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The Determinants of Utilization of Nonphysician Providers in Rural Community and Migrant Health Centers

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Leiyu Shi, DrPH, Michael E. Samuels, DrPH, Thomas R. Konrad, PhD,
Thomas C. Ricketts, PhD, Carleen H. Stoskopf, ScD, and Donna L. Richter, EdD

ABSTRACT: *The use of nonphysician providers, such as nurse practitioners, physician assistants, and certified nurse midwives, in rural areas is critically important due to the continued primary care access problems. This study examines the major factors influencing the use of nonphysician providers in rural community and migrant health centers based on a 1991 national survey of the centers. This study demonstrates that the employment of nonphysician providers in rural community and migrant health centers is significantly influenced by both supply and demand factors. Among supply factors, there is a significant and positive relationship between the number of total staff and the number of nonphysician providers employed. There is a significant but inverse relationship between the number of physicians and the number of nonphysician providers employed, indicating nonphysician providers primarily serve as substitutes for physicians in rural community and migrant health centers. The supply of nonphysician providers, as measured by the number of affiliated training programs, is significantly related to the employment of nonphysician providers. The demand variable, geographic location, and the centers' staffing policies are also significant determinants of the use of nonphysician providers.*

The employment of nonphysician providers such as nurse practitioners, physician assistants, and certified nurse midwives by community and migrant health centers is one of the major breakthroughs in extending cost-effective primary care to medically underserved areas in the United States (Sardell, 1988). As a result of the maldistribution of physicians both by specialty and geography, and the lack of primary care services, the development of community and

migrant health centers and their use of nonphysician providers has been viewed as an important approach to providing access to rural areas. (Fowkes, Hafferty, Goldberg, & Garcia, 1983; Freeman, Kiecolt, Harris, & Allen, 1982; Repicky, Mendenhall, & Neville, 1980; Styles, 1990).

For more information, contact Leiyu Shi, DrPH, University of South Carolina, School of Public Health, Department of Health Administration, Columbia, SC 29208.

Since their emergence in the 1960s, community and migrant health centers have served as a primary care safety net for the nation's poor (U.S. Senate, 1988). They incorporate the concepts of comprehensive and coordinated health services within a single institutional setting. The organization of these services can also take advantage of economies of scale and minimize unnecessary duplication of administrative and medical services (Reid, Bartlett, & Kozoll, 1981; Sardell, 1988). In 1990 these centers comprised 540 organizations operating 1,800 health centers on a \$1 billion budget (Zuvekas, 1990).

Efforts to formally establish the roles of nurse practitioners, physician assistants, and certified nurse midwives as nonphysician health care providers who can improve access to primary care, especially in rural areas, began in the late 1960s (Aaronson, 1991; Abdellah, 1982; Rosenbaum, 1986).

The American Nurses Association defines nurse practitioners as individuals who have completed a program of study leading to competence as registered nurses in an expanded role. The training of nurse practitioners may be a certificate program (nine or more months of training) or a master's degree program (two years of full-time study). There are currently 117 nurse practitioner training programs in the United States (32 certificate programs and 85 master's degree programs) (Department of Health and Human Services [DHHS], 1991; Samuels & Shi, 1992).

The American Academy of Physician Assistants (1986) defines physician assistants, "as part of the health care team...(who) work in a dependent relationship with a supervising physician to provide comprehensive care" (p.3). Currently there are 51 accredited physician assistant training programs in the United States (Samuels & Shi, 1992). Although the typical student will have already completed a baccalaureate program in another discipline, most of the programs grant a baccalaureate degree upon graduation (Association of Physician Assistant Programs [APAP], 1987). Physician assistants are more specialized than nurse practitioners and are licensed to perform medical procedures only under the supervision of a physician.

Certified nurse midwives are registered nurses with additional training in midwifery, including maternal and fetal procedures, nursing, and patient assessment, from a nurse-midwifery program (Endicott, 1976). They are certified by the American College of Certified Nurse Midwives to provide care for normal expectant mothers and refer abnormal, high-risk patients to obstetricians or manage them jointly. Unlike nurse practitioners and physician

assistants, certified nurse midwives have fewer training programs (nine certificate programs and 20 master's degree programs) and fill a unique role in providing maternal care (Adams, 1989; American College of Certified Nurse Midwives [ACCNM], 1988).

