Overview of Minnesota’s Health Professions Workforce

Projecting future health professions workforce trends in the United States and Minnesota requires a comprehensive view across disciplines and professions as well as drawing conclusions through an ever-changing mosaic of demand and supply reports. Experience demonstrates that predicting workforce needs is an inexact science that has resulted in fluctuations of over- and under-supply of nearly all health professions at one time or another. Historically, a problem that has repeated throughout the years is the volatility of demand followed by a quick response of overbuilding infrastructure and capacity in higher education. These types of responses have led to the overproduction of one or more professional groups at one time or another. Often these periods are followed by attempts to close health professions schools because of too many professionals.

In 2006 during the University of Minnesota strategic positioning process, the Health Professions Workforce Taskforce comprised of Academic Health Center faculty and external stakeholders filed a report that described the current health professions workforce nationally and in Minnesota. Included is a report of the role of the University of Minnesota in health professions workforce education development and specific issues in health professions education. One finding is that nationally and in Minnesota we are in a period of high demand for most professions for the foreseeable future. General recommendations included that we need to monitor the workforce cycles with internal and external stakeholders and develop more flexible, cross-profession agile strategies in workforce development to adjust to cycles of demand. (Appendix A)

In 2007, a large percentage of Minnesota counties carry a full or partial Health Professional Shortage Area (HPSA) or Medically Underserved Area (MUA) designation in primary care, mental health, and dentistry. (Table 1) The federally defined primary care specialties are doctors of medicine (M.D.) and doctors of osteopathy (D.O.) who practice in: general or family practice, general internal medicine, pediatrics, and obstetrics and gynecology. The United States Department of Health and Human Services establishes this designation through federal recognition of geographic areas, population groups, and facilities as having an acute shortage of primary care, dental, and mental health professionals. The designation establishes eligibility to receive federal funding for programs, including community health centers, rural health clinics,

Table 1: Minnesota Health Professional Shortage Areas/Medically Underserved Areas

<table>
<thead>
<tr>
<th>Shortage Area Designation (date)</th>
<th>Number of Full County Designations</th>
<th>Number of Partial County Designations</th>
<th>Total County Shortage Designations/Total Counties</th>
<th>Percent Designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care HPSA (04.07)</td>
<td>26</td>
<td>28</td>
<td>54/87</td>
<td>62.1%</td>
</tr>
<tr>
<td>Dental HPSA (02.06)</td>
<td>29</td>
<td>12</td>
<td>41/87</td>
<td>47.1%</td>
</tr>
<tr>
<td>Mental Health HPSA (05.07)</td>
<td>70</td>
<td>0</td>
<td>70/87</td>
<td>80.5%</td>
</tr>
<tr>
<td>MUA (01.06)</td>
<td>26</td>
<td>35</td>
<td>61/87</td>
<td>70.1%</td>
</tr>
</tbody>
</table>

Indian Health Service sites, and others. These federal sites can receive a wide range of clinical and workforce assistance, including placements of National Health Service Corps providers such as primary care physicians, advanced nurse practitioners, physician assistants, pharmacists, and mental health professionals. Currently, organizations and agencies in Minnesota receive more than $55 million in federal funding from the Health Resources and Services Administration in the United States Department of Health and Human Services for clinical services and workforce development.3

The designation is comprised of three major components of the federal HPSA criteria, including 1) rational service area, 2) population-to-provider ratio, and 3) accessibility of populations to primary care resources in surrounding areas. MUA designation is similar in that it focuses on primary care, but considers a broader set of criteria, including 1) ratio of primary medical care physicians per 1,000 population, 2) infant mortality rate, 3) percentage of the population with incomes below the poverty level, and 4) percentage of the population age 65 or older. Counties or partial county governmental entities work with the Minnesota Department of Health Office of Rural Health and Primary Care to apply for HPSA designations. HPSA designation is not awarded automatically, and groups typically need to value the potential benefit of the designation compared to the cost of the required processes for application. As a result, it is likely more areas of Minnesota experience actual workforce shortages than are formally designated.

The HPSA designation is the federal governmental formal recognition of workforce need. In addition to federal designations, many other current and emerging health professions are not tracked formally by governmental sources. Further complicating the situation, the state of Minnesota has several offices that also collect health workforce data, notably in the Department of Employment and Economic Development (DEED) and the Department of Human Services (DHS). In September 2007, the Minnesota Department of Health Office of Rural Health and Primary Care convened more than 40 individuals who have an interest in and collect health workforce data for a variety of reasons. Forum participants experienced a wide range of issues and recognized the need for leadership to sort through a number of chaotic issues related to workforce.

In 2007, as demographics and health care needs change, Minnesota also faces problems in workforce strength, adequate supply, and distribution of other health professions groups such as specialty care medicine, pharmacy, advanced practice nursing, public health, large animal veterinarians, and allied health professionals as well as health professions faculty broadly. Below is a snapshot of current status of these professions in Minnesota:

2007 Minnesota Health Professional Shortage and Medically Underserved Areas
**Specialty Care Medicine.** In addition to primary care needs, evidence is growing that there is a demand for more specialty physicians as well, particularly in rural and Greater Minnesota. Six of Minnesota’s top 10 physician vacancy rates are in specialty medicine. In 2002, rural Minnesota faced shortages in the following specialties: family practice, internal medicine, obstetrics/gynecology, pediatrics, general surgery, gastroenterology, ophthalmology, orthopedic surgery, otolaryngology, psychiatry, and urology. Thirty-one percent of rural Minnesota’s specialty care physicians are over the age of 55, compared to 25 percent as a state average. The 2005 Greater Minnesota Health Professional Demand Survey indicated a combined vacancy rate of 27.5 percent for medical, surgical, and other specialty physicians.

**Pharmacy.** In a 2002 study, the *Journal of the American Pharmacists Association* reported Minnesota as the number one state with a need for pharmacists. Minnesota pharmacist salaries, an indicator of workforce shortages, have risen from an average of $30.81 per hour in 1999 to $53.38 per hour in 2007. As with other professions, vacancy rates are often an inexact indicator of actual workforce need. The longer positions are advertised and vacant, employers often remove them from vacancy lists, obscuring both actual demand and need. Rural pharmacies, a vital economic center and health care access point of the communities, have a higher vacancy rate and face greater hiring challenges than those located in urban areas. Nearly half of all rural pharmacies with vacancies have been attempting to fill their positions for more than 10 months, compared to 30 percent of pharmacies in urban counties. Between 1996 and 2002, 189 pharmacies closed in Minnesota; 102 in rural areas; 87 in the Metro area. Many of the closures in rural areas are independent pharmacies that are not likely to be replaced by chain pharmacies and will likely contribute to growing pharmacy access issues in Greater Minnesota.

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10 Profile of Pharmacies in Rural Minnesota. Minnesota Department of Health Office of Rural Health and Primary Care, October 2003.
**Nursing.** The nursing shortage has received significant attention both in Minnesota and nationally. Historically and more recently the nursing workforce need has been difficult to predict for a variety of reasons. The 2003 estimated shortage of registered nurses in Minnesota was 1,977\(^{12}\). Ninety-eight percent of the R.N. workforce is white, non-Hispanic and does not mirror the changing Minnesota demographics, adding to the disparity in care for ethnic populations.\(^{13}\)

The Minnesota Department of Health Office of Rural Health and Primary Care is currently completing a nursing workforce survey report of 90 Minnesota employers (December 2007). According to this unreleased study, the demand for advanced practice nurses is currently strong across these health care organizations that employ “several hundred” advanced practice nurses. These data demonstrate a vacancy rate of approximately 13 percent in Greater Minnesota (excluding Mayo Health System). This percentage compares with 6 percent in 2005. According to the Minnesota Department of Health, a vacancy rate of more than 10 percent is considered high. At this time, advanced nurse practitioners can likely find employment in Greater Minnesota, but perhaps not in the locales they prefer.\(^{14}\) Demand for certified registered nurse anesthetists (CRNAs) is “robust”\(^{15}\).

**Dentistry.** Minnesota faced a greater negative percentage change in the dentist-to-population ratio than any other state in the nation between 1993 and 1999.\(^{15}\) Rural areas have a dentist-to-population ratio of 1:2,000 compared with 1:1,400 in the metropolitan area. An estimated 60 percent of Minnesota’s dentists may retire in the next 15-20 years.\(^{16}\) The dental workforce in rural areas has a larger percentage of dentists over the age of 59, magnifying the loss of dentists due to retirement in the near future.

