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Characterizing the General Surgery Workforce in Rural America

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by

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Characterizing the General Surgery Workforce in Rural America

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ABSTRACT

CONTEXT

General surgeons form a crucial component of the medical workforce in rural areas of the United States. Any decline in their numbers could have profound effects on access to adequate health care in such areas.

OBJECTIVE

To determine the numbers, characteristics and distribution of general surgeons currently practicing in the rural United States.

DESIGN AND SETTING

The American Medical Association's (AMA) Physician Masterfile was used to identify all clinically active general surgeons as well as their location and characteristics. Their geographic distribution was examined using the ZIP code version of the Rural-Urban Commuting Areas (RUCAs). Surgeons were classified as practicing in urban areas, "large rural" areas, or "small/isolated" areas.

RESULTS

There are currently 17,243 general surgeons practicing in the United States. Nationally, the number of general surgeons per 100,000 population varies from 6.53 in urban areas to 7.71 in large rural areas and 4.67 in small/isolated rural areas. Only 10.6 percent of the nation's general surgeons are female. Wide variations in numbers of general surgeons were found between and within individual states. General surgeons in the smallest rural areas are more likely than those in urban areas to be male (92.7% versus 88.3%, $p < 0.001$), 50 years of age or older (51.6% versus 42.1%, $p < 0.001$), or international medical graduates (25.2% versus 20.1%, $p < 0.001$).

CONCLUSIONS

The overall size of the rural general surgical workforce has remained static over the last decade, but its demographic characteristics suggest that numbers will decline. Many rural residents have limited access to surgical services. Steps to reverse this trend are needed to preserve the viability of health care in many parts of rural America.

INTRODUCTION

General surgeons are a crucial component of the health care workforce in rural America. A 1993 conference on rural health care, sponsored by the University of Alabama, concluded that the presence of a general surgeon was a requirement for adequate health care in the rural setting. General surgeons provide essential support for rural family physicians by performing emergency surgeries and critical care services. Additionally, where other specialists are unavailable, they often perform necessary obstetrical, gynecological, orthopedic, and endoscopic procedures. The presence of general surgical services has been shown to be critical to the financial viability of rural hospitals and the success of rural trauma systems.[1-5] Indeed, in many smaller hospitals general surgery is the second most common specialty after family practice.[6] Given the importance of general surgeons to rural health care, determining their numbers relative to the populations they serve and detecting any significant trends is essential for ensuring an adequate supply in rural areas.

Although there are few prior estimates of the number of rural general surgeons *per se*, workforce studies from the mid 1990s estimated that there were between 17,000 and 23,000 general surgeons in the United States, depending on the data sources and definitions of general surgeons used.[7,8] However, it is likely that both the overall number of general surgeons, and their number in rural areas has declined. First, the general surgery workforce, particularly in rural areas, appears to be aging. A study in rural Missouri, for example, noted that almost half of the general surgeons were within a decade of retirement.[9] Second, interest of graduating U.S. medical students in general surgery careers as reported in graduation questionnaires has declined since the early 1980s.[10] Finally, the proportion of general surgery residency graduates selecting rural practice declined from 20 percent in the late 1970s to 13 percent in the mid-1980s.[8,11]

Recognizing this decline in rural general surgeons, the Council on Graduate Medical Education suggested ameliorative policies,[12] including increased attention to residencies that promote and prepare general surgeons for rural practice.

General surgeons face mounting challenges in rural areas as a result of rural hospital closures, changing referral patterns, increasingly tight reimbursement policies, difficulties with recruitment because of "lifestyle issues" and other factors—leading some to describe rural surgery as facing a "crisis."[13] We report here on the current state of the general surgery workforce in the United States, with particular emphasis on the characteristics and distribution of surgeons in rural areas.

METHODS

We used the 2001 American Medical Association (AMA) Physician Masterfile data set, which contains information on all 771,491 nonfederal allopathic and osteopathic physicians in the United States, with names omitted. We identified general surgeons on the AMA data set based on primary specialty listed. We included only surgeons who listed their primary specialty as general surgery, abdominal surgery, trauma surgery or critical care. We only included surgeons if they were clinically active, namely, if they reported their major professional activity as one of office-based practice, hospital staff, or locum tenens. We excluded physicians in residency training because the purpose of this study is to examine the practice location of general surgeons who form part of the permanent physician workforce. Finally, we only included general surgeons ages 62 years or younger, based on the average age of retirement of Fellows of the American College of Surgeons.[14] This definition of clinically-active, nonresident general surgeons was identical to the "minimum scenario calculation" used by Jonasson et al.,[8] except that they included only those surgeons less than 62 years of age.