Previous studies have confirmed the efficacy of nonphysician providers as health care providers. According to a report generated by the Office of Technology Assessment (OTA) (1986), nurse practitioners and physician assistants often give care equivalent to that provided by physicians. Moreover, nurse practitioners have been noted to have better communication and interviewing skills than physicians, skills particularly important in community and migrant health centers for assessing patients predominantly of minority origin and often with little education (Brody, Cole, Storey, & Wink, 1976).

Certified nurse midwives are considered to be effective in providing access to obstetrical and prenatal services in rural and poor communities (Institute of Medicine, 1985; Rosenbaum, 1985; The Southern Governors' Association [SGA], 1985). The OTA (1986) report concludes that certified nurse midwives manage routine pregnancies safely and as well as physicians. Certified nurse midwives' patients have shorter waiting times for visits, shorter hospitalizations, and are more likely to express satisfaction with their care.

Many studies have demonstrated that nonphysician providers can provide both high quality and cost-effective medical care (Abdellah, 1982; Bessman, 1974; Garrard et al., 1990; Lawrence, 1978; Ostwald & Abanobi, 1986; Sackett, Spitzer, & Gent, 1974; Smith, 1979; Sox, 1979; University GNP Program Consortium Evaluation Project, 1988). Nonphysician providers are also more likely to be employed in rural and medically underserved areas than in urban areas (Hafferty & Goldberg, 1986; Moscovice & Rosenblatt, 1979; Smith, 1979). By 1990, the nation's community and migrant health centers employed about 1,200 nurse practitioners, physician assistants, and certified nurse midwives (Zuvekas, 1990).

Although community and migrant health centers frequently employ nonphysician providers, few studies have examined why nonphysician providers are employed by the centers. This study focuses on the major factors influencing the use of nonphysician providers in rural health centers. The use of nonphysician providers is critically important given the sustained lack of access to primary care in rural areas where Americans have higher mortalities, morbidities, and shorter life expectancies than their urban counterparts (Cordes, 1989; Defriese & Ricketts,

1989; McManus & Newacheck, 1989; Rowland & Lyons, 1989; Sherman, 1991).

Conceptual Framework

The theory of supply and demand provides the conceptual framework of our analysis (Feldstein 1979; Newhouse, 1978). Demand comes from the consumers who live in areas where there is a persistent shortage of primary care physicians. On the supply side, community and migrant health centers are assumed to be maximizing their provider staffing subject to constraints imposed by the available resources and the prices they face in hiring input or resources. Thus, the scarcity and/or costliness of physicians relative to nonphysician providers could induce rural centers to look toward the latter as input substitutes. Larger centers could also hire more nonphysician providers due to economy of scale if these providers are believed to be capable of producing more cost-effective care (Feldstein, 1967). Health center administrators' decisions to employ nonphysician providers also is influenced by legislative restrictions on nonphysician providers' status, practices, and prescriptive authority. These supply and demand notions are also reflected in the market force model of health professional distribution developed by Schwartz, Newhouse, and Bennett (1980) and Newhouse, William, and Bennett (1982), which contends that the key variables are the number of providers and the geographic distribution of demand.

This study offers an opportunity to test whether such a supply and demand model can account for the use of nonphysician providers in rural community and migrant health centers. The hypothesis is that the employment of nonphysician providers in rural centers is expected to be influenced by both supply and demand factors. Supply factors include the number of physicians in community and migrant health centers (as a measure of physician availability), the total size of center professional staff (as a measure of whether economy of scale exists), and the number of affiliated nonphysician provider training institutions (as a measure of supply of nonphysician providers). In terms of demand factors, because by law the centers have been placed in medically underserved areas, usually in inner deteriorating neighborhoods of major cities or in rural areas that are too isolated or too poor to attract private physicians (National Association of Community Health Centers [NACHC], 1991), a

high and homogeneous level of demand for medical care services is assumed for all community and migrant health centers. This study used a regional variable to see if there were variations of demand across regions. Finally, the nonphysician provider policy of each center is used to reflect, although indirectly, the impact of legislation and regulation on nonphysician provider employment.

The number of nonphysician providers employed in a health center is expected to be significantly and positively influenced by the total number of staff, the number of affiliated nonphysician provider training institutions, and center nonphysician provider hiring policies. Larger centers are likely to employ proportionately more nonphysicians, not only because of the relatively insufficient supply of primary care physicians in rural areas, but also due to the relative cost effectiveness of employing them as health care providers. Larger community and migrant health centers also are likely to have sufficient physicians available to provide supervision over greater numbers of nonphysician providers. Centers with more affiliated nonphysician provider training institutions are expected to employ more nonphysician providers because training institutions are likely to place students in affiliated community and migrant health centers for practical training and then to channel them to these centers for career employment. Community and migrant health centers with policies that encourage nonphysician provider hiring are likely to employ more nonphysician providers than those without such policies.