**Public Health.** An estimated 21 percent of the public health workforce in Minnesota will retire within 10 years. Public health leadership, on average, is 48 years old.\(^{17}\) Minnesota also faces a 58.5 percent public health nurse retirement rate in the next 10 years; it is estimated that 36 percent of retirements will occur in the next five years. This rate represents the highest of any public health professional job classification.\(^{18}\)

**Large Animal Veterinary.** The nation is facing serious shortages in all areas of veterinary public practice because the educational capacity in veterinary medical education has not changed in 20 years. Each year 2,500 veterinarians graduate from the 28 veterinary medicine colleges in the United States. This number is insufficient to meet societal needs.\(^{19}\) In southern Minnesota, where

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14 Fonkert, J. Personal communication regarding the unreleased 2007 Nursing Workforce Demand Survey Report, November 29, 2007.
food animal production is one the mainstays of the economy; 30 percent of the veterinarians are over 55.\textsuperscript{20}

\textbf{Clinical Laboratory Science.} Since the mid-1980s, hospital-based and higher education-hosted clinical laboratory science programs have been closed. Nationwide, there were 208 fewer programs training clinical laboratory scientists and related disciplines in 2004 than in 1995. In 1987, Minnesota had 12 CLS programs, and by 2004, there was one higher education-hosted program at the University of Minnesota and two hospital-based programs remaining in the state. In 2003, 72 percent of the laboratory workforce was more than 40 years old. One-fourth of Minnesota labs with clinical laboratory technician vacancies report that the positions had been vacant for more than six months.\textsuperscript{21} It is estimated that Minnesota needs to graduate 100 to 150 new clinical laboratory scientists to meet demand.

\textbf{Trends Influencing Health Professions Workforce}

\textbf{The State of Primary Care Medicine in Minnesota.} Since 1990, Minnesota has ranked among the top two states as the “healthiest” since the American Health Rankings\textsuperscript{TM} have been published. Eleven out the 17 years, Minnesota has ranked at the top of the list of healthiest states.

Minnesota’s strengths include ranking first for a low rate of cardiovascular deaths, a low premature death rate, and a low percentage of uninsured population. It is also in the top five states with a low percentage of children in poverty, a low infant mortality rate, a low occupational fatalities rate, a low rate of motor vehicle deaths, and a high rate of high school graduation. Minnesota’s biggest challenges are a high prevalence of obesity at 23.7 percent of the population; limited access to adequate prenatal care with 75.9 percent of pregnant women receiving adequate prenatal care; a moderate violent crime rate at 297 offenses per 100,000 population; and, a high prevalence of smoking at 20 percent of the population.\textsuperscript{22}

In one of the first published studies on the relationship between physician supply and outcomes, it was shown that at the state level, the higher the ratio of primary care physicians to population, the better the outcomes as measured by age-specific mortality rates.\textsuperscript{23} In the early 1990s, studies demonstrated that U.S. states with higher ratios of primary care physicians to population had better health outcomes, including lower rates of all causes of mortality: mortality from heart disease, cancer, or stroke; infant mortality; low birth weight; and poor self-reported health, even after controlling for sociodemographic measures and lifestyle factors.\textsuperscript{24} Additionally, Starfield et al showed than an increase of one primary care physician per 10,000 population at the state level was associated with a 6 percent decrease in all-cause mortality and about a 3 percent decrease in infant,

\textsuperscript{20} Southern Minnesota Health Professional Workforce and Community Health Analysis. Rural Health Resource Center, Minnesota Center for Rural Health. October 2005.
\textsuperscript{22} America’s Health Rankings. United Health Foundation. 2007 Edition.
low-birth weight, and stroke mortality after controlling for economic and demographic characteristics. For total mortality at the state level, this translates to a reduction of 34.6 deaths per 100,000 population.25

The Minnesota Department of Health Office of Rural Health and Primary Care surveys physicians regarding employment status and the nature of their practices each year when they renew their licenses. In 2002, there were 4,261 primary care physicians licensed and practicing in Minnesota. Of those, 1,286 (30 percent) were practicing in rural Minnesota.

Primary care physicians represent the largest proportion of physicians practicing in Minnesota. In 2007, 49 percent of Minnesota physicians claim a primary care discipline as their principal specialty (family medicine, internal medicine, pediatrics, and obstetrics/gynecology)26. The breakdown is as follows: 23 percent were in family medicine, 12 percent in internal medicine, 9 percent in pediatrics, 4 percent in obstetrics/gynecology.27 Distribution of physicians based on type of practice also varies greatly in Minnesota. In 2003, Minnesota had 76 active primary care physicians per 100,000 population, higher than the national ratio of 69.28

Only 28 percent of all physicians are women, but women account for more than 40 percent of physicians under the age of 45. Fifty-nine percent of female physicians in Minnesota report primary care as their principal specialization, compared with 42 percent of male physicians.29

29 Ibid.
The geographic distribution of physicians is critical to health care access. The distribution of physicians in urban and rural areas differs depending on which counties are defined as urban and which are defined as rural. The U.S. Census Bureau supports the use of the terms metropolitan and micropolitan statistical areas. Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. Each micropolitan statistical area must have at least one urban cluster of at least 10,000 but less than 50,000 population. In a 2005 report, the Minnesota Department of Health Office of Rural Health and Primary Care adopted this new approach to demonstrate the distribution of physicians in Minnesota. Others use such terms as “hyper-rural” to describe those rural areas with very limited access to community development services of any kind. Northeast and northwest Minnesota contain several areas that can be categorized using this definition.

New definitions for reporting physician workforce is defined in three groupings: 1) Metropolitan Statistical Areas (MSA) counties, or the 21 Minnesota counties included in seven metropolitan statistical areas (Minneapolis-St. Paul, St. Cloud, Rochester, Duluth-Superior, Fargo, Grand Forks, LaCrosse); 2) Micropolitan counties (20 counties surrounding smaller urban centers of at least 10,000 people; and, 3) Rural (46 counties outside of MSAs).

The percentage of health care delivered by primary care physicians varies in rural, micropolitan, and urban Minnesota. Seventy-eight percent of rural physicians are primary care physicians, compared with 57 percent of physicians in micropolitan counties and only 44 percent of physicians in metropolitan counties.

The number of primary care physicians in Minnesota grew by 20 physicians between 1999 and 2002, increasing the supply from 4,241 to 4,261. The number of other specialty care physicians rose by 129 (6 percent) during the same time period. A similar trend has been demonstrated nationally, with the rate of growth in subspecialty physicians far exceeding the rate of growth in family medicine and other primary care specialties in the last 25 years. Specialists accounted for more than three-fourths of the growth in the physician (per capita) workforce from 1980 to 1999, despite concerted, widely publicized policy and funding efforts to increase the number of primary care physicians.

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32 Ibid.
33 Ibid.
physicians. During that time period, the number of family physicians grew 0.3 percent, general internists rose 8 percent, and general pediatricians 7.5 percent, while the production of other physician specialists was greater at 41 percent.\(^35\)

In 1997, nearly 400 family medicine residency programs across the country attracted 2,340 U.S. medical school (MD) seniors through the National Residency Matching Program, representing 17.3 percent of U.S. medical school graduates. In the 2003 match, 1,234 U.S. medical school seniors chose family medicine, a decline of nearly 50 percent in a period of only six years.\(^36\) The declining interest in primary care has been associated with new generational student perceptions that primary care is not sufficiently remunerative and that its demands are not compatible with their lifestyle expectations.\(^37\) Recent surveys of students also demonstrate a decline in valuing primary care’s “intellectual stimulation” (“Is my work interesting and challenging?”), meaning “Am I contributing to the greater good of individuals and society?”\(^38\)

**New Models of Care.** A number of reports call for new models of quality in health care, including patient-centered care, whole person orientation, team approach, elimination of barriers to access, information systems, redesigned offices, focus on quality and safety, enhanced practice finance, and a commitment to provide a portfolio of services. The team approach describes care that is provided through a multidisciplinary team approach, involving physicians, nurses, pharmacists, physician assistants, nurse practitioners, nutritionists, health educators, behavioral scientists, clerical personnel, and other professional and lay partners. The team approach requires a shift in the culture; cooperative efforts among all clinicians will be the norm, and it will be understood that the practice is more than the sum of its individual parts.\(^39,40\)

**Prospective Students into the Health Professions in Minnesota.** As with the rest of the country, Minnesota’s population is changing. In Minnesota, the population is growing older. Between now and 2030, the population age 65 and older will grow from 12.1 (in 2000) to 23 percent of the state’s total population. That equals a doubling of the older population from 600,000 to 1.2 million.\(^41\) By contrast, the population under age 65 will grow only 10 percent.\(^42\)


\(^{42}\) Ibid.
The state of Minnesota Office of Higher Education projects that graduation rates for high school students will begin decreasing in 2009, with a 10 percent decline by 2015. The overall decrease does not explain the whole picture. Within that decrease, the number of white high school graduates is projected to decrease by 17 percent. At the same time, the number of students of color is projected to increase by 40 percent, ultimately making up about 20 percent of graduates in Minnesota in 2015. Most of these new graduates will be Hispanic and Black students; many are academically under-prepared. Between 2005 and 2015, the total number of high school graduates in the Twin Cities region is projected to decrease by 7 percent, while the Greater Minnesota area will decrease by 13 percent. The southeast and northeast regions of the state will face the most significant decline.