The AMA Masterfile lists a ZIP code, assumed to be a work address, for each physician. In order to determine the rural or urban location of a physician's reported practice, we used the ZIP code version of the Rural-Urban Commuting Areas (RUCAs). The RUCAs were developed in a collaboration between the Department of Agriculture's Economic Research Service and the WWAMI Rural Health Research Center at the University of Washington, supported by the Federal Office of Rural Health Policy.[15] RUCAs use Census Tracts (to which ZIP codes are approximated) rather than counties as building blocks, to define rurality based on community populations and work commuting patterns. RUCAs are currently being used by several federal agencies to define rurality and determine eligibility for some federal programs directed at rural areas and residents.

For the purposes of this study, the 30 RUCA categories were collapsed in three groups—"Urban" (metropolitan area core with population greater than 50,000), "Large rural" (large town core with a population between 10,000 and 50,000) and "Small or isolated rural" (towns with populations of 2,500 to 10,000 or areas without an urban core population of at least 2,500). ZIP code-based population estimates from 1998 Claritas data were used to determine surgeon/population ratios.

We examined the demographic characteristics of general surgeons, including age, gender, medical school, and board certification, in order to identify differences in those practicing in rural and urban areas. International medical graduate (IMG) surgeons were defined as those who had graduated from a medical school outside of the United States or Canada. Bivariate associations between urban/rural site of practice, and the demographic factors were examined using the chi-square test.[16] Analysis was performed using SPSS version 6.0.

Using the AMA Masterfile supplemented with county population data, we calculated the absolute numbers of clinically-active general surgeons, and the general surgeon/100,000 population ratios for the nine Census Bureau Divisions, as well as for each state. Additionally, we calculated general surgeon/100,000 population ratios for urban, large rural, and small/isolated rural areas in each of the regions, divisions and states. This allowed comparisons across divisions, states, rural and urban areas by taking into account the wide variations in absolute numbers of general surgeons in such disparate categories.

RESULTS

GENERAL SURGEON NUMBERS AND DEMOGRAPHICS

There were 17,243 clinically-active, nonresident general surgeons in the United States in 2001, with an overall general surgeon to population ratio of 6.40 general surgeons per 100,000 population (Table 1). Nationally, 10.6 percent of general surgeons were female, and 80.1 percent were graduates of U.S. or Canadian medical schools. General surgeons in urban areas were more likely to be female (11.7%) than those in large rural (6.1%) or small/isolated rural areas (7.3%) ($p < 0.001$). General surgeons ages 50 years or older were significantly more likely to be located in small/isolated rural areas than in urban areas (51.6% vs. 42.1%, $p < 0.001$), and more likely to be located in small/isolated rural areas than large rural areas (51.6% vs. 44.2%, $p < 0.001$). Board certification information

Table 1: Characteristics of General Surgeons in Urban, Large Rural, and Small/Isolated Rural Areas of the U.S. in 2001

	Urban Areas (n = 13,647)	%	Large Rural Areas (n = 1,956)	%	Small and Isolated Rural Areas (n = 1,636)	%	Overall U.S. (n = 17,243)	%	Overall Chi-Square p Value
Gender*									
Female	1,594	11.7	120	6.1	120	7.3	1,834	10.6	< 0.001
Male	12,053	88.3	1,836	93.9	1,516	92.7	15,405	89.4	
Age (years)*									
< 40	2,753	20.2	390	19.9	249	15.2	3,392	19.7	< 0.001
40-49	5,153	37.7	702	35.9	542	33.1	6,397	37.1	
≥ 50	5,741	42.1	864	44.2	845	51.6	7,450	43.2	
Medical school*									
US or Canadian medical graduate	10,900	79.9	1,682	86.0	1,223	74.7	13,805	80.1	< 0.001
International medical graduate	2,747	20.1	274	14.0	413	25.2	3,434	19.9	
Board certified in general surgery†									
Yes	10,548	94.7	1,575	97.6	1,180	97.7	13,303	95.2	< 0.001
No	595	5.3	39	2.4	28	2.3	662	4.7	

* Data on gender, age and country of medical school were missing for 4 individuals.
† Data on Board Certification were missing for 3,278 individuals.
Percentages may not add to 100 owing to rounding.

was not reported for 19 percent of general surgeons. General surgeons who are IMGs were significantly more likely to be located in small/isolated rural areas (25.2%) or urban areas (20.1%), as compared to large rural areas (14.0%) ($p < 0.001$ for both), and significantly more likely to be practicing in small/isolated rural areas than urban areas (25.2% vs, 20.1%, $p < 0.001$).

