Health Care Degree Programs: 
Their Role in Serving Pennsylvania’s 
Rural Health Care Workforce
Health Care Degree Programs:  
Their Role in Serving Pennsylvania’s Rural Health Care Workforce

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This research explored how Pennsylvania’s health care degree programs serve the commonwealth’s health care workforce, especially in rural areas. It involved an inventory of Pennsylvania’s health care degree programs, a description of their geographic distribution, and an assessment of educational capacity by discipline. The research, conducted in 2006, paid particular attention to physicians, dentists, and nurses.

The research results showed that Pennsylvania has an extensive infrastructure for education in health care disciplines. However, only 36 percent of Pennsylvania medical school graduates remain in the state to provide care and only 7 percent are retained in rural areas. Even fewer are retained to provide primary care in rural areas (4 percent) and in underserved areas (1 percent or less).

Forty-three percent of Pennsylvania dental graduates remain in the commonwealth to provide care and 6 percent provide care in rural areas.

In Pennsylvania, there are more than 200,000 registered nurse licensees and more than 50,000 practical nurse licensees; however, a considerable number of these licensees are not engaged in patient care.

The research findings suggest that policies to maintain an adequate health care workforce should be more comprehensive in their approach, rather than simply seeking to increase educational capacity in disciplines that are projected to be in demand.

From these and other findings, the researchers proposed several policy considerations. For physicians and dentists, the education-to-practice pipeline is a significant factor and should be the focus of most policy interventions. For nursing and similar disciplines, the education-to-practice pipeline is naturally strong, so capacity and the geographic distribution of educational programs are the most significant factors and should receive the most attention.
INTRODUCTION

This research, which was conducted in 2006, examined the educational capacity of Pennsylvania’s degree granting programs in the health care disciplines and what this capacity implied for maintaining an adequate health care workforce in the commonwealth. Knowing more about Pennsylvania’s degree-granting programs and how they supply health care providers to Pennsylvania and its rural areas is important for several reasons, as follows:

1. Because of the rapidly aging population, the need for health care workers will increase significantly in the near future. Pennsylvania may choose to rely on a workforce that receives its education outside of the commonwealth, but a more prudent policy is to build in-state educational capacity and institute policies that retain this workforce, especially in needy and rural areas.
2. The public makes a financial investment in its schools and should expect a return on that investment.
3. Recruitment and retention of health care providers in rural areas is challenging. Degree-granting health care education institutions are a critical link in the successful recruitment and retention of providers in rural areas. It is important to document the degree to which Pennsylvania schools are placing providers in rural areas and the degree to which these institutions have made efforts to place more graduates in rural and needy areas.

While inventories of health care degree-granting programs in Pennsylvania have been compiled (Pennsylvania Area Health Education Center (Primary Care Interdisciplinary Task Force), 1999; Schwartz, 1997; Southwest Pennsylvania Area Health Education Center, 2000), these inventories were developed as a resource for potential students and counselors. They do not include information about student training capacity or special programs to recruit rural students or place students in rural areas.

This research addresses the gaps in the existing information by describing the scope and geographic distribution of Pennsylvania’s degree granting programs in health care, their recruitment and student placement policies, and, for physicians and dentists, an in-depth analysis of the pipeline from Pennsylvania educational institutions to Pennsylvania practice.

GOALS AND OBJECTIVES

The research had four goals. The first was to describe Pennsylvania’s health care degree granting programs for the following practitioners: physicians, dentists, advanced practice nurses, registered nurses, licensed practical nurses, physician assistants, pharmacists, social workers (MSW), dental hygienists, dental assistants, physical therapists, occupational therapists, and selected technical and support personnel.

The second was to describe the pipeline from Pennsylvania’s medical schools and residency programs to Pennsylvania practice, primary care practice, rural practice, and underserved area practice. Included in the description is the contribution that Pennsylvania medical schools have made to the current physician workforce in the state, especially in primary care, rural areas, and underserved areas.

The third goal was to describe the pipeline from Pennsylvania’s dental schools to dental practices in the commonwealth. Included in the description is the contribution that Pennsylvania dental schools have made to the current dentist workforce in the state, including rural areas and underserved areas.

The final goal was to provide policy considerations for the Pennsylvania General Assembly and other public entities.

METHODOLOGY

Inventory and Analysis of Health Care Degree Granting Programs

The research was completed by inventorying the degree-granting health care educational programs and their educational capacity, and by examining the role they play in supplying health care providers to rural Pennsylvania.

1 Capacity here refers to both current program enrollment and maximum program enrollment.
2 “Pipeline” is a general term referring to the flow of students from public education through professional education to health care practice. It can be used in a more limited sense to refer to the flow for a specific profession, the flow to a specific geographic area, or to part of the more general pipeline process. “Pipeline development” can refer to the volume of the flow or to the infrastructure built to facilitate it.
The researchers used the inventories of the Southwest Pennsylvania Area Health Education Center and the Eastcentral Pennsylvania Area Health Education Center. (Eastcentral Pennsylvania Area Health Education Center, 2004; Southwest Pennsylvania Area Educational Center, 2000). The researchers edited the inventory to eliminate programs that were no longer operating and updated any incorrect information. They also eliminated the health aide and technician programs that were non-degree or optional degree programs, with the exception of dental hygienists. The researchers then conducted a telephone survey of the 327 programs in the edited inventory: 317 surveys were completed, for a response rate of 97 percent. The following data were collected in the survey:

- Program enrollment;
- Program capacity;
- Plans to expand capacity;
- Barriers encountered in expansion;
- Distance education offerings;
- Student origins (geographic);
- Rural placement programs; and
- Use of Workforce Investment Board (WIB) information.

The survey data and the inventory data were then combined into a single master data file. The researchers then coded the program addresses to identify the program location as rural or urban, using the Center for Rural Pennsylvania’s rural definition.

License data obtained from the Pennsylvania Department of State’s Bureau of Professional and Occupational Affairs was used to tabulate the number of current licensees (in selected disciplines) with a Pennsylvania practice address. These data were used as estimates of the current workforce for disciplines in which no registry or survey data were available.

Analysis of Study to Practice

To analyze the journey of Pennsylvania medical and dental school graduates from study to Pennsylvania health care practice, the researchers used data from the American Medical Association (AMA) Masterfile (2004). The masterfile included all graduates of Pennsylvania medical schools, all physicians who completed a Pennsylvania residency, and all physicians with a Pennsylvania practice address. Physician professional addresses were coded to determine their rural-urban status, their Health Professional Shortage Area (HPSA) status, their Medically Underserved Area (MUA) status, and the local primary care physician supply. In this case, urban was defined as a location within an urbanized area. All other addresses were classified as rural. A physician was considered to be in a designated HPSA if he/she was located in either a geographic primary care HPSA or a population primary care HPSA and was considered to be in a designated MUA if he/she was located in either a MUA or a MUP (Medically Underserved Population).

A physician was considered to be in a low primary care physician service area if the municipality in which he/she practiced was in the lowest quartile of all municipalities with respect to its service level. There are approximately 2,580 municipalities of which 25 percent (645) are considered to be areas of low supply. It should be noted that these municipalities are generally small and rural, and have the lowest physician to population ratios.

The AMA data included descriptions of both allopathic (MD) and osteopathic (DO) physicians. The data are continuously compiled and data for some physicians may be more recent than for others. All analyses were performed on active, patient-care physicians including federal and military physicians.

Physicians classified by the AMA as currently in a residency program were not included in the counts of currently practicing physicians. A residency location is typically a temporary location for a physician. Although these physicians provide patient care service, the goal of the research was to understand the pipeline from medical school to more permanent practice locations.

Primary care physicians are defined as those physicians whose self-proclaimed specialty is family practice, general internal medicine, general obstetrics and gynecology, general pediatrics, and a few specialties that serve as primary care providers for an age-restricted population.

Physicians were classified as having completed a...
Pennsylvania residency if any of their residencies were located within the state.

Data used in the analyses of commonwealth dental school graduates were based on American Dental Association (ADA) data from 2006. The ADA data\(^9\) included all graduates of Pennsylvania dental schools and all dentists with a Pennsylvania address.

All addresses were coded to determine the urban-rural status of the address, the HPSA status, and the local dentist supply. In this case, urban was defined as a location within an urbanized area. All other addresses were classified as rural. A dentist was considered to be in a designated HPSA if he/she was located in either a geographic dental HPSA or a population dental HPSA.

Only dentists currently providing patient care were included in the analyses. Dentists classified by the ADA as currently in a residency program were not included in the counts of currently practicing dentists.

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**RESULTS**

Health Care Degree Programs in Pennsylvania

Table 1 on Page 8 shows the number of health care education programs in the commonwealth by type of higher education institution and Table 2 on Page 9 shows the estimated percentage of enrollees in each health care discipline by type of higher education institution. In these tables, a gray background indicates the most common educational institution type for each discipline.\(^9\)

Pennsylvania has a well-developed higher education system and is a net importer of college students.\(^10\) The research identified 484 different educational programs in health care disciplines; however this number should not be considered exhaustive. Specific program types, including many doctoral programs in the sciences, were excluded from the research since doctoral programs educate a combination of teachers, researchers and practitioners. Also, some programs are often included in a more general curriculum and, consequently, may not be included in this count.

