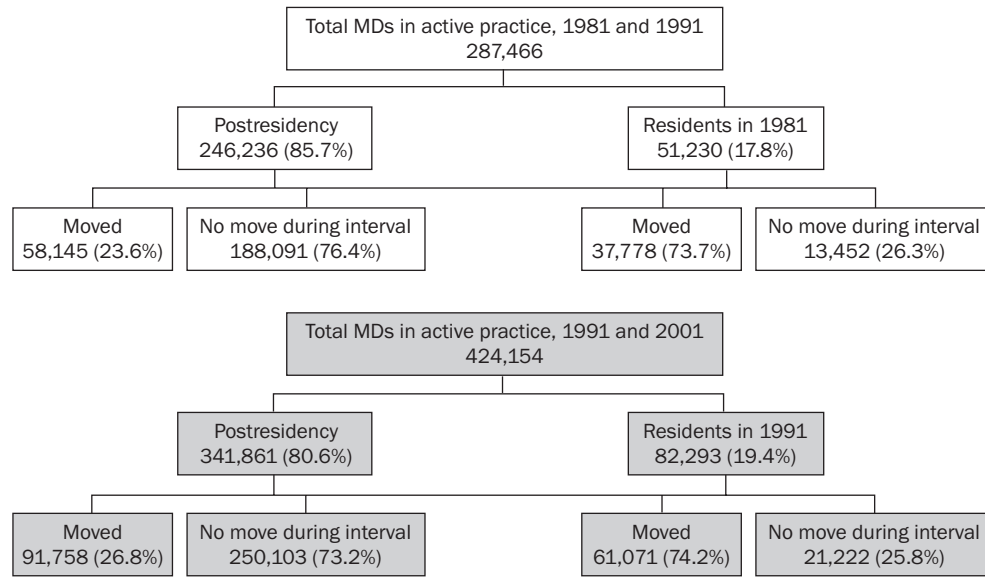
■ **Physician-to-population ratios.** Physician-to-population ratios for all U.S. counties were computed for all three years; these were divided into deciles from those with the greatest supply (category 1) to the least (category 10). The socioeconomic structure of U.S. counties was characterized by the ratio of physicians to population, county per capita income, unemployment rate, percentage of the population that was nonwhite and non-Hispanic, and the proportional change in population.

To examine the effects of these characteristics on migration, we created a series of four multivariate regressions that modeled the odds that a physician would move from one county to another during the two ten-year intervals. The regressions examined the characteristics of the physicians who moved as well as the characteristics of the departure and destination counties. The models were designed to determine if there were differences between the departure and destination counties.

Study Results

In the interval 1981–1991, 95,923 of 287,446 physicians active in both years changed their county of practice—33 percent of the total. For the 1991–2001 interval, 152,829 of 424,154 moved—or 36 percent of the total (Exhibit 1).

EXHIBIT 1
Patterns Of Physicians' Moving Or Staying In Same County For Practice, 1981-1991
And 1991-2001



SOURCE: American Medical Association, *AMA Physician Masterfiles*, 1981, 1991, and 2001.

These totals include physicians who were just establishing practice after their residency training. In the 1981-1991 files there were 246,236 physicians under age seventy in active clinical practice in both years and not in residency training in 1981. Of those, 58,145 (23.6 percent) moved from one county to another, and 33,100 of those (56.9 percent) moved to a county in another state. Of the 341,861 physicians in practice in both 1991 and 2001 (not in residency), 91,758 (26.8 percent) moved from one county to another, and 51,549 (15.1 percent) went to a county in another state (56.9 percent of those who moved).

Female physicians were less likely than male physicians to have moved to a different county in the 1981-1991 cohort (21 percent versus 23 percent) but more likely than male physicians to have moved between 1991 and 2001 (33.2 percent versus 25.4 percent). Slightly higher proportions of primary care than specialist physicians moved during both decades (24.75 percent versus 23 percent and 28.3 percent versus 26.1 percent, respectively).

