
A Rural-urban Comparative Study of Nonphysician Providers in Community and Migrant Health Centers

LEIYU SHI, DrPH, MBA
MICHAEL E. SAMUELS, DrPH
THOMAS C. RICKETTS, III, PhD
THOMAS R. KONRAD, PhD

Dr. Shi and Dr. Samuels are both with the Department of Health Administration, School of Public Health, University of South Carolina. Dr. Shi is Assistant Professor, Dr. Samuels is Chairman and Associate Professor. Dr. Ricketts and Dr. Konrad are both with the Rural Health Research Program, Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill. Dr. Ricketts is Director of the Rural Health Program and Associate Director of the Sheps Center. Dr. Konrad is Associate Director of the Rural Program.

Tearsheet requests to Leiyu Shi, DrPH, Department of Health Administration, School of Public Health, University of South Carolina, Columbia, SC 29208; tel. 803-777-5041; FAX 803-777-4783.

Synopsis

This is a study of the employment of nonphysician providers—nurse practitioners, physician assistants, and certified nurse midwives—in both rural and

urban Community and Migrant Health Centers and of factors associated with their employment, based on a 1991 national survey of 383 Centers.

Results of the survey suggest that nonphysician providers, in particular nurse practitioners and certified nurse midwives, primarily serve as physician substitutes, and are more likely to be employed by Centers that are larger and have affiliations with nonphysician provider training programs.

Rural or urban location is not significantly related to the employment of nonphysician providers after controlling for center size. The fact that rural centers employ fewer nonphysician providers than urban centers can primarily be accounted for by their relatively small size, rather than a lack of interest.

These findings demonstrate that the use of non-physician providers is an important way both to achieve cost containment and improve access to primary care for those residing in medically underserved areas.

THE ABILITY OF NONPHYSICIAN primary care providers—nurse practitioners, physician assistants, and certified nurse midwives—to deliver both high quality and cost-effective medical care has been well established (1–3).

Nurse practitioners (NPs) are registered nurses who have completed either an advanced certificate program or a master's degree program of study leading to competence in an administrative role (4). Physician assistants (PAs) are graduates of the physician assistant training program and licensed to perform medical procedures under the supervision of a physician (5). Certified nurse midwives (CNMs) are registered nurses with additional training in midwifery from a nurse-midwifery program that includes maternal and fetal procedures and patient assessment (6).

The Congressional Office of Technology Assessment (OTA), in its evaluation of nonphysician providers (NPPs) based on two decades of research, found that the measures by which the quality of care

provided by NPs, PAs, and CNMs is evaluated are equivalent to those used to evaluate care provided by physicians (7). Further, NPPs are more adept than physicians at providing services that depend on communication with patients and preventive services. Another OTA report concluded (1a),

Given that the quality of care provided by nurse practitioners, physician assistants, and certified nurse midwives within their areas of competence is equivalent to the quality of comparable services provided by physicians, using nurse practitioners, physician assistants, and certified nurse midwives rather than physicians to provide certain services would appear to be cost-effective from a societal perspective.

NPPs are also more likely than physicians to work in medically underserved areas. NPPs provide access to care in settings where there is an inadequate supply of physicians and expand the scope of care

available to patients by emphasizing services that physicians might not address, according to OTA research (1,8).

There has been little research, however, on the employment of NPPs in Community and Migrant Health Centers (C-MHCs). For nearly three decades, C-MHCs have been providing primary care and preventive health services to populations from designated medically underserved areas (9–10). The U.S. Public Health Service Act (as published in the November 17, 1980 issue of the Federal Register) defines a medically underserved area as one with a shortage of personal health services based on such indicators as infant mortality rate, ratio of primary care physicians to population, percentage of population ages 65 and older, and percentage of population below poverty level (11).

Such designated areas receive national priority in meeting their health care needs and are targets for special Federal health initiative programs (Community and Migrant Health Centers, for example). Traditionally, these areas have experienced difficulty in attracting private physicians, particularly of primary care specialties (12,13). As a result, C-MHCs rely heavily on NPPs for services delivery. In 1990, there were 547 C-MHCs in the United States, serving 6 million patients, about 25 percent of the nation's indigent population (10). The patients are drawn principally from minority groups—31 percent African American, 28 percent Hispanic, and 5 percent other minorities.

