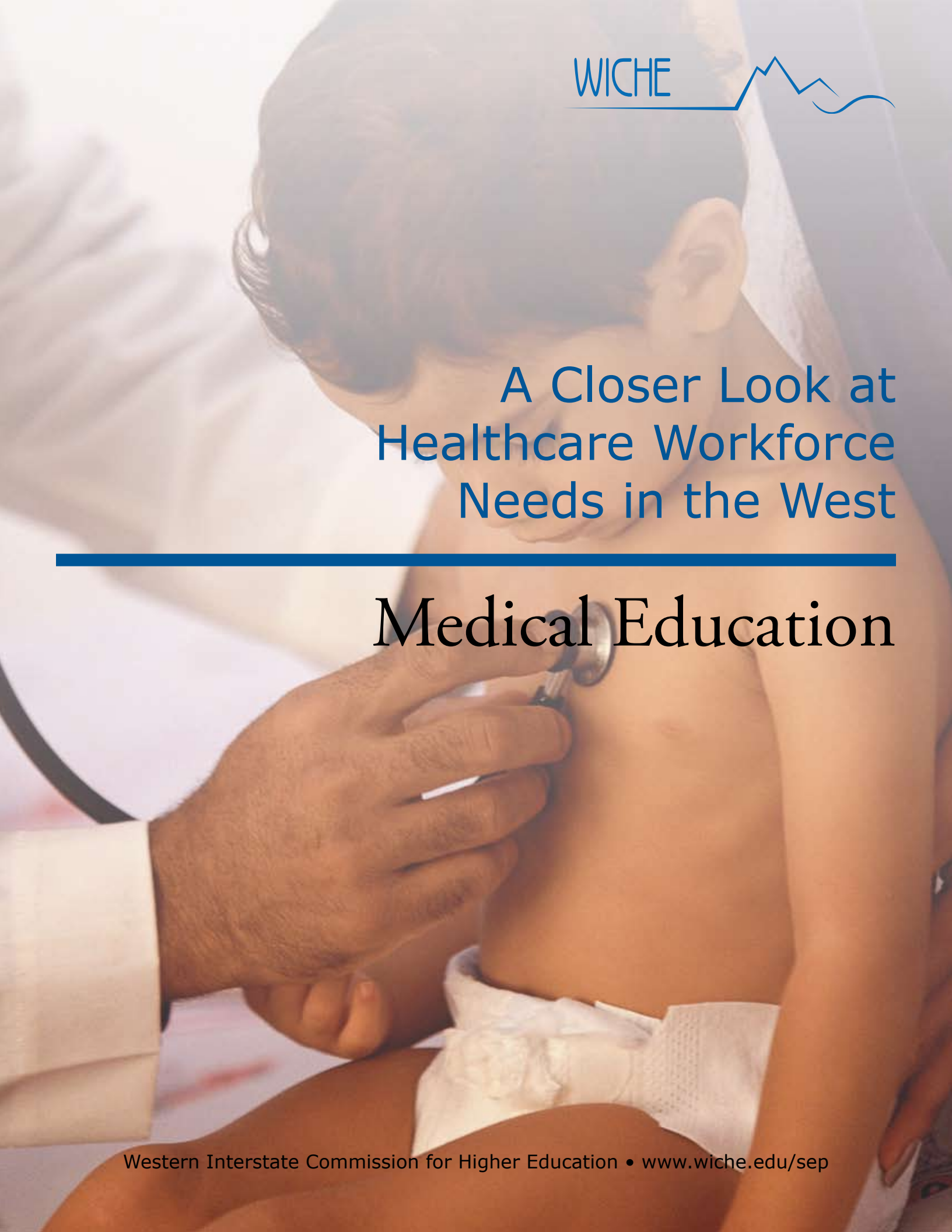




WICHE



A Closer Look at
Healthcare Workforce
Needs in the West

Medical Education

A Closer Look at Healthcare Workforce Needs in the West: Medical Education

This report highlights three interrelated workforce issues of importance to physicians and medical schools that prepare individuals for a career in medicine: the shortage of physicians and the planned expansion of medical school enrollment, medical student indebtedness, and primary care physician service with emphasis on care delivery in rural areas. The West's demographics present unique challenges in educating our future healthcare professionals, and this analysis suggests strategies for how Western states can link their resources to respond, particularly in higher education.

In 2006 176,781 physicians were active across the Western Interstate Commission for Higher Education (WICHE) region.¹ Of these physicians 95 percent were allopathic and 5 percent were osteopathic (Table 1). Allopathic physicians earn M.D. degrees; osteopathic physicians earn D.O. degrees. The curricula of allopathic and osteopathic schools are similar, although osteopathic schools have a greater focus on a holistic perspective and primacy of the musculoskeletal system than allopathic schools. State licensing agencies and most hospitals and residency programs recognize the allopathic and osteopathic degrees as equivalent.

Nationwide, 35 percent of physicians are over the age of 55 and many are likely to retire within the next 10 years. Within the same decade, baby boomers are becoming eligible for Medicare. By the year 2030, one fifth of Americans will be over the age of 65, with an increasing proportion above age 85.² Given the increase of physicians nearing retirement and a growing senior population that utilizes extended physician services, a shortage of physicians is anticipated.

Expansion of Medical School Enrollment

In response to growing concerns of physician shortages, the Association of American Medical Colleges (AAMC) in 2006 recommended a 30 percent increase in U.S. medical school enrollment by 2015 compared to enrollment in 2002.³ Based on a fall 2007 survey of U.S. medical schools, AAMC estimates that first-year allopathic enrollment will grow to nearly 19,909 in 2012 from 16,488 in 2002 – an increase of 21 percent.⁴ First-year U.S. osteopathic enrollment is projected to increase to 5,227 in 2012, an increase of 70 percent or 2,148 students, from the same baseline year of 2002.⁵

This enrollment growth will primarily occur at existing medical schools. Expansion strategies typically follow either an “in place” model, in which an increased

number of medical students are enrolled on an existing academic medical center campus, or a “distributed education” model, in which branch campuses of medical schools are created.⁶ Medical schools are also addressing the adequacy of faculty size to deliver curricula to a larger number of students; the adequacy of educational facilities (e.g., classrooms, lab space); and the availability of clinical training sites.

Table 1. Distribution of Active Allopathic (M.D.) and Osteopathic (D.O.) Physicians: 2006*

	WICHE REGION	OUTSIDE OF WICHE REGION	U.S.
All Physicians	176,781	624,930	819,711
M.D.s	168,030	598,806	766,836
Percent of all physicians	95.0%	93.1%	93.5%
D.O.s	8,751	44,124	52,875
Percent of all physicians	5.0%	6.9%	6.5%
All Physicians in Primary Care	63,856	224,245	288,101
Percent of all physicians	36.1%	34.9%	35.1%
M.D.s in Primary Care	59,242	203,669	262,911
Percent of All M.D.s	35.3%	34.0%	34.3%
D.O.s in Primary Care	4,614	20,576	25,190
Percent of all D.O.s	52.7%	46.6%	47.6%

* “Active physicians” excludes physicians not classified, inactive, or those with an unknown address; “primary care” is defined here as family medicine, general practice, internal medicine, and pediatrics.

Source: American Medical Association, *Physician Characteristics and Distribution in the U.S.: 2008 Edition* (Chicago: American Medical Association, 2008).

Examples of Expansion Programs

The University of Arizona College of Medicine

in Tucson, in partnership with Arizona State University, established a four-year college of medicine program in Phoenix enrolling its first four-year class of 24 students in August 2007 and is anticipated to grow to 150 students per year within the next five years.⁷ The Tucson program will graduate 110 new physicians per year. The overarching structure driving the expansion revolves around one allopathic college of medicine, with departments, financial and administrative infrastructures, and communication channels organized to achieve synergies and efficiencies across the two locations.

The University of California (U.C.) system completed a multiyear health sciences planning effort in 2007.⁸ U.C. plans to enroll 60 to 80 students per campus (across five-year programs), or more than 300 students systemwide. In November 2006 U.C. medical schools received \$200 million in California bond funding to support this growth and to create telemedicine programs to increase access to services provided by faculty physicians. The first phase of growth for all U.C. medical schools will occur through the development of new programs in medical education (PRIME). Individually and collectively, these programs seek to address the needs of California's underserved population in both rural communities and urban areas. Each program has (or will have) an area of focus that is selected on the basis of faculty expertise, the populations served by each school and its medical center, and other local considerations.