The distribution of students by institution type is based on responses from the survey of health care programs.\(^11\)

In Pennsylvania, there are eight medical schools, three dental schools, more than 100 RN (registered nurse) programs, and 45 LPN (licensed practical nurse) programs.\(^12\) There are also significant numbers of physician assistant (14), nurse practitioner (MSN) (29),\(^13\) other advanced practice nurse, occupational therapist (13), physical therapist (15), dental hygienist (11), dental assistant (18), master of social work (MSW) (10), advanced practice nursing (50) and pharmacist (6) programs (Table 1).

Private colleges and universities offer a plurality of all health care education programs, although other higher education institutions are responsible for a majority of programs and students for specific disciplines. Consistent with background observations, programs and students in disciplines requiring the most training are found at four-year colleges and universities, while programs and students in disciplines requiring lesser training are found at vocational technical schools, proprietary schools, and community colleges. Community colleges educate the majority of dental hygienists and associate degree nurses (ASN). Vocational technical schools (AVTS) educate nearly two-thirds of LPNs in the commonwealth. Private proprietary schools offer a plurality of programs for technicians and aides. Education for more advanced professions is distributed across four-year colleges and universities, with private schools predominating, except in dentistry.

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\(^{a}\) ADA obtains data from a variety of sources and dentists in this file are not limited to ADA members.

\(^{b}\) Both non-degree and degree programs are included in these two tables.

\(^{c}\) In the survey, program representatives were asked to estimate enrollment in their programs. These are not based on officially reported student enrollment. In some cases, survey respondents could not provide enrollment estimates. For these programs, enrollment was considered the average of all other programs. Non-surveyed disciplines are not shown in Table 2.

\(^{d}\) There are variations in the manner in which programs are counted, especially with respect to nursing. The Pennsylvania Department of Health (2004a), reports 33 BSN programs, 22 diploma programs, 25 ASN programs, and 47 LPN programs. This research reports 54 BSN programs, 22 diploma programs, 30 ASN programs, and 45 LPN programs. The significant difference in BSN programs between the two reports is most likely due to the researchers’ philosophy of reporting branch campuses of host institutions that offer complete programs.

\(^{e}\) Nurse practitioner programs are often considered a track in a more general master of science in nursing (MSN) program. The researchers have attempted to isolate all nurse practitioner stand-alone and MSN track programs.

*Health Care Degree Programs*
Table 1: Number of Health Care Education Programs by Type of Educational Institution, 2006

<table>
<thead>
<tr>
<th>Type of Program</th>
<th>Private College or University</th>
<th>State Related</th>
<th>State University System</th>
<th>Hospital or Health System</th>
<th>Proprietary School</th>
<th>Community College</th>
<th>AVTS</th>
<th>Non-Profit Organization</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentist</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3 100%</td>
</tr>
<tr>
<td>Dental Hygienist</td>
<td>2</td>
<td>18%</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td>11 100%</td>
</tr>
<tr>
<td>Dental Assistant</td>
<td>2</td>
<td>11%</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>44%</td>
<td>3</td>
<td>5</td>
<td>18 100%</td>
</tr>
<tr>
<td>Physician</td>
<td>5</td>
<td>62%</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8 100%</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>12</td>
<td>86%</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14 100%</td>
</tr>
<tr>
<td>Social Work (MSW)</td>
<td>4</td>
<td>40%</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10 100%</td>
</tr>
</tbody>
</table>
| Nurse Practitioner                   | 16                           | 55%           | 8                       | 4                         | 0                 | 0                | 0                 | 0                       | 1 29%
| Nurse Anesthetist                    | 10                           | 84%           | 1                       | 1                         | 0                 | 0                | 0                 | 0                       | 1 12%
| Nurse Midwife                        | 2                            | 100%          | 0                       | 0                         | 0                 | 0                | 0                 | 0                       | 2 100%|
| RN-Diploma                           | 0                            | 0             | 0                       | 22                        | 0                 | 0                | 0                 | 0                       | 22 100%|
| RN-Associate’s Degree                | 6                            | 20%           | 6                       | 2                         | 0                 | 0                | 0                 | 16                      | 0 30%
| RN-Bachelor’s Degree                 | 29                           | 54%           | 14                      | 11                        | 0                 | 0                | 0                 | 0                       | 0 54%
| RN-Master’s Degree (MSN-general, clinical nurse specialist) | 22 | 61% | 6 | 8 | 0 | 0 | 0 | 0 | 0 36%
| LPN                                  | 1                            | 100%          | 1                       | 0                         | 2                 | 2                | 9                 | 29                      | 1 45%
| Optometrist                          | 1                            | 100%          | 0                       | 0                         | 0                 | 0                | 0                 | 0                       | 0 100%|
| Podiatrist                           | 0                            | 0             | 1                       | 0                         | 0                 | 0                | 0                 | 0                       | 0 100%|
| Pharmacist                           | 4                            | 67%           | 2                       | 0                         | 0                 | 0                | 0                 | 0                       | 0 6 100%|
| Occupational Therapist               | 11                           | 85%           | 2                       | 0                         | 0                 | 0                | 0                 | 0                       | 0 13 100%|
| Physical Therapist                   | 12                           | 80%           | 2                       | 1                         | 0                 | 0                | 0                 | 0                       | 0 15 100%|
| Technology (various) and Aides        | 31                           | 20%           | 10                      | 9                         | 33                | 49               | 14                | 8                       | 0 154 100%|
| Total                                | 171                          | 100%          | 65                      | 38                        | 58                | 60               | 48                | 42                      | 2 484 |

The Geographic Distribution of Health Care Degree Programs in Pennsylvania

Consistent with the distribution of most public resources and the geographic distribution of the population, most health care education programs (about 75 percent) are located in urban counties (Table 3 on Page 10).

LPN training is the discipline with the greatest rural presence (46.7 percent). Between 20 and 35 percent of education programs for social work, most other nursing disciplines, physician assistants, and technology and aides are located in rural counties. No physician or dentist programs are rural and a small percentage of all other disciplines are rural.

Educational Capacity of Health Care Degree Programs in Pennsylvania

Table 4 on Page 11 presents the current enrollment, existence of additional education capacity, estimates of the current commonwealth workforce size, and the ratio of enrollment to workforce size by health care discipline. Current enrollment estimates are based on aggregated responses from the survey of health care degree programs. If the survey respondent could not supply an enrollment estimate, the researchers allocated enrollment to the program using the average of all other programs of that type. In all instances, except for the MSN programs, only a few programs required allocation.
Health Care Degree Programs

The effect that the current enrollment/capacity of educational programs in a health care discipline has for the future maintenance of an adequate workforce in that discipline is variable and complex. The most significant factor is that the number of students who are trained and practice in the commonwealth varies by discipline and by school. Only 36 percent of medical students remain in Pennsylvania to provide care. Similarly, only 43 percent of dental school graduates remain in the state to practice. Systematic statistics on other disciplines is not generally available, but the retention rates for these disciplines are considerably higher given their more local nature. Another factor in the complex relationship between educational capacity and workforce maintenance is the length of time required for training in the discipline and variation in the amount of time from matriculation to graduation. In disciplines in which a significant number of students receive their education part-time, the duration of education varies from student-to-student and school-to-school. Also, in some disciplines, such as nursing, a significant proportion of credentialed professionals do not continuously participate in the workforce throughout their careers (Sochalski, 2002).

The ratio of current enrollment to current workforce size is presented in Table 4. Although the effect of enrollment capacity on the maintenance of the workforce cannot be definitively determined, some general conclusions can be made. For example, disciplines with relatively low ratios of current enrollment to current workforce size (e.g., dental hygienist) suggest a modest capacity to repopulate the workforce, while disciplines with a relatively high ratio of current enrollment to current workforce size (e.g., physician assistants) suggest excess capacity to repopulate the workforce.14

Rural Programs

Very few educational programs report the existence of specific efforts to do any of the following: find students employment, place students in rural areas upon graduation, place students in Pennsylvania upon graduation, or place students in underserved areas upon graduation. The number of programs reporting the existence of these efforts, by discipline, is presented in Table 5 on Page 11. These tallies are based on survey responses from representatives at the

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14The enrollment estimates for the discipline are for total students and not for a matriculating class. Consequently, these are not normed for program length. In some disciplines, program length is standard (e.g., medicine) and in others it more variable (e.g., physician assistant). This measurement strategy will result in lower ratios for disciplines with programs that are typically shorter in length.
10 The Center for Rural Pennsylvania

program level and queries about their specific programs.

Physicians

In 2004 in Pennsylvania, there were 32,702 active non-resident physicians whose major activity was providing patient care.15 About 18 percent (6,087) were located in rural areas16 and about 39 percent (12,655) were practicing a primary care specialty. Among rural physicians, 46 percent (2,782) were in primary care practice compared to 37 percent (9,873) of urban physicians.

Among all physicians, 26 percent (8,511) were practicing in a designated HPSA or MUA, and 9 percent (3,096) were practicing in a rural HPSA or MUA. Considering rural physicians only, 23 percent (1,422) were practicing in a designated HPSA or MUA and 14 percent (825) were practicing primary care in a designated area. Considering urban physicians only, 27 percent (7,089) were practicing in a designated HPSA or MUA, and 9 percent (2,271) were practicing primary care in a designated area.