GEOGRAPHIC DISTRIBUTION OF GENERAL SURGEONS

Nationally, there were 6.40 general surgeons per 100,000 population, however this varied from 6.53 in urban areas to 7.71 in large rural and 4.67 in small/isolated rural areas (Table 2). For urban areas, the lowest number of surgeons per 100,000 population was found in the Pacific (5.41), West South Central (6.11), Mountain (6.17), and East North Central (6.22) census divisions. In large rural areas, the West South Central (6.20) and Pacific (6.82) divisions again had the lowest number of general surgeons relative to population. Finally, in the small/isolated rural areas, the census divisions with the smallest relative number of general surgeons included the West South Central (3.04), West North Central (3.66) and Pacific (4.22) divisions.

The numbers of general surgeons per 100,000 population for urban, large rural, and small/isolated rural areas of all 50 states and the District of Columbia (Table 3 and Figure 1) demonstrated an even wider degree of inter- and intra-state variation than was noted at the more aggregated division level. In some states, such as Wyoming, there were proportionately more surgeons in rural and urban areas than the national average. In others, such as Washington however, there were proportionately fewer surgeons in all types of areas than the national average. Finally, in many states there were proportionately more surgeons in some types of areas, and fewer in other types of areas (e.g. North Dakota).

COMMENT

For almost a decade, there have been concerns raised about the adequacy of the general surgical workforce serving rural America. Any decline in rural general surgeons would have profound effects on patient access to clinical services, the viability of trauma systems, rural hospital financial viability, and surgical back up for primary care practitioners in rural areas.

There were 17,243 general surgeons practicing in the United States in 2001; this is very similar to the 17,289 identified from the AMA Masterfile in 1994 using similar criteria to ours,[8] and suggests that the general surgical workforce has not kept pace with the rising population. This may be due to a number of factors, including more general surgeons taking early retirement, or an increasing tendency for graduating residents to seek fellowship training rather than practicing general surgery. Moreover, our study suggests that the number of general surgeons in the

Table 2: Ratios of General Surgeons per 100,000 Population in Urban, Large Rural, and Small/Isolated Rural Areas of Census Bureau Divisions in 2001

Census Bureau Division	Overall Number of General Surgeons	Total Population (1,000s)	Ratio	General Surgeons in Urban Areas	Population in Urban Areas (1,000s)	Ratio	General Surgeons in Large Rural Areas	Population in Large Rural Areas (1,000s)	Ratio	General Surgeons in Small or Isolated Rural Areas	Population in Small or Isolated Rural Areas (1,000s)	Ratio
New England	981	13,407	7.32	801	11,184	7.16	62	755	8.22	118	1,467	8.04
Middle Atlantic	2,863	38,234	7.49	2,525	33,135	7.62	161	1,951	8.25	177	3,147	5.62
East North Central	2,721	44,034	6.18	2,122	34,138	6.22	345	4,496	7.67	254	5,399	4.70
West North Central	1,167	18,650	6.26	736	10,897	6.75	249	2,775	8.97	182	4,976	3.66
East South Central	1,152	16,433	7.01	712	9,081	7.84	235	2,875	8.17	205	4,476	4.58
South Atlantic	3,283	48,684	6.74	2,565	37,659	6.81	344	4,183	8.22	374	6,842	5.47
West South Central	1,699	29,918	5.68	1,334	21,846	6.11	227	3,662	6.20	134	4,409	3.04
Mountain	1,024	16,760	6.11	752	12,193	6.17	161	2,146	7.50	111	2,420	4.59
Pacific	2,353	43,287	5.44	2,100	38,849	5.41	172	2,520	6.82	81	1,917	4.22
Total	**17,243**	**269,411**	**6.40**	**13,647**	**208,985**	**6.53**	**1,956**	**25,366**	**7.71**	**1,636**	**35,058**	**4.67**