U.C. Davis School of Medicine (PRIME – rural health and telemedicine). U.C. Davis's program offers course work addressing rural health needs, telemedicine, primary care, and the challenges of practicing in rural locations. Courses focusing on rural health policy, public health, language competency, and other topics relevant to rural health and healthcare delivery will be provided. Students will complete clinical clerkships in rural sites and will participate in telemedicine consultations provided by the medical staff at U.C. Davis at the request of rural preceptors and attending physicians.

U.C. Irvine School of Medicine (PRIME – Latino communities). All students admitted to the U.C. Irvine program have a record of prior service with and a commitment to the Latino community, as well as a minimal fluency in speaking Spanish. The program begins with a summer immersion experience in Mexico that provides further instruction in Spanish, supervised interaction with Spanish-speaking patients and

healthcare personnel, and additional instruction about Latino cultures. The program continues at Irvine with didactic sessions and structured clinical experiences in settings serving predominantly Spanish-speaking patients. The program requires that all students complete requirements for a master's degree in one of several areas requiring further study and research relevant to Latino health needs.

U.C. Los Angeles School of Medicine (PRIME – diverse disadvantaged communities). With the U.C. Los Angeles program, students will participate in a curriculum and clinical rotations that prepare them to use new technologies and multicultural solutions. The program will stress learning related to delivering culturally competent clinical care, providing leadership for health delivery systems, conducting research on health disparities, and serving as advocates for their communities. The program will include a combined M.D. and master's degree selected from UCLA degree programs in public health, public policy, telemedicine, clinical informatics, or other related fields.

U.C. San Diego School of Medicine (PRIME – health equity). San Diego has one of the largest and most rapidly changing immigrant and migrant communities in the country. The U.C. San Diego program will emphasize multicultural, multidisciplinary approaches to patient care, research, and healthcare advocacy. The program will offer culture and language studies and immersion experiences. It will give students the flexibility to examine health equity in an area of their interest consistent with objectives of the federal initiative Health People 2010, which calls for the elimination of health disparities between various segments of the population. Through dual degree options concentrating in minority health and health disparities, and the use of community-university partnerships, the program will seek to increase the number of clinicians, scientists, and advocates who will strive to reduce health inequities.

U.C. San Francisco School of Medicine (PRIME – urban underserved). U.C. San Francisco will offer a curriculum including a core seminar series, required community projects, and community preceptorships. The seminar series will include interactive teaching sessions with experts on homelessness, immigrant health, the prison health system, and related topics. Clinical experiences will be based at regional safety-net clinics and hospitals that provide healthcare to urban, underserved populations in San Francisco and the greater Bay Area. In these settings, students will care for diverse populations and learn more about systems-level disparities. All students will complete a longitudinal community health or social advocacy

(continued on next page)

Examples of Expansion Programs

(continued from p. 3)

project, such as setting up community-based disease-prevention programs, engaging in local community organizing campaigns, or conducting community-based research. The program will also include comprehensive mentorship programs, with faculty and peer-mentoring relationships organized to provide ongoing academic and social support.

The University of New Mexico School of Medicine and College of Arts and Sciences

developed a combined B.A./M.D. degree program, which will increase the medical school class from 75 students to 100 in the fall of 2010.⁹ The program, which began operation at the undergraduate level in 2006, is committed to allocating 100 percent of its increased enrollment to a program designed to expand opportunities in medical education for New Mexico students from rural and underserved minority communities, and to prepare them to practice in the underserved areas of state. A two-step, eight-year program, equally divided between four years in an undergraduate college and four years in medical school, is planned, along with enhanced academic and financial support for the students. Students work with a community physician mentor in summer service-learning projects during the undergraduate years; then they return for required rural medicine rotations in the first, third and fourth years of medical school.

Oregon Health and Science University (OHSU)

School of Medicine began implementing a four-phase plan to increase medical student enrollment in 2001. The plan minimized capital expenditure while leveraging existing resources at OHSU.¹⁰ Phase one (2001-2006) increased enrollment incrementally at the School of Medicine's Portland site (from 101 in 2001 to 120 in 2006). Phase two (2006-2007) created community partnerships to develop regional sites using the physical facilities of partners, avoiding the need for capital investment. Phase three (2007-2010) builds on the prototype developed in Phase two to create additional regional education sites; and phase four (2010-2015) involves a feasibility study and subsequent capital campaign for a facility on Portland's south waterfront.

There are 18 allopathic schools within the WICHE region and currently five osteopathic schools. The allopathic medical schools have increased first-year student enrollment from 1,948 in 2002 to 2,114 in 2007, a gain of 166 seats.¹¹ The allopathic schools followed the in-place and distributed education models for expansion; examples of strategies used are shown in the sidebar on pp. 3-4.

The osteopathic medical schools have increased first-year student enrollment from 461 in 2002 to 753 in 2007, a gain of 292 seats.¹² In recent years four new osteopathic schools have been founded in the West:

- Touro University College of Osteopathic Medicine in Henderson, NV, with a 2004 first-year enrollment of 78, increasing to 135 in 2007.
- A.T. Still University School of Osteopathic Medicine in Mesa, AZ, with a 2007 first-year enrollment of 107.
- Pacific Northwest University of Health Sciences College of Osteopathic Medicine in Yakima, WA, with a projected 2008 enrollment of 70.
- Rocky Vista University College of Osteopathic Medicine in Parker, CO, with a projected 2008 enrollment of 150.

While the addition of new allopathic medical schools is being discussed in Idaho and elsewhere, it is not yet known if any will be created. In the 1960s and 1970s, medical educators were able to create new medical schools with support from federal subsidies.¹³ Today, the likelihood of a 1960s-style federal response, given both current structural constraints on the federal budget and the political environment, is low. Current medical schools must rely on state support (for public institutions), private sources, clinical cross-subsidies, institutional funds, and tuition revenues.

Graduate Medical Education

Since all physicians must complete accredited resident training to become licensed in the U.S., the number of graduate medical education (GME) positions (residencies) must increase in order for expanded school enrollment to lead to an increase in physician supply.¹⁴ Movement to expand these training programs has not been in step with the growth rate of medical student class size, and GME positions are becoming a key bottleneck. A central reason is that the number of residency positions funded by the federal Medicare program is frozen, and institutions with GME programs must seek additional funding sources to expand residency positions.

Health Needs of the Population

A balance is needed between boosting physician supply and simultaneously working toward a more efficient and coordinated use of resources.¹⁵ These resources include, among other things, the full

range of healthcare professionals, not just physicians, and more widespread utilization of health information technologies.¹⁶ Coherent regional and state policies that integrate healthcare delivery strategies need to be crafted. Expanded collaborations are needed with allied health professionals, providing incentives for disease prevention. In addition, health information needs to be disseminated in a way that patients, regardless of their culture or lifestyle, will understand. New approaches also are needed to meet the needs of underserved and rural areas.