High school graduation trends will have implications for Minnesota post-secondary institutions. Minnesota is not the only state to experience declines in the region. Iowa, South Dakota, North Dakota, and Wisconsin all are expected to experience a decrease in their high school populations over the next 10 years. Currently 74 percent of undergraduate students enrolled in Minnesota are 24 years old or younger. Presently about 60 percent of Minnesota graduates enroll in post-secondary education. This number has not changed significantly in the last 10 years. Therefore, unless the number of high school students attending college increases, colleges will have a smaller pool of potential students and greater competition to recruit them. Looking at the changing demographics, that increase would need to come from those students traditionally under-represented in post-secondary education, including students from communities of color and students from lower socio-economic situations.

**Generational Issues.** Work patterns across all health professions are changing. Professionals are tending to work fewer hours per week. Additionally, more professionals are working part time than previously. These changes have been linked to increasing numbers of women in the workforce, aging professionals, and lifestyle preferences. Future health care professionals will come from Generations X and Y, which are both smaller in number than the Baby Boomer Generation. Compared to the boomers who placed high priority on their careers and stayed in one profession for their lifetime, Generation Xers and Yers desire work that accommodates their personal and family lives. They often seek flexibility, telecommuting, family leave, and part-time hours, many of which cannot be met by a demanding career in the health professions. Even if the appropriate number of workers were recruited into the workforce, with the generational issues identified, there is no ability to meet current needs, to replace those retiring, or to expand capacity of the health care system.

**Cost of Health Professions Education.** The cost of health professions education continues to increase and has a number of impacts on students, graduates, and health systems. In 2005, at the request of the Health Professions Workforce Taskforce, Peter Zetterberg, University of Minnesota, conducted an instructional cost analysis that yielded the following data on cost per degree in the

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45 Ibid.
46 Ibid.
Academic Health Center. All degree programs within the AHC are listed in the following table. It is important to note that this is a high-level, straightforward analysis that relies on a flat credit hour cost across each school. There is no differentiation of costs by degree level or type within a school. A more sophisticated analysis might attempt that level of analysis.

Aggregating these costs, the Health Professions Workforce Taskforce arrived at estimated **total instructional costs** in 2005 for AHC schools. This figure includes both direct instructional costs and indirect costs, such as the costs of facilities, the library, and central administrative services. Historically, indirect costs have not been covered by schools directly; rather, they have been funded centrally.  

<table>
<thead>
<tr>
<th>Academic Health Center FY 2005 Cost per Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>College/School</td>
</tr>
<tr>
<td>Medical School</td>
</tr>
<tr>
<td>School of Dentistry</td>
</tr>
<tr>
<td>School of Nursing</td>
</tr>
<tr>
<td>Medical School</td>
</tr>
<tr>
<td>School of Dentistry</td>
</tr>
<tr>
<td>School of Public Health</td>
</tr>
<tr>
<td>School of Nursing</td>
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<tr>
<td>College of Veterinary Medicine</td>
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<tr>
<td>College of Pharmacy</td>
</tr>
<tr>
<td>Medical School</td>
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<tr>
<td>School of Public Health</td>
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<tr>
<td>School of Nursing</td>
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<tr>
<td>College of Veterinary Medicine</td>
</tr>
<tr>
<td>College of Pharmacy</td>
</tr>
<tr>
<td>Medical School</td>
</tr>
<tr>
<td>Medical School</td>
</tr>
<tr>
<td>School of Dentistry</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
</tr>
<tr>
<td>College of Pharmacy</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Total AHC School Instructional Costs (FY 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical School</td>
</tr>
<tr>
<td>School of Nursing</td>
</tr>
<tr>
<td>School of Dentistry</td>
</tr>
<tr>
<td>College of Pharmacy</td>
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<tr>
<td>School of Public Health</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

**Student Debt Load.** As a result of increased costs of education, tuition at health professions schools nationally has been on the rise. Therefore, students are graduating with higher levels of debt than ever before. In 2005, the University of Minnesota was identified as the most expensive of 74 American public medical colleges for resident tuition and fees, at $29,638 for first-year students.  

According to the Association of American Medical Colleges, the average educational debt of

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medical graduates of the class of 2006 (including pre-med borrowing) was $130,571. The average debt of graduating medical students increased in 2006 by 8.5 percent over the previous year. The average indebtedness level for 2007 graduates of the University of Minnesota Medical School was $141,691.

Cost has been identified as a major deterrent for application to medical school. In dentistry, the increase in educational debt has been found to affect both career choice and practice location of dentists. Additionally, it is reported that veterinary medicine is more adversely affected by increased student debt than other graduate degrees because veterinarians' ability to repay student loans lag behind other professions. The consequence to the veterinarian profession is that there is a failure to attract the best and the brightest to the profession, and its graduates are limited to invest in personal and professional growth. Trend data for application, admissions, tuition, and debt load are located in Appendix C.

**Emerging professional degree expectations and changing accreditation standards.** Reports such as *To Err is Human: Building a Safer Health System*, *Crossing the Quality Chasm*, and *Health Professions Education: A Bridge to Quality* have described a health care system that demands highly trained, competent professionals with the educational preparation that allows them to adapt to increasing complexity in their professional roles. In response, professional organizations and associations have pushed for changes in accreditation standards. Accreditation and/or credentialing agencies have in turn mandated higher-level qualifications for professionals. As a result, higher education institutions must respond with new educational programs. This phenomenon is defined as increased degree or credential requirements for entry into a field or profession.

Pharmacy, nursing, physical therapy, and occupational therapy have already undergone this upward climb in credentialing. To maintain accreditation, schools and colleges of pharmacy were required to implement a doctor of pharmacy degree program by July 1, 2000. The Commission on Accreditation of Physical Therapy Education curtailed accrediting bachelor's degree programs on Dec. 31, 2001, and by 2020, all physical therapists will be doctors of physical therapy. In occupational therapy, all programs were required to be at the minimum of a master's level as of January 1, 2007. By 2015, the doctor of nursing practice will be the required degree for national certification for advanced nursing practice. Other health professions such as dietetics, respiratory therapy, and dental hygiene are considering raising their level of credentials.

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The full impact of increased credentialing across the professions is yet unknown as no comprehensive studies have been conducted validating the cost/benefits of increased educational requirements in the health professions. However, critics have identified exacerbated workforce shortages, decreased workforce diversity, greater need for educational capacity and faculty, lower job satisfaction, increased debt load of graduates, higher health care costs, and limited access in rural areas as possible results to this movement.  

**Faculty Workforce Shortages.** The ability to train future generations of health professionals is directly tied to the number of available faculty. Worsening faculty shortages in academic health centers across the nation are threatening the nation’s health infrastructure. In a survey of academic health centers, 94 percent of the responding CEOs indicated that faculty shortages were a problem in at least one of their health professions schools. Factors cited for faculty shortages included low levels of interest in academic careers among those entering health professions; heavy faculty workloads; sharp disparities in salaries between academic and private practice or industry; the cost of education and high incidence of debt among graduates; and, in the case of nursing, late point of entry into faculty careers. Reporting institutions have responded differently to faculty shortages, including merging programs, cutting programs, offering more on-line learning, and lowering enrollment. Nursing is the profession most often cited as being negatively impacted by faculty shortages. For example in 2003, U.S. nursing schools turned away 15,944 qualified applicants into entry-level baccalaureate programs due to insufficient numbers of faculty, clinical sites, classroom space, clinical preceptors, and budget constraints. Faculty shortages across all professions limit academic health centers’ abilities to produce sufficient numbers of professionals to meet the current demands and to address the future health care needs of the nation.

**The Role of the University of Minnesota Academic Health Center**

The University of Minnesota Academic Health Center is one of the largest in the world. The University educates two-thirds of Minnesota’s health professionals. As a Research I institution, the Academic Health Center has a major responsibility to develop the academic health professions workforce in Minnesota, the region, and nation. The AHC is made up of six health professions schools: dentistry, nursing, pharmacy, public health, veterinary medicine, and medicine. Pharmacy and medicine also have a presence on the Duluth campus. Nursing and allied health have a presence on the Rochester campus. The newly formed Center for Allied Health Programs is home to clinical laboratory science and occupational therapy. Other allied health programs include mortuary science, genetic counseling, and physical therapy in the Medical School and dental hygiene in the School of Dentistry. In 2007, the Academic Health Center had a total of 5,690 health professional students, 16 graduate programs, and 840 medical residents. Since 2000, every AHC program and school has increased class size to meet Minnesota’s health professions workforce needs.