In this discussion, an area is considered a HPSA if it has been designated as either a geographic HPSA or a population HPSA. Although the principal consideration for designation of geographic HPSAs is the primary care physician supply, access to care for specific at-risk populations is the primary consideration for designation of population HPSAs. In a similar fashion, primary care physician supply is only one of four factors used in the designation of a MUA. Designated HPSAs and MUAs certainly identify areas of need, but are not pure indicators of low primary care physician supply. Estimates of primary care physician supply (population-to-primary care physician ratios) were calculated for each municipality within the commonwealth and all municipalities in the lowest quartile of this distribution were considered areas of low primary care physician supply. Among all Pennsylvania physicians, slightly less than 2 percent (588) were practicing in areas of low primary care physician supply17; 70 percent (411) of these physicians were in primary care and 81 percent (475) were in rural areas. In all, 59 percent (343) of physicians practicing in the lowest physician supply areas were providing primary care in rural areas. This is consistent with long-standing trends in which the lowest physician supplies are in rural areas and physicians serving in these areas are disproportionately providing primary care.

The primary concern of this discussion is the pipeline from medical education to primary care physician service in Pennsylvania, rural Pennsylvania, and rural underserved areas. The first of two approaches employed here to describe these pipelines is an analysis of the educational origins of the current

<p>| Table 3: Number of Health Care Education Programs by Rural County Status |
|-----------------------------|-----------------------------|-----------------------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentist</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Dental Hygienist</td>
<td>1</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>9%</td>
<td>91%</td>
<td>100%</td>
</tr>
<tr>
<td>Dental Assistant</td>
<td>3</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>17%</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>Physician</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>3</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>79%</td>
<td>100%</td>
</tr>
<tr>
<td>Social Work (MSW)</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>30%</td>
<td>70%</td>
<td>100%</td>
</tr>
<tr>
<td>Nurse Practitioner</td>
<td>7</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>24%</td>
<td>76%</td>
<td>100%</td>
</tr>
<tr>
<td>Nurse Anesthetaist</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Nurse Midwife</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>RN-Diploma</td>
<td>6</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>27%</td>
<td>73%</td>
<td>100%</td>
</tr>
<tr>
<td>RN-Associate Degree</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>33%</td>
<td>67%</td>
<td>100%</td>
</tr>
<tr>
<td>RN-BSN</td>
<td>19</td>
<td>35</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>35%</td>
<td>65%</td>
<td>100%</td>
</tr>
<tr>
<td>MSN (general, CNS)</td>
<td>9</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>LPN</td>
<td>21</td>
<td>24</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>47%</td>
<td>53%</td>
<td>100%</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>1</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>8%</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>2</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>87%</td>
<td>100%</td>
</tr>
<tr>
<td>Technology (various) and Aides</td>
<td>48</td>
<td>106</td>
<td>154</td>
</tr>
<tr>
<td></td>
<td>31%</td>
<td>69%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>133</td>
<td>349</td>
<td>482</td>
</tr>
<tr>
<td></td>
<td>28%</td>
<td>72%</td>
<td>100%</td>
</tr>
</tbody>
</table>

15 All subsequent analyses are based upon active, patient care, non-resident physicians only.
16 For this analysis, rural is defined as not in an urbanized area.
17 The 25 percent of municipalities that are classified as "areas of low primary care physician supply" are predominately rural and sparsely populated. Less than 25 percent of the commonwealth's population resides in these areas. That, in combination with its relatively low physician supply, results in only about 2 percent of physicians practicing there.
primary care and total physician workforce in these areas (Table 6 on Page 12).

About 44 percent of Pennsylvania physicians graduated from a Pennsylvania medical school and 63 percent completed a Pennsylvania residency. About 23 percent were international medical graduates (IMG). The composition of the workforce in rural Pennsylvania differs slightly from the statewide workforce. In rural Pennsylvania, about 42 percent of the active patient care workforce graduated from Pennsylvania medical schools, 54 percent completed a Pennsylvania residency, and 25 percent were IMGs. The Philadelphia College of Osteopathic Medicine (PCOM) contributes the most physicians to both the rural and statewide Pennsylvania physician workforces.

Of the 2,782 primary care physicians in rural areas, 47 percent (1,307) graduated from Pennsylvania medical schools. The percentage is slightly less in HPSA/MUA designated areas (46 percent) and slightly more in areas of low physician supply (52 percent). PCOM contributes more primary care physicians to rural Pennsylvania (14 percent), to rural HPSAs and MUAs (10 percent), and to areas of low primary care physician supply (14 percent) than any other Pennsylvania medical school. The Jefferson Medical College at Thomas Jefferson University (Jefferson) contributes nearly as many primary care physicians and is the second most prolific supplier of physicians in each rural category. Graduates of Penn State College of Medicine (PSU-COM), University of Pittsburgh School of Medicine (Pittsburgh), Hahnemann18, and Temple University School of Medicine (Temple) represent between 5 percent and 8 percent of the total primary care physician workforce. The school supplying the fewest number of physicians to rural and rural underserved areas

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18 Hahnemann has gone through many institutional changes over the years and is currently known as Drexel University School of Medicine. Included in this category are MCP-Hahnemann, MCP, and Allegheny University.
The Center for Rural Pennsylvania

areas in the state is the University of Pennsylvania School of Medicine (2 percent).

Compositional differences between urban and rural physicians are further elaborated in Table 7. In this table, the commonwealth is divided into three mutually exclusive geographic categories (rural HPSAs and MUAs, other rural areas, and all urban areas). Primary care is the norm (58 percent) in designated areas, prevalent in other rural areas (42 percent), and less likely in urban areas (37 percent). Additionally, in rural areas, there are proportionately fewer females, fewer Pennsylvania educated physicians, and more IMGs (designated areas only).

The average age in all three areas is similar, as is the percent of physicians over age 55.

There are a variety of approaches that can be used to describe the pipeline from Pennsylvania medical education into Pennsylvania practice. Two of these approaches are presented in this discussion. One approach is to take a snapshot of the current physician workforce and describe its educational origins. The results obtained from this method are described above and presented in Tables 6 and 7. A second approach is to calculate the percentage of commonwealth-educated physicians that are currently practicing in the state. The results of this analysis are presented in Table 8.

About 36 percent of physicians graduating from Pennsylvania medical schools between 1980 and 2000 are providing patient care in the state. About 7 percent practice in rural areas. Among Pennsylvania medical school graduates, only about 16 percent are providing primary care in Pennsylvania. Fewer still provide primary care in a rural designated area (1 percent), and

Table 7: Characteristics of the Primary Care Physician Workforce (2004)

<table>
<thead>
<tr>
<th></th>
<th>In a Pennsylvania Rural HPSA or MUA</th>
<th>Other Rural Pennsylvania Location</th>
<th>All Urban Pennsylvania Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>49.99</td>
<td>49.84</td>
<td>49.77</td>
</tr>
<tr>
<td>Female</td>
<td>26%</td>
<td>27%</td>
<td>36%</td>
</tr>
<tr>
<td>Over 55</td>
<td>30%</td>
<td>29%</td>
<td>31%</td>
</tr>
<tr>
<td>PA Medical School Graduate</td>
<td>46%</td>
<td>48%</td>
<td>50%</td>
</tr>
<tr>
<td>With a Pennsylvania Residency</td>
<td>56%</td>
<td>57%</td>
<td>67%</td>
</tr>
<tr>
<td>PA Medical School Graduate and Pennsylvania Residency</td>
<td>34%</td>
<td>33%</td>
<td>38%</td>
</tr>
<tr>
<td>IMG</td>
<td>24%</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Primary Care</td>
<td>58%</td>
<td>42%</td>
<td>37%</td>
</tr>
</tbody>
</table>

19 The medical school data presented in Table 8 will not be equivalent to that presented in Table 6, since Table 8 is based upon 1980—2000 graduates only.
even fewer in a rural low physician supply area (1 percent).

Graduates of PCOM have the highest probability (49 percent) of practicing medicine in Pennsylvania, while PSU-COM, at 41 percent, is second most likely. Graduates of PSU-COM have the highest likelihood of practicing in rural Pennsylvania (13 percent) and PCOM is second highest (11 percent).

PCOM graduates are most likely (27 percent) to practice primary care in the state and to practice primary care in rural areas (7 percent). PSU-COM is second in the proportion of its graduates who are now practicing primary care in the state (18 percent) and rural areas (6 percent). PSU-COM graduates are the most likely to provide primary care in rural designated areas (2 percent) and in rural areas of low physician supply (1 percent).

About the same percentage (36 percent) of Pennsylvania residency completers and medical school graduates are currently in Pennsylvania practice. Residency completers are, however, much more likely (24 percent) to provide primary care than are graduates of the state’s medical schools (16 percent). The group of Pennsylvania educated physicians that has the highest rate of state retention (54 percent) attended medical school and completed a residency in Pennsylvania. They are also the group most likely to provide primary care in rural areas (8 percent) and have some likelihood of providing primary care in low supply (1 percent) and designated (2 percent) areas.

