Allied Health Education in Rural Health Professional Shortage Areas of the United States

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Several recent studies[1,2] have highlighted gross deficiencies in the health status of those living in rural areas of the United States, as well as inequities in the distribution of health resources in such areas. Concerns about an adequate supply of primary care physicians and allied health personnel[3,4] in rural areas have catalyzed federal and state governments to action, including reinvigoration of the National Health Service Corps,[5] development of a new federal Office of Rural Health Policy,[6] and design and implementation of interdisciplinary training demonstration projects in rural communities.[7]

Allied health professionals form a vital part of the health care infrastructure necessary to support ambulatory and institutional primary care and to provide the full spectrum of basic health care, yet definitive quantitative studies relating allied health training location and subsequent rural practice choice do not exist. Even basic data on the number and distribution of allied health personnel in the United States are recognized as being grossly inadequate,[8] with distribution data for many occupations consisting solely of data on students entering and graduating from educational programs accredited by the American Medical Association (AMA) Committee on Allied Health Education and Accreditation (CAHEA).

Nonetheless, quantitative evidence from some regional projects[9,10] suggests a link between allied health training sites and subsequent practice locations, and supportive anecdotal results yielded by other projects reinforce the perception that training sites in rural communities can prepare health professions students for rural practice,[11,12] enhance access to care for underserved populations, and provide health career opportunities for rural residents. Training in rural medically underserved areas can favorably influence health professions students to choose rural practice locations on completion of their training.[13,14] In addition, rural-based institutions tend to enroll a disproportionate number of students from rural backgrounds and/or those inclined toward rural practice,[15] which has led to the assumption that recruiting students from rural communities and providing them and others with training opportunities in such communities can contribute to placing and retaining allied health personnel throughout rural America.[16]

The interinstitutional research project described below was undertaken by the the AMA, American College Testing, the University of North Carolina at Chapel Hill, and the Bureau of Health Professions in the US Health Resources and Services Administration to examine the distribution and characteristics of 2,888 allied health education programs accredited by CAHEA and to determine the extent to which the distribution of rural programs and training sites intersects with geographical areas of need. The project was accomplished by consolidating data collected on CAHEA-accredited allied health education programs with county-level sociodemographic and health resources data.

Primary Data Collection

The CAHEA Annual Report, a survey conducted by the AMA Department of Information Analysis and Publications, collects detailed data from CAHEA-accredited programs. The Program Director's Perspectives Survey, distributed to program directors with the CAHEA Annual Report, collects data on a variety of allied health education and practice issues.[17] The 1991 Program Director's Survey requested information on the location and characteristics of rural training sites associated with accredited programs. Rural communities were identified by the US Office of Management and Budget definition of nonmetropolitan: "counties in the US that were not part of a metropolitan statistical area in 1990 (ie, having a city of 50,000 or more population or an urbanized area with at least 50,000 residents that is itself a part of a county or counties with at least 100,000 total residents)."[18]

Data Consolidation

Rural training site data from the Program Director's Survey and student data from the CAHEA Annual Report were merged, using software developed by the American College Testing Program. Using the University of North Carolina Rural Health Geographic Information System (UNC GIS),[19] CAHEA data were subsequently merged with demographic data maintained by the Health Resources and Services Administration Bureau of Health Professions in the Area Resource File.[20]

To identify rural programs and to verify reported rural sites, zip codes for programs and training sites were matched to county Federal Information Processing System (FIPS) Codes.[21] Rural program and training site data were then merged with additional county-level Area Resource File data, which included sociodemographic characteristics and indicators of health care need, health care resources, and federal support for rural health care.

Analyses

Univariate analyses were used to examine the number and distribution of rural programs and rural training sites. Multiple linear regression analyses were used to assess the extent to which programs and training sites were located in rural primary care health professional shortage areas.

RESULTS

Program Director's Perspective Surveys were returned by 2799 of the 2888 programs surveyed; 2761 (96%) of the respondents provided rural training site information. Data on programs in Alaska and Puerto Rico were excluded from analysis because the Area Resource File does not contain county-level metropolitan/nonmetropolitan designations for these jurisdictions. Thirteen percent (384) of all accredited programs were themselves located in rural areas; 205 of these programs reported having

rural training sites, while 517 nonrural programs (18% of all accredited programs) reported having at least one rural training site.

