As increasing numbers of women and osteopathic physicians enter medical practice, it is important to identify their choices in medical specialty and practice location and the implications these choices have for the future of healthcare in the United States. In 2003, data from the Texas Medical Board and the Office of the [Texas] State Demographer were aggregated to compare the rates at which physicians differed in their choices to practice primary care specialties in a rural location. In addition, the impact of sex and type of medical degree on these choices was examined. Analyses revealed that male osteopathic physicians were 2.3 times more likely than all other physician groups to practice rural primary care. Analyses also revealed that female osteopathic physicians were more likely than other physicians to choose primary care as a specialty and were 2.5 times more likely than female allopathic physicians to practice primary care in a rural location. Policies intended to produce primary care or rural primary care physicians should take into account the effects of gender and osteopathic training.

**Physician and Practice Characteristics**

Policymakers are increasingly interested in the specialty choices of physicians. A great deal of effort and money has been expended to address the growing need for primary care physicians, especially in rural areas of the United States. Programs such as loan repayment through the National Health Service Corps and policies such as Title VII programs of the Public Health Service Act encourage new physicians to train for and practice primary care medicine. Other policies have been proposed to boost the numbers of primary care physicians by creating a “medical home” for patients and providing incentives through reimbursement.

One of the anticipated benefits of increased numbers of primary care physicians is an increase in physicians who would locate their practices in rural areas, where significant physician shortages exist. The federal Council on Graduate Medical Education identified specialty choice—especially family medicine—as the most powerful predictor of rural practice location. Despite these efforts, the need for rural primary care physicians remains urgent. For example, from 1975 to 1995, the number of new graduates of family medicine residencies who began practicing in rural areas dropped 61%. The Rural Medical Educators Group of the National Rural Health Association (Kansas City, Mo) warns that the replacement rate of physicians in rural medicine is lagging. Rural demographers estimate that almost 20% of the US population lives in rural areas, but it is left to 9% of the nation’s physicians to meet their healthcare needs.

An important factor in determining the future of the physician supply in rural areas has been the increase in the number of women in the physician workforce. Women tend to enter general practice and family practice residencies in greater numbers than men. In 2001, half of women in graduate medical education were in the primary care specialties of general internal medicine, family medicine, and general pediatrics.

Osteopathic physicians also tend to choose primary care careers more frequently than allopathic physicians and are more likely to practice in rural locations. In 2004, 2769 physicians graduated from osteopathic medical colleges in the United States, and by 2020, the nation will have...
an estimated 80,000 clinically active osteopathic physicians.\textsuperscript{22,23}

As in medicine in general, more women are entering osteopathic medicine. In 2002, at least 41\% of graduates of osteopathic medical colleges were women.\textsuperscript{3,22}

Meaningful comparisons between allopathic and osteopathic physicians are sometimes difficult to make. The master files of the American Osteopathic Association and the American Medical Association are commonly used to estimate physician supply.\textsuperscript{24} However, the utility of these master files is limited for certain analyses.\textsuperscript{16,24} To obtain accurate data on individual and practice characteristics of physicians, it was necessary to turn to a state licensing board, where data document physicians’ degree type, age, practice location, sex, specialty, and other vital information often lacking on the national level.

**Texas Demographic Profile**

The population of Texas at the time of the 2000 state census was 20.9 million.\textsuperscript{25} The state’s five largest metropolitan statistical areas account for almost 60\% of the population of Texas. When applying strict criteria for rurality (nonmetropolitan area not adjacent to a metropolitan area), Texas has 75 rural counties (including 15 “frontier” counties, defined as less than one person per square mile), with a total population of 921,445 (4\% of the population of Texas).\textsuperscript{25–27}

Because 41\% (12,639) of the physicians in this study graduated from one of the eight medical schools in Texas, we wanted to determine whether the state’s investment in osteopathic graduate medical education is having a measurable effect on the supply and distribution of rural and primary care physicians in the state. We also sought to examine the growing presence of women in the physician workforce.