A primary goal of this discussion is to assemble a set of medical education-to-practice physician retention rates that can help evaluate the benefits associated with the state’s investment in medical education. However, an evaluation of current retention levels of Pennsylvania educated physicians is not only complicated by the absence of a universal standard but is also subject to the absence of any clear national-level norms. There is substantial variation in state retention rates for both undergraduate and graduate medical education. Medical school retention varies from a low of 6 percent in Washington D.C. to a high of 63 percent in California; the national average is 39 percent (Henderson and Farmer, 2003). The same variation exists in GME (graduate medical education) retention. Again, California has the highest retention rate (68 percent) and Washington D.C. the lowest (14 percent); the national average is 47 percent (Henderson and Farmer, 2003).

The denominator for this percentage is all residency completers. It is not restricted to primary care residencies only.

For continuity, the state rates presented here are based on Henderson (2003) and not the original rates produced for this report. Due to methodological differences, the percentages estimated in this report may differ substantially from Henderson. The primary methodological differences are (1) inclusion of only MDs in Henderson, (2) the inclusion of only the last residency completed in Henderson, and (3) the inclusion of only active, patient care non-resident physicians in this report.
Substantial variation also exists in a state’s educational contribution to its current physician workforce. Nebraska ranks highest, with 60 percent of physicians having attended medical school in the state (Henderson and Farmer, 2003). New Hampshire has the lowest percentage (7 percent); the national average is 31 percent (Henderson and Farmer, 2003). The scenario is similar with respect to GME. The rate of the current physician workforce whose last residency was in the state varies from 77 percent in New York to 10 percent in Nevada; the national average is 41 percent (Henderson and Farmer, 2003). For indicators of both educational retention and state educational contribution to the current workforce, the rates for generalist physicians are higher (between 6 and 12 percentage points) than specialists (Henderson and Farmer, 2003).

On measures of educational retention, Pennsylvania is close to the national average. Using Henderson’s method, Pennsylvania retains 37 percent of its medical school graduates and 47 percent of its most recent residency completers. Forty-four percent of the current workforce attended a state medical school and 63 percent completed their most recent residency in the commonwealth. This pattern has been observed for all physicians and generalist physicians. Pennsylvania also scores close to the national average in the percentage of the IMG workforce (Hagoplan, Thompson, Kaltenbach, and Hart, 2004).

Because of the complexity of developing a standard, comparing Pennsylvania’s physician retention rates to other states is not in itself sufficient to indicate the acceptability of the current level of retention of state educated physicians. However, it does indicate that the commonwealth is not extreme, and the potential exists for these rates to either increase or decrease.

Dentists

At the start of 2006, 7,433 dentists were providing patient care in Pennsylvania (see Table 9). Among these dentists, about 14 percent (1,009) were providing patient care in rural areas (non-urbanized areas) and 86 percent (6,424) were providing care in urban areas (urbanized areas).

Approximately 67 percent of the total population lives in urban areas and 33 percent in rural areas. This results in quite a disparity between urban and rural dentist supplies. The population-to-dentist ratio in rural areas (4,034:1) is over three times greater than that found in urban areas (1,278:1).

Most dental health professional shortage areas (dental HPSAs) are designated as whole county HPSAs, especially in the more rural areas (Schwartz, 2004). Fifty-six counties are at least partly designated as a dental HPSA. Thirty-two are whole county HPSAs, and, in 24 counties, a sub-county area is defined as a HPSA. The majority of these are defined as a population HPSA (designated as a shortage for the low income population). In a dental HPSA, 1,590 dentists provide patient care (21 percent of all patient care dentists). Since dental HPSAs have flexible geographic boundaries and require the initiative of a principal within the local area to obtain the designation, they do not serve as a definitive measure of low service. A primary goal of this research was to investigate the pipeline from Pennsylvania dental education to practice in areas of low dental service in the state. Two alternative measures of low dental service are used in this report. The first ranks all dentists from lowest to highest, with respect to the supply of dentists in their municipality. It then takes the lowest quartile

![Table 9: Educational Origins of Pennsylvania’s Patient Care Dental Workforce, 2006](image)
of Pennsylvania contribute slightly less to the rural workforce than to the urban workforce and the University of Pittsburgh slightly more to rural. Pennsylvania dental school graduates constitute about three-fourths of the workforce in low dentist supply areas of the state, approximately the same contribution that they make to the statewide workforce. The contribution is slightly less than 75 percent when the liberal definition of low service (lowest quartile of dentists) is used. Pennsylvania graduates represent 71 percent of dentists in HPSAs and 70 percent of dentists in areas where the lowest quartile of dentists are located. The contribution is slightly more (75 percent) when the more restrictive definition of low service, the lowest quartile of municipalities, is used. The University of Pittsburgh School of Dental Medicine, by a significant margin, contributes more dentists to low service areas in the commonwealth than the two other schools. University of Pittsburgh graduates comprise about 50 percent of the dentists in the lowest quartile of municipalities. Temple grads constitute about 19 percent and University of Pennsylvania grads 7 percent of dentists in these municipalities. This same inter-school pattern exists, but to a lesser degree, when the two other definitions of low service are used. Out-of-state schools distribute dentists to these areas in roughly the same proportions that they distribute dentists to the remainder of the state.

About 80 percent of all active patient care dentists in the commonwealth practice general dentistry; while orthodontics (6 percent) and oral surgery (4 percent)
are the two most prevalent specialties (Table 10). This is consistent with the national distribution. General dentistry is even more ubiquitous in rural (85 percent) and low supply areas (84 to 91 percent). About 16 percent of commonwealth dentists are women (also on par with national rates), even though over 40 percent of new dental school enrollees are women (Sinkford, Valachovic, and Harrison, 2003). The mean age of patient care dentists in the state is 50.5 years, and about 53 percent are over 50 years of age (Pennsylvania Department of Health, 2004b). In low supply areas, there is a higher percentage of older dentists; Pennsylvania than graduates of the other two dental schools. Well over half (58 percent) practice in the state, while only 50 percent of Temple graduates and 25 percent of University of Pennsylvania graduates provide patient care in the state. University of Pittsburgh graduates are also more likely to practice in rural areas (9 percent) and in low service areas (16 percent); and are three times more likely than Temple and six times more likely than University of Pennsylvania graduates to practice in the lowest supply areas (lowest quartile of municipalities).

Fifty-seven percent of Pennsylvania dental school graduates are not providing patient care in the state. About 2 percent remain in Pennsylvania, but are not primarily engaged in patient care. The remainder is practicing in other states. Overall, New Jersey (10 percent) and New York (8 percent) are the most frequent destinations. University of Pittsburgh graduates not serving in Pennsylvania are widely distributed, although only about 40 percent leave the state. A great many more University of Pennsylvania graduates choose to leave the state (about 74 percent), and many of these dentists choose to practice in New Jersey (16 percent) or New York (16 percent).

26 Data referred to in Tables 3 and 4 are restricted to dentists who graduated from dental school in 1980 or later.

27 This estimate is slightly less than previously published results for 2001 (53 percent) using a different methodology (U.S. Department of Health and Human Services, HRSA, 2005).
New Jersey is also the most frequent destination (10 percent) for Temple graduates. In sum, less than half of all dental school graduates remain in the commonwealth to provide patient care, far fewer remain to serve in rural or low service areas. Consistent with their relative contributions to the current dentist workforce, the University of Pittsburgh is more likely to send its graduates into Pennsylvania service, rural service, and service in low supply areas.

In general, dentists who recently graduated from the commonwealth’s three dental schools are less likely to remain in Pennsylvania than those who graduated before them. The 1985-1989 graduation cohort is the most likely of all graduation cohorts since 1980 to remain in Pennsylvania to provide patient care (Figure 1). More than 50 percent of these graduates are now Pennsylvania patient care dentists. The probability has decreased for each successive cohort since then, and for the most recent cohort, this percentage has declined to about 30 percent.

The same pattern holds true for service in rural Pennsylvania. Once again, the 1985-1989 cohort is the cohort most likely to provide patient care in rural areas (about 6.5 percent). This probability has dropped to about 5 percent for the most recent graduation cohort.

A similar pattern is evidenced with respect to the pipeline from Pennsylvania dental schools into service in low supply areas. The percentage of graduates who practice in municipalities in which the lowest quartile of dentists serve has declined continuously since 1980, from almost 12.5 percent for the 1980-1984 cohort to under 5 percent for the 2000-2004 cohort.

The current workforce includes a large cohort of older dentists who were educated in the peak capacity years (the late 1970s through the mid 1980s) and significantly fewer younger dentists, who are members of the much smaller graduation cohorts, entering the labor force since the mid 1980s. These large graduation cohorts are now reaching retirement age while the number of current dental school graduates is insufficient to replace them. As a consequence, the number of dentists in the workforce is declining (Eberhardt, Ingram, Makuc, and al., 2001). Further exacerbating the declining supply is the increased participation of women dentists, along with older dentists, who tend to engage in less clinical care than younger men (Sinkford, Valachovic, and Harrison, 2003; U.S. Department of Health and Human Services, 2005). In fact, average patient time has decreased to about 33 hours a week (Mertz and O’Neil, 2002).