Table 3: Ratios of General Surgeons per 100,000 Population in Urban, Large Rural, and Small/Isolated Rural Areas of All 50 States and the District of Columbia in 2001

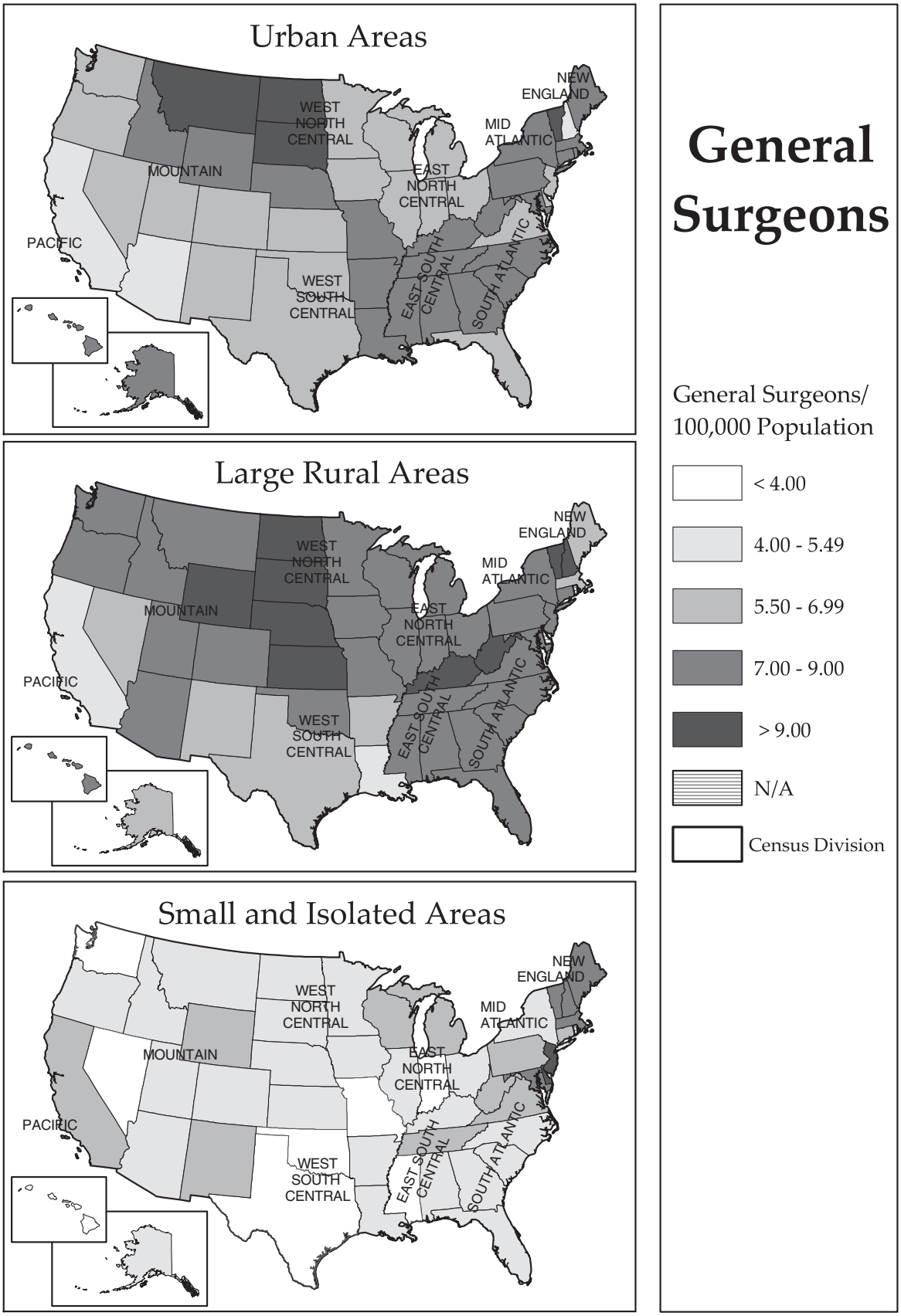
State	Overall U.S.	Urban Areas	Large Rural Areas	Small or Isolated Rural Areas
Alabama	6.98	7.42	7.36	4.95
Alaska	6.04	7.01	6.23	4.16
Arizona	5.48	5.40	7.59	3.72
Arkansas	6.69	8.78	6.63	3.98
California	5.21	5.21	5.13	5.50
Colorado	6.22	6.32	7.03	5.49
Connecticut	7.15	7.16	8.30	6.03
Delaware	7.05	6.57	–	9.02
DC	15.18	15.18	–	–
Florida	5.92	5.94	7.92	4.76
Georgia	6.80	7.02	8.09	4.75
Hawaii	6.80	7.11	8.36	1.74
Idaho	6.99	8.24	7.97	3.93
Illinois	6.19	6.28	7.79	4.00
Indiana	5.28	5.54	7.21	2.79
Iowa	6.06	6.72	8.82	4.23
Kansas	6.30	5.77	9.24	4.26
Kentucky	7.03	7.83	10.48	4.44
Louisiana	6.86	7.76	5.30	4.68
Maine	8.21	8.87	6.35	8.17
Maryland	7.74	7.67	7.80	8.95
Massachusetts	7.04	7.00	6.08	8.65
Michigan	5.92	5.58	8.64	6.58
Minnesota	5.47	5.58	8.00	3.81
Mississippi	6.08	8.00	7.75	2.71
Missouri	6.24	7.11	7.82	2.89
Montana	7.49	9.37	8.89	4.76
Nebraska	7.09	8.51	9.21	3.39
Nevada	6.24	6.53	6.89	2.74
New Hampshire	6.26	4.69	11.01	7.08
New Jersey	6.67	6.63	7.14	12.84
New Mexico	6.38	6.65	6.23	5.58
New York	7.49	7.60	8.44	5.42
North Carolina	7.07	7.51	8.31	4.98
North Dakota	8.11	10.93	11.81	3.76
Ohio	6.60	6.83	7.24	3.40
Oklahoma	5.31	5.88	7.21	2.16
Oregon	6.98	6.91	8.79	4.09
Pennsylvania	8.03	8.49	8.15	5.59
Rhode Island	8.32	8.37	–	–
South Carolina	7.02	7.79	7.23	4.49
South Dakota	8.51	11.51	12.59	3.36
Tennessee	7.49	8.18	7.28	5.90
Texas	5.35	5.66	5.96	2.27
Utah	5.45	5.57	7.28	3.20
Vermont	9.64	11.28	10.73	8.68
Virginia	6.19	5.98	7.22	6.79
Washington	5.46	5.55	7.03	2.79
West Virginia	8.05	8.57	11.42	5.97
Wisconsin	6.76	6.76	8.13	6.25
Wyoming	7.89	8.37	9.29	6.56
U.S. average	**6.40**	**6.53**	**7.71**	**4.67**