Our study is a look at the employment of NPPs in both rural and urban C-MHCs and factors associated with their employment, based on a population survey of the nation's C-MHCs. The first objective is to compare rural and urban C-MHCs to see if there are significant differences in general center characteristics and in current and future planned employment of NPPs. The second objective is to test four hypotheses that associate the employment of NPPs by C-MHCs with certain center characteristics.

Specifically, the first hypothesis assumes NPPs' role as physician substitutes and expects an inverse relationship between the number of NPPs employed and the number of physicians presently in the center. The second hypothesis assumes it is more cost-effective for larger centers to employ more NPPs because of economy of scale and expects the number of NPPs employed to be positively associated with center size. The third hypothesis assumes that training programs are likely to place students in affiliated C-MHCs for practical training and to channel them to the centers for career employment and expects the number of NPPs employed to be positively associated

with the number of affiliated NPP training programs of C-MHCs.

The fourth hypothesis assumes that geographic location is expected to affect the number of NPPs employed. C-MHCs in the South are expected to be more active than the other regions in seeking NPP employment because there is a greater demand for primary care professionals, brought about by an inadequate supply of physicians and less access to primary care services. The actual number of NPPs they employ, however, would also depend on the availability and willingness of NPPs to serve in those areas, a factor often beyond the control of C-MHC administrators.

Our research should improve our knowledge about NPPs working in C-MHCs and benefit both C-MHCs concerned about recruiting NPPs and NPP training programs interested in placing their graduates.

Methods

Data. Our research is based on data from a 1991 survey of C-MHCs to assess the use of midlevel providers that we conducted under contract with the National Rural Health Association. The 1991 C-MHC directory was used as the sampling frame (14). All 515 C-MHCs in the contiguous United States were included. The survey instrument was first mailed to administrators of all the C-MHCs in North Carolina and South Carolina during May 1991 for a pre-test. The questionnaire was modified based on respondents' feedback and sent to executive directors of all remaining C-MHCs in the contiguous United States. All nonrespondents were sent an additional mailing in October 1991, and the remaining nonrespondents were contacted by telephone in November 1991.

The final survey instrument included questions on the following major components:

1. current staffing of physicians, nurse practitioners, physician assistants, certified nurse midwives, and others;
2. average length of employment for NPPs;
3. 3-year projection of health professional staffing needs;
4. extent to which training experiences are provided to students and nonphysician training programs affiliated with the center; and
5. region where C-MHC is located.

Overall, 383 C-MHCs (74 percent) responded to the survey, including 243 rural and 140 urban C-MHCs. Centers were identified as rural if they were designated as "rural" grantees by virtue of

having one or more of their clinical sites or a significant portion of their clientele located in rural areas (14). The response rate was 87 percent for rural C-MHCs and 59 percent for urban Centers. Based on data from Bureau Common Reporting Requirements (BCRR), forms submitted to the Bureau of Health Care Delivery and Assistance of the Public Health Service as part of the requirement for receiving Federal funding, however, we did not find significant differences between responding and nonresponding C-MHCs, both rural and urban, in terms of center size (either measured by budget, total staff, or medical staff) and scope of services provided.

Models. Four multivariate models were used to test the four hypotheses listed previously. The dependent variables for the four models were the numbers of total NPPs (model 1), NPs (model 2), PAs (model 3), and CNMs (model 4) currently employed by C-MHCs. The total NPPs currently employed is the sum of NPs, PAs, and CNMs currently employed by C-MHCs. Since no significant difference was noted when variables measuring current vacant NPP positions were included in the analysis, we will not present separate analysis including those variables.

The independent variables included in the four models were the number of physicians employed by C-MHCs (measuring the substitution of NPPs for physicians), the size of C-MHC professional staff (as a measure of whether economy of scale exists), the number of affiliated training programs (as a measure of potential supply of NPPs), and geographic location of C-MHCs (entered as three dummy variables, with Northeast as the default category). The rural-urban location of the C-MHC was included as a control variable. The number of affiliated NPP training programs was used in model 1, the number of affiliated NP training programs in model 2, the number of affiliated PA training programs in model 3, and the number of affiliated CNM training programs in model 4. Using affiliated NPP training programs as proxy for potential supply of NPPs may not be totally valid given that NPPs are likely to practice in the least restrictive climate. More properly, supply variables should include measures of barriers to practice, such as restrictive laws, absence of prescriptive privileges, and rigid physician supervision requirement. Unfortunately, those variables were not collected at the time of survey.