Postdoctoral dental education is not a requirement for the practice of general dentistry. However, there has been a significant increase in the number of dentists choosing a residency program in general practice or advanced general dentistry. Almost 40 percent of the most recent class of dental school graduates plan to participate in a residency program (Chamar, Weaver, and Valachovic, 2006). Postdoctoral medical education is, arguably, the best predictor of eventual practice location for physicians (Schwartz, 2006). Consequently, in-state residency programs have a significant impact on the physician pipeline, and, with increasing dentist participation in postdoctoral education (Institute of Medicine, 1995), it will be an important pipeline consideration in the future.

It is difficult to make a definitive assessment concerning Pennsylvania’s pipeline with respect to its retention rate for state-educated dentists and the composition of its dentist workforce, since there is no universal standard of comparison. However, the researchers contend that: 1) Pennsylvania will have difficulty in repopulating its state-educated dentists with current retention rates, 2) the pipeline is inadequate to address the public health mandate of universal access, and 3) Pennsylvania has significant educational capacity that can be exploited for further pipeline development.

For the project, the researchers considered several indicators of low dental service: rural, dental HPSAs, and two measures of the supply of dentists in municipalities. All of these areas have significantly fewer dentists than other areas of the state. Consequently, an effective pipeline will disproportionately populate these areas with dentists and contribute to the equality of access to dental care. Unfortunately, Pennsylvania’s pipeline does not perform in that manner. Pennsylvania dental graduates comprise about the same percentage (or slightly less) of the workforce in these low service areas as they do in the remainder of the state. Moreover, the percentage of Pennsylvania graduates with practice destinations in these areas is modest. For example, about 6 percent of graduates are currently providing patient care in rural areas of the commonwealth. This is about 13 percent of all graduates who remain to provide patient care in Pennsylvania; about the same percentage of Pennsylvania dentists who are currently providing care in rural areas. If the pipeline from the commonwealth’s dental schools to rural areas continues at the same rate, it will only maintain the current inequality and not contribute to diminishing it. Unfortunately, there is evidence that the distribution of dental graduates to rural areas is on the decline, further exacerbating the inequality (Chamar, Weaver and Valachovic, 2006). Also, the percentage of recent graduates providing patient care in Pennsylvania who practice in a HPSA is less than the current percentage of dentists in these areas (19 percent vs. 21 percent).
The same is true, albeit to a lesser degree, in areas of the commonwealth with the lowest dentist supplies. At best, the Pennsylvania dentist pipeline will only serve to maintain the current inequality in the geographic distribution of dentists within Pennsylvania, and most likely will contribute to increasing the inequality.

Also, current trends and other constraints, such as increasing student tuition and increasing student debt upon graduation, suggest that, without purposeful intervention, the ability of the pipeline to deliver dentists to Pennsylvania will weaken in the future.

Since research on the dental pipeline is minimal, the researchers used the physician pipeline as a model for dentists.

As with the physician model, the most important component of the dental model is dental school recruitment. Enrolling more in-state students, rural students, lower income students, and minority students should strengthen the dentist pipeline to the state as a whole and to areas of need within the state. Dental school curricula that emphasize rural practice and community dentistry should strengthen the pipeline and help retain those students with a predisposition to practice in rural and underserved areas. Additionally, special programs to help encourage licensed dentists to practice in areas identified as underserved will also contribute to the overall impact of the pipeline. These include loan repayment programs, programs that support the development of dental practice sites, and other practice incentives. These types of programs are currently being employed in most states for both physicians and dentists.

In commonwealth dental schools, Pennsylvania applicants are disproportionately selected from all applicants. Although only 10 percent of all applications were Pennsylvania residents in 2001, 31 percent of enrollees were. It is not clear how much effect formal school policy has on this phenomenon. The percentage of dental school applications from in-state students has declined in recent years, as has the number of enrollees.

Temple University has formed alliances with several Pennsylvania colleges to develop the pipeline from undergraduate education into professional dental education. Temple also participates in the Robert Wood Johnson Foundation “Pipeline” program intended to garner the participation of more minorities into the dental profession. The University of Pittsburgh actively recruits from traditionally black colleges in Pennsylvania, but few minority students enroll. All three dental schools incorporate some strategies to encourage service in rural or underserved areas. The University of Pittsburgh has a community dentistry program that exposes students to underserved areas, both urban and rural. Additionally, the school partners with the Pennsylvania Area Health Education Center, whose mission is to improve health care in underserved areas. Temple’s pipeline program involves an active community dentistry component with clinical training in underserved areas in Philadelphia. The University of Pennsylvania incorporates academically based service learning courses in all four years of its program. In the first two years, students provide dental education at schools and community centers, and, in the third and fourth years, provide clinical service in low-income areas in Philadelphia via a mobile van.

Commonwealth sponsored initiatives that support the pipeline are also in place. These include the loan repayment and challenge grant programs, as well as loans, sponsored by the Pennsylvania Higher Education Assistance Agency program, that encourage students to remain in Pennsylvania.

Dental school recruitment policy holds the most promise for pipeline development. Formalized links with Pennsylvania colleges is one strategy for enhancing in-state recruitment. Special programs that expose potential applicants to the profession are effective also, especially with minority students (Chamar, Weaver and Valachovic, 2006). Differential tuition and fee schedules can also make dental school enrollment more attractive to commonwealth residents. These are policies that need to be developed privately within each of the dental schools. However, the state has some influence in the policies of the two state-related dental schools and it always has the option to offer incentives to all three schools.

Any initiative that will help ease the debt burden of students will encourage more low-income and minority students to enroll in dental school.

Establishing a universal residency requirement also may contribute to the pipeline by encouraging a residency location in Pennsylvania and exposing graduate dentists to community dentistry. A universal residency requirement also extends service to populations traditionally not well served by dentists.

The continuation and expansion of state programs that encourage the practice of dentistry within the state and within underserved areas will contribute to the pipeline.

Nurses

Arguably, nursing is the discipline that has received the greatest attention with respect to its impending workforce shortages. In the latter half of the 1990s, nursing shortages captured many headlines and
provoked discussions by policy makers in the commonwealth, as well as the nation as a whole. This concern prompted hearings and legislative development by both the U.S. Congress and the Pennsylvania General Assembly. There was good reason for this concern. The nursing workforce is the largest of all health care provider workforces and it is critical to the foundation of care, especially in hospitals and long term care facilities. In Pennsylvania, there are more than 200,000 registered nurse licensees (Pennsylvania Department of Health, 2006) and more than 50,000 practical nurse licensees (Pennsylvania Department of Health, 2005). A considerable number of these licensees are not engaged in patient care. This contributes to the complexity of the educational capacity-workforce maintenance relationship in nursing.

Because of this complexity, any effort to ameliorate future workforce shortages by focusing solely on educational capacity would be shortsighted. An enlightened policy course designed to address the problem of an inadequate nursing workforce in the future should include a variety of other targets as follows: adequately preparing secondary school students for nursing education, using the inactive licensed workforce, encouraging participation in nursing by males and underrepresented minorities, increasing employment satisfaction and decreasing workforce departures, securing adequate clinical training sites and faculty, and financially supporting students who may find it difficult to participate in nursing education because of limited financial resources.

Through a variety of enacted legislative initiatives, the commonwealth has responded to these targets by instituting programs that encourage students to pursue nursing, supporting new and existing nursing programs, and facilitating an increase in the number of nurse educators. These initiatives include student loans through PHEAA and grants to educational programs (Pennsylvania Center for Health Careers, 2006).

The response of the commonwealth resulted in a turnaround in nursing school enrollment only a few years after the impending nursing shortage garnered the public’s attention. Enrollment increased in RN programs 59 percent between 1999 and 2003 and in LPN programs by 63 percent (Pennsylvania Department of Health, 2004a). Faculty increased by 36 percent in RN programs and by 127 percent in LPN programs, although many were part-time (Pennsylvania Department of Health, 2004a).

By many reports, this increase in educational demand has resulted in an inability to accommodate many potential new students. Two-thirds of administrators report that current educational capacity will not meet current and projected needs (Legislative Budget and Finance Committee, 2004). Many schools have had to institute waiting lists for the admission of potential students. Eight of the 12 universities in the State System of Higher Education report that they are at or over capacity (Legislative Budget and Finance Committee, 2004). Despite the increase in faculty hires, student-faculty ratios increased in RN programs (Pennsylvania Department of Health, 2004a). Results from the survey of programs associated with this research indicate a less serious strain on educational capacity. Many programs report that they are currently able to accommodate more students, although many have encountered barriers to program expansion.

Irrespective of the current capacity’s ability to meet today’s workforce needs, it is a near certainty, given the sheer magnitude of the nursing workforce and nursing’s traditional role in delivering health care, that additional capacity will be required for the future. Any decline in enrollment in the future will have negative effects on maintaining the workforce and on the delivery of health care to state citizens. It can also be asserted that a public policy response needs not only to increase system capacity but also to address the effective use of that capacity and incorporate effective methods to retain nurses in the workforce.