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55 Moskowitz, M.C. Academic Health Center CEOs Say Faculty Shortages a Major Problem. Association of Academic Health Centers. 2007.
56 Ibid.
### Academic Health Center Schools Applicants and Matriculants
#### 2000 and 2007

<table>
<thead>
<tr>
<th>AHC School/Program</th>
<th>2000 Applicants N</th>
<th>2007 Applicants N</th>
<th>% Change</th>
<th>2000 Matriculants N</th>
<th>2007 Matriculants N</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>School of Dentistry</td>
<td>702</td>
<td>855</td>
<td>+ 22%</td>
<td>86</td>
<td>95</td>
<td>+ 10%</td>
</tr>
<tr>
<td>Medical School</td>
<td>2604</td>
<td>4423</td>
<td>+ 70%</td>
<td>219</td>
<td>241</td>
<td>+ 10%</td>
</tr>
<tr>
<td>College of Pharmacy</td>
<td>263</td>
<td>1163</td>
<td>+ 342%</td>
<td>104</td>
<td>162</td>
<td>+ 56%</td>
</tr>
<tr>
<td>School of Nursing (BSN)</td>
<td>N/A</td>
<td>527</td>
<td>--</td>
<td>95</td>
<td>130</td>
<td>+ 37%</td>
</tr>
<tr>
<td>Other Nursing</td>
<td>189</td>
<td>446</td>
<td>136%</td>
<td>151</td>
<td>195</td>
<td>+29%</td>
</tr>
<tr>
<td>School of Public Health</td>
<td>667</td>
<td>1042</td>
<td>+ 56%</td>
<td>185</td>
<td>357</td>
<td>+ 93%</td>
</tr>
<tr>
<td>College of Veterinary Medicine</td>
<td>1036</td>
<td>916</td>
<td>- 12%</td>
<td>76</td>
<td>90</td>
<td>+ 18%</td>
</tr>
</tbody>
</table>

(N/A = not available)

A primary focus of the schools of the Academic Health Center is to educate and train the next generation of health professionals. The care-delivery system has recognized the need for health professionals who understand systems and their roles in them, make decisions based on evidence and best practices, use electronic systems, value and promote patient-centered care, and can effectively work with other providers as needed. Therefore, training or lecturing to each profession in isolation from the others is no longer adequate. Academic health centers need to create the structures and team approaches to care that focus on improving health. The benefits of a more coordinated and cohesive effort include cost efficiencies as well as improvements in quality, health status, and linkages across research.\(^{58}\)

In 1999, the Academic Health Center recognized the growing and looming health professions workforce challenges in Minnesota and initiated systematic deployment of a number of strategies to meet the health care workforce need. This comprehensive system includes:

- Addressing youth’s low awareness and preparedness for health careers
- Enhancing multiculturalism in the health professions to serve the changing Minnesota population
- Assuring an adequate supply of health professionals in the state of Minnesota
- Improving distribution of health professionals by linking AHC students to practice opportunities in medically underserved Minnesota communities
- Linking health professions education with community health

Specific strategies include: developing “pipeline” or “pathway” programs for K–16 recruitment into the health professions through the establishment of the Health Careers Center and individual health professions school programming; increasing class size in targeted health professions schools; strengthening programs to influence the retention of graduates in Minnesota, specifically the distribution of health professions in underserved areas of Minnesota; and, educating a “new” health professional for new models of care. Since 2000, the Academic Health Center has received state and federal investments to specifically invest in a number of health profession workforce initiatives. (Appendix D)

\(^{58}\) Brandt, B.F., Cerra, F.B. Building a Sustainable Environment for Interprofessional Education within the University of Minnesota Academic Health Center. Association of Academic Health Centers. 2004.
In 2006, the AHC deans committed to strengthen interprofessional collaboration to address a number of powerful forces and currents, including the need to improve the quality and safety of health care; the need to have more efficient care delivery with decreased cost and improved value; market place, consumer, and student demand; the importance of interdisciplinary/interprofessional education and research activities to *Transforming the U*; the shift in this direction by accrediting bodies in their definition of competencies and capabilities; the recognition that teaming is a learned behavior and needs a planned approach in a learning environment; and, the call for accountability and demonstrating the value of how we are educating health professionals. The deans recognized that strengthening interprofessional education and new models of care delivery will also help forecast workforce needs and impact workforce planning.\(^{59}\)

**Snapshot of Academic Health Center Schools**

**School of Dentistry\(^{60}\)**

Recognizing its partnership with other key stakeholders in the battle to ensure access to oral health care for Minnesota’s residents, the School of Dentistry has chosen to work with the legislature, organized dentistry, consumer advocates, and the dental insurance industry to explore ways in which both short- and long-range strategies can be developed to maintain an appropriate workforce which will ensure access to care. Driving this strategic planning effort is the spectre of the 1960s-80s when health professional schools were subjected to the significant changes of state and federal policies. Developed in reaction to workforce shortages and surpluses, those policies caused enrollments to be expanded, then contracted, schools constructed, then closed; through it all, maldistribution problems persisted, and disease went unattended. The School of Dentistry is now implementing a balanced, controllable, and responsible workforce monitoring and training program which focuses on a long-term, stable supply of dental care providers equitably distributed across the state.

To accomplish this goal the school has started a number of initiatives. Ensuring the state has a skilled and adequate dental workforce is the highest priority of the School of Dentistry. The school has trained 77 percent of the state’s active practicing dentists and continually strives to increase the effectiveness of this workforce.

To help address the issue of available providers, over the past 10 years the school has increased the size of its first-year class by 12 percent (from 86 to 96). Additionally, in 2006, the school launched a program, Program for Advanced Standing Students, for internationally educated dentists and accepted 10 students with advanced standing. Students are enrolled in this program for two years, offering a more flexible approach to increased enrollment and making it possible to respond more quickly to changing workforce needs than is possible with a traditional four-year dental curriculum.

To address access to dental care challenges and to influence the distribution of the dental workforce in underserved Minnesota communities, the school expanded community-based education experiences for students. Beginning in 2007, the school increased the length of time its students are required to participate in extramural community-based rotations outside the School of Dentistry.

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\(^{59}\) University of Minnesota Academic Health Center Deans Council Leadership Statement on Interprofessional Education, December 12, 2006

clinic from two to eight weeks. These rotations occur in clinics that are affiliated with the school and are in urban and rural areas of the state. Many of these experiences are located in or near some of Minnesota’s areas of highest need for access to dental care.

The state’s dentist-to-population ratio is 1:1,693 overall. There are counties with ratios much higher (some as high as 8,000 people per dentist) and others much lower (nearly 1,200 people per dentist), but such figures are often misleading since “dental trade areas” are such that people often cross political boundaries to obtain care. Suffice it to say that geographic disparities do exist and need to be addressed. The school’s outreach programs expose students to lifestyles and practice opportunities that could be considered upon graduation, many of them in or similar to areas where provider shortages are most severe. While on these rotations to support the AHC K–16 pathway recruitment, students actively promote careers in dentistry to patients they care for, at schools within the community and at other locations where the opportunity presents. These outreach rotations will also instill a sense of professional responsibility to the underserved, which could carry over to the professional lives of students upon graduation.

Within the Twin Cities, the School of Dentistry is in the process of developing a hospital-based clinic with University of Minnesota Medical Center, Fairview. This clinic will provide access to hospital-based dental services for the underserved from the metropolitan area and be a home for a School of Dentistry–affiliated general practice residency in dentistry, which should attract quality dental graduates from other schools in the country, a certain percentage of whom may decide to make Minnesota their home after completing their training.

The school has taken substantial steps to enhance the diversity of its student body. By consolidating a number of smaller, privately funded scholarships, it has been able to offer awards to underrepresented students. The school’s program for internationally educated dentists has also had a positive impact. Of the 16 students enrolled in the program, 70 percent are students of color, many of whom originate from countries with significant representation in the state. The recent appointment of an assistant dean for admissions and diversity has further promoted diversity in the school. This new faculty member has been charged with developing an effective diversity recruitment plan, studying the effectiveness of measures taken to promote diversity, and recommending other approaches to build on its successes.

Future directions the School of Dentistry will take to support the workforce needs of the state will need to be based on reliable, comprehensive, and longitudinal data. For the past 20 years, the school has surveyed students upon graduation regarding their career plans (Post-Graduate Plans Survey). The school’s current effort to monitor graduate plans and career decisions is based not only on those surveys, but also on data drawn from Board of Dentistry licensing files, from School of Dentistry Annual Alumni Survey files, and other sources. The table below condenses much of this information for the most recent five-year period. One should note that data for 2006 and 2007 are somewhat less stable than those for earlier years due to early career movement by graduates as they complete military commitments, advanced education, and clinical associateships. However, the dramatic jump in retention of graduates (roughly 55 percent during 2003-2005 to 70 percent in 2006) suggests that the school’s efforts are beginning to have an impact. These include promoting in-state practice opportunities through outreach and community-based service-learning experiences, through enhanced professional mentoring, and through an improved practice management curriculum are beginning to have an impact. Interestingly, some 30 percent of 2003-2005 graduates
have chosen to practice outside the seven-county metropolitan area, with the majority of these dentists choosing to practice in towns with populations less than 15,000. This is in stark contrast to the “conventional wisdom” about where dentists are likely to locate and again tends to support the value of School of Dentistry outreach and community-based educational experiences.