Table 1 shows, by occupation, the number of rural training locations, including rural programs, their rural training sites (if applicable), and rural sites associated with nonrural programs. As shown in the Table, rural training locations are distributed across 901 of the 2342 nonmetropolitan counties in the United States. Although the average number of training locations per rural county is less than one, almost 40% of all rural counties have an allied health education program or training site. Figure 1 displays the distribution of all rural training locations in the United States.

Of all programs reporting rural training sites, 43% required a rural training site rotation; 34% indicated that all program requirements could be fulfilled at one site; 28% reported that students were required to live in the community associated with the rural site. Students who rotated through one or more sites reportedly spent a median of 16 weeks in one or more rural training sites before completing the program.

Variations in Rural Training Among Allied Health Professions

That some occupational areas are clearly more involved in rural education than others seems related to (1) the profession's association with the delivery of primary care and (2) the profession's use of sophisticated technologies and equipment. Physician assistants and occupational therapists are frequently perceived as being involved in the delivering of primary care services. Although each of these disciplines has a low number of rural programs, each is associated with large numbers of rural training sites.

Occupations that require sophisticated institutional facilities, such as cytotechnology, diagnostic medical sonography, emergency medical technician-paramedic, radiation therapy technology, and specialist in blood bank technology, have relatively few rural programs or training sites. Occupations with no rural programs or training sites include those with few programs nationally--anesthesiologist's assistant, cardiovascular technologist, electroneurodiagnostic technologist, medical illustrator, ophthalmic medical technician/technologist, perfusionist, and surgeon's assistant.

When the profession involves two training levels, programs providing the shorter training option are usually more extensively involved in rural education. For example, medical laboratory technician programs granting 1-year certificates or associate degrees have a higher percentage of programs in rural areas and an overall higher average number of rural training sites, than do medical technologist programs granting baccalaureate degrees. Respiratory therapy technician programs are more frequently located in rural areas and offer more rural training sites than respiratory therapy programs. This disparity in rural training opportunities is not observed between the two training levels in health information management.

Predictors Associated with the Distribution of Rural Training

A multivariate regression model was constructed to examine factors associated with the distribution of rural allied health training locations. The dependent variable was the number of allied health training locations in each US rural county, excluding Alaska and Puerto Rico. Allied health training locations included rural programs, their training sites (if applicable), and rural training sites associated with nonrural programs.

As shown in Table 2, the independent variables included in the model were county-level sociodemographic characteristics and indicators of health care need and health care resources. Also included as independent variables were three indicators of support for rural health care from the Health Resources and Services Administration: Primary Care Health Professions Shortage Area (HPSA) designation,[22] Area Health Education Centers (AHECs),[23] and Community or Migrant Health Centers (C/MHCs).[24] The Primary Care Health Professions Shortage Area designation, established for the National Health Service Corps, reflects the availability of primary care health professionals in a county. The designation is based primarily on a primary care physician-to-population ratio and to a lesser degree on four indicators of need: poverty rate, infant mortality rate, low birthweight birth rate, and access to primary health care services. The access indicator reflects estimates of travel time to health care facilities. Significantly more importance is given to physician availability in determining the overall HPSA designation. Area Health Education Centers, funded by the Bureau of Health Professions, are programs designed to improve the supply of health professionals by dispersing medical and allied health educational resources. Community and Migrant Health Centers, funded by the Bureau of Health Care Delivery and Assistance, are primary care facilities that provide services to underserved populations.

Sociodemographic characteristics–Populous rural counties are significantly more likely to have allied health programs or training sites. Counties that grew rapidly over the last decade and those with higher numbers of Hispanics are significantly less likely to have allied health training locations than those that grew slowly or have lower numbers of Hispanics.

The presence of allied health training sites seems unaffected by a large black population in the county. Rural counties in Southeastern states have significantly fewer allied health education programs and training sites.

Indicators of Health Care Need–Although not statistically significant, percentage of persons over the age of 65, per capita income, and infant mortality rate were each shown to be negative predictors of rural training location.