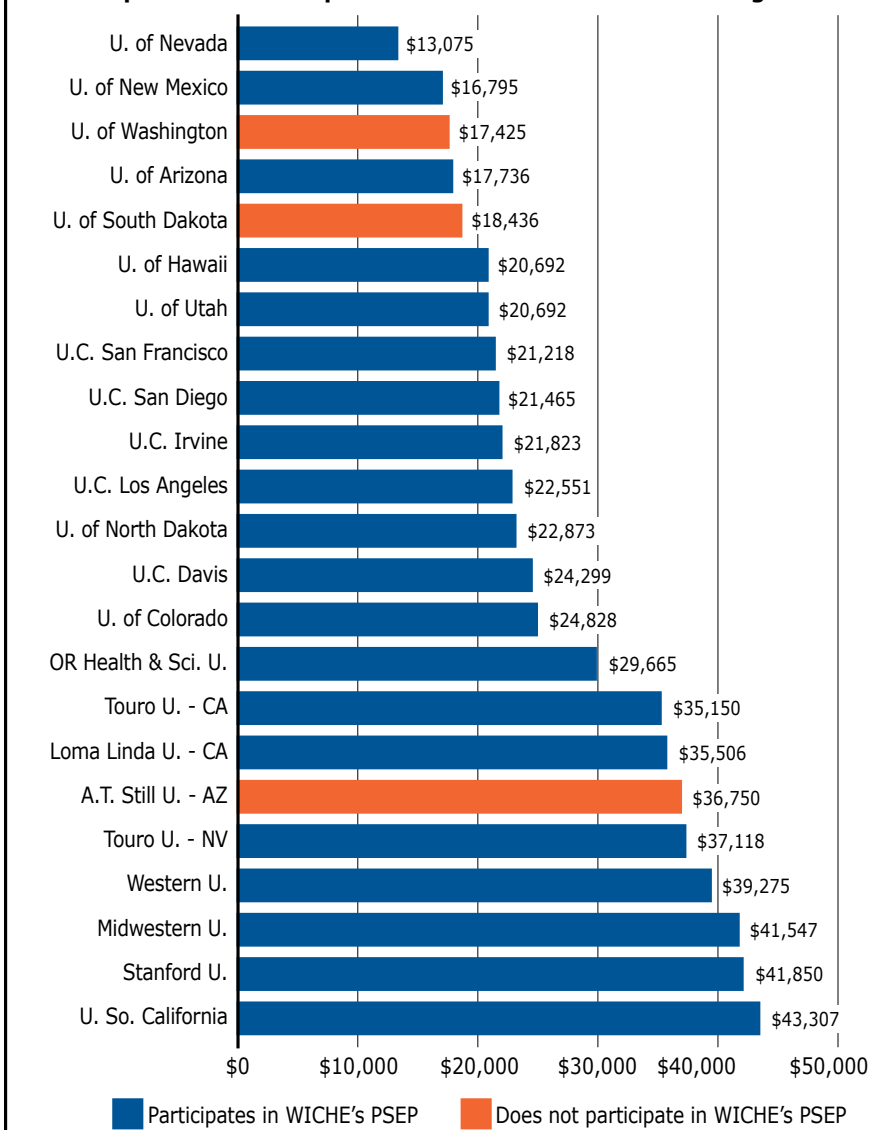
Medical Student Indebtedness

A medical education continues to be a positive professional and financial investment. Over the years, however, tuition in both private and public medical schools has substantially increased. Correspondingly, indebtedness among graduating medical students has increased while physician income has become relatively flat in relation to inflation.

The WICHE region has 15 public and three private allopathic schools and five private osteopathic schools (Figure 1).¹⁷ For the 2007-08 academic year, the average in-state resident tuition and fees for first-year students of allopathic public medical schools within the WICHE region was \$20,905, with nonresident tuition and fees roughly twice that paid by in-state residents.¹⁸ Tuition and fees for first-year students of private medical schools averaged \$40,221 (allopathic) and \$37,968 (osteopathic).¹⁹

Across the country, the average educational debt for graduating medical school students in 2006 was \$113,200 for allopathic students and \$153,800 for osteopathic students.²⁰ Comparing 2001 to 2006, the percentage change in increased debt was 38 percent (allopathic) and 20 percent (osteopathic). As shown in Figure 2, in 1999, 2 percent of allopathic medical school graduates were in educational debt of \$200,000 or more.²¹ In 2007 the number grew to 16 percent.

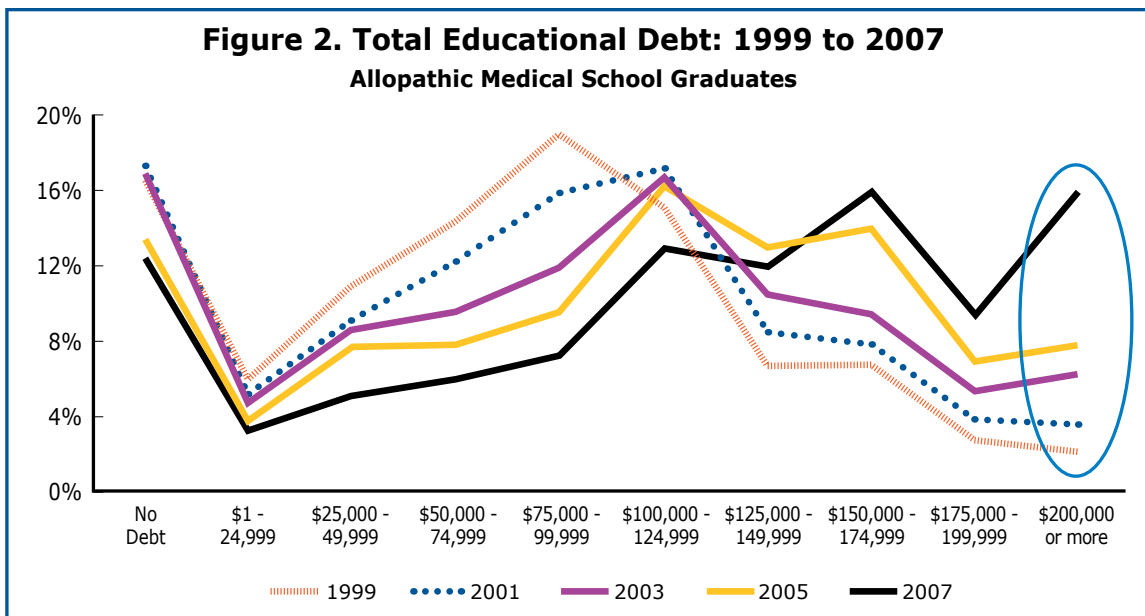
Figure 1. In-state Resident Tuition and Fees: 2007-2008
Allopathic and Osteopathic Medical Schools in WICHE Region



Sources: Association of American Medical Colleges, "Tuition and Student Fees, First-Year Medical School Students 2007-2008" (Washington, D.C.: Association of American Colleges), accessed 2/27/2008 from <http://services.aamc.org/tsfreports/select.cfm?year_of_study=2008>; American Association of Colleges of Osteopathic Medicine, *Osteopathic Medical College Information Book* (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, 2007).

Healthcare policymakers are concerned that applicants from lower socioeconomic groups may choose not to pursue careers in medicine because of educational costs. A 2003 national survey asked students who appeared to be qualified for medical education on the basis of academic achievement, why they did not apply to medical school.²² As Table 2 shows, cost was a major deterrent for all students, but it was the number one deterrent for minority students.

Students who do go to medical school and graduate with high indebtedness are likely to take future income



Sources: Association of American Medical Colleges, "2007 Medical School Graduation Questionnaire: All Schools Summary Report" (Washington, D.C.: Association of American Medical Colleges, 2007), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>; Association of American Medical Colleges, "2003 Medical School Graduation Questionnaire: All Schools Summary Report" (Washington, D.C.: Association of American Medical Colleges, 2003), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>; Association of American Medical Colleges, "2001 Medical School Graduation Questionnaire: All Schools Summary Report" (Washington, D.C.: Association of American Medical Colleges, 2001), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>.

Table 2. Reasons for Nonapplication to Medical School*

	Majority	Minority	Total
Cost of attending medical school	20%	33%	31%
The time it takes to become a doctor	32%	29%	30%
The demands of the physician lifestyle	25%	21%	22%
Concern about not being accepted	13%	19%	18%
Unsure medicine is the right career	19%	17%	17%
The pursuit of another postgraduate degree	20%	14%	16%
The pursuit of another health profession	26%	13%	16%

* Survey respondents were asked to pick the top two reasons (of 17 reasons tested) that had the greatest impact on their decision not to apply to medical school.

Source: Paul Jolly, "Medical School Tuition and Young Physician Indebtedness" (Washington, D.C.: Association of American Medical Colleges, March 23, 2004), accessed January 15, 2008 from <https://services.aamc.org/Publications/showfile.cfm?file=version21.pdf&prd_id=102&prv_id=113&pdf_id=21>. Reprinted with permission of the AAMC.

potential into account when choosing a specialty, practice location, or type of practice. They may be increasingly inclined toward specialties, practices, or geographic areas where remuneration is highest. These trends may also lead to further maldistribution of physicians in rural and underserved areas.

Between 1995 and 2003, average physician net income declined 7 percent, after adjusting for inflation.²³ This trend particularly affects primary care physicians.²⁴ In comparison to a 2006 estimated income of \$216,600 for all physicians, primary care physicians were

estimated to earn 30 percent less, with specialists earning 16 percent more.

Primary Care Physicians

Primary care physicians are at the forefront of managing chronic disease, providing comprehensive care and coordinating long-term care. Primary care is defined as family medicine, general practice, internal medicine, and pediatrics. The benefits of having an optimal supply of experienced primary care physicians are demonstrated by: reduced all-cause mortality

rates; less frequent use of emergency departments and hospitals; better preventive care; improved detection and reduction in mortality from several cancers; less frequent testing and medication use; better patient satisfaction, and a reduction in health disparities.²⁵

As shown in Table 1, thirty-six percent of all active physicians in the WICHE region in 2006 practiced in primary care.²⁶ Osteopathic physicians in the West were practicing in primary care at substantially higher levels than allopathic physicians – 53 percent, compared to 35 percent.