The relationship between the number of nonphysician providers employed and the number of physicians employed hinges on the expected roles of nonphysician providers in community and migrant health centers. Much of the descriptive analysis in the nonphysician provider literature reveals two major divergent role expectations of these providers—a physician extender model and a medical care expander model (Aaronson, 1991; Foundation of the American College of Health Care Administrators [FACHCA], 1989).

In the physician extender model, the nonphysician providers are used exclusively as a substitute for physicians in carrying out medical care responsibilities. This suggests an inverse relationship between number of nonphysician providers employed and the number of physicians present.

In the medical care expander model, the nonphysician provider acts to expand medical services through the integration of medical and

nursing professionals. Physician support and backup are important to ensure the successful use of nonphysician providers (Rogers, 1988). This model suggests a positive relationship between number of nonphysician providers and physicians employed. The empirical relationship between number of nonphysician providers and physicians employed was tested as part of this study.

Finally, the effect of geographic location on the number of nonphysician providers employed was tested. Community and migrant health centers in the South are likely to be more active than those in other regions in seeking nonphysician provider employment due to greater demand for primary care professionals because of an inadequate supply of physicians and less access to primary care services. However, the actual number of nonphysician providers employed in the southern centers would also depend on the availability and willingness of nonphysician providers to serve, as measured by the number of affiliated nonphysician provider training institutions.

Methods

Data. Data for this study comes from a 1991 survey of rural community and migrant health centers assessing the use of nonphysician providers conducted by the authors under contract with the National Rural Health Association. The survey instrument had the following major components: (1) current staffing of physicians, nurse practitioners, physician assistants, certified nurse midwives, and others; (2) centers' staffing policies regarding nonphysician providers; (3) a three-year projection of health professional staffing needs; (4) the average length of employment for nonphysician providers; (5) the extent to which training experiences are provided to students and the training institutions' affiliations with the center; and (6) the region where the community or migrant health center is located.

All the rural community and migrant health centers in the contiguous United States were included. The Bureau of the Census defines as rural those individuals who live in towns with a population of less than 2,500 or in the open country (Cordes, 1989). 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 (DHHS, 1991). About 54 percent (N=278) of commu-

nity and migrant health center grantees in the United States could be designated as rural.

The survey instrument was first mailed to the administrators of all the community and migrant health centers in North and South Carolina in May 1991 for a pretest. Telephone interviews were then conducted with those not responding and selected respondents to obtain feedback. The survey instrument was modified slightly and sent to executive directors of all remaining community and migrant health centers. Those who did not respond were sent an additional mailing in October 1991; those who still did not respond were contacted by telephone in November 1991.

Overall, 243 (86%) of the current 278 rural community and migrant health centers responded to the survey. The high response rate was attributed to both the high level of interest by rural centers in the subject and to follow-up with those who did not respond through telephone reminders and a repeated mailing. The response rate was highest in the south (90%) and similar among the Northeast (80%), Midwest (83%), and West (80%). The South leads the nation in the number of rural community and migrant health centers (N=152) because of the large number of people living in medically underserved areas. The West has 54 rural migrant and community health centers, the Midwest had 42, and the Northeast had 30. The proportion of surveyed centers among the four regions closely resembled the national distribution of rural community and migrant health centers.

Measurements. The dependent variables examined in this study were the numbers of nurse practitioners, physician assistants, certified nurse midwives, and total nonphysician providers currently employed by community and migrant health centers, which is the total of these three groups.

The independent variables include six supply variables measuring physician availability (number of physicians), economy of scale (number of total staff), and supply of nonphysician providers (number of total affiliated training institutions and number of affiliated nurse practitioner, physician assistant, and certified nurse midwife training institutions, respectively); one demand variable (program location) measuring variations in area demand; and one policy variable (nonphysician provider hiring policy).