Indicators of Health Care Resources--Both the relative density of physicians and the availability of short-term hospital beds have a strong and independent relationship with rural allied health training activity. This is not surprising, as physicians or physician-associated facilities employ most allied health personnel and hospitals sponsor 36% of all CAHEA-accredited programs.

HRSA Support for Rural Health Care--The statistically significant ($P<.02$) negative regression coefficient for counties designated as Primary Care Health Professions Shortage Areas demonstrates the need for targeted expansion of some rural training locations and suggests that the HPSA designation is measuring factors beyond the availability of physicians. Although not statistically significant, the model also suggests that states with Area Health Education Centers may have somewhat higher numbers of rural training locations than those without them.

CONCLUSIONS

Allied health education, an important part of the US rural health care infrastructure, is offered in nearly 2000 widely dispersed rural locations, with almost 40% of all nonmetropolitan counties having one or more CAHEA-accredited programs or training sites. The most important finding, from a health policy perspective, is that counties with a Primary Care Health Professions Shortage Areas (HPSA) designation also lack allied health training resources. Even after statistically controlling for the effects of three components of the HPSA designation (physician-to-population ratio, per capita income, and infant mortality rate), the designation remains a sensitive predictor of the distribution of rural allied health training locations. This suggests that the location of rural training is related to a community's physical isolation (access to health care), the remaining component of the HPSA designation.

The lack of an association between rural training and Community and Migrant Health Centers suggests that these centers should be considered as potential sites when rural training locations are established. The lack of allied health training resources in HPSA-designated areas supports the premise that targeted expansion of allied health education resources in underserved areas might improve the health care infrastructure by enhancing access to care for the medically underserved, making rural health professions shortage areas more attractive as practice locations for physicians and allied health personnel, and providing health career opportunities for residents of rural areas.

FUTURE STUDY

This project, the first phase of an ongoing rural health research agenda, may serve as a model for further collaborative studies addressing the distribution of health professions training and personnel distribution in rural health professions shortage areas. Prospective studies that collect data from

graduates of programs with rural locations can now assess the relationship between health professions training in rural areas and subsequent rural practice location and retention patterns of health professionals. Researchers will be able to determine if rural training enhances access to care for rural residents, determine the mix of health services provided to the underserved, and identify the complex of health personnel providing such services.

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24. Title III of the Public Health Service Act, Sec 329/330.

Table 1 - CAHEA-Accredited Allied Health Education Programs and Rural Training Sites, 1991*

Occupation	Accredited Programs	Rural Programs		Rural Training Sites		Rural Training Locations	Rural Counties with Programs and Training Locations	
		N	%	N	%		N	%
Radiologic Sciences								
Radiographer	673	117	17.4	106	15.8	337	286	12.2
Radiation Therapy Technologist	109	3	2.8	11	10.1	10	10	0.4
Medical Laboratory Sciences								
Cytotechnologist	47	1	2.1	4	8.5	6	4	0.2
Histologic Technician/Technologist	38	4	10.5	5	13.2	10	8	0.3
Medical Lab Tech--Assoc Degree	215	56	26.0	81	37.7	247	202	8.6
Medical Lab Tech--Certificate	42	14	33.3	9	21.4	50	113	4.8
Medical Technologist	415	31	7.5	33	8.0	118	104	4.4
Respiratory Care								
Respiratory Therapist	263	31	11.8	38	14.4	109	93	4.0
Respiratory Therapy Technician	163	34	20.9	32	19.6	163	128	5.5
Health Information Management								
Medical Record Administrator	55	11	20.0	16	29.1	53	54	2.3
Medical Record Technician	113	23	20.4	28	24.8	176	141	6.0
Other Therapists/Assistants								
Medical Assistant	192	25	13.0	41	21.4	162	126	5.4
Occupational Therapist	74	4	5.4	39	52.7	150	121	5.2
Physician Assistant	50	2	4.0	39	78.0	288	234	10.0
Other Health Technologists/Technicians								
Diagnostic Medical Sonographer	47	4	8.5	5	10.6	18	16	0.7
Emergency Medical Tech -Paramedic	73	7	9.6	15	20.5	36	31	1.3
Nuclear Medical Technologist	108	5	4.6	3	2.8	7	6	0.3
Surgical Technologist	117	12	10.3	12	10.3	44	38	1.6
Total	**2,794**	**384**	**13.7**	**517**	**18.5**	**1,984**	**901**	**38.5**

* Alaska and Puerto Rico were excluded.