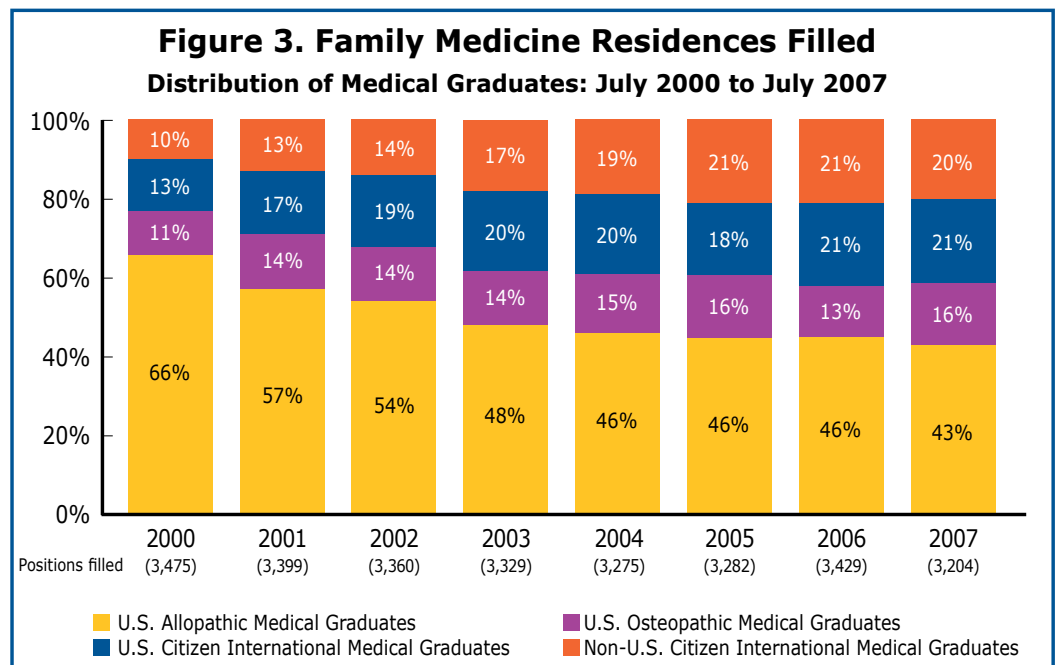
Demand for primary care physicians peaked in the 1990s during the high point of managed care, when many medical school graduates gravitated toward primary care residences and created a bulge in supply. One national healthcare search and consulting firm indicated that by the early years of the current decade, 75 percent of search assignments were for surgical or diagnostic specialists.²⁷ By 2007 hospitals, medical groups, and other organizations again shifted their recruiting emphasis toward primary care. Between April 2006 and March 2007, family medicine and general internal medicine were the two most requested physician search assignments.

This renewed employer focus on primary care exists, however, during a time in which medical students indicate a declining interest. Most primary care

physicians practice in family medicine. As Figure 3 displays, 3,204 family medicine residency positions were filled in July 2007 through the National Resident Matching Program (NRMP); of those, 43 percent were filled by U.S. allopathic medical students.²⁸ This represents a decrease from 2000, when 3,475 family medicine positions were filled, and of those 66 percent were filled by allopathic students.

The cornerstone of family medicine is the ongoing, personal patient-physician

relationship across the age spectrum. Where other specialties are limited to a particular organ system, technology, disease, age, or sex, family medicine takes pride in integrating care for each person. Students, however, often develop perceptions about the content and characteristics of each specialty during medical school. The University of Arizona compared 12 medical schools with the greatest increase in students entering family medicine from 1998 to 2000, and the 12 medical schools with the greatest decrease.²⁹ The researchers found that students who reject family practice have concerns about the profession's prestige, lower income, and breadth of required knowledge. Family medicine was viewed by a number of faculty as not being equal to other specialties in terms of prestige and academic rigor. A commonly held view was that the content of family medicine is too broad and cannot be mastered. Additionally, many students showed preference for medical specialties that offer more control over work hours. When preference in work hours is reinforced by diverging income trends between specialties and primary care, the result may be leading to fewer medical school graduates choosing to enter primary care generally and family medicine specifically.



Source: Perry A. Pugno, Amy L. McGaha, Gordon T. Schmittling, Ashley DeVilbiss, and Norman B. Kahn, "Results of the 2007 National Resident Matching Program: Family Medicine." *Family Medicine* 39, no.8 (2007), 562-571.

Osteopathic Medical Students

In contrast to the U.S. allopathic medical students participating in the NRMP, in 2007 the percent of family medicine residency positions filled by U.S. osteopathic students was 16 percent, an increase from 2000's 11 percent (Figure 3).³⁰

Currently (as shown in Table 1) and historically, osteopathic physicians have chosen primary care careers in greater proportions than allopathic physicians and have played an important role in healthcare delivery in rural areas.³¹ Nonetheless, as noted by senior osteopathic medical students and through the osteopathic-specific resident matching program, osteopathic students are displaying a decreasing interest in primary care.³²

International Medical Graduates

In 2007 the percent of family medicine residency positions filled by U.S. citizens who were international medical graduates (IMGs) was 21 percent, an increase from 2000's 13 percent (Figure 3).³³ The percent of positions filled by non-U.S. citizen IMGs was 20 percent, an increase from 10 percent.

Americans who attend medical schools outside the country either do so as a first choice or because they failed to obtain entrance into U.S. schools.

Cost, family ties, or interest in new experiences may all contribute to the number of students who choose this option.³⁴ The education and training provided by foreign medical schools vary and may not be comparable to that offered by U.S. schools.³⁵ A standardized set of information needs to be gathered on international medical schools, such as curricula and clinical training sites, to help determine whether students who attend a particular school outside the country have had the opportunity to gain knowledge and skills similar to those of their U.S.-trained counterparts.

Many communities rely heavily on non-U.S. IMGs for their primary care needs.³⁶ In particular, these graduates uniquely contribute to the delivery of healthcare by being more willing than U.S. IMGs or U.S. medical school graduates to practice in remote, rural areas through J-1 visa waivers.³⁷ IMGs, beyond medical manpower, have consistently infused the United States with new ideas and skills that

have been critical to the nation's economic, scientific, and cultural growth.³⁸

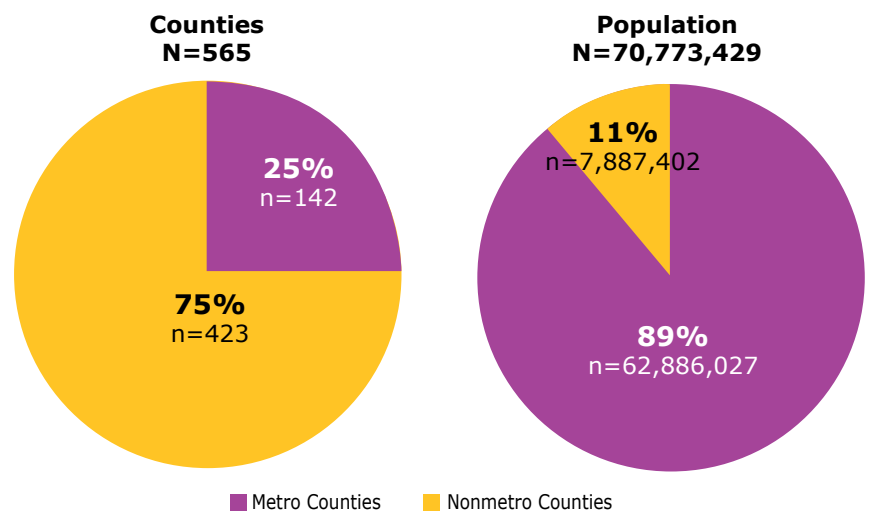
Medical training positions in the United States have proven to be a strong draw for physicians from many nations.³⁹ As the American healthcare delivery system benefits from IMGs, this medical migration, often referred to as the "brain drain" is thought to reduce the supply of physicians in many lower-income countries. A growing concern across nations is the negative impact that the scarcity of physicians has on global health.

Rural Service

Ensuring that residents of rural areas have access to quality healthcare is an increasing challenge for policymakers and practitioners alike. Geographic isolation, sparse population densities, and growing numbers of older rural residents make it increasingly difficult to draw doctors to these areas and provide an optimal spectrum of health services to rural communities. A major disparity between rural and urban healthcare is the long-standing shortage of physicians in rural areas.

Figure 4. Counties in WICHE Region Metro vs. Nonmetro Population Status: 2006

Of the 565 counties composing the WICHE region, 75% (423) are considered nonmetro. Within those 423 nonmetro counties, only 11% of the population resides.