Statistics. To fulfill the first objective of comparing rural and urban C-MHCs in terms of center characteristics and the employment of NPPs, we performed bivariate statistical comparisons to test the relation-

Table 1. General characteristics, by percentages, of 383 Community-Migrant Health Centers (C-MHC), comparing 243 rural centers with 140 urban ones

Characteristics	Total	Rural	Urban
Region:			
Northeast	18.3	111.9	129.3
Midwest	15.9	14.4	18.6
South	46.5	156.0	130.0
West	19.3	17.7	22.1
Patient ethnicity:			
White, non-Hispanic	42.0	149.3	129.9
African American	26.0	119.6	137.0
Hispanic-Latino	26.8	26.5	27.2
Asian-Pacific Islander	3.0	2.9	3.2
Native American	1.0	1.1	0.8
Other	1.2	0.6	1.9
Mean number: (standard error)			
Years since establishment ...	14.2	113.6	115.2
(Standard error)	(5.6)	(0.4)	(0.5)
Physicians	5.3	14.2	17.1
(Standard error)	(4.7)	(0.3)	(0.4)
Nurses	5.5	14.5	17.2
(Standard error)	(6.7)	(0.4)	(0.6)
Total staff	13.4	110.8	117.8
(Standard error)	(11.6)	(0.7)	(0.9)
Affiliated NPP training programs	0.7	10.6	10.9
(Standard error)	(0.8)	(0.1)	(0.1)
Now provide training for:			
Nurse practitioners	41.5	136.6	150.0
Physician assistants	29.0	126.3	133.6
Certified nurse midwives	6.8	6.6	7.1
No one	93.2	93.4	92.9
Affiliated training programs for:			
Nurse practitioners	37.9	133.3	148.0
Physician assistants	25.3	123.3	129.6
Certified nurse midwives	5.4	4.2	7.2
No one	74.7	76.7	71.4
Interested in training:			
Nurse practitioners	71.4	71.6	71.2
Physician assistants	58.1	61.3	52.5
Certified nurse midwives	31.1	29.6	33.6
Supervising students by:			
Nurse practitioners	36.3	132.1	143.6
Physician assistants	22.6	21.9	23.6
Certified nurse midwives	11.1	18.4	115.7
Physicians	77.3	180.7	171.4

¹Indicates observed difference between rural and urban C-MHCs for this variable is significant at $P < .05$.

NOTE: Differences between rural and urban C-MHCs were evaluated by chi-square test for categorical variables and by a one-way analysis of variance for continuous variables.

ships between rural-urban location and center characteristics as well as the employment of NPPs. Chi-square statistics was used for categorical variables and analysis of variance for continuous variables. To fulfill the second objective of testing the four hypotheses that associate the employment of NPPs with center characteristics, we performed four multiple regressions to determine the relative significance of identified independent variables on the numbers of NPs, PAs, CNMs, and total NPPs employed. The *t*-statistics associated with the independent variables were used to ascertain the significance level based on a *P* value of 0.05.

Table 2. Comparison of current and planned 1992-94 employment of nonphysician providers (NPP) in 383 Community-Migrant Health Centers (C-MHC) between 243 rural centers and 140 urban ones

