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**U.S. Rural Physician Workforce:
Analysis of Medical School
Graduates from 1988-1997**

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by

Frederick M. Chen, MD, MPH

Meredith A. Fordyce, PhD

Steve Andes, PhD

L. Gary Hart, PhD

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ABOUT THE CENTER

The WWAMI Rural Health Research Center (RHRC) is one of six centers supported by the Federal Office of Rural Health Policy (FORHP), a component of the Health Resources and Services Administration (HRSA) of the U.S. Public Health Service. The major focus of the RHRC is to perform policy-oriented research on issues related to rural health care and the rural health professional workforce. Specific interests of the RHRC include the adequacy of the supply and education of rural health care professionals, and the availability and quality of health care for rural populations, with particular emphasis on access to high-quality care for vulnerable and minority rural populations.

The WWAMI Rural Health Research Center is based in the Department of Family Medicine at the University of Washington School of Medicine, and has close working relationships with the WWAMI Center for Health Workforce Studies, state offices of rural health, and the other health science schools at the University, as well as with other major universities in the five WWAMI states: Washington, Wyoming, Alaska, Montana, and Idaho. The University of

Washington has over 30 years of experience as part of a decentralized educational research and service consortium involving the WWAMI states, and the activities of the RHRC are particularly focused on the needs and challenges in these states.

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Mark P. Doescher, MD, MSPH, Director
Susan M. Skillman, MS, Deputy Director
WWAMI Rural Health Research Center
Department of Family Medicine
School of Medicine
University of Washington
Box 354982
Seattle, WA 98195-4982
E-mail: rhrc@fammed.washington.edu
WWW: <http://depts.washington.edu/uwrhrc/>

ABOUT THE AUTHORS

FREDERICK M. CHEN, MD, MPH, is an Acting Assistant Professor in the Department of Family Medicine, University of Washington School of Medicine.

MEREDITH A. FORDYCE, PhD, is an Investigator in the WWAMI Rural Health Research Center, University of Washington School of Medicine.

STEVE ANDES, PhD, is with the American Osteopathic Association.

L. GARY HART, PhD, was Director of the WWAMI Rural Health Research Center and Professor in the Department of Family Medicine, University of Washington School of Medicine, at the time of this study.

The U.S. Rural Physician Workforce: Analysis of Medical School Graduates from 1988-1997

FREDERICK M. CHEN, MD, MPH

MEREDITH A. FORDYCE, PhD

STEVE ANDES, PhD

L. GARY HART, PhD

EXECUTIVE SUMMARY

Despite continued federal and state efforts to increase the number of physicians in rural areas, disparities between the supply of rural and urban physicians persist. The recent Institute of Medicine (IOM) report on rural health quality highlights the critical role of well-trained physicians to deliver high quality care to rural areas. It has been over 15 years since Rosenblatt et al. described the medical schools that train rural allopathic physicians (MDs). This paper describes the training of the rural physician workforce in the United States, and examines the variations in medical school and residency production of rural physicians.

METHODS

We performed a national cross-sectional analysis of the 2005 American Medical Association (AMA) and American Osteopathic Association (AOA) Masterfile physician data. We examined a ten-year cohort of clinically-active, allopathic and osteopathic physicians who graduated from medical school 1988 through 1997 and had completed residency training. Physicians' locations were determined by reported ZIP code and reflected the physician's primary practice location. The ZIP codes were then mapped to Rural-Urban Commuting Area designations.

We identified the medical school of graduation for each physician. We identified the most recent residency program for each physician and identified the location of that residency program as rural or urban, based on its ZIP code. Rural physicians were aggregated to each medical school and medical schools were compared to show the percentage of the rural physicians produced by each school.

RESULTS

There were 175,649 clinically-active physicians in the cohort of physicians who graduated from medical school from 1988-1997. 11% (20,037) of this cohort of physicians was currently practicing in a rural location

in 2005. 18% of osteopathic medical school graduates were currently practicing in a rural location but only 11% of allopathic medical school graduates were in a rural location. Over the ten-year study period, there was an increase in the number and proportion of allopathic physicians practicing in rural areas (10.3% of 1988 graduates vs. 11.6% of 1997 graduates).