Sources: Office of Management and Budget, "Metropolitan Statistical Areas, Metropolitan Divisions, Micropolitan Statistical Areas, Combined Statistical Areas, Combined New England City and Town Areas," *OMB Bulletin* no. 06-01. (Washington, D.C.: Office of Management and Budget, 5/26/2006), accessed 2/26/08 from <http://www.whitehouse.gov/omb/bulletins/fy2006/b06-01_rev_2.pdf>; U.S. Census Bureau, "Population Estimates by County," (Washington, D.C., U.S. Census Bureau, 3/22/2007), accessed 2/27/2008 from <<http://www.census.gov/popest/counties/CO-EST2006-01.html>>.

The WICHE region is largely rural. The 15-state region includes 565 counties. Of these, 75 percent are considered nonmetropolitan – but only 11 percent of the WICHE population resided in these nonmetro counties in 2006 (Figure 4).⁴⁰ In addition, many counties in the Western states are vast, compared to those in other regions. Counties outside the WICHE region average 637 square miles in land area, where counties in the WICHE region average 3,359 square miles – more than five times that of their more eastern counterparts.⁴¹

The nonmetro WICHE counties have fewer physicians. The number of allopathic physicians performing patient care per 1,000 population was only 1.33 in nonmetro counties in 2006, compared to 2.36 in metro counties.⁴² Given the increase in healthcare services required by older individuals, it is noteworthy that across the WICHE region, 11 percent of the population residing in metro counties was 65 and older, while 15 percent of those residing in nonmetro counties was 65 and older.⁴³

Rural communities often experience difficulty in recruiting a sufficient number of physicians and in retaining those they have.⁴⁴ Physicians decide on practice locale based on their perceptions of lifestyle, type of practice, and economics. A concordance between a physician's needs and interests and his or her practice site environment and opportunities is key to retention in rural areas. Donald Pathman of the Cecil G. Sheps Center for Health Services Research and Department of Family Medicine at the University of North Carolina, Chapel Hill, indicates that background or training will not bring physicians meaningful contentment, enthusiasm for work, and a desire to stay put if work and community settings don't fit them.⁴⁵

The Rural Environment

While the characteristics of rural life are viewed as desirable to some, the same variables may dissuade others.⁴⁶ Physicians attracted to rural areas often cite their desire to raise a family in a rural setting as central to their decision. They may also value participation in outdoor activities, lower crime rates, less traffic, and living in a closely knit community. Physicians selecting urban practice, on the other hand, may be drawn by the cultural amenities of urban living, the variety of restaurants, entertainment, goods and services,

Rural Physicians' Role as Mental Health Providers

Individuals often seek help from their primary care physician for conditions such as depression, anxiety, or complaints that represent underlying mental health issues.⁴⁸ Patients who would not normally seek a mental health provider due to stigma surrounding mental illness, lack of awareness of a mental health problem, time constraints, or other reasons are likely to approach their physician with their mental health needs. Rural physicians, who are often the only healthcare provider in the area, may become the default or safety net mental health provider. In rural areas the burden of caring for people with mental illnesses can be great, as these communities often lack adequate outpatient and inpatient mental healthcare. Healthcare providers in rural areas may experience increased stress and decreased job satisfaction due to these demands on their time and the necessity of treating people for problems which they were not trained to address in depth. It is important that all primary care providers destined to serve in rural communities receive adequate training in mental healthcare. WICHE's mental health staff offer this training regionally via Webcast.

and cultural and ethnic diversity. The choice of rural practice also depends on whether career opportunities exist for a physician's spouse.

Rural physicians enjoy clinical independence, and their scope of medical practice is frequently more diverse than in urban areas. Some rural physicians, however, may experience professional isolation, with less access to colleagues and medical resources. Physicians worry about finding themselves in medical situations they are unable to manage, and they are unable to take time away from their practices to pursue continuing medical education opportunities. Some voice concern about the around-the-clock strain of rural practice.

In addition, low population densities in rural areas often result in decreased patient volumes and diseconomies of scale.⁴⁷ Rural areas often have high proportions of elderly and low-income individuals, who may be uninsured or have Medicaid or Medicare, with their inequities in reimbursement policies, as a source of payment. These factors have the potential to lower average incomes for rural physicians. While rural physicians have fixed overhead expenses similar to those of urban physicians, they cannot take advantage of economies of scale that spread costs over a large

number of patients. The cost of housing is generally lower in most rural areas, however, and can result in a higher standard of living for many rural physicians.

Medical School – Rural Emphasis

Individuals who are comfortable with rural life are more likely to remain in rural practice over an extended period. Medical schools' admission programs need to attract service-oriented and rural candidates, and the schools also need to offer rural-oriented curricula and residency programs with rural training tracks. For students contemplating a rural practice location, rural clinical experiences and role models facilitate realistic career decision making. Taking a rural clinical rotation during medical school is a strong predictor of future rural practice.⁴⁹

Several institutions in the WICHE region have created programs to promote primary care and rural service options to medical students. For example, the Arizona Legislature established the University of Arizona's Rural Health Professions Program (RHPP) in 1997. An advisory committee selects 15 first-year students; preference is given to individuals who have lived in a rural community or who are recipients of the Arizona Medical Student Loan Program, which forgives loans for graduates who practice in underserved areas. They are mentored by rural preceptors from their first year forward, based on their specialty interest (family practice, pediatrics, internal medicine, obstetrics and gynecology, and surgery). RHPP students gain experience using telemedicine technologies when they serve in communities linked to the Arizona Telemedicine Program, a telecommunications network that allows rural physicians and their patients to consult with specialists at the University of Arizona Health Science Center in Tucson.

The University of California at Davis's School of Medicine began its "rural PRIME" initiative as part of U.C.'s expansion efforts, described earlier. Their five-year M.D./M.A. program began in 2007-08 with 12 students. Its goal is to educate physicians who will become leaders for improving healthcare in isolated communities. Students will participate in rural preceptorships, experience immersion in rural communities, and be mentored by rural physicians. An important focus of the program will be to provide students with extensive experience in the latest healthcare technologies and telemedicine.

The University of Colorado at Denver's School of Medicine created a rural track designed to encourage and support rural practice. Since the program's inception in 2005, new student cohorts have averaged 15 per year. Students are matched with a rural preceptor, attend seminars focused on rural practice issues, participate in a six-week summer rural preceptorship, and conduct scholarly research on a rural medicine-related topic. The program is forging relationships with local rural communities in need of primary care physicians. The school of medicine has also enhanced its curriculum to develop a broad skill base for future primary care physicians who opt for rural practice. Participants are being tracked to evaluate the effectiveness of the program.

The University of North Dakota's School of Medicine and Health Sciences' Rural Opportunities in Medical Education (ROME) is a third-year curricular option that allows students to complete seven months in a rural practice site. The program began in 1998 and is now in its tenth year. Two students are assigned to each clinical site, where they work one-on-one with competent rural physicians and earn credit for their family medicine, surgery, pediatrics, internal medicine, and obstetrics and gynecology clerkships. Ten students participated in the 2007-08 academic year.

Western University's College of Osteopathic Medicine of the Pacific has a "Northwest Track" that provides opportunities for students from Alaska, Idaho, Montana, Oregon, Washington, and Wyoming to be involved in rural rotations across the northwest area of the country.

Some schools require all their medical students to participate in a rural rotation in order to graduate. These include:

- University of Colorado's School of Medicine
- University of Nevada's School of Medicine
- University of New Mexico's School of Medicine
- Oregon Health and Science University's School of Medicine
- Sanford School of Medicine of the University of South Dakota
- Midwestern University's College of Osteopathic Medicine.

Rural Pipeline

Using primary care medicine as an example, the pipeline from early education to a rural medical career passes through a supportive science education environment to a medical school that supports primary care and finally to a placement program that matches physicians to a rural community that is linked to a system of continuing education and support.

Students are motivated to enter medicine through positive experiences in the healthcare system and by participating in health-related activities with the support of role models.⁵⁰ When students are interested in a health career, they need academic preparation in science, mathematics and technology. Partnerships between K-12 and institutions of higher learning can help with this preparation and provide students with a smoother transition into healthcare programs.

Rural high school students need exposure to the sciences and medicine. As an example, the Stanford Medical Youth Science Program (SMYSP) would have applicability for students living in rural areas. SMYSP is a biomedical pipeline program that provides academic enrichment in the medical sciences and college admissions support to very low-income high school students.⁵¹ Each summer 24 students are recruited from over 250 California high schools for a five-week residential program. Participants divide their time between classroom instruction, anatomy practicums, hospital field

placements, research projects, and college admissions advising. Since its inception in 1988, 405 students have completed SMYSP and 96 percent have been observed for up to 18 years. The majority are from underrepresented minority groups, and many had poor academic preparation. One hundred percent of age-eligible participants graduated from high school, and 99 percent were admitted to college. Of those, 81 percent earned a four-year college degree, the majority majoring in biological and physical sciences. Among the four-year college graduates, 52 percent are attending or have graduated from medical or graduate school.