Plans	Total		Rural		Urban	
	Mean	SE	Mean	SE	Mean	SE
Current employment:						
Nurse practitioners	1.4	1.9	11.0	0.1	12.0	0.2
Physician assistants	1.0	1.6	0.9	0.1	1.1	0.1
Certified nurse midwives	0.3	1.0	0.3	0.1	0.4	0.1
Nonphysician providers	2.7	2.9	12.1	0.2	13.5	0.3
Vacancies	2.2	2.5	11.9	0.2	12.7	0.2
Physician-to- nonphysician ratio	2.3	2.2	12.0	0.2	13.7	0.2
Years of service by:						
Nurse practitioners	4.5	3.7	4.5	0.4	4.4	0.3
Physician assistants	4.3	3.8	4.5	0.4	4.0	0.5
Certified nurse midwives	2.9	3.1	3.1	0.5	2.7	0.5
Nonphysician providers	4.3	3.5	4.5	0.3	4.1	0.3
Planned hiring (1992-94):						
Physicians	3.5	5.2	13.0	0.3	14.3	0.4
Nurse practitioners	1.5	2.6	11.3	0.2	12.0	0.2
Physician assistants	0.9	2.0	0.9	0.1	1.1	0.2
Certified nurse midwives	0.6	1.7	0.6	0.1	0.7	0.1
Nonphysician providers	3.1	4.8	12.7	0.3	13.8	0.4

*Indicates observed difference between rural and urban C/MHCs for this variable is significant at $P < .05$.
NOTE: SE = Standard error.
Differences between rural and urban C/MHCs were evaluated by one-way analysis of variance for all continuous variables.

Results

Comparisons between rural and urban C-MHCs.

Information from tables 1 and 2 can be used to address the first study objective. Table 1 presents the general characteristics of sampled C-MHCs. Nearly half of the surveyed agencies (46.5 percent) are situated in the South, followed by the West (19.3 percent), Northeast (18.3 percent), and Midwest (15.9 percent). As can be expected from their locations in inner city and remote rural areas, C-MHCs serve disproportionately large numbers of minorities. Forty-two percent of C-MHC patients are white and 58 percent are members of racial and ethnic minorities, compared with 74 percent white and 26 percent minorities for the nation's population as a whole. The average C-MHC has 14.2 years of operation and employs a staff of 13.4, including 5.3 physicians and 5.5 nurses.

Table 1 also compares rural and urban C-MHCs in terms of the centers' general characteristics. In terms of geographic location, most of the rural C-MHCs (56

percent) are in the South, whereas urban C-MHCs are more evenly situated. The racial composition of patients differs significantly between rural and urban centers. The percentage of non-Hispanic white patients is significantly higher in rural centers (49.3 percent) than in urban centers (29.9 percent). Urban centers have a significantly higher proportion of African American patients than rural centers (37 percent versus 19.6 percent). The proportions of Hispanic-Latino, and Asian-Pacific Islander patients are approximately the same in urban and rural centers. On average, urban centers have operated 1.6 years longer than rural centers. Urban centers are also significantly larger than their rural counterparts whether measured by average number of physicians (7.1 versus 4.2), nurses (7.2 versus 4.5), or total staff (17.8 versus 10.8).

NPP training. In terms of NPP training, currently, 41.5 percent of the centers provide training for NPs, 29 percent for PAs, and 6.8 percent for CNMs. More than one-third of the centers (37.9 percent) are affiliated with NP training programs, 25.3 percent with PA training institutions, and 5.4 percent with CNM training programs. Most of the centers (71.4 percent) are interested in training NPs, 58.1 percent in training PAs, and 31.1 percent in training CNMs. NPP students are supervised by physicians in 77.3 percent of the centers, by NPs in 36.3 percent of the centers, by PAs in 22.6 percent of the centers, and by CNMs in 11.1 percent of the centers.

Compared with rural centers, urban centers are more likely to provide training for NPs (50 percent versus 36.6 percent), have more affiliated training programs for NPs (48 percent versus 33.3 percent) and PAs (29.6 percent versus 23.3 percent), and more likely to have their NPP students supervised by NPs (43.6 percent versus 32.1 percent) and CNMs (15.7 percent versus 8.4 percent). Rural centers are more likely to have physicians supervise the students than urban centers (80.7 percent versus 71.4 percent).

Table 2 provides summary information about current and future planned employment of NPPs. On average, a community or migrant health center employs 2.7 NPPs, including 1.4 NPs, 1 PA, and 0.3 CNM, and has 2.2 NPP vacancies. The average length of employment by an NPP is 4.3 years, ranging from 4.5 years for NPs, 4.3 years for PAs, to 2.9 years for CNMs. In terms of planned hiring of physicians and NPPs between 1992 and 1994, a C-MHC will on average hire 3.5 new physicians, 3.1 new NPPs, including 1.5 NPs, 0.9 PA, and 0.6 CNM.