31% of rural physicians are women. Women continue to be less likely than men to practice in rural areas, although the gap is narrowing. There was, however, an increasing proportion of female physicians entering rural practice over the study period (7.8% to 9.8% female MDs, 12.2% to 17.7% female DOs) (Figure 2).

Medical Schools and Residency Programs: The medical schools that produced the highest percentage of rural physicians placed between 21-36% of their graduates in rural areas. Among these physicians who trained in rural residencies, 36% (n = 814) are currently in rural practice. 3.6% (343) of osteopathic physicians in the cohort trained in a rural program. 50% of DO graduates (n = 170) who trained in a rural residency are now in rural practice. While rural residency trainees are over three times more likely to practice in rural areas (RR = 3.4, p < .001), rural residencies account for only 5% of MD physicians practicing in rural areas and 10% of DO physicians in rural areas.

DISCUSSION

This national analysis shows that the proportion and number of physicians entering rural practice has remained stable, compared to earlier analyses. Osteopathic physicians and primary care physicians are more likely to practice in rural areas. Only ten medical schools had over 25% of their graduates in rural practice.

These data further support the valuable contribution of rural residency programs. Though few in number, these training programs are successful at producing rural physicians. A previous study showed that these rural

residency programs accounted for 71% of the nation's rural training in family medicine. Unfortunately, rural residency programs, especially in family medicine, face serious challenges.

As the IOM report emphasizes, rural health is critically dependent upon both the supply and the quality of its rural workforce. Not only do rural areas require an adequate supply of physicians to ensure access to care, but the training of these physicians in information technology, quality improvement, and new models of care is vital to the future of rural health. Current calls to expand medical school production may help support the pipeline for rural physician training. However, if medical schools expand class sizes without explicitly emphasizing primary care or rural health, it may result in more physicians choosing to practice in urban centers, worsening the rural urban maldistribution.

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INTRODUCTION AND BACKGROUND

Among the most enduring problems in rural America is the shortage and maldistribution of physicians.¹⁻³ Despite continued federal and state efforts to increase the number of physicians in rural areas, disparities between the supply of rural and urban physicians persist.³⁻⁵ The recent Institute of Medicine (IOM) report on rural health quality highlights the critical role of well-trained physicians to deliver high quality care to rural areas.¹ While the report emphasizes the need for rural physicians to be trained in quality improvement, information technology, and evidence-based medicine, the ability to provide high quality care in rural areas depends primarily upon an adequate supply of physicians.

It has been over 15 years since Rosenblatt et al. described the medical schools that train rural allopathic physicians (MDs).^{10,11} In addition, the contributing role of osteopathic physicians (DOs) and international medical graduates (IMGs) in the rural physician workforce has not been adequately described. This paper describes the training of the rural physician workforce in the United States, and examines the variations in medical school and residency production of rural physicians. We hypothesized that the majority of rural physicians in the United States are produced by a small subset of the nation's medical schools. In addition, we tested the hypotheses that DOs are more likely to practice in rural areas and that rural residency programs are more likely to produce rural physicians.

METHODS

We performed a national cross-sectional analysis of the 2005 American Medical Association (AMA) and American Osteopathic Association (AOA) Masterfile physician data. We examined a ten-year cohort of clinically-active, allopathic and osteopathic physicians

who graduated from medical school 1988 through 1997 and had completed residency training. This cohort allowed for a reasonable comparison to the ten year cohort from Rosenblatt’s previous work.¹⁰ In addition, this cohort allows for the most recent graduates (from 1997) to have completed residency training (typically 3-5 years) and then establish practice in order to be captured in the AMA Masterfile. Resident physicians and osteopathic physicians with an unknown professional employment status were excluded from the analyses.