Rural Incentive Programs

All states in the WICHE region have at least one incentive program to attract rural healthcare providers. The policy options used in the West include scholarships, loan forgiveness, loan repayment, tax credits, residency stipends, payment of malpractice premiums, rural facilities grants, and retention grants.⁵²

Table 3 describes common support-for-service programs.⁵³ These program categories were based on the career stage of targeted eligible applicants (i.e., students, junior residents, senior residents, or practitioners); whether service was required or optional (from which many other program characteristics followed, such as the criteria for selecting practitioners and the buyout terms of practitioners' contracts); and

Table 3. Support-for-Service Programs

Program Type	Eligible Individuals	Service	Use of Funds	Typical Design
Scholarship/ Loan forgiveness	Students	Required	Up-front training costs	Funds to students for tuition, fees, books, and living expenses, with service expected after training.
Loan	Students	Optional	Up-front training costs	Loans to students for tuition, fees, books, and living expenses; loan is repaid after training, either financially or by providing service.
Resident support	Junior residents	Required	Variable	Unrestricted funds for junior and, occasionally, senior residents, with service expected after training.
Loan repayment	Senior residents and practitioners	Required	Repayment of educational loans	Funds to repay outstanding educational loans of graduating residents and practitioners in exchange for service.
Direct financial incentive	Senior residents	Required	Unrestricted	Unrestricted incentive funds for graduating residents and practitioners in exchange for service.

Source: Donald Pathman, Donald Taylor, Thomas Konrad, Tonya King, Tyndall Harris, Tim Henderson, James Bernstein, Thomas Tucker, Kathleen Crook, Cora Spaulding, and Gary Koch, "State Scholarship, Loan Forgiveness and Related Programs," *Journal of the American Medical Association* 284, no. 16 (2000), 2084-2092. Copyright © 2000, American Medical Association.

whether programs' financial support to practitioners was to be used solely for up-front training costs, after-the-fact repayment of educational loans, or for unrestricted use.

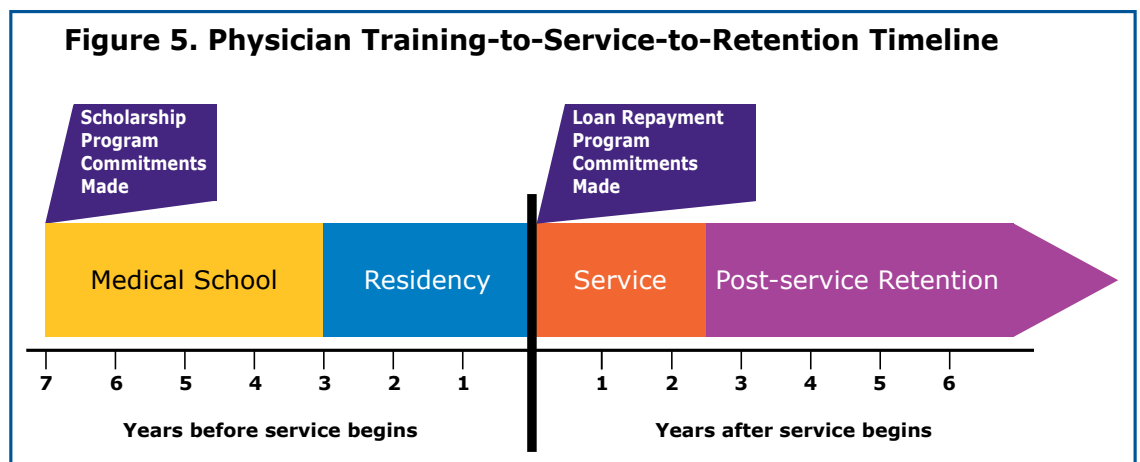
Figure 5 displays a timeline of physicians' training and service years in relation to scholarship and loan repayment programs with service-requiring commitments.⁵⁴

In general, states' support-for-service programs do bring physicians to rural and underserved communities. Of the 15 states in the Western region, 11 offer some type of loan repayment program for physicians – usually both allopathic and osteopathic.⁵⁵ Funding for loan repayment programs comes primarily from state sources, with two states (California and Colorado) also using funding from private foundations. One reason loan repayment is common is the National Health Service Corps (NHSC), a federal program that encourages health professionals to serve in health professional shortage areas.

Loan repayment programs recruit physicians as they complete their residency and are ready to begin service in exchange for paying off traditional education loans they acquired years earlier. Individuals at this point in their career development are generally more settled and perceptive of their professional, personal, and family needs than they were as medical students. The Congressional Government Accounting Office and NHSC concluded that the NHSC Loan Repayment Program achieved better outcomes – higher service-completion rates, greater satisfaction, and longer retention – than the NHSC Scholarship Program.

Recommendations

As policymakers of states in the WICHE region strive to address physician shortages, it is important to examine the effectiveness of programs related to enrollment expansion, student debt alleviation, and the promotion of primary care service within rural areas in the West. Through regional coordination, state



Source: D. E. Pathman, "What Outcomes Should We Expect from Programs that Pay Physicians' Training Expenses in Exchange for Service?" *NC Medical Journal* 67, no. 1 (2006), 77-82.

and institutional leaders can avoid duplication, address gaps in existing programs, and identify synergistic opportunities.

Some crucial issues are discussed below.

Expansion

- The number of medical students supported through WICHE's Professional Student Exchange Program (PSEP), in both allopathic and osteopathic medicine, should be increased. Increased support for osteopathic medical students enrolled in the private institutions in the West in all WICHE states should be encouraged as a means of increasing enrollment with relatively nominal cost to the supporting states. For more information about PSEP, see sidebar on p. 12.
- The ability of a medical school to expand its class size is predicated on the availability of financial resources. Schools are encouraged not to rely on student tuition to fund additional costs.
- The number of GME positions should be expanded to accommodate the increased number of graduates from medical schools. Schools should continue to work to have the current Medicare caps on the number of funded residency positions lifted to enable programs to readily respond to increases in medical school enrollment.
- Increasing physician supply and diversity are equally important goals. Strategies should be identified to enhance the cultural competencies of the physician workforce, to enable them to better care for culturally diverse populations.
- Given the focus on increasing the number of physicians, a parallel focus should be on how

health professionals can best provide healthcare services. The medical community should explore how physician assistants, nurse practitioners, and allied health professionals can work in complementary roles with physicians. In addition, health information technologies should be explored to enhance the information availability and the efficiency of medical practice.

Medical Student Indebtedness

Medical education is an expensive undertaking for both medical schools and medical students. Medical schools are encouraged to:

- Ensure medical school administrators are sensitive to students' ongoing challenges regarding educational cost and debt. Students who are incurring educational debt should participate in educational activities regarding financial, debt, and loan management at multiple points during medical school.
- Facilitate students' consideration of loan repayment and loan-for-service avenues as a means of reducing their level of indebtedness while also providing much needed medical services to underserved populations. For example, medical schools could partner with cooperating PSEP schools to establish residency placement within the WICHE region; the goal of which would be to bring residents back to their home state to perform their residency.
- Develop and implement strategies to enhance financial aid for medical students such as: supporting legislative activities to expand loan repayment and forgiveness programs and to expand deductibility of interest on educational loans; and seeking community-level financial sponsorship of students who commit to return to the area following completion of training.

Primary Care and Rural Service

The future rural physician workforce is threatened by the trend of U.S. medical students training in nonprimary care specialties. Medical schools are urged to:

- Communicate a positive image of primary care to medical students and to the broader community, and highlight the current demand for primary care physicians.

- Identify inspiring and competent primary care physicians to serve as mentors and role models.
- Facilitate programs that expose students from elementary school onwards to healthcare careers in general and to primary care medicine specifically.
- Identify characteristics of individuals who are likely to enter primary care, and recruit a diverse medical student population that reflects these characteristics.
- Go beyond grades as selection criteria, and have a concomitant focus on individuals who desire to serve vulnerable populations.
- Recruit students with a mindset for retention in rural areas (i.e., early on, select individuals based on their potential fit with rural practice situations).
- Support medical school class expansion with an objective to fill more family medicine and other primary care seats with U.S. graduates, with an emphasis on underrepresented minorities and students from rural backgrounds.