Furthermore, and perhaps more graphically, the chart below displays the dispersion of School of Dentistry graduates, comparing the number of students coming from an area relative to the number of graduates returning to that area. Rather than dealing with raw numbers, the chart portrays the net change expressed as a percentage of the total class size. Thus, in 2006, 65 percent of the graduating class came from Minnesota, but 79 percent chose to remain in the state, resulting in a net gain of 14 percent.

<table>
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<tr>
<th>Graduating class</th>
<th>2003</th>
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<th>2005</th>
<th>2006</th>
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<td>50</td>
<td>54</td>
<td>55</td>
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<tr>
<td>Out-of-state</td>
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<td>30</td>
<td>34</td>
<td>30</td>
<td>36</td>
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<table>
<thead>
<tr>
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<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tr>
<td>Located in MN</td>
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<td>45</td>
<td>50</td>
<td>60</td>
<td>51</td>
</tr>
<tr>
<td>Located elsewhere</td>
<td>31</td>
<td>33</td>
<td>34</td>
<td>10</td>
<td>39</td>
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<td>Clinical service in the military</td>
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<td>4</td>
<td>3</td>
<td>2</td>
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<td>0</td>
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<th>2006</th>
<th>2007</th>
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<td>Programs in MN</td>
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<td>15</td>
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<td>9</td>
</tr>
<tr>
<td>Programs elsewhere</td>
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<table>
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<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
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<td>7</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

* As noted in the narrative, movement in the years immediately following graduation often makes it difficult to track recent graduates. Many of these “unknowns” may be in the process of locating in Minnesota and not yet have been captured by our monitoring system.
Dispersion of Dental School Graduates, 2000-2007

As indicated in the legend, the blue line portrays the gains and losses experienced by Minnesota, the red line the gains and losses of the four state region (WI, ND, SD, and MT), and the green line, the remaining areas from which recruits have been drawn and to which graduates go. When the same number of persons is returning to an area as came from it, the net change would be zero.

Workforce studies conducted in the school in the 1970s concluded that it is not possible to predict students’ ultimate practice location at the time of graduation. Most studies have shown it takes
several years before definitive conclusions can be drawn about practice location decisions. For example, more than 10 percent of recent graduates enter the military or public health service for a two- to three-year commitment. Such opportunities have attracted a greater degree of student interest over the past few years because of loan repayment programs and the chance to gain additional clinical instruction and experience to better prepare students for practice. Anecdotal evidence suggests that many such graduates return to practice in the state. To help deal with the shortfall of information about recent graduates’ practice destinations, two years ago the school independently initiated a survey of its alumni who had graduated within the past 10 years. Early returns of the alumni survey indicate a significant correlation between size of hometown and size of practice community. It is also noteworthy that increasingly larger percentages of our graduates are choosing to practice in Minnesota. Other data from the survey will help us understand the complex role of gender differences in the profession and the growing importance of marriages in which there are dual professional careers. As this survey process matures and the data can be followed over time, it should better inform the school’s administration in making decisions to meet the needs of the citizens of the state.

Within the last several years since strategically focusing programs on practice in underserved areas, an increasing number of School of Dentistry graduates have selected practice opportunities in areas of the state considered access-challenged.

As a final observation, it should be noted that in addition to its role as a primary facility for training dental professionals, the School of Dentistry offers a unique combination of tertiary dental services, including all of the board-recognized specialty services, orofacial pain management, and a full spectrum of treatment for cleft palate, among other unique services. Additionally, the School of Dentistry was the number one dental school in the nation in 2007 in terms of the number of dental providers enrolling in continuing education courses. More than 6,700 individuals turned to the University of Minnesota School of Dentistry for their continuing professional development, the majority from Minnesota and the Upper Midwest, reaffirming the pivotal role the school plays in ensuring the oral health of the residents of Minnesota and the north central plains.

Medical School

The University of Minnesota Medical School has a historical commitment to training the Minnesota physician workforce for primary and specialty care medicine. From 1990-2007, slightly more than 50 percent of University of Minnesota graduates entered primary care residencies and practice (family medicine, internal medicine, pediatrics, and obstetrics-gynecology).

According to the Association of American Medical Colleges, Minnesota’s track record in retention of Medical School graduates and residents in the state is notable. Minnesota ranks ninth in the nation for retaining practicing physicians who completed medical school in-state, retaining just over 50 percent of all medical school students compared with the nation’s median of 39 percent. Additionally, Minnesota ranks seventh in the nation for active physicians in the state also completing residencies/fellowships within the state. Nearly 55 percent of all active physicians were trained in the state. The nation’s median is 44.7 percent with 40 states falling below that median.

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More than 70 percent of Minnesota residents who attend the University of Minnesota Medical School remain in Minnesota after completing their education. Minnesota also benefits from Wisconsin and North Dakota residents who attend school at the University. Sixty percent of Wisconsin residents who complete their education at the University of Minnesota remain in Minnesota to practice; 40 percent, North Dakota.

From 2003 to 2007, at the University of Minnesota Medical School, the percentage of students selecting primary care has declined slightly. Because the number of medical school students has increased at this same time, the absolute number remains approximately 100 graduates who enter primary care annually. In absolute numbers and percentage of the graduating class, the Twin Cities-based students selecting primary care has remained relatively constant [2003, 70 (45.2 percent); 2007, 68 (39.5 percent)] while the steepest decline in interest has been experienced in Medical School-Duluth students [2003, 34 (68.0 percent); 2007, 29 (54.8 percent)]. Compared with other medical schools, this decline in interest is not as steep as the “exodus from primary care”, or a 50 percent reduction in students selecting primary care as reported nationally.

One University of Minnesota program, the Rural Physician Associate Program (RPAP), has a long track record of addressing a shortage of primary care physicians in rural Minnesota since 1971. RPAP, a nine-month elective immersion program for third-year medical students, has trained students in rural communities. Features of this program include:

- Thirty to forty students are placed each year in Minnesota communities.
- 1,200 students have completed the program in 110 communities that range in population from 1,000 to 30,000.
- 597 physicians who completed the RPAP program currently practice in Minnesota—63 percent of those (361 physicians) practice in rural communities.
- Of those 362 physicians, 61 percent practice in Minnesota communities with populations less than 20,000.
- 81% of RPAP physicians selected primary care specialties (family medicine, internal medicine, pediatrics, and obstetrics and gynecology); 67%, family medicine.

Experience demonstrates that communities that have engaged with medical students during rotations and stayed in touch with them after they leave the community where they trained have benefited long-term.

The RPAP is now on the third generation of former RPAP students who have become preceptors to other RPAP students, who are now teaching RPAP students. Two hundred fifty-six former RPAP students are practicing in current RPAP sites.

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64 Rueben, 2007.
65 Medical School response to request for specific data for the Health Professions Workforce Taskforce, University of Minnesota Strategic Positioning, 2006.
As noted in the 2006 Health Professions Workforce Report, several issues confound understanding primary care medicine and projecting future needs for Minnesota. These include: new models of care, incorporating teams of health professionals such as clinical pharmacists and advanced nurse practitioners; reimbursement rates; the growing uninsured populations; reduced number of hours worked by women; future generational issues related to work-week hours; salary differentials between female and male physicians; salary differences between primary care physicians and other specialties; salary differentials between rural and urban physicians; and, role of international medical graduates. Trends to note include:

One-quarter of all physicians in Minnesota is older than 55 and will likely reach retirement age within the next 10 years.

In the past two decades, the proportion of female physicians has grown steadily in Minnesota, with females currently accounting for 23.2 percent of the workforce and 31.6 percent of physician residents.