■ **Physician density.** The total number of physicians who moved from one county to another is included in the appropriate cell in Exhibit 2. Decile 1 denotes the most dense counties; decile 10, the least. In both ten-year spans, more physicians moved from a county with a relatively higher ratio (greater supply) to one with a lower ratio (lesser supply) than moved in the opposite direction (27,567 or 47.4 percent of all movers in 1981-1991 and 42,258 or 46.1 percent in 1991-2001).

For the least-dense counties in 1981-1991 there were 9,516 movers from category 9 and 10 counties to more dense counties, compared to 6,918 who moved into those counties, resulting in a net loss of 2,598 among postresidency physicians. The same pattern held for 1991-2001, with 13,836 moving from category 9 and 10 counties to relatively more-dense counties and 11,135 moving in. However, the overall supply in the lowest-supply counties grew as a result of the in-migration of physicians who were in a residency program at the start of each decade. Almost half—28,747, or 47.1 percent—of all

EXHIBIT 2**Changes In Practitioner-To-Population Ratio Classified By Deciles For Physicians Who Moved, 1981–1991 And 1991–2001**

1991 county supply decile											
1981	1	2	3	4	5	6	7	8	9	10	Total
1	1,765	1,105	854	761	597	442	549	582	523	315	7,493
2	1,018	892	719	611	508	352	472	420	490	432	5,914
3	813	799	608	622	488	387	382	521	564	356	5,540
4	723	745	572	638	545	424	394	520	362	697	5,620
5	708	757	656	559	808	368	401	437	375	724	5,793
6	487	428	639	390	600	681	186	360	176	209	4,156
7	638	663	522	637	550	391	546	350	390	398	5,085
8	631	766	685	656	423	433	403	413	475	432	5,317
9	547	595	638	680	659	385	583	448	1,020	908	6,463
10	419	517	624	629	735	627	495	935	759	1,024	6,764
Total	7,749	7,267	6,517	6,183	5,913	4,490	4,411	4,986	5,134	5,495	58,145

2001 county supply decile											
1991	1	2	3	4	5	6	7	8	9	10	Total
1	2,554	1,731	1,293	808	977	994	912	1,020	786	449	11,524
2	1,729	1,288	1,313	921	812	876	634	858	659	539	9,629
3	1,368	1,197	1,019	590	659	855	675	761	887	425	8,436
4	1,185	1,154	1,283	976	784	804	676	744	671	1,163	9,440
5	791	1,017	789	836	1,090	535	541	447	464	402	6,912
6	1,470	1,146	1,168	858	1,022	1,140	995	1,584	991	1,107	11,481
7	651	597	721	581	503	520	517	487	601	533	5,711
8	1,218	1,092	962	883	842	882	732	1,014	866	592	9,083
9	661	770	752	739	960	942	568	1,229	1,342	1,493	9,456
10	625	877	1,019	778	709	1,031	1,046	1,130	1,225	1,646	10,086
Total	12,252	10,869	10,319	7,970	8,358	8,579	7,296	9,274	8,492	8,349	91,758

SOURCE: American Medical Association, *AMA Physician Masterfiles*, 1981, 1991, and 2001.

NOTES: For 1981–1991, moves to counties with lesser supply, 27,567 (47.4%); with greater supply, 22,183 (38.2%); same, 8,395 (14.4%). For 1991–2001, moves to counties with lesser supply, 42,258 (46.1%); with greater supply, 36,914 (40.2%); same, 12,586 (13.7%).

1991 physicians in residencies who moved during the next ten years—left category 1 and 2 counties, which created an overall net loss of 11,063. Between 1991 and 2001, 13,817 physicians in residencies in 1991 moved to counties in the lowest two categories of density, which created a net gain for those counties of almost 10,000. The physician population in the category 9 and 10 counties was thus younger and included more newly trained physicians.

■ **Regional movement.** The movement of physicians across regions reflects both the location of medical training and shifts in the U.S. population and economic activity. Exhibit 3 shows a marked shift in the supply of post-residency physicians from the Northeast and Midwest to the South and West. In 1991–2001,

the Northeast lost a net 4,520 physicians to the South, 1,763 to the Midwest, and 2,177 to the West; the Midwest experienced an interregional loss of 3,639 to the South and 2,492 to the West. Similar patterns were observed for physicians who were in residency positions in 1991.⁸ Interregional movements for 1981–1991 followed the same pattern for both immediate post-training and established practitioner groups (data not shown).