Other Disciplines

The increased demand for health care, in general, leads to the expectation that the demand for most, if not all professions, will also increase (Salzburg, 2003). However, the demand for less traditional disciplines is more likely to be affected by new technologies or by reorganization of the health care delivery system. According to projections by the Center for Workforce Information and Analysis (CWIA) (2006), employment for pharmacists is expected to increase in the near future. The CWIA estimates that about 354 employment opportunities will be available per year in the next 10 years.28 The ratio of commonwealth enrollment to licenses is relatively high (.28) and about 95029 graduates per

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28 This includes replacement of retiring pharmacists as well as new positions.
29 This estimate is based on total enrollment divided by four, the typical duration in years for the professional program. Total educational duration is six years including two years of pre-professional training. Using six as the denominator, the yearly graduate estimate is 640, still exceeding estimates of employment opportunities.

Health Care Degree Programs
year would be more than adequate to supply the CIWA estimates for annual employment opportunities. The retention rate of Pennsylvania-educated pharmacists is not known. Workforce trends that have garnered attention in recent years include the closing of many local retail pharmacies, and increasing employment by drug manufacturers thus decreasing the employment pool for community and hospital pharmacists.

Employment for physician assistants is expected to increase as well. The CWIA estimates that about 113 employment opportunities will be available per year in the next 10 years. The ratio of commonwealth enrollment to licenses is the highest of any discipline estimated in this research (.46). The retention rate of Pennsylvania-educated physician assistants is not known. The number of licensed physician assistants has grown considerably since the mid-1990s.

Employment for social workers is expected to increase in the near future. The CWIA estimates that nearly 1,000 employment opportunities will be available per year in the next 10 years.30 The retention rate of Pennsylvania educated social workers is not known. Social workers are employed in a variety of positions and in a variety of settings. The clinical responsibilities of social workers often duplicate that of counselors and other mental health care workers. Consequently, estimation of an absolute need for the social worker workforce is difficult to estimate.

Employment for occupational therapists is expected to increase in the next future. The CWIA estimates that about 129 employment opportunities will be available per year in the next 10 years. The U.S. Bureau of Labor statistics also estimates a 21 percent to 35 percent growth rate in occupational therapy employment between 2000 and 2010 (American Occupational Therapy Association, 2006). The current national occupational therapist workforce is approximately 86,000 of which 92 percent are female. Enrollment peaked in 1999 and declined thereafter as a response to uncertainty in labor market demand (American Occupational Therapy Association, 2006). Beginning in 2007, the entry-level educational requirement for occupational therapists will be a master’s degree. The ratio of commonwealth enrollment to licenses is in the middle to high range for the disciplines estimated in this report (.23). The retention rate of Pennsylvania educated occupational therapists is not known.

Employment for physical therapists is expected to increase in the near future. The CWIA estimates that about 221 employment opportunities will be available per year in the next 10 years. The number of graduates from physical therapy programs peaked in 1999 and declined thereafter, but is expected to recover in the near future (American Physical Therapy Association, 2005). Enrollment has been fairly stable since 2001 (American Physical Therapy Association, 2005). DPT programs (Doctor of Physical Therapy) are now the modal type of program and the discipline is moving toward an all-doctoral workforce. Bachelor’s programs have all been discontinued. The Northeast, in particular New York, New Jersey and Pennsylvania, have a disproportionate share of the physical therapy educational capacity in the United States (American Physical Therapy Association, 2005) The ratio of commonwealth enrollment to licenses is in the middle to high range for the disciplines estimated in this report (.23). The retention rate of Pennsylvania educated physical therapists is not known.

Employment for dental hygienists is expected to increase in the near future. The CWIA estimates that about 274 employment opportunities will be available per year in the next 10 years. The ratio of commonwealth enrollment to licenses is quite low (.10). The oral health care community is debating expanding the scope of practice for dental hygienists in limited settings with the intention of improving access for indigent and institutional populations (Pennsylvania Dental Hygienists’ Association, 2006). If such a policy were adopted, the demand for hygienists would probably witness an increase. The retention rate of Pennsylvania educated dental hygienists is not known.

Employment for dental assistants is expected to increase in the near future. The CWIA estimates that about 459 employment opportunities will be available per year in the next 10 years. Given the looming short supply of dentists, the participation of dental hygienists and dental assistants will contribute greatly to the efficiency of the delivery of oral health care and attenuate the impact of the declining supply of dentists. This is especially important since the commonwealth is in the process of establishing license protocols for extended function dental auxiliaries (EFDA). The retention rate of Pennsylvania-educated dental assistants is not known, but dental assisting is one of the more local disciplines and retention is expected to be quite high.

Other non-degreed disciplines for which the CWIA projects an employment increase in the near future include: pharmacy aides, physical therapy assistants, clinical laboratory technologists, occupational therapy assistants, health information technicians, medical assistants, emergency medical technicians, paramedics,
Table 12: Health Care Education Programs by Plans to Increase Enrollment Capacity, 2006

<table>
<thead>
<tr>
<th>Program</th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
<th>Under discussion/ No action</th>
<th>Total</th>
</tr>
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<td>0</td>
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<tr>
<td>Dental Hygienist</td>
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<td>9</td>
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<td>1</td>
<td>15</td>
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<tr>
<td>Total</td>
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<td>2</td>
<td>11</td>
<td>300</td>
</tr>
</tbody>
</table>

Plans to Increase Capacity

For all disciplines, 27 percent of programs report that they have plans to increase the enrollment capacity of their programs (Table 12). An additional 4 percent report that expansion plans are under discussion.

No dental school indicated plans to increase enrollment; this is in a discipline that could well use increased educational capacity for both general supply and distributional purposes. Additionally, only one hygienist program reported plans for expansion, in a discipline that has the lowest enrollment to license ratio. In contrast, about 27 percent of dental assistant programs report plans to increase enrollment and it is anticipated that new EFDA programs may well be established. The Pennsylvania Department of Health received a grant from the Robert Wood Johnson Foundation to develop a model EFDA training program. The department contracted with Harcum College to develop this program and, as this research was being conducted, the program was being distributed to other institutions in the commonwealth.

Three of the eight medical schools report enrollment expansion plans. This follows recent enrollment increases for several schools and the establishment of out-of-state campuses for two of the medical schools. Thirty-one percent of RN programs (all types), over 40 percent of general MSN programs, and about 25 percent of LPN programs report expansion plans. These plans follow other expansion efforts and enrollment growth stimulated by commonwealth initiatives to address the nursing shortage.

Among physician assistant programs, a discipline with relatively high educational capacity, only one program has indicated expansion plans (these plans are under discussion in another program). Similarly, for pharmacy programs, another discipline with relatively high capacity, no programs reported plans to expand enrollment. In physical and occupational therapy, disciplines that have experienced historical enrollment declines and for which enrollment has recently been...
recovering, 13 and 25 percent of programs report expansion plans, respectively.

**Use of Distance Education**

One strategy to broaden the geographic access to a health care education program is through the incorporation of distance education. A significant proportion (36.4 percent) of the programs surveyed reported offering at least some distance education opportunities for their students. The disciplines that are most likely to offer distance education opportunities are advanced practice and professional nursing\(^{31}\) and physical and occupational therapy programs. However, very few programs offer most of or the entire curriculum via distance education. Since clinical education is a significant component of the curriculum in most of these programs, it is unlikely that most or all of the education needed for a student to complete the requirements for a degree would be available through distance education. Because of this, distance education primarily functions to increase opportunities for students who may otherwise find it difficult to complete program requirements.

**Student Origins**

The dominant\(^{32}\) geographic origins of students, as reported by the program, are presented in Table 13. The only disciplines for which the modal student origin category is out-of-state are medicine, dentistry, and physician assistant.

In Table 14, the percentage of programs reporting that a significant proportion of their students (at least 20 percent) come from each of the five geographic areas identified in the table is presented. Programs were given the opportunity to identify as many of these areas as were appropriate,\(^{33}\) therefore, the percentages do not add up to 100 percent.

**Workforce Data and Program Planning**

The majority of programs (64 percent) have indicated that they incorporate workforce information into their development plans for the program. In only a few disciplines (pharmacist, social work, physician assistant, and dental assistant) is this percentage

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\(^{31}\) With the exception of hospital diploma programs and nurse anesthetist programs.

\(^{32}\) Dominant in this table is defined by the geographic category from which most students originate.

\(^{33}\) The percentages shown in the table are the percent of programs responding in the affirmative that a significant percent of students come from that type of region. The denominator for the percentage includes these responses, the “no” responses, and the “don’t know” responses.
significantly lower than the overall average. The frequent use of workforce information by program planners is significant to commonwealth policy makers since it suggests a mechanism by which they can influence institutional plans to increase the educational capacity of health care education programs, especially in disciplines that are projected to be in high demand.

There is evidence that this process has already begun. More than 60 percent of the program representatives surveyed indicated they have received Workforce Information Board materials or they believe that administrative personnel at their institution received them. Of those not reporting the receipt of this information, the overwhelming majority (79 percent) indicates that they would like to receive it.