**Methods**

The Texas Medical Board (TMB) (Austin) archives information about every physician licensed to practice medicine in Texas. As of February 2003, the TMB’s records contained personal and practice demographic data for 52,856 physicians.\textsuperscript{28} Study criteria narrowed this number to 31,228 physicians.

We included physicians who were in the active practice of medicine, who currently practiced in Texas, who were not in residencies or fellowships, and who participated in direct patient care. Physicians employed by the federal government, including the US Public Health Service, the military, and the US Department of Veterans Affairs were excluded.\textsuperscript{19,29}

The TMB’s database consists of 35 fields of data (eg, physician license number, date of birth, ethnicity, practice type, and mailing address). The data of interest for the present study were primary specialty, type of medical degree, practice type, practice setting, sex, and county in which each physician practices. Information from the Texas State Data Center and the Office of the State Demographer (San Antonio) were used to determine which Texas counties are rural.

Because criteria used to define a rural area in regard to healthcare vary, we chose the narrowest definition (nonmetropolitan area not adjacent to a metropolitan area).\textsuperscript{11} Ten of the rural counties had no physician and were excluded.

Data from the TMB and the Office of the State Demographer were aggregated to compare the rate at which physicians differed in medical practice specialties and locations across Texas as of 2003. We used sequential numbers to code physicians to obscure their names, license numbers, and birthdates. The proposal for this research project was granted exempt status by the institutional review board of the University of North Texas Health Science Center at Fort Worth–Texas College of Osteopathic Medicine.

All data were analyzed using SPSS statistical software (version 11.0 for Windows; SPSS Inc, Chicago, Ill) and Microsoft Excel (version 2002 for Windows; Microsoft Corp, Redmond, Wash). The odds ratio (OR) for being currently practicing primary care physician in Texas was calculated for each category of physician, with significance determined by the Yates-corrected $\chi^2$ test.\textsuperscript{30} A 95\% confidence interval (CI) was obtained for all calculated ORs using the Woolf procedure for interval estimation.\textsuperscript{30} Observed and expected values were calculated for the rate of primary care and rural primary care practice among categories, and the Yates-corrected $\chi^2$ test for a $2 \times 2$ contingency table was calculated. Exact $P$ values for each comparison category’s result were obtained by Microsoft Excel’s CHITEST function.

To control for the effect of greater saturation of osteopathic physicians in primary care specialties when analyzing the choice of rural practice locations, comparisons were made among identified primary care physicians as well as the entire physician population. While we recognize that many factors contribute to the selection of rural practice locations, the intent of this study is to focus on the broad contributions of physician groups rather than on the characteristics of individuals. For this reason, we did not attempt to control for the many specific variables that affect practice choices.

**Results**

At the beginning of 2003, there were 52,856 physicians licensed to practice medicine in Texas.\textsuperscript{31} Study criteria reduced this number to 31,228, with 94\% (29,336) allopathic (including MBBS and MB Chir) and 6\% (1892) osteopathic physicians (Table 1). Women comprised 21\% (6629) of the studied physicians, with 374 osteopathic and 6255 allopathic physicians.

Most physicians in Texas are located in metropolitan areas. Of the 39,959 licensed physicians (all categories) with Texas addresses, 37,434 were located within one of the 27 metropolitan statistical areas.\textsuperscript{25,32} Only 3\% (994) of Texas physicians were located in nonmetropolitan areas that are not adjacent to metropolitan areas.\textsuperscript{32}

Of the 11,884 Texas physicians who met the study criteria and practiced primary care, 1123 were osteopathic physi-
Most female (70%) and male (57%) osteopathic physicians practiced in primary care fields. In comparison, almost half of female and a third of male allopathic physicians were in primary care (Table 2).