Comparing NPP employment differences between rural and urban C-MHCs, we found that urban centers

Table 3. Regression models of number of nonphysician providers employed on selected Community/Migrant Health Center characteristics

Independent variable	Dependent variables											
	Nonphysician providers			Nurse practitioners			Physician assistants			Certified nurse midwives		
	Parameter estimate	Standard error	t value	Parameter estimate	Standard error	t value	Parameter estimate	Standard error	t value	Parameter estimate	Standard error	t value
Intercept	-.66	.27	-2.45	-.15	.20	-.77	-.61	.18	-3.36	.07	.12	.57
Rural-urban location	-.10	.12	-.82	.16	.09	1.80	.09	.08	1.07	-.03	.05	-.53
Physicians	-.24	.04	¹ -5.83	-.20	.03	¹ -6.78	-.003	.03	¹ -.09	-.05	.02	¹ -2.80
Total staff	.26	.02	¹ 14.76	.17	.01	¹ 12.69	.06	.01	14.75	.04	.01	14.96
Affiliated training programs	.51	.13	¹ 3.82	...	...	...	...	...	...	...	...	...
Nurse practitioner training programs	...	...	...	.58	.13	¹ 4.56	...	...	...	...	...	...
Physician assistant training programs	...	...	...	...	...	...	.78	.15	¹ 5.22	...	...	...
Certified nurse midwife training programs	...	...	...	...	...	...	...	...	...	1.16	.20	¹ 5.92
Midwest	.34	.17	¹ 2.01	-.05	.12	-.40	.43	-.12	¹ 3.71	-.12	.08	-1.56
South	.86	.18	¹ 4.86	.32	.13	¹ 2.47	.45	.12	¹ 3.72	.04	.08	.48
West	.83	.14	¹ 5.89	.28	.11	¹ 2.68	.56	.10	¹ 5.59	-.05	.07	-.77
R ²	.57	...	...	.47	...	...	.32	...	...	.20	...	...
Sample ²	365	...	...	338	...	...	337	...	...	337	...	...

¹P < .05.

²Sample size not equal to survey total due to exclusion of centers with missing values.

on average have significantly more NPPs than rural centers (3.5 versus 2.1). The difference is accounted for mainly by the average number of NPs in urban and rural centers (2 versus 1) and the size differential between them. The physician-to-NPP ratio is significantly higher in urban than rural centers (3.7 versus 2), implying that rural centers hire significantly more NPPs relative to physicians than urban centers. Urban centers have more NPP vacancies, (2.7 versus 1.9), and plan to hire more physicians (4.3 versus 3 per center) and NPs (2 versus 1.3 per center) than rural centers. Planned new hires of PAs and CNMs are approximately the same between rural and urban centers. Assuming that responding C-MHCs resembled the C-MHC population, total planned hiring of NPPs would be 751 for rural centers and 901 for urban centers between 1992 and 1994. There is no significant difference in length of employment of NPPs between rural and urban centers.

Factors in the Employment of NPPs

The results of multiple regression models presented in table 3 can be used to address the second study objective—to test four hypotheses associating NPPs' employment in C/MHCs with characteristics such as the number of physicians presently in the Center, the total number of staff members employed, the number of affiliated NPP training programs, and the geographic location of the Center. The independent variables jointly account for 57 percent of the

variations in total NPPs employed and 47 percent in the number of NPs, 32 percent in PAs, and 20 percent in CNMs employed.

These relatively high levels of R²s make apparent the significance of the hypothesized explanatory factors. The relative effect of the independent variables on NPPs' employment can be assessed by examining the *t*-ratios of their indicators. The number of NPPs employed is most affected by the total staff and number of affiliated training institutions in all four models. The next most significant predictor, except for the PA model, is the number of physicians employed, followed by the geographic location variables.

Physicians. Among independent variables, the number of physicians in the center is inversely associated with the number of NPPs employed (hypothesis 1). This inverse relationship is significant for all but the PA model, suggesting that the predominant role for NPPs is as substitute physicians (after controlling for center size).