WICHE's Role in Professional Healthcare Education

WICHE has a long history of providing access to the health professions. Its Professional Student Exchange Program (PSEP – <http://wiche.edu/sep/psep>) has been in operation for more than 50 years. It provides students in 12 Western states with access to a wide range of professional programs that otherwise might not be available to them because the fields of study are not offered at public institutions in their home states. The program includes dentistry, allopathic medicine, osteopathic medicine, physician assistant, physical therapy, occupational therapy, optometry, pharmacy, podiatry, and veterinary medicine.

Over 14,000 students have earned professional degrees since the program's inception in 1951. In the 2007-08 academic year, almost 780 students paid reduced tuition to train in one of the healthcare professions, with \$14.6 million in appropriations from their home states offsetting the nonresident tuition costs.

Montana and Wyoming financially supported 41 students in their study of allopathic medicine at 17 public and private schools of medicine through PSEP in 2007-08, while Arizona, Montana, New Mexico, Washington, and Wyoming supported 55 students to study osteopathic medicine at five private institutions. Some states use PSEP as a loan forgiveness program, requiring graduates to return to their home state to practice; others use it primarily as an access program.

- Promote higher Medicare and private payer reimbursement for healthcare services provided by primary care physicians.
- Promote new approaches to improve retention of physicians who complete their initial obligations in an underserved area, such as paying year-to-year retention bonuses and providing financial assistance to purchase practices.

Endnotes

- ¹ American Medical Association (AMA), *Physician Characteristics and Distribution in the U.S., 2008 Edition* (Chicago: American Medical Association, 2008).
- ² U.S. Census Bureau, "U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin" (Washington, D.C.: U.S. Census Bureau, 2004), accessed 2/27/2008 from <<http://www.census.gov/ipc/www/usinterimproj/>>.
- ³ Association of American Medical Colleges, "AAMC Statement on the Physician Workforce" (Washington, D.C.: Association of American Medical Colleges, June 2006), accessed 2/27/2008 from <<http://www.aamc.org/workforce/workforceposition.pdf>>.
- ⁴ Association of American Medical Colleges, "Medical School Enrollment Plans: Analysis of the 2007 AAMC Survey" (Washington, D.C.: Association of American Medical Colleges, April 2008), accessed 5/2/2008 from <https://services.aamc.org/Publications/showfile.cfm?file=version111.pdf&prd_id=229&prv_id=279&pdf_id=111>.
- ⁵ Thomas Levitan, "A Report on a Survey of Osteopathic Medical School Growth, 2007-08," (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, 2008), accessed 5/12/08 from <http://www.aacom.org/resources/bookstore/Documents/college_growth_report_2008.pdf>, and American Association of Colleges of Osteopathic Medicine, "2006 Annual Statistical Report on Osteopathic Medical Education," (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, 2007).
- ⁶ Sarah A. Bunton, Robert F. Sabalis, Rajeev K. Sabharwal, Chris Candler, and William T. Mallon, *Medical School Expansion: Challenges and Strategies* (Washington, D.C.: Association of American Medical Colleges, 2008).
- ⁷ Keith Joiner, Ernest Schloss, Philip Malan, Stuart Flynn, and Jacqueline Chadwick, "Phoenix Rises, with Tucson's Help: Establishing the First Four-Year Allopathic Program in the Nation's Fifth Largest City," *Academic Medicine* 82, no. 12 (2007), 1126-1138.
- ⁸ Cathryn L. Nation, Andrea Gerstenberger, and Dena Bullard, "Preparing for Change: The Plan, the Promise, and the Parachute," *Academic Medicine* 82, no. 12 (2007), 1139-1144.
- ⁹ Ellen Cosgrove, Gary Harrison, Summers Kalishman, Kathryn Kersting, Valerie Romero-Leggott, Craig Timm, Lily Velarde, and Paul Roth, "Addressing Physician Shortages in New Mexico Through a Combined B.A./M.D. Program," *Academic Medicine* 82, no.12 (2007), 1152-1157.
- ¹⁰ Joseph E. Robertson, Jr., Jennifer Boyd, Jerris R. Hedges, and Edward J. Keenan, "Strategies for Increasing the Physician Workforce: The Oregon Model for Expansion," *Academic Medicine* 82, no. 12 (2007), 1158-1162.
- ¹¹ Association of American Medical Colleges, "Facts, Matriculants and Graduates" (Washington, D.C.: Association of American Medical Colleges, 2002-2007), accessed 3/3/2008 from <<http://aamc.org/data/facts/start.htm>>.
- ¹² Personal communication with osteopathic schools and the American Association of Colleges of Osteopathic Medicine, 3/2008.
- ¹³ William T. Mallon, "Medical School Expansion: Déjà Vu All Over Again," *Academic Medicine* 82, no. 12 (2007), 1121-1125.

- ¹⁴ Bunton et al., *Medical School Expansion*.
- ¹⁵ Darrell G. Kirch, "The Physician Workforce: Avoiding the Tyranny of the 'Either-Or,'" AAMC Reporter (Washington, D.C.: Association of American Medical Colleges, July 2007), accessed 1/15/2008 from <<http://www.aamc.org/newsroom/reporter/july07/word.htm>>.
- ¹⁶ Read more about health information technology workforce needs at <http://www.wiche.edu/sep/psep/workforceHIT.pdf>.
- ¹⁷ Pacific Northwest University of Health Sciences College of Osteopathic Medicine and Rocky Vista University College of Osteopathic Medicine were not included in the analysis. First-year enrollment for these schools will be the 2008-2009 school year.
- ¹⁸ Association of American Medical Colleges, "Tuition and Student Fees, First-Year Medical School Students: 2007-2008" (Washington, D.C.: Association of American Medical Colleges), accessed February 27, 2008 from <http://services.aamc.org/tsfreports/select.cfm?year_of_study=2008>.
- ¹⁹ Association of American Medical Colleges, "Tuition and Student Fees, First-Year Medical School Students: 2007-2008," and American Association of Colleges of Osteopathic Medicine, *Osteopathic Medical College Information Book* (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, 2007).
- ²⁰ Indebtedness amounts include undergraduate and medical school debt levels of all graduating medical students including that of students who have no debt. See Association of American Medical Colleges (AAMC), "2007 Medical School Graduation Questionnaire: All Schools Summary Report" (Washington, D.C.: Association of American Medical Colleges, 2007), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>; and American Association of Colleges of Osteopathic Medicine, "Data from AACOM's 2005-2006 Survey of Student Indebtedness and Career Plans of Osteopathic Medical School Seniors and First Year Students" (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, in process).
- ²¹ Association of American Medical Colleges, "2007 Medical School Graduation Questionnaire"; and Association of American Medical Colleges, "2003 Medical School Graduation Questionnaire: All Schools Report" (Washington, D.C.: Association of American Medical Colleges, 2003), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>; and Association of American Medical Colleges, "2001 Medical School Graduation Questionnaire: All Schools Report" (Washington, D.C.: Association of American Medical Colleges, 2001), accessed 1/2/2008 from <<http://aamc.org/data/gq/allschoolsreports/start.htm>>.
- ²² Paul Jolly, "Medical School Tuition and Young Physician Indebtedness" (Washington, D.C.: Association of American Medical Colleges, March 23, 2004), accessed 1/15/2008 from <https://services.aamc.org/Publications/showfile.cfm?file=version21.pdf&prd_id=102&prv_id=113&pdf_id=21>.
- ²³ Ha T. Tu and Paul B. Ginsburg, "Losing Ground: Physician Income, 1995-2003," Tracking Report no. 15. (Washington D.C.: Center for Studying Health Systems Change, June 2006), accessed 1/15/2008 from <<http://www.hschange.com/CONTENT/851/>>.
- ²⁴ Paul Jolly, "Medical School Tuition and Young Physician Indebtedness: An Update to the 2004 Report" (Washington, D.C.: Association of American Colleges, October 2007), accessed 1/15/2008 from <https://services.aamc.org/Publications/showfile.cfm?file=version103.pdf&prd_id=212&prv_id=256&pdf_id=103>.
- ²⁵ James Macinko, Barbara Starfield, and Leiyu Shi, "Is Primary Care Effective? Quantifying the Health Benefits of Primary Care Physician Supply in the United States," *International Journal of Health Services* 37, no. 1 (2007), 111-126.
- ²⁶ AMA, "Physician Characteristics."
- ²⁷ Merritt, Hawkins, and Associates, "2007 Review of Physician and CRNA Recruiting Incentives" (Irving, TX: Merritt, Hawkins and Associates, 2007), accessed 1/15/2008 from <http://merrithawkins.com/pdf/2007_Review_of_Physician_and_CRNA_Recruiting_Incentives.pdf>.
- ²⁸ Perry Pugno, Amy McGaha, Gordon Schmittling, Ashley DeVilbiss, and Norman Kahn, "Results of the 2007 National Resident Matching Program: Family Medicine," *Family Medicine* 39, no. 8 (2007), 562-571.
- ²⁹ Doug Campos-Outcalt, Janet Senf, and Randa Kutob, "A Comparison of Primary Care Graduates from Schools with Increasing Production of Family Physicians to Those from Schools with Decreasing Production," *Family Medicine* 36, no. 4 (2004), 260-264.
- ³⁰ Pugno et al., "Results."
- ³¹ AMA, "Physician Characteristics"; and Thaddeus Miller, Roderick Hooker, and Douglas A. Mains, "Characteristics of Osteopathic Physicians Choosing to Practice Rural Primary Care," *Journal of the American Osteopathic Association* 106, no. 5 (2006), 274-279.
- ³² American Association of Colleges of Osteopathic Medicine, "Data from AACOM's 2005-2006 Survey of Student Indebtedness and Career Plans of Osteopathic Medical School Seniors and First Year Students" (Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine, in process); and The Robert Graham Center, "Osteopathic Physicians and the Family Medicine Workforce" (Washington, D.C.: The Robert Graham Center, August 2005), accessed 3/1/2008 from <<http://www.graham-center.org/x585.xml>>.
- ³³ Pugno et al., "Results."
- ³⁴ Karin Johnson, Amy Hagopian, Catherine Veninga, and L. Gary Hart, "The Changing Geography of Americans Graduating from Foreign Medical Schools," *Academic Medicine* 81, no. 2 (2006), 179-184.
- ³⁵ John Boulet, David Swanson, Richard Cooper, John Norcini, and Danette W. McKinley, "A Comparison of the Characteristics and Examination Performances of U.S. and Non-U.S. Citizen International Medical Graduates Who Sought Educational Commission for Foreign Medical Graduates Certification: 1995-2004," *Academic Medicine* 81, no. 10 (supplement, 2006), S116-S119.
- ³⁶ American Medical Association, "International Medical Graduates in the U.S. Workforce." (Chicago: American Medical Association, October 2007), accessed 1/20/2008 from <<http://www.ama-assn.org/ama1/pub/upload/mm/18/img-workforce-paper.pdf>>.
- ³⁷ The J-1 Visa Program is for foreign medical graduates who wish to pursue graduate medical training in the United States. At the completion of their training, they are expected to return to their home countries for two years before