Rural training locations include rural programs and rural training sites.

Table 2 - Characteristics of Rural Training Sites Associated with CAHEA-Accredited Programs, by Occupation, 1991*

Occupation	Programs Reporting Rural Training Sites	Rural Training Required for Completion		Requirements Fulfilled at a Single Site		Reqire Residency at Rural Site		Total Weeks Spent at all Rural Training Sites Upon Program Completion			
		N	%	N	%	N	%	Mean	SD#	Min	Max
Radiologic Sciences											
Radiographer	106	63	59.4	37	34.9	18	17.0	35.9	34.7	2	110
Radiation Therapy Technologist	11	3	27.3	0	0.0	3	27.3	9.5	12.2	2	44
Medical Laboratory Sciences											
Cytotechnologist	4	1	25.0	2	50.0	3	75.0	17.3	22.0	3	50
Histologic Technician/Technologist	5	2	40.0	5	100.0	3	60.0	35.3	16.3	12	50
Medical Lab Tech--Assoc Degree	81	34	42.0	45	55.6	18	22.2	19.4	11.7	1	61
Medical Lab Tech--Certificate	9	1	11.1	7	77.8	5	55.6	29.1	9.5	23	48
Medical Technologist	33	11	33.3	11	33.3	20	60.6	15.5	15.8	1	60
Respiratory Care											
Respiratory Therapist	38	23	60.5	6	15.8	8	21.1	24.5	34.1	1	150
Respiratory Therapy Technician	32	25	78.1	8	25.0	2	6.3	16.9	16.2	1	60
Health Information Management											
Medical Record Administrator	16	5	31.3	1	6.3	3	18.8	4.3	2.2	2	10
Medical Record Technician	28	9	32.1	5	17.9	1	3.6	8.6	12.6	2	68
Other Therapists/Assistants											
Medical Assistant	41	8	19.5	23	56.1	4	9.8	7.5	3.7	1	16
Occupational Therapist	39	4	10.3	7	17.9	21	53.8	10.3	3.3	1	15
Physician Assistant	39	17	43.6	7	17.9	35	89.7	8.2	6.1	4	30
Other Health Technologists/Technicians											
Diagnostic Medical Sonographer	5	3	60.0	4	80.0	1	20.0	21.0	19.7	4	40
Emergency Medical Tech -Paramedic	15	8	53.3	2	13.3	1	6.7	15.3	17.9	1	60
Nuclear Medical Technologist	3	1	33.3	1	33.3	1	33.3	23.7	25.1	4	52
Surgical Technologist	12	6	50.0	3	25.0	0	0.0	15.0	14.2	2	40
All occupations with rural training sites	**517**	**224**	**43.3**	**174**	**33.7**	**147**	**28.4**	**19.2**	**23.1**	**1**	**150**