On average, male physicians work more hours than female physicians in Minnesota. Males work an average of 49.25 hours per week compared with females who work an average of 43.77 hours per week.67

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MEDICAL STUDENT MATCH DATA

All University of Minnesota Medical Students
Primary Care Positions

<table>
<thead>
<tr>
<th>Year</th>
<th>Residency</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Int Medicine</td>
<td>15.6%</td>
<td>35</td>
<td>17.8%</td>
<td>40</td>
<td>22.4%</td>
<td>30</td>
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<td>33</td>
<td>17.1%</td>
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<tr>
<td></td>
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<td>17.3%</td>
<td>39</td>
<td>15.6%</td>
<td>35</td>
<td>17.9%</td>
<td>40</td>
<td>21.2%</td>
<td>44</td>
<td>22.9%</td>
<td>47</td>
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<tr>
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<td>Pediatrics</td>
<td>5.8%</td>
<td>13</td>
<td>8.4%</td>
<td>19</td>
<td>6.3%</td>
<td>14</td>
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<td>18</td>
<td>7.8%</td>
<td>16</td>
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<tr>
<td></td>
<td>Med/Peds</td>
<td>4.4%</td>
<td>10</td>
<td>4.0%</td>
<td>9</td>
<td>2.2%</td>
<td>5</td>
<td>2.9%</td>
<td>6</td>
<td>1.5%</td>
<td>3</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Primary Care</td>
<td>43.1%</td>
<td>97</td>
<td>45.8%</td>
<td>103</td>
<td>48.8%</td>
<td>109</td>
<td>48.7%</td>
<td>101</td>
<td>50.8%</td>
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Students who did first two years on Duluth Campus
Primary Care Positions

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<th>Year</th>
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<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
<th>% of Class</th>
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<tr>
<td></td>
<td>Int Medicine</td>
<td>15.1%</td>
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<td>18.9%</td>
<td>10</td>
<td>17.5%</td>
<td>10</td>
<td>6.5%</td>
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TC Students
Primary Care Positions

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<th># Matched</th>
<th>% of Class</th>
<th># Matched</th>
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<td>15.7%</td>
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<td>44.4%</td>
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<td>49.7%</td>
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**School of Nursing**

Recognized for its graduate and research programs, the University of Minnesota School of Nursing plays a unique role in Minnesota’s nursing profession. The school has the state’s largest graduate and professional nursing education program, preparing master’s and doctoral graduates for practice and teaching in higher education. Health care ethics is a cornerstone in all of its academic programs. The school prepares approximately 55 percent of all nursing faculty in the state of Minnesota.

The University of Minnesota School of Nursing is addressing both the supply and distribution in the nursing workforce, by increasing class sizes, offering distance education options, and employing strategies for clinical rotations across Minnesota. The school is taking the lead on organizing a statewide initiative to address nursing workforce issues and higher education response. Since 2000, the student body has grown by 72 percent, from 477 to 808 students in 2007. Fifty-three percent of these students are seeking graduate and professional degrees. With funding from the Minnesota State Legislature, the school expanded its baccalaureate degree program to Rochester in 2003. From 2004 to 2007, the total number of Rochester graduates is 92. Forty-eight, or 52%, of the graduates have reported their practice locations. Of those, 46 graduates are currently in Minnesota, with thirty B.S.N. Rochester graduates, or 35% of the graduates, reporting they are employed by Mayo Health System.

In 2006, the school created a new vision for nursing education, articulating a pathway from baccalaureate and master preparation to two terminal degrees, the doctor of philosophy (Ph.D.) and the doctor of nursing practice (D.N.P.). Notably, the school is a leader in developing a new 18-month professional master’s degree (the master of nursing), preparing baccalaureate graduates in non-nursing fields for nursing degrees. In alignment with the new vision for nursing is refocusing the baccalaureate of science of nursing (B.S.N.) program to prepare graduates as leaders and to engage in an expedited pathway to doctoral preparation.

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**University of Minnesota School of Nursing Vision for Nursing Education**

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The School of Nursing is recognized campus-wide for leadership in technology-enhanced learning initiatives and accessibility of nursing education in the state, nationally, and internationally. Currently, 100 percent of the School of Nursing courses have an online presence. Fifty percent of the school’s courses are fully on-line, and the post-masters doctor of nursing practice program is entirely online. Clinical placements in experiential education are made throughout Minnesota.

The school has a number of innovative initiatives to address new care delivery models, diversity, and nursing research. In collaboration with the School of Public Health, the School of Nursing was awarded a $2.7 million federal grant to establish the Minnesota Emergency Readiness Education and Training (MERET), a statewide effort to help communities prepare for public health and bio-terrorism emergencies. Recently, the school received funding to establish a John A. Hartford Center for Geriatrics Education.

A high percentage of School of Nursing graduates stay in Minnesota to practice. A 2004 survey of B.S.N. graduates indicated that one year after graduation, an average of 83% of the graduates were employed in Minnesota; five years after graduation, more than 90 percent were still practicing in Minnesota. The master of nursing (formerly the post-baccalaureate in nursing certificate) graduated 123 nurses from December 2003 to December 2006. In December 2007, an additional 39 students graduated with the M.N. and have not yet taken the National Council of
Licensing Examination to become registered to practice. Of the 123, 17 were men (13.8%) and 8.5% identified themselves as ethnic minorities. Of the 123, at least 20 are employed by Fairview (UMMC or Southdale). Another 20 indicate other Minnesota practice locations; five have moved out of state, with three of those in advanced nursing degree programs. Of the 123, at least 48 have completed or are currently enrolled in the M.S., D.N.P., or Ph.D. program here or at another institution.

In all educational pathways, the School of Nursing is undergoing significant transformation in creating clinical nurse leaders who are prepared for contemporary practice. As a result of leadership in innovative, hybrid curricula, the programming reach of the school creates a nursing workforce for Minnesota while developing academic relationships world-wide.

**College of Pharmacy**

Over the past 15 years, the pharmacy profession has transformed its focus from drug product to clinical management of medication therapy. Pharmacists are incorporated into the health care team as clinicians who provide cost-effective and patient-centered care. Nationally and at the University of Minnesota, pharmacy education has changed in response to new competencies and accreditation standards to create a doctorally educated “generalist” pharmacist. These standards established the doctor of pharmacy degree as entry level rather than the baccalaureate degree.

Concurrently, the demand for pharmacists increased, creating workforce shortages throughout the United States. In response, the University of Minnesota College of Pharmacy expanded class size by creating a class of 50 students per professional year on the University of Minnesota, Duluth campus. A primary goal of this program expansion is to graduate pharmacists who will practice in Greater Minnesota. The College of Pharmacy consistently recruits students from Minnesota communities. More than 70 percent of entering students are from Minnesota. Rural student admissions have increased by 223 percent since 2002. During the 2006 and 2007 academic years, 79 students were placed in rural Minnesota communities for clinical education.

To further encourage graduates to consider practicing in rural Minnesota, most of the focus of expansion in the pharmacy experiential program was on Greater Minnesota. To assist practices in providing quality education, to coordinate student group educational activities, and to simplify housing acquisition, a regional model of experiential administration was developed. Seven regions in Greater Minnesota were established with a half FTE regional education coordinator in each. These coordinators have established close connections with preceptors and practice sites and facilitated program and preceptor development (through a videoconferencing network) as the program increased the number of student rotations completed in Greater Minnesota from approximately 40 in 2002-03 (at 25 sites) to 400 in 2006-07 (at 80 sites).

Of the 157 May 2007 graduates, 120, or 76.4 percent (77, Twin Cities; 37, Duluth) have reported their practice locations. Thirty graduates (21, Twin Cities; 9, Duluth) report that they will pursue post-graduate education in pharmacy residencies, three of these in Greater Minnesota. Of the 90 who entered the workforce, 25 graduates, (23 percent of those reporting) have taken positions in Greater Minnesota. Of these students, 22 (88 percent) report rural backgrounds, validating the
fact that students with rural backgrounds and training in rural areas are more likely to practice in rural areas.

Additionally, the College of Pharmacy delivers more than 15 online educational programs annually to pharmacists throughout the state and beyond. These courses have focused on medication therapy management and other topics aimed at increasing pharmacists' ability to meet patients' medication-related needs. In particular, the college has been actively involved in preparing pharmacists for immunization delivery with more than 500 pharmacists and 600 students now trained.
School of Public Health

The Minnesota Department of Health is the largest employer of public health workers in the state at 1,368 employees, 78 percent of which are considered professional staff and upper management. The average age of professionals at the Minnesota Department of Health is 46.2. Almost 40 percent of professional staff is eligible for retirement in the next 10 years. In response, the School of Public Health has increased student enrollment to graduate public health professionals to meet Minnesota’s needs. As a result, student enrollment is now more than 1,000, up from 346 in 1999. Of the 359 School of Public Health graduates from 2003-2007, 255 (71%) of those awarded the master of public health (M.P.H) and the Ph.D. are employed in Minnesota.

The Centers for Public Health Education and Outreach (CPHEO) is the school’s central platform for professional outreach and continuing education for public health workforce, including Greater Minnesota. Distance learning through Internet, Webcast, and podcast technologies and short institutes enable the school to provide high-quality coursework to adult and distance learners whose life and work situations may preclude regular campus-based and classroom attendance.

- Coursework has expanded from 86 courses serving 1,483 registrants in 2000 to 263 courses serving 36,661 registrants in 2006.
- Through partnerships with regional health departments and universities, the school has become the chief platform connecting public health education, research and practice in Minnesota, Wisconsin, and North Dakota.
- The reach of programming is extensive and throughout the United States.
- The School of Public Health is a leader in the University, is rapidly expanding programming globally, and will be a leader in the Digital Campus expansion.