most rural areas of the United States, in particular, will decline further. First, we found that rural general surgeons are older than those in urban areas, suggesting that the relative deficit of general surgeons in more rural areas will only continue to increase. Second, the preference of female surgeons for urban practice suggested by our data may exacerbate the situation in an era when an increasing number of medical students and thus surgeons are female. Third, we found that general surgeons who are IMGs are more likely to be found in smaller rural areas than in urban areas, suggesting that IMG general surgeons are filling positions in what is deemed by U.S. graduates to be less attractive practice settings, in this case rural general surgery.

The majority (79.1%, or 13,647) of the 17,243 clinically-active general surgeons in the United States practice in urban areas, with 11.3 percent (1,956) in large rural areas and 9.5 percent (1,636) in small/isolated rural areas. Overall, the 60 million Americans (22.4% of the total population) living in rural areas are served by 20.8 percent of the nation's general surgeons, suggesting that as a whole rural areas are adequately served by general surgeons. This contrasts markedly with previous studies which estimated that approximately 10 percent of general surgeons were practicing in rural areas,[17] possibly because of less precise definitions of rurality. However, we did note that there are relatively more general surgeons (per population) in large rural areas, compared to urban areas, perhaps reflecting the fact that many of the clinical services performed by general surgeons in large rural areas are undertaken by surgical subspecialists in urban areas. Alternatively, it is possible that in some states (e.g., California) managed care organizations have a greater presence in urban areas than in large rural areas, and such organizations tend to manage patients with fewer surgeons. The ratio of general surgeons is far lower in small/isolated rural areas, however, with only 4.67 general surgeons per 100,000 population in these areas. Within small/isolated rural areas we noted wide variation across the country, with even fewer surgeons in many states situated in the West North Central, West South Central, Mountain and East North Central divisions. This suggests that particular small/isolated areas in certain states are less attractive than others. This may be the case in areas that lack the required threshold population to support a general surgeon, and may also reflect other factors such as lifestyle, practice viability, lack of training, or limited access to clinical facilities in such areas.