Nonphysician provider hiring policy was operationalized as: actively seek to employ nonphysician provider (coded as 3), not actively seek

to employ nonphysician provider (coded as 2), and never employ nonphysician provider (coded as 1). The specific nonphysician provider hiring policy also may reflect how each state stands on legal authority, reimbursement policies, and prescriptive authority affecting nonphysician provider practice. Currently, nurse practitioners in 35 states are regulated by the Board of Nursing (Pearson, 1990) (Note 1). In 19 states, third-party reimbursement to nurse practitioners is legislatively addressed, and nurse practitioners in 35 states have legislative authority to prescribe. Physician assistants are licensed to practice in every state except New Jersey. Their services can be reimbursed under the Rural Health Clinic Services Act (P.L. 95-210) and about one half of the states reimburse them under Medicaid. The Omnibus Reconciliation Act of 1980 (OBRA 80) requires nurse midwifery services to be a mandatory benefit under Medicaid and does not permit states to require physician supervision as a condition of reimbursement. However, it can be a condition for licensure in that state. All states, except four and the District of Columbia, were in compliance by 1986. Twenty-four states and the District of Columbia provide statutory prescriptive authority for nurse midwives (Rooks, 1990).

Statistics. The analytical strategy was to compare centers that currently employ nonphysician providers with those that do not employ nonphysician providers. Bivariate statistical comparisons were performed to test the relationships between use of nonphysician providers and other center characteristics. The study employed the *Chi square* statistic for categorical variables and analysis of variance for continuous variables. Multiple regressions were then performed to determine the relative significance of identified independent variables on numbers of nurse practitioners, physician assistants, certified nurse midwives, and total nonphysician providers employed.

Results

Comparisons Between Community and Migrant Health Centers that Employ Nonphysician Providers and Those that Do Not. Among the 243 rural centers surveyed, 186 (77%) currently employ nonphysician providers (nonphysician provider centers) and 57 (23%) do not (not nonphysician provider centers). Seventy percent of the centers were

established between 1971 and 1981.

Table 1 shows the frequency distributions and test statistics for the locations and nonphysician provider training role of surveyed rural community and migrant health centers. Proportionally fewer centers in the Northeast and West employ nonphysician providers than those in the South and Midwest. Among the centers surveyed, nearly one half of the surveyed nonphysician provider centers (43%) provide training for nurse practitioner students, compared with only 16 percent of not nonphysician provider centers ($X^2=15.3$; $P=0.0001$). Eight percent of the nonphysician provider centers provide training for certified nurse midwife students compared with 2 percent of not nonphysician provider centers ($X^2=7$; $P=0.03$). In terms of affiliation with nonphysician provider training institutions, 39 percent of these centers are affiliated with nurse practitioner programs compared with only 15 percent of not nonphysician provider centers ($X^2=11.9$; $P=0.0077$). Compared with not nonphysician provider centers, nonphysician provider centers are more likely to supervise their students with physicians (83% versus 72%; $X^2=3$, $P=0.0832$), nurse practitioners (40% versus 4%; $X^2=32.4$, $P=0.0000$), physician assistants (28% versus 2%; $X^2=22.9$, $P=0.0000$), and certified nurse midwives (10% versus 2%; $X^2=5.1$, $P=0.0236$).

Table 2 provides the mean values and test statistics for current staffing characteristics of surveyed community and migrant health centers. On average, nonphysician provider centers are 1.6 years older than not nonphysician provider centers (14 versus 12.4; $t=2$, $P=0.0451$). In terms of staffing, the total number of professional staff is significantly higher in nonphysician provider centers than in not nonphysician provider centers (11.8 versus 7.5 on average; $t=2.9$, $P=0.0046$), suggesting that larger centers are more likely to employ nonphysician providers. The average years of nonphysician provider employment in nonphysician provider centers are 4.7 years, 1.6 years greater than in not nonphysician provider centers ($t=1.7$; $P=0.092$). Likewise, nonphysician provider centers have significantly more affiliated training programs (0.7 per center on average) than not nonphysician provider centers (0.4 per center on average) ($t=3.1$; $P=0.0024$).

Determinants of Nonphysician Provider Use by Community and Migrant Health Centers. Virtually all of the correlations between number of nonphysi-

Table 1. Frequency Distributions and Test Statistics for Location and Training Role of Rural Community and Migrant Health Centers (C/MHC) in the United States, 1991.