Physicians’ locations were determined by reported ZIP code and reflected the physician’s primary practice location. The ZIP codes were then mapped to Rural-Urban Commuting Area (RUCA, <http://depts.washington.edu/uwruca/data.html>) and county designations. The RUCA codes were then divided into four categories: urban, large rural, small rural, and isolated small rural (Appendix).

We identified the medical school of graduation for each physician. IMGs were defined as physicians who graduated from a non-U.S. or Canadian medical school, including Puerto Rico. We identified the most recent residency program for each physician and identified the location of that residency program as rural or urban, based on its ZIP code. Rural residency programs were those located in large rural, small rural, or isolated small rural RUCA categories. The residency analyses focused on family physicians (FPs) because they are the predominant specialty in rural areas.

Rural physicians were aggregated to each medical school and medical schools were compared to show the percentage of the rural physicians produced by each school. A similar analysis was performed for residency training programs. Standard bivariate statistical testing was performed using SPSS (v. 11.0.4). This study was approved

for an exemption by the University of Washington Institutional Review Board.

RESULTS

There were 175,649 clinically-active physicians in the cohort of physicians who graduated from medical school from 1988-1997. Of these, 93.6% (164,385) were allopathic physicians (MD) and 6.4% (11,264) were osteopathic physicians (DO). 11% (20,037) of this cohort of physicians was currently practicing in a rural location in 2005. 18% of osteopathic medical school graduates were currently practicing in a rural location but only 11% of allopathic medical school graduates were in a rural location (Table 1). 13% of international medical graduates were practicing in a rural location.

Table 1: Percentage of Physicians Graduating from 1988-1997 Practicing in Rural Areas in 2005, by Physician Type

Physician Type	Urban	Large Rural	Small Rural	Isolated Small Rural	Total Rural
MD (n = 164,375)	89.1	7.3	2.6	1.1	11.0
DO (n = 11,262)	81.8	10.4	5.3	2.5	18.2
IMG (n = 26,393)	86.7	7.9	3.7	1.7	13.3

The proportion of medical school graduates entering rural practice varied by specialty. Among the specialties, 23% of family physician graduates practiced in rural areas. In comparison, 16% of general surgeons, 11% of internists, and 9% of pediatricians practiced in a rural area (Table 2). Over the ten-year

Table 2: Percentage of Physicians Graduating from 1988-1997 Practicing in Rural Areas in 2005, by Specialty

Specialty	Large Rural	Small Rural	Isolated Small Rural	Total Rural
Family medicine	11.3	7.6	3.7	22.6
Internal medicine	7.0	2.8	1.4	11.3
General pediatrics	6.4	2.0	0.7	9.1
General surgery	11.0	4.3	1.1	16.4
Orthopedics	10.4	2.6	0.6	13.5
Obstetric-gynecology	8.2	2.1	0.4	10.7
Emergency medicine	6.9	1.9	0.8	9.6
Psychiatry	6.5	1.6	0.5	8.7
Medical specialties	6.0	1.5	0.6	8.1
Surgical specialties	3.4	0.3	0.2	3.9
Total	7.5	2.8	1.2	11.4

study period, there was an increase in the number and proportion of allopathic physicians practicing in rural areas (10.3% of 1988 graduates vs. 11.6% of 1997 graduates). This increase was greater among DO physicians (18.1% of 1988 graduates vs. 19.6% of 1997 graduates) (Figure 1).

RURAL PHYSICIAN GENDER

Among all the allopathic physicians in the cohort (rural and urban), 37% (60,908) were female. In the cohort of DO physicians, 31% (3,467) are women. Over the course of the ten-year study period, the percentage of MD and DO female physician graduates increased from 32% in 1988 to 44% in 1997.

31% of rural physicians are women. Women continue to be less likely than men to practice in rural areas, although the gap is narrowing. There was, however,

an increasing proportion of female physicians entering rural practice over the study period (7.8% to 9.8% female MDs, 12.2% to 17.7% female DOs) (Figure 2).