The relatively smaller numbers of general surgeons per unit population located in small rural/isolated areas compared to urban and large rural areas begs

Figure 1: Comparison of Numbers of General Surgeons per 100,000 Population in Urban, Large Rural, and Small/Isolated Rural Areas of the United States in 2001



the question of whether there is a baseline shortage of general surgeons in rural areas at present. There is no single accepted criterion of an "adequate" general surgeon to population ratio. The Primary Care Health Professional Shortage Areas Maps produced by the U.S. Health Resources and Services Administration designate areas with shortages of family physicians, general pediatricians, general internists and obstetrician/gynecologists—but not general surgeons. In our study, the average number of general surgeons per 100,000 population in small rural/isolated areas nationwide is certainly lower than 2 standard deviations below the mean number of surgeons per 100,000 population in urban and large rural areas in our study. It is also markedly lower than the national average of 7.1 practicing general surgeons per 100,000 population found by Jonasson and Kwakwa in 1996.[14] It is also below the HMO benchmark of 5.1 general surgeons per 100,000 population cited by Goodman et al. in 1996.[18] What exactly constitutes a "shortage" of general surgeons is beyond the scope of this paper, but our data suggest that residents of isolated/small rural areas have less immediate access to general surgical care than do residents of urban and large rural areas.

This study has several potential limitations. First, we assumed that a physician's ZIP code listed in the AMA Masterfile was his or her practice address—it is possible however that some surgeons may have listed their home address. Second, it should be borne in mind that this study addresses only the supply of general surgeons available to different populations, not the utilization of surgical services. For various reasons, patients from, for example, small/remote areas may seek care in large rural or urban areas regardless of the local availability of care. Third, this study does not take into account any effects of 'traveling' or 'itinerant' general surgeons, i.e., those whose ZIP code indicates they work in one (possibly more urbanized) area, but who travel on a regular basis to surrounding rural areas to provide consultations and surgical services.[19] Fourth, although the AMA Masterfile is the most complete nationally-available source of information on physicians, the criteria for including general surgeons that we used might exclude surgeons who perform general surgery as part of a subspecialty surgical practice, those who have clinical responsibilities in addition to teaching or research, as well as the clinical services provided by surgical residents, federally-employed surgeons, and those who are still clinically active beyond the retirement age that we selected.

Attempts to increase the proportion of general surgeons choosing rural practice will require a multifaceted approach. Selection of students at medical school entry could emphasize those from rural backgrounds, as they are more likely than their urban counterparts to eventually practice in rural areas.[20] Efforts to promote student interest could include developing more student rotations with rural general surgeons.[21] Student interest in general surgery residencies increased in the 2003 National Residency Matching Program match, with 82.7 percent of positions filled by U.S. seniors (and 99.0% of positions filled overall).[22] Surgical residencies could include rural training tracks with structured periods of rural exposure, more diverse case exposure, or even a rural fellowship.[13,23]

Further research is needed to assess rural surgeons' ongoing requirements to maintain and update their clinical skills, and—most importantly—the factors vital to retaining them in rural practice. There may also be opportunities to examine alternatives to the current funding (e.g., changing Medicare fee schedules) and organization of surgical services in rural areas (e.g., more favorable reimbursement for rural training and practice). In Australia a regular locum tenens service provided by the regional academic center and flying surgical teams have been used to provide surgical services in isolated areas. Finally, telemedicine has shown promise in the areas of orthopedics and trauma. Once issues of reimbursement and liability have been resolved, telemedicine, along with the nascent field of telesurgery, may contribute to improved surgical care in isolated rural areas.

General surgeons and family practitioners are core components of rural medical care. If rural residents are to achieve health care parity with the urban populace, medical schools and health care policy makers need to address the growing crisis in the rural general surgical workforce.

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