Variables	Total C/MHC ¹		Nonphysician Provider C/MHC ²		Not Nonphysician Provider C/MHC ³		Likelihood	Ratio
	N	(%)	N	(%)	N	(%)	X ²	P-Value
Region								
Northeast	29	(12%)	28	(15%)	1	(2%)	22.7	0.0000
Midwest	35	(14%)	25	(13%)	10	(18%)		
South	136	(56%)	93	(50%)	43	(75%)		
West	43	(18%)	40	(22%)	3	(5%)		
Now provide training for nurse practitioner								
Yes	89	(37%)	80	(43%)	9	(16%)	15.3	0.0001
No	154	(63%)	106	(57%)	48	(84%)		
Now provide training for physician assistant								
Yes	64	(26%)	52	(28%)	12	(21%)	1.1	0.2923
No	179	(74%)	134	(72%)	45	(79%)		
Now provide training for certified nurse midwife								
Yes	16	(7%)	15	(8%)	1	(2%)	7.0	0.0300
No	226	(93%)	170	(92%)	56	(98%)		
Training institution for nurse practitioner								
Yes	72	(33%)	65	(39%)	7	(15%)	11.9	0.0077
No	144	(67%)	103	(61%)	41	(85%)		
Training institution for physician assistant								
Yes	50	(23%)	41	(24%)	9	(19%)	3.1	0.3702
No	165	(77%)	127	(76%)	38	(81%)		
Training institution for certified nurse midwife								
Yes	9	(4%)	8	(5%)	1	(2%)	1.3	0.5219
No	206	(96%)	160	(95%)	46	(98%)		
Interested in training nurse practitioner								
Yes	171	(72%)	137	(75%)	34	(60%)	5.0	0.0256
No	68	(28%)	45	(25%)	23	(40%)		
Interested in training physician assistant								
Yes	146	(61%)	119	(65%)	27	(48%)	5.2	0.0223
No	92	(29%)	63	(35%)	29	(52%)		
Interested in training certified nurse midwife								
Yes	69	(30%)	55	(31%)	14	(25%)	0.6	0.4348
No	164	(70%)	123	(69%)	41	(75%)		
Supervisor for students								
Nurse practitioner	76	(32%)	74	(40%)	2	(4%)	32.4	0.0000
Physician assistant	52	(22%)	51	(28%)	1	(2%)	22.9	0.0000
Certified nurse midwife	20	(8%)	19	(10%)	1	(2%)	5.1	0.0236
Physician	192	(81%)	153	(83%)	39	(72%)	3.0	0.0832
Family practice	126	(58%)	101	(60%)	25	(52%)	0.9	0.3431
Internal medicine	26	(12%)	21	(12%)	5	(10%)	0.2	0.7011
Pediatrics	26	(12%)	20	(12%)	6	(13%)	0.02	0.9007
Obstetrics/Gynecology	12	(6%)	9	(5%)	3	(6%)	0.06	0.8073

1. N=243 surveyed total rural community and migrant health centers.

2. N=186 surveyed rural community and migrant health centers employing nonphysician provider.

3. N=57 surveyed rural community and migrant health centers not employing nonphysician provider.

Table 2. Mean Values and Test Statistics for Staffing Characteristics of Community and Migrant Health Centers (C/MHCs) in the United States, 1991.

Variables	Total C/MHC ¹	Nonphysician Provider MLP C/MHC ²	Not Nonphysician Provider Non-MLP C/MHC ³	t Test	P-Value
	Mean (SD)	Mean (SD)	Mean (SD)		
Average years since center was set up	13.6 (5.2)	14.0 (0.4)	12.4 (0.7)	2.0	0.0451
Current physician	4.2 (4.4)	4.3 (0.3)	3.8 (0.6)	0.8	0.4039
Current nurses	4.5 (5.3)	4.7 (0.4)	3.8 (0.7)	1.1	0.2650
Total current staff	10.8 (10.0)	11.8 (0.7)	7.5 (1.3)	2.9	0.0046
Nonphysician provider staffing policy ⁴	2.8 (0.5)	3.0 (0.03)	2.2 (0.1)	11.0	0.0000
Years of service of nonphysician provider	4.5 (3.8)	4.7 (0.3)	3.1 (0.9)	1.7	0.0920
Current nonphysician provider vacancies	0.4 (0.9)	0.4 (0.1)	0.3 (0.1)	0.6	0.5798
Affiliated nonphysician provider training institutions	0.6 (0.8)	0.7 (0.1)	0.4 (0.1)	3.1	0.0024
Planned hiring of physicians (1992-94)	3.0 (4.5)	3.1 (0.3)	2.7 (0.6)	0.6	0.5630
Planned hiring of nurse practitioner (1992-94)	1.3 (2.2)	1.3 (0.2)	1.3 (0.3)	0.2	0.8683
Planned hiring of physician assistant (1992-94)	0.9 (1.6)	0.9 (0.1)	0.7 (0.2)	1.0	0.3438
Planned hiring of nurse midwife (1992-94)	0.6 (1.4)	0.6 (0.1)	0.5 (0.2)	0.6	0.5421
Planned hiring of nonphysician provider (1992-94)	2.7 (4.1)	2.8 (0.3)	2.5 (0.6)	0.5	0.6405