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69 Ibid.
College of Veterinary Medicine

The College of Veterinary Medicine is one of the nation’s premier centers for the study of animal and human health. The close proximity to the Medical School, the College of Biological Sciences, the College of Food, Agricultural, and Natural Sciences, and the School of Public Health ensures many collaborative opportunities for faculty and students that benefit Minnesota and the nation. It is estimated that 80 percent of Minnesota veterinarians were trained at the University of Minnesota College of Veterinary Medicine.

In addition to preparing the next generation of veterinarians and biomedical scientists, the college has the largest combined D.V.M./M.P.H. program in the nation and has the only accredited veterinary public health residency program in the world. These programs help address the critical shortage of public health-trained veterinarians. As the incidence of infectious diseases such as avian influenza and tuberculosis (TB) increase internationally, the intersect between public health and veterinary medicine is critical to protecting the health and well-being of people and animals. This research and education focus makes the University of Minnesota programs truly unique and recognized throughout the world.

Students are engaged in community-based projects: Beginning in 2003, the college partnered with the Minnesota Department of Natural Resources and Board of Animal Health to provide surveillance for chronic wasting disease. Each year 50-100 veterinary students collect samples from deer during the hunting season in all regions of the state to process for testing. In 2006, this
partnership was expanded to include TB testing. Veterinary public health residents have participated in planning a number of educational seminars that are delivered to external groups.

Two University centers are focused on the safety and security of the nation’s food systems. The Center for Animal Health and Food Safety contributes to the safety and security of the global food system and significantly strengthens the nation’s ability to anticipate and respond to emerging issues and imminent threats from animal and foodborne illnesses. The Center for Food Protection and Defense was named one of three Homeland Security Centers of Excellence in 2004 by the U.S. Department of Homeland Security. The center received a three-year, $15 million grant to help develop ways to protect the nation's food supply from deliberate contamination or terrorist attack.

The University of Minnesota received the two largest grants ever to be awarded for animal disease research from the United States Department of Agriculture. The grants, totaling $8.8 million over four years, are to study Johne’s disease in cattle and porcine reproductive and respiratory syndrome in swine.

Through the Center for Animal Health and Food Safety a number of initiatives have been completed or are in progress with faculty and public health residents working closely with government agencies and industry. Examples include: avian influenza response planning, risk assessment in TB herds, dairy beef residue avoidance, backyard poultry flocks, and multiple educational programs. In addition, public health residents through the Centers for Public Health Education Outreach have addressed such topics as infectious disease related to animal production, livestock industry worker health, and healthy farm families.

In attempt to address the growing demand for large animal veterinarians, the VetFAST (Veterinary Food Animal Scholars Track) program was initiated with the Animal Science Department during the 2003-04 academic year as an early decision program for students interested in a career in food-animal veterinary medicine. Students are admitted during their freshman year of college and complete their bachelor’s and doctorate in veterinary medicine in seven years instead of eight years. The qualified student applicant pool has increased each year. Two students were accepted for fall 2004 admission. Twelve students have been accepted to start the program fall 2009.

VetFAST Summary of Applicants for Early Decision Admission 2004-2009

<table>
<thead>
<tr>
<th>Applications</th>
<th>Total Apps Rcvd by AnSci</th>
<th>Complete Vet Med App</th>
<th>Interviewed</th>
<th>Admitted</th>
</tr>
</thead>
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<tr>
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<td>4</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Fall 2009</td>
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<td>17</td>
<td>15</td>
<td>12</td>
</tr>
</tbody>
</table>

The college uses targeted recruiting to attract rural students at college campuses outside of the Minneapolis/St. Paul metropolitan area who have an interest in large animal medicine including participation in the “University on the Prairie” program coordinated by the Southern Minnesota Area Health Education Center office which targets rural high school students, exposing them to careers in health care, engineering, environment science, and veterinary medicine.

**Center for Allied Health Programs: The Technology Learning Platform**

The Center for Allied Health Programs (CAHP), an emerging academic unit within the Academic Health Center, was created by the Board of Regents in July 2006. The aim of the center is to address workforce shortages in key allied health disciplines in the state through innovative, accessible, technology-enhanced curricula. A key feature of the center is its plan for multiple performance sites distributed throughout the state and offered with regional partners in higher education and industry. These performance sites will include program faculty and laboratories for face-to-face educational interaction to supplement online, technology-based educational strategies.

Two performance sites are now operational, including the Twin Cities (University of Minnesota Twin Cities campus) and the University of Minnesota-Rochester (UMR), a new coordinate campus of the University of Minnesota. Currently, the center is focusing on clinical laboratory sciences (CLS) and occupational therapy (OT), with additional disciplines expected to be added in the future. Both programs are aggressively developing new blended or hybrid curricula that mix interactive Internet-based learning with traditional face-to-face instruction. The occupational therapy program is operational at both Rochester and Twin Cities performance sites, and the CLS program is slated to supplement its Twin Cities enrollment with operations in Rochester beginning in August 2008. Each program is partnering with UMR and Winona State University (WSU) to provide innovative shared curricula in order to maximize accessibility and foster career progression from two-year to four-year degrees.

Clinical laboratory science is the current nomenclature used for the diagnostic laboratory workers who used to be known as medical technologists and who specialize in hematology, chemistry, microbiology, and molecular biology. There are currently two levels of certification within the field. Four-year degree graduates are known as either certified medical technologists or clinical lab scientists (MT/CLSs). Two-year graduates are known as medical laboratory technicians (MLT).

Occupational therapists are health care professionals who specialize in habilitation and rehabilitation, focusing on assisting patients with functional performance limitations to develop or regain the skills necessary to participate in activities and tasks of everyday life. The term occupation refers to everyday pursuits of living, and is not limited to work-related rehabilitation, although some therapists specialize in that area. Occupational therapy also has two recognized levels of entry, with certified occupational therapy assistants graduating at the two-year level, and occupational therapists entering the field at the master’s or clinical doctoral levels.

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**Workforce Profile in Clinical Laboratory Sciences.** Despite a growing demand for laboratory workers, there are serious shortages in labor supply in the United States. The American Society of Clinical Laboratory Scientists (ASCLS) convened three summits since 2001 to develop strategies to address the growing national shortage. Bureau of Labor Statistics (BLS) data reports that the combined need for new and replacement technicians and scientists is 15,000 per year, but schools only graduated 5,000 students in 2005. The need for technicians is only slightly greater than the need for lab scientists because of the high incidence of retirements among workers who are further along the lab career pathway. One strategy for addressing shortages is to foster career progression from the two-year technician level to the technologist level.

This national demand for clinical laboratory workers is similar in Minnesota. Based on 2002 data from the Minnesota Department of Employment and Economic Development (DEED), clinical laboratory technicians accounted for 1,831 workers at a median annual salary of $47,698. Despite the relatively limited numbers of these workers, technicians were in high demand with a projected 33 percent increase or demand for 612 net new jobs in the state by 2012. When projections for retirements are considered, there is a local need for at least 1,000 new technician positions, as well as an equal number of lab scientists.

Individual employers within the Twin Cities have shown a strong demand for clinical laboratory workers. For example, Allina Hospitals and Clinics, Minnesota’s largest health care employer and among the 10 largest in the nation, reports its lab workforce is disproportionately impacted by retirements compared with other jobs, including nursing. Eighteen percent of its lab workforce is over age 55, 39 percent of those over 55 work in management positions, and 14 percent are retirement-eligible as of 2006. Allina Health System’s hiring data for lab technicians shows 80 hires in 2007, growing to a projected 341 by 2010 and 684 by 2015.\(^2\)

There is also a limited capacity of educational institutions to sustain or grow their programs. According to the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), the number of accredited lab technician programs has dropped from 241 programs in 2003 to 224 in 2007. In Minnesota, there were nine accredited programs producing 146 lab scientists in 1985. In 2005, there was only one NAACLS-accredited program producing eight graduates. Despite strong demand and school waiting lists that exceed available classroom seats by a 3:1 ratio, many educational institutions have been forced to drop programs for several reasons, including extensive clinical rotation requirements totaling 720 hours (the highest of any two-year program for health care workers), a shortage of available rotations, a shortage of available faculty, and the costly nature of laboratory equipment and facilities. The declining workforce supply and school enrollments coupled with increased workforce demand signify an urgent need to expand capacity and innovative educational models to build the workforce. With its expansion, the CAHP will double the University’s capacity to produce MT’s before the end of 2008.

**Workforce Profile in Occupational Therapy.** Historically, there has consistently been a very strong demand for occupational therapists nationally since the field’s inception in 1921. This trend was broken for a period in 2000-2004, when enrollments at many of the 150 accredited programs for occupational therapists in the United States were well below capacity. Today,

\(^{72}\) Source: Mary Clem, Allina Health Systems.
within the national workforce some employers are again offering signing bonuses, and enrollments at accredited programs are reaching capacity.73

According to a report published by the American Occupational Therapy Association (2007), the total occupational therapy workforce is estimated to be 118,500. Eighty percent (90,500) of this workforce consists of occupational therapists, of which 95% are women. Thirty percent of therapists work in schools, while 23% work in hospitals and about 17% in nursing facilities and an equivalent proportion providing outpatient services in clinics and in home health care.74

Jobs are projected to continue growing due to the aging population and its emphasis on remaining active, increases in the number of children with autism and other developmental disorders, and a greater demand for occupational therapists as consultants.75 According to the Bureau of Labor Statistics, national projections indicate a 33.61 percent job growth rate over the next decade.