applying for a permanent visa in the United States. A J-1 visa waiver waives the two-year home residency requirement and allows a physician to stay in the country to practice in a federally designated health professional shortage area (HPSA) or medically underserved area (MUA) if sponsored by an interested U.S. government agency. State government agencies may also sponsor J-1 physician waiver requests, which are called Conrad State 30 programs. See Rural Assistance Center, "J-1 Visa Waiver. (Grand Forks, ND: Rural Assistance Center, February 19, 2008), accessed 3/5/2008 from <http://www.raconline.org/info_guides/hc_providers/j1visa.php>.

³⁸ Graham T. McMahon, "Coming to America – International Medical Graduates in the United States," *New England Journal of Medicine* 350, no. 24 (2004), 2435-2437.

³⁹ Fitzhugh Mullan, "The Metrics of the Physician Brain Drain," *New England Journal of Medicine* 353, no. 17 (2005), 1810-1818.

⁴⁰ Office of Management and Budget (OMB), "Metropolitan Statistical Areas, Metropolitan Divisions, Micropolitan Statistical Areas, Combined Statistical Areas, Combined New England City and Town Areas," *OMB Bulletin*, no. 06-01. (Washington, D.C.: Office of Management and Budget, May 26, 2006.), accessed 2/26/08 from <http://www.whitehouse.gov/omb/bulletins/fy2006/b06-01_rev_2.pdf>; also see U.S. Census Bureau, "Population Estimates by County" (Washington, D.C., U.S. Census Bureau, March 22, 2007), accessed 2/27/2008 from <<http://www.census.gov/popest/counties/CO-EST2006-01.html>>.

⁴¹ U.S. Census Bureau, "Density Using Land Area for States, Counties, Metropolitan Areas, and Places" (Washington, D.C.: U.S. Census Bureau, 2000), accessed 2/27/2008 from <<http://www.2010census.biz/population/www/censusdata/density.html>>.

⁴² AMA, "Physician Characteristics"; OMB, "Metropolitan Statistical Areas"; Census, "Population Estimates."

⁴³ OMB, "Metropolitan Statistical Areas"; Census, "Population Estimates."

⁴⁴ Donald E. Pathman, Thomas R. Konrad, Rebekkah Dann, and Gary Koch, "Retention of Primary Care Physicians in Rural Health Professional Shortage Areas," *American Journal of Public Health* 94, no. 10 (2004), 1723-1729.

⁴⁵ Donald E. Pathman, "The Principles of Retaining (and Not Just Recruiting) Physicians in Rural Areas," presentation at the University of Colorado School of Medicine, February 6, 2008.

⁴⁶ Howard Rabinowitz and Nina Paynter, "The Rural vs. Urban Practice Decision," *Journal of the American Medical Association (JAMA)* 287, no. 1 (2002), 113.

⁴⁷ Hilda Heady and Robert Byrd, "A Delicate Balance: The Economics of Rural Health Care Delivery" *JAMA* 287, no. 1 (2002), 110.

⁴⁸ Donald Sawyer, John Gale, and David Lambert, "Rural and Frontier Mental and Behavioral Health Care: Barriers, Effective Policy Strategies, Best Practices" (Waite Park, MN: National Association for Rural Mental Health, 2006), accessed 3/28/2008 from <<http://www.narmh.org/pages/Rural%20and%20Frontier.pdf>>. Also see John Gale and David Lambert, "Mental Healthcare in Rural Communities: The Once and Future Role of Primary Care," *North Carolina Medical Journal* 67, no. 1 (2006), 66-70.

⁴⁹ Howard Rabinowitz, James Diamond, Fred Markham, and Nina Paynter. "Critical Factors for Designing Programs to Increase the Supply and Retention of Rural Primary Care Physicians." *Journal of the American Medical Association (JAMA)* 286, no. 9 (2002), 1041-1048.

⁵⁰ Louis Zayas and Denise McGuigan, "Experiences Promoting Healthcare Career Interest among High-School Students from Underserved Communities," *Journal of the National Medical Association* 98, no. 9 (2006), 1523-1531.

⁵¹ Marilyn A. Winkleby, "The Stanford Medical Youth Science Program: 18 Years of a Biomedical Program for Low-Income High School Students," *Academic Medicine* 82, no. 2 (2007), 139-145.

⁵² For a full inventory of incentives offered to rural healthcare professionals in the WICHE region, see WICHE, *Inventory of Rural Health Practice Incentives in the Western WICHE States* (Boulder, CO: WICHE, October 2007) at <<http://www.wiche.edu/sep/psep/stateinventory.pdf>>.

⁵³ Donald Pathman, Donald Taylor, Thomas Konrad, Tonya King, Tyndall Harris, Tim Henderson, James Bernstein, Thomas Tucker, Kathleen Crook, Cora Spaulding, and Gary Koch, "State Scholarship, Loan Forgiveness and Related Programs" *JAMA* 284, no. 16 (2000), 2084-2092.

⁵⁴ Donald Pathman, "What Outcomes Should We Expect from Programs that Pay Physicians' Training Expenses in Exchange for Service?" *North Carolina Medical Journal* 67, no. 1 (2006), 77-82.

⁵⁵ WICHE, "Inventory of Rural Health Practice Incentives in the Western WICHE States." (Boulder, CO: Western Interstate Commission for Higher Education, October 2007), accessed January 2, 2008 from <<http://www.wiche.edu/sep/psep/stateinventory.pdf>>.

Rev. June 2008

WICHE developed this new series *A Closer Look at Healthcare Workforce Needs in the West*, to help policymakers and higher education decision makers and in the Western states to share resources and develop a regional response to meet the West's healthcare needs. This issue, focused on medical education, was prepared by Pamela F. Dinkfelt. Briefs on pharmacy and health information technology workforce issues are also available.

Contacts:

David A. Longanecker, President
Jere J. Mock, Vice President, Programs & Services
Margo Schultz, Program Coordinator, Student Exchange
Western Interstate Commission for Higher Education (WICHE)
3035 Center Green Drive • Boulder, CO 80301 • Tel. 303.541.0214
www.wiche.edu/sep

The Western Interstate Commission for Higher Education (WICHE) and its 15 member states work to assure access and excellence in higher education for all citizens of the West. Member states include Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.