1. N=243 surveyed total rural community and migrant health centers.
2. N=186 surveyed rural community and migrant health centers employing nonphysician provider.
3. N=57 surveyed rural community and migrant health centers not employing nonphysician provider.
4. An index coded as: 3=actively seek to employ nonphysician provider, 2=not actively seek to employ nonphysician provider, and 1=never employ nonphysician provider.

cian providers employed and determinants thereof are positive (Note 2). The number of nonphysician providers employed is associated positively and significantly with the total staff ($R=0.59$) and affiliation with training institutions ($R=0.29$). The same patterns can be found for the number of nurse practitioners, physician assistants, and certified nurse midwives. Community and migrant health centers' nonphysician provider hiring policies are significantly correlated with the number of affiliated training institutions ($R=0.3$), suggesting that centers actively seeking to employ nonphysician providers are more likely to set up training and employment channels with nonphysician provider training programs.

In terms of regional differences in the employment of nonphysician providers, community and migrant health centers in the South are more likely to employ nonphysician providers in general ($R=0.3$)—and physician assistants ($R=0.34$) and nurse practitioners ($R=0.2$) in particular—than the rest of the country. On the other hand, community and migrant health centers in the Midwest are less likely to employ nonphysician providers in general ($R=-0.2$) and physician assistants in particular ($R=-0.3$).

The estimates for the models of nonphysician provider employment determinants are presented in Table 3. The hypothesized determinants that represent supply, demand, and policy variables jointly account for 56 percent of the variations in the aggregate model and 45 percent, 38 percent, and 20 percent respectively in the nurse practitioner, physician assistant, and certified nurse midwife models. These relatively high levels of R^2 s make apparent the significance of these determinants of employment of nonphysician providers by rural community and migrant health centers.

Among supply variables, the number of total staff has a significant and positive effect on the number of nonphysician providers employed in all of the models (t ratios=10.41, 9.42, 4.03, and 4.7 respectively, $P<0.01$) and the number of nonphysician providers employed was estimated to increase by 0.23 for every additional staff employed. In other words, for every 4.4 staff employed, one of them is a nonphysician provider. Comparisons of three individual models show that the number of nurse practitioners employed is most affected by the size of the center. However, the multiple regression models show that the number of physicians inversely affects the number of nonphysician providers employed. This inverse relationship is significant for all but the

physician assistant model, suggesting that the predominant role for nonphysician providers are physician substitutes (after controlling for center size). The insignificant relation between physician assistants and number of physicians may be explained by the fact that physician assistants are more likely to work under the supervision of physicians.

The number of nonphysician providers employed is also significantly influenced by the supply of nonphysician providers, measured by the number of affiliated training institutions. The four models show that nonphysician providers are more likely to be employed in centers that have affiliations with training programs (t ratios=3.64, 5.12, 3.85, and 4.15 for the four models respectively; $P<0.01$). The variable nonphysician provider policy significantly affects nonphysician providers employed ($t=2.67$; $P<0.01$) even though its positive relationship with three individual models is not statistically significant. Finally, the demand variable, geographic location, shows that community and migrant health centers in the Midwest and South are more likely to employ nonphysician providers than those in the Northeast, but those in the East are less likely to do so.

The relative effect of these factors on nonphysician provider use can be assessed by examining the t ratios of their indicators. The number of nonphysician providers employed is most affected by the total staff and number of affiliated training institutions in all four models. The next most significant predictor for all but the physician assistant model is the number of physicians employed, followed by the region variable and the nonphysician provider hiring policy variable.

Discussion

For more than 26 years community and migrant health centers have provided preventive and primary care services to America's poor and medically underserved populations, most of whom previously had limited health care alternatives. The development of nonphysician providers is beneficial to the U.S. health care system for at least three important reasons (Aaronson, 1991; Bottom, 1987): (1) nonphysician providers can help alleviate the shortage of primary care providers particularly in rural areas; (2) they can compensate for geographic and specialty maldistributions of physicians; and (3) they can help control health care costs.

The results of this study are largely consistent

Table 3. Regression of Number of Nonphysician Providers Employed on Selected Rural Community and Migrant Health Center Characteristics, 1991.