### Table 14: Health Care Education Programs for Which At Least 20 Percent of Students Come From Designated Geographic Areas, 2006

<table>
<thead>
<tr>
<th>Program</th>
<th>Local Area</th>
<th>Region But Not Local</th>
<th>State But Not Region</th>
<th>Outside State</th>
<th>Region But Not Local--Includes Another State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentist</td>
<td>0%</td>
<td>67%</td>
<td>33%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Dental Hygienist</td>
<td>78%</td>
<td>100%</td>
<td>33%</td>
<td>22%</td>
<td>0%</td>
</tr>
<tr>
<td>Dental Assistant</td>
<td>100%</td>
<td>90%</td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Physician</td>
<td>0%</td>
<td>29%</td>
<td>86%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>69%</td>
<td>92%</td>
<td>85%</td>
<td>85%</td>
<td>0%</td>
</tr>
<tr>
<td>Social Work (MSW)</td>
<td>100%</td>
<td>100%</td>
<td>70%</td>
<td>40%</td>
<td>0%</td>
</tr>
<tr>
<td>Nurse Practitioner</td>
<td>84%</td>
<td>90%</td>
<td>63%</td>
<td>16%</td>
<td>5%</td>
</tr>
<tr>
<td>Nurse Anesthetist</td>
<td>80%</td>
<td>100%</td>
<td>100%</td>
<td>70%</td>
<td>0%</td>
</tr>
<tr>
<td>Nurse Midwife</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>RN-Diploma</td>
<td>100%</td>
<td>100%</td>
<td>38%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>RN-Associate Degree</td>
<td>97%</td>
<td>93%</td>
<td>38%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>RN-BSN</td>
<td>92%</td>
<td>92%</td>
<td>77%</td>
<td>26%</td>
<td>2%</td>
</tr>
<tr>
<td>MSN (general, CNS)</td>
<td>83%</td>
<td>90%</td>
<td>62%</td>
<td>14%</td>
<td>3%</td>
</tr>
<tr>
<td>LPN</td>
<td>100%</td>
<td>93%</td>
<td>43%</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>83%</td>
<td>83%</td>
<td>100%</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>50%</td>
<td>67%</td>
<td>83%</td>
<td>75%</td>
<td>8%</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>79%</td>
<td>100%</td>
<td>79%</td>
<td>79%</td>
<td>7%</td>
</tr>
</tbody>
</table>
The following summarizes the major findings from this research:

- Pennsylvania has an extensive infrastructure for education in health care disciplines. The research identified 330 educational programs for the following health care providers: dentists, dental hygienists, dental assistants, physicians, physician assistants, social workers (MSW), nurses (all disciplines), optometrists, podiatrists, pharmacists, occupational therapists, and physical therapists. An additional 154 institutions offering programs for technologists and aides have also been identified (non-exhaustive).

- Private colleges and universities are responsible for educating the majority of students in most disciplines. However, community colleges are responsible for educating the majority of dental hygienists and associate degree nurses; Area Vocational Technical Centers are responsible for educating the majority of LPNs; and proprietary schools are responsible for educating the majority of dental assistants and are home to a plurality of technology and aides programs.

- Twenty-eight percent of all programs are located in rural counties. LPN programs have the greatest presence (47 percent) in rural areas. This is largely a consequence of the broad geographic distribution of Area Vocational Technical Centers, the institutional type responsible for the majority of LPN programs.

- The number of programs in medicine, pharmacy, and dentistry is limited and are predominately located in larger cities. Because these disciplines generally require residency training, their broad geographic distribution is not critical. Most disciplines, including nursing, have a rather broad distribution throughout Pennsylvania. The areas with the fewest programs are the least populated regions of the commonwealth: the northern tier and southwest portions of the state. Dental hygienist and dental assistant programs are not well distributed.

- RN enrollment was over 22,000 students with programs indicating additional capacity. LPN enrollment was approximately 3,000 with programs indicating additional capacity. The additional capacity in nursing identified by this research is in contrast to other reports that report waiting lists and strained capacity. There are about 6,000 medical students in the commonwealth and about 1,300 dental students. There are only 684 hygienist students and 525 dental assistant students. There are over 3,800 pharmacy students and approximately 1,300 OT-PT students currently enrolled in commonwealth educational programs.

- Very few programs report special efforts to place graduates in Pennsylvania, in rural areas, or underserved areas.

- About 30 percent of all programs report plans to increase capacity or are discussing that possibility. No dental schools report such plans, but more than 25 percent of dental assistant programs have instituted expansion plans. Thirty-one percent of nursing programs report expansion efforts are underway.

- Many programs reported encountering barriers in their efforts to increase their program capacity. The most frequently mentioned barriers were availability of clinical training sites and availability of qualified faculty.

- The geographic reach of programs may be increased by the use of distance education. About one-third of programs offer distance education, but very few offer it for most of or their entire curriculum.

- The dominant student geographic origin for physician, dentist, and physician assistant programs is out-of-state. The dominant origin for hygienist, dental assistant, RN-diploma, RN-associate, and LPN programs is the local area where the institution is located. Other programs predominately serve the region in which the program is located.

- Many programs already use Workforce Investment Board information for planning purposes and more would like to receive that information.

- Pennsylvania educates many physicians; however only 44 percent of the physician workforce attended medical school in the commonwealth, slightly less in rural areas (42 percent). Sixty-three percent of the workforce completed a residency in Pennsylvania.

- Only 36 percent of Pennsylvania medical school graduates remain in the state to provide care and only 7 percent are retained in rural areas. Even fewer are retained to provide primary care in rural areas (4 percent) and in underserved areas (1 percent or less). Among all medical schools, the Philadelphia College of Osteopathic Medicine
The major challenge in the education-to-workforce pipeline is retaining physicians in rural and underserved areas.

- The major challenge in the education-to-workforce pipeline is retaining physicians in rural and underserved areas. Capacity will become an issue in the future, but the distribution of physicians is more critical. The distributional challenge should be addressed through educational program initiatives and reforms in the health care delivery system.
  - The national educational capacity of dental schools is insufficient to meet the public health demand for dentists in the future. Pennsylvania has a disproportionate share of the national educational capacity. Seventy-five percent of the current dentist workforce attended Pennsylvania dental schools and 70 percent of the rural dentist workforce attended Pennsylvania schools.
  - Forty-three percent of Pennsylvania dental graduates remain in the commonwealth to provide care and 6 percent provide care in rural areas. The University of Pittsburgh School of Dental Medicine retains a greater percentage of its graduates for service in Pennsylvania and in rural Pennsylvania. Retention rates for more recent cohorts are less than the retention rates for older cohorts.
  - Because of the declining supply of dentists, dental education capacity is a more important issue than capacity in other disciplines. However, dentist retention and distribution is also very important.
  - Expanding the educational capacity of nursing education is a complex policy issue. Strategies to expand capacity, effectively use that capacity, and maintain an adequate workforce must include science education at the elementary-secondary level, abating premature exits from the workforce, and exploiting the inactive workforce. Meeting Pennsylvania’s nursing workforce needs for the future will be a continual challenge.

**POLICY CONSIDERATIONS**

The policy considerations presented here are intended to contribute to the maintenance of an adequate health care workforce in rural areas by addressing health care education and workforce policies. Six policy themes are presented.

**Target Geographic Distribution of Physicians**

Public policies intended to maintain an adequate supply of physicians in rural Pennsylvania should focus on the development of and support for initiatives that help distribute graduates to rural and underserved areas, including family medicine residencies, especially in rural areas. Since these initiatives are likely to be developed as programs within independent educational institutions, it may be best to develop them as publicly supported demonstration projects with continued public support contingent upon significant public impact. Since the medical education infrastructure is more national in scope, policies intended to increase capacity for medical education within the commonwealth should be given a lower priority.

- The Pennsylvania General Assembly should consider funding demonstration projects for rural track programs within the commonwealth’s eight medical schools. These demonstration projects should result in both a high probability of rural placements and a high absolute number of rural placements. The Jefferson Medical College at Thomas Jefferson University currently operates a successful rural track program that results in a high probability of rural placements. However, these placements do not constitute a significant percentage of the rural workforce. Consequently, other schools should be encouraged to develop their own programs. There are many models for these programs and the schools should develop programs that are consistent with their existing structures. One model that should be afforded special consideration is the combined undergraduate-graduate family practice program. This model integrates a family practice residency with medical school and, as a result, shortens the total length of time needed for a student to complete a family practice education.
- Family practice physicians are the foundation of rural physician service. The Pennsylvania General Assembly should consider funding demonstration projects for family medicine track programs within the commonwealth’s eight medical schools. Emphasis on other specialties that are in short supply in rural areas,
like general surgery, should also be considered. Programs that encourage medical school graduates to participate in commonwealth graduate medical education should be encouraged. Nationally, family residency programs are finding it difficult to recruit students. In Pennsylvania, the situation is not as severe, but many family practice residents are international medical graduates. To effectively develop the pipeline from graduate medical education to rural practice, the proportion of international medical graduates needs to be reduced and replaced by Pennsylvania medical graduates. Since, in recent years, there has been a decline in the number of medical school graduates choosing a family practice residency, residency programs have filled their slots with international medical graduates.