MEDICAL SCHOOLS AND RESIDENCY PROGRAMS

The medical schools that produced the highest percentage of rural physicians placed between 21-36% of their graduates in rural areas (Table 3). There was no substantial change in the list of allopathic medical schools when compared to the earlier study by Rosenblatt et al. However, several osteopathic schools were identified that contribute relatively high percentages of rural physicians.

RURAL RESIDENCIES

1.4% (2,247) of allopathic physicians in the cohort trained in a rural residency location. Among these physicians who trained in rural residencies, 36% (n = 814) are currently in rural practice. 3.6% (343) of osteopathic physicians in the cohort trained in a rural program. 50% of DO graduates (n = 170) who trained in a rural residency are now in rural practice. While rural residency trainees are over three times more likely to practice in rural areas (RR = 3.4, p < .001), rural residencies account for only 5% of MD physicians practicing in rural areas and 10% of DO physicians in rural areas.

Rural family medicine training programs are an important contributor to the rural physician workforce.¹⁴ 60% of rural family medicine residency graduates are in rural practice and they were three times more likely than graduates of nonrural residency programs to practice in a rural location (RR = 2.8, p < .001). However, only 9% of all rural family physicians trained in a rural residency.

Figure 1: Percentage of Physicians Practicing in a Rural Area in 2005, by Physician Type and Year of Graduation

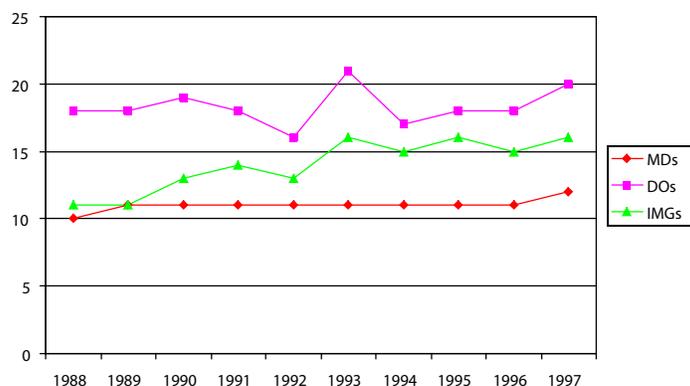
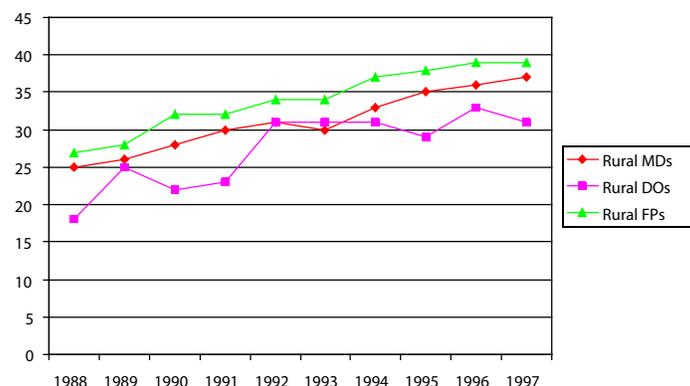


Figure 2: Percentage of Female Rural Physicians in 2005, by Physician Categories and Year of Graduation



DISCUSSION AND POLICY RELEVANCE

This national analysis shows that the proportion and number of physicians entering rural practice has remained stable, compared to earlier analyses. Osteopathic physicians and primary care physicians are more likely to practice in rural areas. Although the number and percentage of rural physicians produced by medical schools was continuously distributed, a small number of medical schools produced high proportions of rural physicians. As seen in Table 3, only

Table 3: Medical Schools (MD and DO) with the Highest Percentages of Graduates from 1988-1997, Practicing in Rural Areas in 2005