Variable	Nonphysician Providers Employed	Nurse Practitioners Employed	Physician Assistants Employed	Certified Nurse Midwives Employed
Intercept	0.88 [0.42] (2.08**)	0.20 [0.23] (0.85)	0.15 [0.25] (0.63)	-0.29 [0.18] (-1.59)
Number of physicians	-0.24 [0.05] (-4.90***)	-0.20 [0.03] (-6.21***)	-0.02 [0.04] (-0.47)	-0.09 [0.03] (-3.44***)
Number of total staff	0.23 [0.02] (10.41***)	0.14 [0.02] (9.42***)	0.06 [0.02] (4.03***)	0.05 [0.01] (4.70***)
Number of affiliated training institutions	0.51 [0.14] (3.61***)			
Nonphysician provider staffing policy	0.58 [0.22] (2.67***)	0.08 [0.07] (1.12)	0.003 [0.08] (0.04)	0.03 [0.06] (0.58)
Number of affiliated nurse practitioner training institutions		0.62 [0.12] (5.12***)		
Number of affiliated physician assistant training institutions			0.65 [0.17] (3.85***)	
Number of affiliated certified nurse midwife training institutions				1.09 [0.26] (4.15***)
Midwest	0.65 [0.22] (3.01***)	0.28 [0.14] (2.00**)	0.19 [0.15] (1.28)	0.21 [0.11] (1.93*)
South	0.45 [0.18] (2.49**)	0.06 [0.12] (0.51)	0.33 [0.13] (2.66***)	0.12 [0.09] (1.34)
West	-0.39 [0.21] (-1.87*)	-0.18 [0.13] (-1.32)	-0.28 [0.14] (-1.93**)	0.12 [0.11] (1.16)
R ²	0.56	0.45	0.38	0.20
F value	42.07	23.21	17.69	16.25
Sample	243	211	210	210

Note: parameter estimates are on top, standard errors in brackets, *t* values in parentheses.

* $P < 0.1$

** $P < 0.05$

*** $P < 0.01$

with the hypothesis that the employment of non-physician providers in rural community and migrant health centers is significantly influenced by both supply and demand factors. The study shows that nonphysician providers employed in rural centers primarily serve as substitutes for physicians, thus mitigating the severe consequences of the shortage of primary care physicians willing to practice in medically underserved rural areas.

Among the nonphysician providers, nurse practitioners and certified nurse midwives are even more likely than physician assistants to serve as substitutes for physicians in rural community and migrant health centers after controlling for center size, nonphysician provider training, hiring policy, and regional effects. Physician assistants, on the other hand, are more likely to work as physician extenders, under the supervision of on-site physicians. This is consistent with the literature that suggests that physicians are more accepting of physician assistants than nurse practitioners (OTA, 1986). This bias toward physician assistants may have been due to comparatively closer ties between physician assistant educational programs and physician educational programs, as well as to the reticence of the physician assistant profession to disentangle itself from the physician extender label. Physician assistant training programs continue to be physician dominated, while nurse practitioner programs are more heavily influenced by nursing practice.

In addition to the finding that nonphysician providers predominantly function as physician substitutes, this study also shows that there is a significant relationship between the size of the center and the number of nonphysician providers employed. It is likely that large centers employ more nonphysician providers proportional to the number of physicians employed, presumably due to nonphysician providers' abilities to produce cost effective care. This would be consistent with the factors associated with input substitution in health care institutions (Feldstein, 1967).

The supply of nonphysician providers, as measured by number of affiliated training institutions, is a significant factor accounting for nonphysician providers' employment. In both the aggregate and separate models, this variable appears to be highly significant. Centers with closer ties with training programs are more capable of recruiting nonphysician provider staff, a finding consistent with the earlier studies by Hafferty and Goldberg (1986) and Goldberg and Hafferty (1984).

In terms of the demand for nonphysician providers, there appears to be a significant geographic difference. Community and migrant health centers in the South generally employ more nonphysician providers after controlling for other explanatory factors. This could reflect the relative shortage of primary care physicians in this region and the need for primary care services generated by the high poverty and high infant mortality of the population (Cordes, 1989; Norton & McManus, 1989), the major factors for the development of community and migrant health centers in this region. This finding is also reflected in the reported planned hiring by rural community and migrant health centers between 1992 and 1994. Table 4 shows the total planned hiring of physicians and nonphysician providers as reported by surveyed centers. Because the South has the most community and migrant health centers, the surveyed southern rural centers (N=136) jointly plan to hire 449 physicians, 162 nurse practitioners, 96 physician assistants, and 68 certified nurse midwives between 1992 and 1994, the equivalent of 63 percent of total physician hiring, 52 percent of total nurse practitioner hiring, 45 percent of total physician assistant hiring, and 63 percent of total certified nurse midwife hiring by surveyed rural community and migrant health centers. Assuming the planned hiring of surveyed centers is indicative of all rural community and migrant health centers, the study also calculated the total projected employment of nonphysician providers by all rural centers (N=278) between 1992 and 1994 as 363 nurse practitioners, 245 physician assistants, and 120 certified nurse midwives.