■ **Multivariate analysis.** The regression results indicate that females and younger physicians were consistently more likely than male and older physicians to move (Exhibit 4). Lower per capita income levels and higher proportions of nonwhites in the population were associated with the departure models of both

EXHIBIT 3
Interregional Moves Of Physicians (Not in Residency In 1991), 1991–2001

1991, from	2001, to					Total
	Outside 50 states	Northeast	South	Midwest	West	
Outside 50 states	1,100	114	542	58	76	1,890
Northeast	76	75,756	4,520	1,763	2,177	84,292
South	244	2,187	98,244	2,423	2,493	105,591
Midwest	19	1,344	3,639	65,903	2,492	73,397
West	53	1,391	2,897	1,778	70,572	76,691
Total	1,492	80,792	109,842	71,925	77,810	341,861

SOURCE: American Medical Association, *AMA Physician Masterfiles*, 1981, 1991, and 2001.

cohorts. There were nonsignificant ($p < 0.01$) trends for physicians to move from counties with higher to lower unemployment. In both pairs of models, however, the parameter for the physician-to-population ratio for the departure counties was positive and significant but was negative and significant for the destination counties.

Discussion

■ **Residency physicians versus postresidency.** The overall pattern in the data is one of relative stability in the total number of physicians remaining in their practice location if they had completed a residency program at least a year before they moved to that location. Close to three-quarters of physicians in a postresidency practice stayed in their index-year practice county over a ten-year interval. In contrast, nearly three-quarters of physicians who were in a residency in the index year moved during the next ten years. It has long been held that practice location is heavily influenced by residency location. The scope of the postresidency intercounty movement suggests the need for further analysis of that phenomenon to determine whether these moves are to nearby counties or confined to regions.

■ **Movement pattern over time.** The pattern of movement of physicians over time, if viewed in the context of an emerging physician shortage, might indicate that the problems with supply can develop quickly as a result of selective migration and will likely occur

at the top and bottom ends of the distribution of physicians. Likewise, regions that have not traditionally had supply problems—the Northeast and the Midwest—can anticipate continuing to lose physician supply. The data, however, do not support clear conclusions about the specific geographic effects of a relative slowdown in physician production.

■ **Established physicians versus general population.** Physicians in established practices (postresidency) may be seen as lagging behind the general population as it moves. When we examined census data for the general population, we found that physicians in established practice were less likely than the general population to move over a ten-year time period. Only a quarter of physicians moved to another county, compared to 50–60 percent of the population making an intercounty move in a ten-year period.⁹ Physicians who recently completed a residency were slightly more likely than the general population to make a move.

■ **Physician supply among minorities.** The overall tendency for established physicians was to move to places with lower physician-to-population ratios; the counties with the lowest ratios gained more physicians coming out of residency than established physicians making a move. The pattern is for the younger physicians to replace the older physicians in markets with higher demand and lower supply, while established physicians

EXHIBIT 4
Summary Of Regression Results, Analysis Of Physicians' Movement, 1981–2001
(Excludes Residents)

Variables	Odds ratios			
	1981–1991		1991–2001	
	Departure	Destination	Departure	Destination
Female	1.288***	1.353***	1.189***	1.281***
Age of physician	0.932***	0.899***	0.939***	0.937***
Ratio, total physicians to population	1.008 ^a	0.988 ^a	1.007 ^a	0.973 ^a
Ratio, primary care physicians to population	0.999	0.742***	0.981	0.824***
County population	1	0.999	1	0.999
Percent in county with high school education	0.998	0.999	0.997	0.999
Percent unemployment	1.008	0.996	1.024***	0.984
Percent nonwhite	1.009***	0.996	1.012***	0.998
Per capita income	0.970***	1.013	0.989***	1.005
Number of hospitals	0.985***	1.006	0.959	0.994
Pseudo R-square	0.0654	0.1465	0.075	0.0578

SOURCE: American Medical Association, *AMA Physician Masterfiles*, 1981, 1991, and 2001.