Medical School	MD/DO	Percent Rural Graduates
West Virginia	DO	41
University of Minnesota—Duluth	MD	36
University of Mississippi	MD	32
University of South Dakota	MD	31
Mercer University	MD	31
Oklahoma State	DO	30
University of North Dakota	MD	28
AT Still—Kirksville	DO	27
East Carolina University	MD	26
University of Kentucky	MD	25
University of Nebraska	MD	23
East Tennessee State University	MD	23
Kansas City	DO	21
University of Arkansas	MD	21
Ohio University	DO	21
University of New England	DO	20

ten medical schools had over 25% of their graduates in rural practice. The earlier survey identified a slight decline in the percentage of physicians entering rural practice. These data show that the decline, albeit slight, has continued. In 1991, 13% of recent medical school graduates entered rural practice. In 2005, that number had slipped to 11% of recent medical school graduates. As noted in the earlier study, the likelihood of a physician entering rural practice is associated with specialty. In this cohort of medical school graduates from 1988-1997, primary care physicians continue to be more likely to enter rural practice than specialty physicians. However, compared to the earlier Rosenblatt paper, the percentage of family physicians, general internists, and pediatricians entering rural practice has declined (see Table 2). An exact comparison is difficult because the Rosenblatt article used nonmetropolitan county areas to define rural practice location.

Of note, the previously reported gender gap among rural physicians is disappearing. The increasing proportion of female rural physicians (Figure 2) is more likely attributed to the increasing number of female medical school graduates coupled with a decline in the percentage of male physicians entering rural practice.

As previously reported, DO physicians are significantly more likely to enter rural practice. The percentage of DO graduates entering rural practice remained stable over the decade, approaching 20%.

These data further support the valuable contribution of rural residency programs. Though few in number, these training programs are successful at producing rural physicians. A previous study showed that these rural residency programs provided 71% of the nation's rural training in family medicine.¹⁴ Unfortunately, rural residency programs, especially in family medicine, face serious financial challenges. In a recent study, 10% (3) of 33 rural residencies have closed, with an additional 7% at severe risk of closure.^{14,16} Perhaps the greatest drawback to these data is that they do not capture the most recent decade of physician workforce trends. The mid-1990s were a high water mark for the number and percentage of U.S. medical students entering family medicine, and as a result, rural practice. The past ten years have shown a dramatic and precipitous decline in the percentage of U.S. medical school graduates entering family medicine, with over half of current family medicine residency positions being filled by IMGs (<http://www.aafp.org/fpm/20070400/news.html>). The declining interest in primary care will have major impacts upon rural areas, whose needs are often met by generalist physicians and which often cannot support any physician practice other than primary care.

POLICY IMPLICATIONS

As the IOM report emphasizes, rural health is critically dependent upon both the supply and the quality of its rural workforce. Not only do rural areas require an adequate supply of physicians to ensure access to care, but the training of these physicians in information technology, quality improvement, and new models of care is vital to the future of rural health. While this study cannot address the adequacy of training in these realms, future research should explore the extent to which rural physicians acquire these skills.

Current calls to expand medical school production may help support the pipeline for rural physician training. However, if medical schools expand class sizes without explicitly emphasizing primary care or rural health, it may result in more physicians choosing to practice in urban centers, worsening the rural urban maldistribution.¹⁷ At the same time, there has been little discussion of the role of state legislatures in holding state-supported medical schools accountable for producing a substantial percentage of rural physicians. Federal rural health programs and Title VII programs continue to support primary care and rural health training.¹⁸ While these data show little significant change in the rural physician workforce, the effects of these policy changes will need to be closely monitored in coming years.

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Appendix: RUCA Version 2.0 Categorization

Rural/Urban Category	RUCA Version 2.0 Code
Urban	1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, 10.1
Large Rural	4.0, 4.2, 5.0, 5.2, 6.0, 6.1
Small Rural	7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2
Isolated Small Rural	10.0, 10.2, 10.3, 10.4, 10.5, 10.6

RELATED RESOURCES FROM THE WWAMI RURAL HEALTH RESEARCH CENTER AND THE CENTER FOR HEALTH WORKFORCE STUDIES

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