The staffing policy by community and migrant health centers also influences the number of nonphysician providers employed. Centers that actively seek to employ nonphysician providers generally do employ significantly more of them than do centers reluctant to employ them. However, the centers' staffing policy could be affected by the legal and reimbursement restrictions on nonphysician providers. These restrictions reflect a still ambiguous roles of these providers in our health care system (Weston, 1980). The role of nonphysician providers was designed to increase access to primary care services, however they have been constrained by legal and reimbursement issues. Legal constraints include the restrictions placed on their services under various state professional practice acts, e.g., supervision requirements and the range of permitted activities including prescribing drugs. The reimbursement issue is whether their services are covered by third-

Table 4. Actual and Projected Planned 1992-1994 Hiring by Rural Community and Migrant Health Centers (C/MHCs) by Region in the United States.

	Northeast		Midwest		South		West		Total	
	Planned ¹	Projected ²	Planned	Projected	Planned	Projected	Planned	Projected	Planned	Projected
Physician										
1992	20	21	35	42	150	167	39	49	244	279
1993	23	24	46	55	163	182	39	49	271	310
1994	15	15	21	25	136	152	30	38	202	230
1992-1994	58	60	102	122	449	501	108	136	717	819
Nurse Practitioner										
1992	9	9	11	13	54	61	30	38	104	121
1993	12	12	18	21	54	61	30	38	114	132
1994	6	6	18	21	54	61	17	22	95	110
1992-1994	27	27	47	55	162	183	77	98	313	363
Physician Assistant										
1992	3	3	14	17	27	30	26	32	70	82
1993	6	6	18	21	41	46	17	22	82	95
1994	3	3	7	8	27	30	22	27	59	68
1992-1994	12	12	39	46	96	106	65	81	212	245
Certified Nurse Midwife										
1992	1	1	4	4	27	30	13	16	45	51
1993	3	3	4	4	14	15	4	5	25	27
1994	3	3	4	4	27	30	4	5	38	42
1992-1994	7	7	12	12	68	75	21	26	108	120

1. Refers to total actual planned number of hiring reported by responding centers.

2. Refers to projected number of hiring based on extrapolations to all centers from the actual planned number of hiring reported in the sample.

party payers, including Medicare and Medicaid. While these constraints have eased somewhat in some states during past years, they remain major impediments to the full use of these primary care providers. Because the study did not directly ask the reasons for centers' staffing policies, the difference in nonphysician provider staffing policy cannot be explained with confidence.

In the 1960s, policy analysts and political decision makers perceived resource shortages at all levels of service delivery and among all health professionals. Congress initiated several programs to alleviate the identified shortage of human resources, primarily by acting to increase the supply of physicians, nurses, and allied health personnel through an expansion of educational opportunities (Aaronson, 1991). In addition to political activity by other health profes-

sional groups, it was recognized by researchers and professionals that physicians, because of licensing restrictions on professional practice, were performing tasks that could be undertaken by persons with less training, and at lower cost (Hudson, 1961). The new health professionals (e.g., nonphysician providers) could perform these tasks, allowing the existing supply of physicians to become more productive. Furthermore, because these new health professionals could be trained in less time, 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. Despite success in alleviating shortages during the last three decades, geographic imbalances in the supply of medical professionals continue to be a focus of concern. The use of nonphysician providers by

community and migrant health centers remains a critical approach to improving primary care access.

This study has demonstrated that to the extent that rural community and migrant health centers are successful in using nonphysician providers, they are more likely to use nonphysician providers as substitutes for physicians. Their staffing policies encourage and actively seek to use nonphysician providers, and they maintain close contact with training programs so that future placement of nonphysician providers can be ensured. Future studies could focus on the organizational determinants of nonphysician provider employment, such as the attractiveness of the working environment and community, job satisfaction, and professional roles, so that a more complete understanding of nonphysician providers in rural community and migrant health centers can be obtained.

Notes

1. Legal authority, reimbursement policies, and prescriptive authority for advanced nursing practice vary from state to state. Since 1989, *Nurse Practitioner, the American Journal of Primary Health Care* has provided annual updates of the status of these three areas for all 50 states plus the District of Columbia.
2. The complete correlation matrix table may be obtained from the authors.

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