According to the Bureau of Labor Statistics (2007), employment of occupational therapists in the health care industry in Minnesota is currently estimated to be 2,030 individuals. This statistic does not include consultants and other self-employed practitioners. The estimated current capacity for the three accredited programs in Minnesota is approximately 175 graduates annually, which falls short of the projected annual demand by approximately 10 percent. The ratio of occupational therapists to the population at large is estimated to be 1:2,350 in Minnesota. This compares with a national ratio of approximately 1:3,327 and places Minnesota in the top quartile of states for supply of occupational therapy practitioners. In general, the distribution of occupational therapists nationally is related to the number of accredited programs within a given region. However, the geographic distribution of therapists continues to favor urban areas, although the proportion of therapists serving rural areas is improving76. A similar profile exists for occupational therapy in Minnesota.

University- and Academic Health Center-wide Workforce Initiatives

Health Careers Center. The University of Minnesota Health Careers Center (HCC) in the AHC Office of Education provides campus-wide health career planning services to current and prospective undergraduate students to help them explore career options in the health care fields; clarify their interest, skills, and values; and, make more informed decisions about their future. Since opening in 2002, the Health Careers Center has developed a unique campus-wide, collaborative model that streamlines career exploration. The HCC works collaboratively across 12 academic units including University undergraduate colleges of the University of Minnesota, the colleges and schools of the Academic Health Center, the Office of the Senior Vice President for Health Sciences, and the Office of the Associate Vice Provost for Undergraduate Education, including the Office of Admissions. Through a continuum of career planning programs and services, the HCC engages students from diverse backgrounds early in their high school careers and supports them throughout their undergraduate exploration of health careers. The HCC offers

73 (Source: Midwest Center for Health Workforce Studies, University of Illinois-Chicago, 2005).
75 (Source: American Occupational Therapy Association Workforce Study, 2006).
76 (Source: Midwest Center for Health Workforce Studies, 2005).
a unique group model approach to providing career planning programs and services. Through information sessions, workshops, courses, special events, and pre-college outreach sessions, students are encouraged to consider a broad range of health professional career opportunities.

Furthermore, the center stresses the importance of academic rigor, student achievement, and the value of experiential learning through volunteering, service learning, internship, research, and learning abroad opportunities. As the center has grown over the past five years, programming efforts have concentrated on identifying and attracting high-ability students early on in their academic careers to prepare them for application into competitive professional and graduate programs. From June 1, 2003 - May 31, 2006, the Health Careers Center served more than 10,000 students. This includes University of Minnesota and non-University of Minnesota students who have participated in information sessions, workshops, courses, and pre-health science visit sessions held at the Health Careers Center. A comprehensive report of the Health Career Center is located in Appendix F.

**Center for Interprofessional Education** – Established in 2007, the Center for Interprofessional Education will work collaboratively with AHC schools, colleges, centers, faculty, students, and staff to identify, promote, implement, and evaluate interprofessional education in a continuum of activities across the educational lifespan. As each profession addresses workforce issues, the center will work toward deploying teams, emerging professional roles, and the appropriate professions for care-delivery models. This type of planning is very different from each profession planning in isolation from each other. (Appendix E)

**The Digital Campus and Learning Platform.** In an effort to expand the reach and efficiencies of educational programs, the University of Minnesota is creating a Digital Campus through the development of its “learning platform.” The assistant vice president for education and the vice provost for distributed education and information technology have coordinated this effort with the Center for Allied Health Programs being a proof of concept for development. This system provides the architecture that contains enterprise technology tools that students use to learn with, that faculty use to teach with, and the University uses to administer all learning programs. The technology tools are integrated into one system, the primary access point of which is the My U Portal. The Digital Campus will increase the reach and capacity of the University of Minnesota to meet workforce needs.

**Greater Minnesota Strategy.** In 2002, the University of Minnesota Academic Health Center renewed its commitment to addressing health professional workforce shortages and distribution problems in greater Minnesota through the Greater Minnesota Strategy. This effort focused resources of rural educational programs to increase efficiency, reduce costs, and share financial risks and opportunities with communities. As noted, several AHC schools have increased their efforts to address workforce issues in rural Minnesota. The Greater Minnesota Strategy’s focus on health is the overarching vision to coordinate these efforts across not only the Academic Health Center but the University. (Appendix G)

The vision for rural health education programs in Minnesota is to: promote health outcomes by developing future health professionals who value community engagement; assure a vital health

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77 AHC Center for Interprofessional Education Charter, December 12, 2006.
professions workforce through community-campus partnerships; and, contribute to a vibrant rural economy by eliminating health professions shortage areas.

• **Minnesota Area Health Education Center (AHEC).** The Minnesota AHEC, funded through a combination of HRSA, state, and local funds, is an important University of Minnesota resource in establishing partnerships, providing service, and linking the University with Greater Minnesota. The central office, located in the Academic Health Center Office of Education, has developed infrastructure such as an affiliation agreement database, tracking systems, support for students and programs in the AHC and University. The philosophy is to integrate health professions experiential education with promoting community health outcomes to develop future health professionals who value community engagement.

The four regional centers are located in Hibbing, Willmar, Fergus Falls, and Crookston, in addition to a Northeast Minnesota AHEC satellite office in Moose Lake. Through Minnesota AHEC, the Academic Health Center has developed important relationships at a regional level to address health professional workforce needs. Community leaders serve as AHEC board directors across Minnesota and work to identify, develop, support, and assess partnerships with the University of Minnesota at a local level that meet community needs while enhancing educational opportunities for health professions students. This partnership aims to add value in the community and encourage health professions students to consider rural practice.

An example of significant community-campus partnership is the dental clinic of the School of Dentistry/Rice Memorial Hospital in Willmar that launched in December 2007. This clinic will support the school’s vision for community outreach while providing needed care to underserved populations. The goal is to continue the upward trajectory of dental graduates selecting practice in rural and underserved Minnesota. The Minnesota AHEC central program office and Southern AHEC regional office have been instrumental in connecting the community with the School of Dentistry, writing grants, and raising funds to support the clinic development.

• **MN AHEC Faculty Leadership Council.** A council of eight faculty members across the Academic Health Center guides the work of the Minnesota AHEC. This council has developed protocols for distribution of funding to support students on rural rotations, coordination of experiential education across rural Minnesota, development of workshops for clinicians on team care for community health projects, and workshops for students in rural communities, among other activities.

• **Community-Campus Health Liaison.** In 2005, the Academic Health Center Office of Education received University compact funding to establish a position, the community-campus health liaison, with the University of Minnesota Extension. The position was the original vision of the dean of the former College of Human Ecology and the assistant vice president for education. It was negotiated with the then dean of University of Minnesota Extension and became a reality in January 2006. It is currently housed in a neutral administrative home in the office of the director of family social science. Working
closely with both AHEC and Extension statewide, the liaison convenes a University-wide community-campus network of faculty scholars. Early projects include writing and administering a Minnesota Department of Health grant on intergenerational vital aging with 4-H youth and linking the Hibbing Dental Clinic with Extension resources on nutrition education. (Appendix H)

- **MERC Interprofessional Education Projects.** Nine Minnesota communities have received funding from the Medical Education and Research Costs (MERC) funding pool to support locally-identified health projects. Local health professionals collaborate in teams to facilitate these health outcomes. The goal is to build specialized community teaching sites that will attract health professions students who will learn about rural health, contribute to health outcomes, and consider a rural practice upon graduation. Additionally, these sites expect to attract University of Minnesota faculty who want to engage in community-campus projects, research, and continuing education programming. Projects are taking place in Hibbing, Fergus Falls, Montevideo, St. Cloud, Moose Lake, Mountain Iron, New Ulm, Park Rapids, and Brainerd. (Appendix I)

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Appendices

A. Transforming the University – Final Report of the AHC Task Force on Health Professional Workforce, May 2006

B. Admissions, Tuition, Debtload, Tuition Elasticity

C. Investments in the University of Minnesota Health Professions Programs

D. University of Minnesota Academic Health Center Deans Council Leadership Statement on Interprofessional Education, December 12, 2006

E. Report of the University of Minnesota Health Careers Center, December 2007

F. Greater Minnesota Strategy, 2002

G. Report of the University of Minnesota Academic Health Center – University of Minnesota Community-Campus Liaison, December 2007

H. MERC Interprofessional Education Site Report, December 2007 – State Health Access Data Assistance Center, December 2007