* Alaska and Puerto Rico were excluded.
# (SD) Standard Deviation

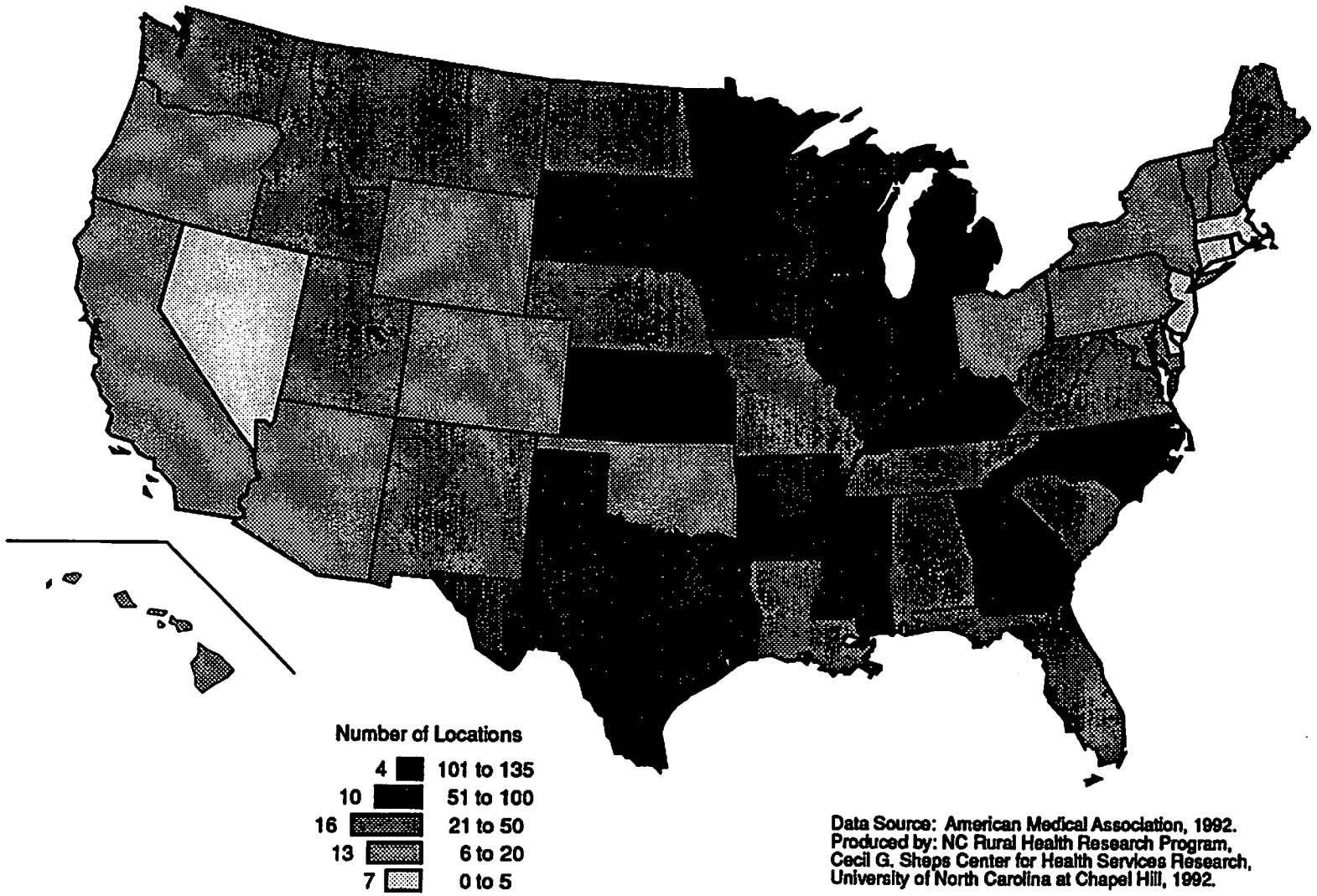
Table 3 - Predictors of CAHEA-Accredited Allied Health Education Locations in US Nonmetropolitan Counties, 1991*

Predictor variable	Beta	t	p-value
Health resources			
MDs per 100,000 population	.0060	11.860	.0001
Hospital beds per 10,000 population	.0281	3.705	.0002
Sociodemographic characteristics			
1990 county population	.0220	13.222	.0001
Population growth 1980-90	-.0016	-8.167	.0001
1990 Black population	.0037	0.444	.6574
1990 Hispanic population	-.0233	-2.408	.0161
Per capita income, 1989	-.0184	-1.578	.1174
Located in Southeast region	-.1213	-1.744	.0813
Health care need/use indicators			
Percent population over 65	-.0114	-1.499	.1339
Infant Mortality Rate, 1984-88	-.0034	-0.498	.6184
Federal & state involvement			
In a state with an AHEC Program	.0958	1.577	.1150
In a Primary Care HPSA County	-.1441	-2.359	.0184

N= 2,342 nonmetropolitan counties, excluding Alaska and Puerto Rico
R-square = 0.239; Adjusted R-square = 0.235
F=60.813; p < .0001

* Rural locations include allied health education programs or training sites in US nonmetropolitan counties, excluding Alaska and Puerto Rico.

Figure 1 – Allied Health Rural Training Locations, by State, 1991



Data Source: American Medical Association, 1992.
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