^aSign change between departure and destination model was significant ($p = 0.01$) in both models.

*** $p = 0.01$

tend to choose places with higher incomes and fewer minorities. This suggests that there needs to be a continued effort to support the flow of physicians into places with lower supply combined with lower incomes and higher proportions of minorities, which are often rural counties. The counties with the lowest physician density include underserved places that depend upon programs such as the NHSC and state loan repayment programs to attract physicians. The movement of new-to-practice physicians away from counties with lower incomes and more nonwhites may be a function of the location of residency programs in central metropolitan counties.

■ **Moves toward less competitive areas.**

There is diffusion from the population centers outward, but the regression results suggest that physicians tend to move where they may be taking advantage of greater demand as a result of less competition. The indications are that this is also tied to other considerations for practice, including the nature of the surround-

ing population. This agrees, in part, with economic theories of diffusion as potentially solving problems of rural-urban maldistribution.¹⁰ The overall flow of physicians is dominated by movement between and among counties at the top and middle of the distribution of physicians, with the top end losing “share” over time. The consequence of this is that the supply of established physicians will move to the middle of the distribution. The most dense and the least dense will depend on newly trained physicians and residents to meet their patient care needs. Given the relative flows of immediate postresidency physicians compared to established physicians, the data suggest that rural underserved areas may face a greater problem with retention of practitioners than with their initial recruitment.

■ **Study limitations.** An important limitation of the study is that we could not classify physicians who were in their initial practice location after training with 100 percent accuracy; we were only able to approximate

whether a physician was making his or her first or a subsequent move based on the timing of residency training. The rate of transition out of the initial practice location is higher than for subsequent locations, and the higher proportion of younger and new-to-practice physicians supports that contention.

The fact that a higher proportion of female physicians moved is perhaps a function of their younger age relative to all physicians, but their propensity to move is independently higher than that of male physicians. We may speculate that this is a function of family pressures or negotiations or that female physicians may either be more professionally mobile or occupy practice situations that are less permanent. By focusing only on physicians under age seventy, we might have underestimated movements that occur later in physicians' practice careers.

We did not estimate tenure in a specific place. It might be possible, linking across all available files, to develop an estimate of length of time of practice in first and subsequent locations, but that was not the goal of this analysis. Rather, we attempted to determine if there were predictable factors that "sent away" physicians or attracted them. Also, the analysis did not attempt to examine within-county moves, because of limitations in the data; there is the potential to misclassify as moves address changes that occurred as a result of periodic changes in ZIP code assignments by the U.S. Postal Service, misinterpreted address changes for mail delivery purposes, or very-short-distance moves into new offices or adjacent locations.

In sum, the "standard" theory of diffusion of professionals from high- to lower-density markets is confirmed, to a point, in this study, but the counties with the greatest need for additional physicians do not easily retain them.

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NOTES

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5. D. Cherkin and D. Lawrence, "An Evaluation of the American Medical Association's Physician Masterfile as a Data Source—One State's Experience," *Medical Care* 15, no. 9 (1977): 767–769; J. Kessler, M. Whitcomb, and P.T. Williams, "Quality of the Family Physician Component of the AMA Masterfile," *Journal of the American Board of Family Practice* 9, no. 2 (1996): 94–99; and T.R. Konrad et al., "Using the American Medical Association Physician Masterfile to Measure Physician Supply in Small Towns," *Journal of Rural Health* 16, no. 2 (2000): 162–167.
6. Details of the study methods are available in a Technical Appendix, online at <http://content.healthaffairs.org/cgi/content/full/27/5/1409/DC1>.
7. D. Smart, *Physician Characteristics and Distribution in the U.S., 2006 Edition* (Chicago: AMA, 2006).
8. See online Technical Appendix, as in Note 6.
9. J. Schachter, *Geographical Mobility: 2002 to 2003* (Washington: U.S. Census Bureau, 2004).
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