In 2003, the OR for a female osteopathic physician to practice primary care medicine in Texas was 3.9 (95% CI, 3.2–4.9). This OR was twice that of male osteopathic and female allopathic physicians and eight times that of male allopathic physicians (Table 3).

Seventy-five percent of rural primary care physicians in Texas are male allopathic physicians. Female allopathic physicians make up 13%, and male and female osteopathic physicians make up 10% and 2%, respectively. Osteopathic physicians practice primary care in rural Texas at a higher rate than allopathic physicians. In 2003, 4% of male osteopathic, 3% of female osteopathic, 2% of male allopathic, and 1% of female allopathic physicians in Texas practiced rural primary care (Table 2).

When female osteopathic physicians were compared by specific medical specialties, the OR for rural primary care yielded statistically significant differences in the prevalence of all female physicians in rural primary care (Table 3). In a direct comparison, female osteopathic physicians were 2.5 times as likely as female allopathic physicians to practice

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**Table 1**

<table>
<thead>
<tr>
<th>Type of Medical Degree</th>
<th>Primary Care</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Not Rural</td>
</tr>
<tr>
<td>Osteopathic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>10 (0.03)</td>
<td>253 (0.81)</td>
</tr>
<tr>
<td>Men</td>
<td>54 (0.17)</td>
<td>806 (2.58)</td>
</tr>
<tr>
<td>Allopathic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>68 (0.22)</td>
<td>2959 (9.48)</td>
</tr>
<tr>
<td>Men</td>
<td>385 (1.23)</td>
<td>7349 (23.52)</td>
</tr>
<tr>
<td>Total</td>
<td>517 (1.66)</td>
<td>11,367 (36.40)</td>
</tr>
</tbody>
</table>

* Data are given as No. (%) of physicians.
† Inclusion criteria: active in medical practice; practice located in Texas; practices direct patient care; is not in graduate training program (eg, internship, residency, fellowship).

**Table 2**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Osteopathic</th>
<th>Allopathic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Not Rural</td>
</tr>
<tr>
<td>Women</td>
<td>263 (70.3)</td>
<td>10 (2.7)</td>
</tr>
<tr>
<td>Men</td>
<td>860 (56.7)</td>
<td>54 (3.6)</td>
</tr>
<tr>
<td>Total</td>
<td>1123 (59.4)</td>
<td>64 (3.4)</td>
</tr>
</tbody>
</table>

*Data are given as No. (%) of physicians.
rural primary care (95% CI, 1.27–4.88). When compared directly with male allopathic physicians, female osteopathic physicians were 1.6 times more likely to practice rural primary care (although this observation did not reach statistical significance [Table 4]).

Physician subtypes were compared with private practice physicians to determine the OR of rural primary care practice. In this comparison, only two statistically significant results were obtained: those for male osteopathic and those for female allopathic physicians. When compared with all other private practice physicians in rural primary care practice, the OR for male osteopathic physicians was 2.33 (P=.0; α=.01) and for female osteopathic physicians was 1.64 (P=.099). Male allopathic physicians had an OR of 0.60 (P<.001; α=.01), and female allopathic physicians had an OR of 1.03 (P=.76).

### Comment
A number of findings emerged when the physicians were compared by different variables. The physician-patient ratio was similar in both rural and nonrural areas (rural, 1:1782 persons, or 56:100,000; nonrural, 1:1753, or 57:100,000). Despite similar physician ratios, rural areas have greater spatial distribution of physicians to population. There was one rural primary care physician per every 182.4 square miles of rural county and one nonrural primary care physician per every 22 square miles of nonrural county.  