The finding that NPPs employed in C-MHCs primarily serve as substitutes for physicians is consistent with previous research about the unique role of NPPs in alleviating the shortage of physicians in medically underserved areas (15,17). The employment of NPPs can compensate for geographic and specialty maldistributions of physicians, thus mitigating the severe consequences of the shortage of primary care physicians. Among NPPs, NPs and CNMs are more

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likely than PAs to serve as substitutes for physicians in C-MHCs. The insignificant relation between PAs and number of physicians may be explained by the fact that PAs are more likely to work under the supervision of physicians (1). PA training programs continue to be physician-dominated, whereas NP programs are more heavily influenced by nursing practices.

Total staff. The total number of staff members has significant and positive effect on the number of NPPs employed in all the models (hypothesis 2). Based on the regression coefficients, we estimate that the number of NPPs employed will increase by 0.26 for every additional staff member employed. In other words, one NPP is employed for every 3.9 staff members employed. Comparison across three individual models shows that the number of NPs employed is most affected by the size of the C-MHC. Specifically, one NP is employed for every 5.9 staff members employed, one PA for every 16.7 staff members, and one CNM for every 25 staff members.

The significant impact of center size, along with the finding that NPPs predominantly function as physician substitutes, suggests there may be economy of scale in using NPPs. The fact that larger centers employ more NPPs proportional to the number of physicians to maximize services is consistent with the factors associated with input substitution in health care institutions (18,19).

Affiliated NPP training programs. The number of NPPs employed is also significantly influenced by the number of affiliated NPP training programs (hypothesis 3). The four models show that NPPs are more likely to be employed in centers that have affiliations with training programs. The finding that C-MHCs having closer ties with training programs are more

successful in recruiting NPPs supports previous work on provider training program and practice location (20,21).

Geographic location. In terms of the geographic location variables, C-MHCs in the South and West are more likely to employ NPs and PAs than those in the Northeast, but there seems to be no difference in terms of employing CNMs (hypothesis 4).

Although bivariate comparisons indicate that urban centers both currently have and plan to employ more NPs than rural centers, the control variable, rural-urban location of a center, is not significantly related to NPP employment in the multivariate models after controlling for center size. Thus, it is likely that the fact that rural centers employ fewer NPPs can be accounted for primarily by their relatively small size, rather than lack of interest. To the contrary, both rural and urban centers expressed great interest in using NPPs, particularly NPs and PAs.

Conclusion

Our study of the current employment of NPPs in rural and urban C-MHCs demonstrates that NPPs, especially NPs and CNMs, serve as physician substitutes and are more likely to be employed by C-MHCs that are larger and have affiliations with NPP training programs.

In the United States, medical care is not only costly but also unevenly distributed. The chronic shortage of physicians, particularly of primary care specialties, in inner city and remote rural areas is unlikely to disappear in the foreseeable future. Using NPPs as primary care providers may well be a breakthrough in providing needed care to the nation's underserved, since NPPs are trained in less time than physicians and their effect on the perceived physician shortage could be felt more quickly than could the effect of programs designed to increase the availability of medical education. Furthermore, NPPs are capable of providing quality care at much lower costs. Thus, the use of NPPs is an important way both to achieve cost containment and improve access to quality primary care for those residing in medically underserved areas.

Continued employment of NPPs to provide primary care in medically underserved areas hinges on the easing of legal and reimbursement restrictions on NPPs (22,23). Legal constraints involve the supervision requirements and the range of permitted activities, including prescribing drugs. How much of NPPs' services are covered by third-party payers, including Medicare and Medicaid, is financially vital

to the employment of NPPs. These restrictions remain major impediments to the full use of NPPs as primary care providers. Federal and State Governments should coordinate their activities with medical schools and NPP organizations to develop an integrated strategy to encourage the training and use of nonphysician primary care health professionals. Elements of such a strategy may include

- Funding preferences, incentives, and encouragement for Area Education Centers and Health Education and Training Centers to work with C-MHCs to promote interdisciplinary training of nonphysician primary care health professions students in the centers.
- National Health Service Corps preference for placement of nonphysician primary care health professionals in C-MHCs.
- Funding preferences or set asides, or both, for NPP programs that develop teaching experience in C-MHCs and train center clinical staff as preceptors.
- Reduction of constraints to practice for NPPs in terms of prescription authority, physician supervision, and reimbursement eligibility.

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