- The Pennsylvania Department of Public Welfare should consider carving out support for family practice residency programs through its special reimbursement to teaching hospitals. This support should emphasize residency programs that are located away from large academic medical centers.
- Public support for medical education in the commonwealth is not well integrated and not designed to support the education-to-practice pipeline. The Pennsylvania General Assembly should consider convening a commission to study the feasibility of adopting an integrated model of medical education support (Utah model) that is designed to improve the provision of physician services to rural and underserved populations. In the Utah model, the state captures Medicare and Medicaid bonus payments associated with the reimbursement for medical services provided at teaching hospitals and directs those resources into an integrated program that promotes the placement of physicians in rural and underserved areas.
- Continued support for the Pennsylvania Department of Health’s Loan Repayment Program is important to the policies suggested above. If policy makers can integrate participation in that program with the initiatives discussed above, the public benefits of the Loan Repayment Program and the newer initiatives will be maximized. Additionally, public policies such as those that encourage the recruitment of physicians (and other providers) to rural areas should always be developed in conjunction with provider retention policies. Retention is critical to successful outcomes. Serial recruitment of providers to these areas does not serve the public interest and is fiscally unwise. There are many strategies that encourage provider retention in rural and underserved areas. One of these strategies is preferential reimbursement for services. The federal government offers preferential reimbursement for Medicare services performed at community health centers and rural health clinics, as does the Pennsylvania Department of Public Welfare for Medicaid services. Another strategy is support for the provider’s family, especially assistance in finding spousal employment. Providers often cite spousal employment as a barrier to locating and remaining in rural areas. Potential employers often offer this type of support, but there is additional opportunity for local and state governments to assist in these efforts. Finally, providers often cite difficulty in pursuing professional development as a barrier to locating and remaining in rural areas. Programs like the Pennsylvania Area Health Education Center help deliver continuing professional education to these providers and, in collaboration with health professional schools, provide opportunities for providers to mentor students.

**Target Both the Supply of and Geographic Distribution of Dentists**

The supply of dentists is declining in the commonwealth and the distribution of dentists to rural areas is unfavorable. Consequently, policies designed to address the supply of dentists should be directed not only toward increasing the educational capacity of the commonwealth’s dental schools but also toward encouraging Pennsylvania’s dental graduates to practice in rural and underserved areas. The short supply of dentists has a disproportionate impact on rural and underserved populations. As long as an abundant supply of insured and wealthier self-pay patients exists, dentists are not likely to participate in the medical assistance program or locate in rural areas in significant numbers.

- The Pennsylvania General Assembly should consider encouraging the two state-related dental schools to expand their enrollment capacity. Such support should be made contingent on the inclusion of a rural track program. University-operated dental clinics have historically been supported through line items in grants to these universities. Historical levels of support for these clinics should be reinstated and such support should include a mandate to provide service to rural areas as well as underserved inner city populations.
- The Pennsylvania General Assembly should consider funding demonstration projects for rural track programs within the commonwealth’s three dental schools. These demonstration projects should demonstrate both a high probability of rural place-
ments and a high absolute number of rural placements.

- The Department of Public Welfare should mandate their medical assistance contractees to ensure broader geographic access to dental care. Clinical education partnerships between dental schools and medical assistance dental providers may increase access and contribute to the success of rural track programs at these dental schools.
- The short supply of dentists increases the importance of an available dental assistant and dental hygienist workforce. The Pennsylvania Department of Health should encourage the development of more dental assistant programs at rural AVTS sites. The Pennsylvania General Assembly should consider funding demonstration projects by nursing education programs to recruit non-traditional student populations, especially males. For nurse education programs to effectively have access to an available population of potential students in the future, the composition of nursing students must be broadened.

The short supply of dentists increases the importance of an available dental assistant and dental hygienist workforce. The Pennsylvania Department of Health should encourage the development of more dental assistant programs at rural AVTS sites. The Pennsylvania General Assembly should consider funding demonstration projects by nursing education programs to recruit non-traditional student populations, especially males. For nurse education programs to effectively have access to an available population of potential students in the future, the composition of nursing students must be broadened.

- Early exits from nursing careers are common. Evidence exists that a significant proportion of early exits from the profession are due to “burnout” and dissatisfaction with working conditions, especially at hospitals and long-term care facilities. Policies directed at improving the working conditions of nurses should abate the degree of early exits from the profession and, consequently, diminish the need for additional educational capacity. The Pennsylvania General Assembly may consider legislation that specifies the conditions under which mandatory overtime is required for nurses. The Pennsylvania General Assembly and the Pennsylvania Department of Health should consider policies and incentives that encourage the development of nurse-centered hospitals. The Magnet Hospital program is a national program that conducts extensive surveys of hospitals to determine if operation and labor policies are consistent with fair and equitable treatment of nurses. Magnet hospitals must meet rigorous requirements with respect to the work environment of nurses and their representation in hospital administration. Once a hospital is credentialed as a Magnet Hospital, it has a competitive advantage to hire and retain its nursing staff.
- Analysis of education and workforce issues in nursing will be periodically required to inform policy. To that end, the Pennsylvania Department of Health should consider releasing its license renewal survey of RNs and LPNs for use by qualified researchers. Analysis of these data has produced valuable information in the short time that they have been available, but their utility can extend far beyond their current applications. Comprehensive analyses of these data by researchers with different skills and perspectives will increase the scientific basis for future policy.

Maintaining an Adequate Nursing Workforce Requires a Comprehensive Approach

The commonwealth has responded to nursing workforce supply issues in a comprehensive and effective manner by increasing the number and availability of nurse educators, increasing educational capacity, and increasing student interest and enrollment. The components of the response that still need attention include recruiting non-traditional students, abating nurse exits from the profession, and exploiting the trained inactive workforce. However, maintaining an adequate nursing workforce will require constant vigilance.

- The Pennsylvania General Assembly should consider funding demonstration projects by nursing education programs to recruit non-traditional student populations, especially males. For nurse education programs to effectively have access to an available population of potential students in the future, the composition of nursing students must be broadened.

Make Education for Technologists More Accessible and Obtainable for Potential Students

The commonwealth should expand the scope of programs that make education for technological
occupations in health care more accessible for students.

- The Pennsylvania General Assembly should continue to support existing programs that increase accessibility to and participation in educational programs that prepare students for occupations projected to be in high demand. Existing programs like the 2+2+2 Workforce Development Program should be extended to include more rural partners and health care programs. Since community colleges are a primary provider of programs, their limited distribution in the commonwealth needs to be addressed. New Economy Technology Scholarships (NETS)\(^\text{34}\) and the Workforce Advancement Grant for Education (WAGE)\(^\text{35}\) as well as other PHEAA administered programs should be sustained. Any additional initiatives that incorporate the development of partnerships among secondary and vocational schools, two-year colleges, and four-year colleges will increase the availability of educational opportunity in areas that may not be well-served and to students who may otherwise find participation difficult.

**Develop the Community College Infrastructure**

Community colleges are the primary providers of dental hygienist and ASN education and a significant provider of dental assistant and LPN education. They also have a significant local presence and are very responsive to local labor markets. Although the Pennsylvania General Assembly established a statement of purpose in 1982 to, “...facilitate the development of community colleges within reasonable commuting distances of every citizen of the commonwealth,”\(^\text{36}\) this objective is far from being accomplished (National Center for Higher Education Management Systems, 2001). Specific policy recommendations to increase the presence and viability of community college education can be found in a report sponsored by the Pennsylvania Commission for Community Colleges (National Center for Higher Education Management Systems, 2001). This report includes detailed suggestions on the governance and funding of the system of community colleges within the commonwealth.

- New community colleges or branch campuses of existing community colleges need to be developed in areas not currently being served by a community college. Un-served areas include many of the most rural areas of the state. Most of the currently operating community colleges are in or around the commonwealth’s large and medium size cities.

- Community colleges are ideal partners in collaborative arrangements that link secondary and technical education with traditional four-year college degree programs. These collaborative arrangements offer a promising approach to foster the flexibility needed to sustain the educational capacity for health care providers in an ever-evolving health care delivery system.

**Further Develop the Capacity of the AVTS System to Educate LPNs and Dental Assistants**

Area Vocational Technical Centers serve as the preeminent provider of LPN education in the commonwealth. They are also a significant provider of education for dental assistants. This research has revealed a low capacity-to-workforce ratio for LPNs. This suggests a need for additional capacity in LPN education. The research has also suggested that an increase in the dental assistant workforce will be needed to ensure adequate dental care in the presence of a declining supply of dentists.

- The Pennsylvania Department of Education should institute policies that support the development and maintenance of LPN and dental assistant programs at AVTSs. The establishment of collaborative arrangements between AVTSs, certified EFDA programs, dental hygienist programs, and ASN programs should make the program more attractive to potential enrollees.

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\(^{34}\) NETS is a scholarship program for post-secondary education in selected science and technology programs. The recipient must agree to work in Pennsylvania one year for each year of the scholarship. The program is administered by PHEAA.

\(^{35}\) The WAGE program provides block grants to qualified postsecondary institutions. With the funds, the institution provides grants to qualified adult learners who demonstrate financial need. The program is administered by PHEAA.

\(^{36}\) 22PA. Code 35.1.a of the School Code.


Schwartz, Mike. Undated. “The Effect of AHEC Supported Clinical Experience on Students’ Intended Practice Locations.”


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