The differences in prevalence of male and female osteopathic physicians in primary care and rural primary care practice are also of interest. Of the 11,884 primary care physicians in Texas in 2003, 10% were osteopathic physicians, and most were located in nonrural areas (only 517 primary care physicians practiced in rural locations). The smaller number of osteopathic physicians in general and female osteopathic physicians in particular may be overlooked in assessing access for vulnerable populations. Although they comprise only 2% of the study population, female osteopathic physicians were more representative than other physicians in their choice of primary over non–primary care practice and were 2.5 times more likely to be in rural primary care than female allopathic physicians. Compared with male allopathic physicians, female osteopathic physicians in Texas were 4.7 times as likely to practice primary care medicine.

There are several limitations to this study. The first is that a prevalence study does not necessarily reflect trends, thus limiting the conclusions. Also, this study did not consider the tendency for physicians to establish practices in the state in which they were educated and trained. Specialty and location theory is complex and requires a large number of qualitative and quantitative variables.
Economic location theory would suggest that physician distribution will be based on an area’s need and ability to support their practice. Thus, the overall growth of the physician supply should result in a “trickle down” effect to smaller communities. Although there have been small increases in some areas of the United States in the number of rural physicians, that overall need remains unmet.1,29

There are drawbacks to the practice of rural medicine that make it unattractive to many physicians.29,33,34 No attempt was made in this study to explain why an osteopathic physician of either sex is more likely to select rural practice. This analysis did not attempt to parse out differences beyond sex, type of medical degree, primary care specialty, and rurality. Many differences affect practice patterns—age, nationality, undergraduate and Medical College Admission Test qualifications, and predoctoral differences in medical school and practice site selection.29 Future studies should examine these and other factors to determine which variables lead osteopathic physicians to practice in rural primary care at a higher rate than their allopathic colleagues. Studies should be undertaken to determine whether osteopathic physicians, men or women, are willing to accept a lower rate of return on their education by selecting less lucrative rural practices, and if so, why.35

There continue to be disparities in access to healthcare in the United States. This is especially evident for rural and other underserved communities, where practice conditions leave many physicians reluctant to locate. These disparities are in part spurred by a practice climate that encourages specialty over primary care and in which women, who tend to not choose rural practice, play a greater role than ever before. Osteopathic medicine has emerged as one of few consistent remedies for these inequities. In contrast with allopathic physicians, most osteopathic physicians choose primary care specialties. Furthermore, the literature suggests that osteopathic physicians practice in rural areas relatively more than their allopathic colleagues. With more than 50,000 physicians licensed to practice in Texas, the impact of the relatively small but increasing number of female osteopathic physicians should not be overlooked.

When the focus is narrowed to rural primary care practice, female osteopathic physicians continue to distinguish themselves. They outpace male allopathic physicians in rural primary care practice by more than 2.5 times, a finding that holds special significance when viewed in light of the increasing numbers of women practicing medicine.

These results suggest that policies intended to produce rural primary care physicians must consider the effects of gender and medical education on physicians’ practice and location choices.

Numerous governmental and private initiatives exist to improve rural health and healthcare delivery. Many of these initiatives focus on producing family physicians and promoting “rural track” training, including residency programs.1 One of the most prominent efforts is through the US Department of Health and Human Services’ Office of Rural Health Policy (Washington, DC), which is conducting dozens of programs and studies to examine the rural health landscape. Although many physician workforce studies have been done, none of them, to our knowledge, have considered the circumstances described in this study.36 Despite these efforts, there remains a need for additional study of physician supply dynamics, including models that can better forecast rural physician supply. Such forecasts can then be combined with studies such as ours to offer practical solutions to this health policy challenge. The allocation of federal and state financial support must be supported by rational, empiric study. Osteopathic physicians, especially female osteopathic physicians, have an important influence on the nation’s rural healthcare system. The promotion and support of osteopathic medical colleges and the encouragement of medical school candidates to consider osteopathic medical training will increase the numbers of physicians practicing primary care in rural areas.

References


13. Rabinowitz HK, Diamond JJ, Markham FW, Paynter NP. Critical factors for designing programs to increase the supply and retention of rural primary care physicians. JAMA. 2001;286:1041–1048.


