Provision of Care to the Underserved Populations by National Health Service Corps Alumni Dentists

Mahyar Mofidi, DMD, MPH; Thomas R. Konrad, PhD; Deborah S. Porterfield, MD, MPH; Richard Niska, MD, MPH; Barbara Wells, PhD

Abstract

Objective: *This study examined factors associated with dentists continuing to provide care to the underserved populations beyond their National Health Service Corps (NHSC) obligation period.* ***Methods:*** *Self-administered questionnaires were mailed in 1998 to 404 dentists who had completed their service obligation between 1980 and 1997. The outcome variable was dentist self-report of continuing to work with the underserved population past NHSC obligation.* ***Results:*** *Among 249 respondents (62% response rate), 46 percent of alumni dentists continued to work with an underserved population. Multivariate analyses found that being an African American (odds ratio [OR]=3.2), higher final salary during the NHSC assignment (OR=1.2), and higher altruistic motivation to work with the underserved populations prior to entering NHSC (OR=1.1) were significantly associated with continued service to the underserved populations.* ***Conclusions:*** *A small number of factors were associated with alumni NHSC dentists' decisions to continue to provide care for the underserved populations. Targeting African-American students and students interested in caring for the underserved may improve the long-term commitment of dentists to provide care for the underserved populations. Attention will also need to be given to increased salary as a potential intervention to increase the numbers of dentists who continue to serve the underserved populations. [J Public Health Dent 2002;62(2):102-8]*

Key Words: health service accessibility, dental care, underserved populations, National Health Service Corps, dentists.

Access to dental care is a challenge for millions of people (1,2). A key factor contributing to the problem of access is the limited availability of dentists willing to provide care for the underserved (1,2). One way to improve access is to increase the dental public health capacity of the nation (1). A number of public health programs designed to meet the oral health needs of underserved populations already exist (1,2). The National Health Services Corps (NHSC) represents one such program.

The NHSC is a federal government-sponsored direct service delivery program established 30 years ago to provide health care by sending health care professionals to urban and rural communities that lack ready access to a range of health services. The NHSC currently operates two separate incentive programs: scholarship and loan repayment. Under each of these programs, in return for payment for educational expenses, the recipient incurs an obligation to serve an underserved community, identified as a health professional shortage area, for a specified period of time typically ranging from two to four years.

The NHSC has not been an unqualified success. Too few participating health care professionals, low retention rates, and underfunding have consistently plagued the NHSC (2,3). For example, in 1999, of the 228 areas identified by NHSC as needing dental providers, only 84 areas actually received dental providers (2). Further, the NHSC has had difficulty retaining health professionals beyond their service obligation, especially physicians (4-6).

A number of studies have evaluated the success of the NHSC. One broad measure of success is defined as the number of providers who continue to care for the underserved populations after completing their NHSC obligation (7,8). Prior studies of long-term commitment of NHSC alumni to the underserved populations have focused mainly on physicians (4-10). Despite the fact that the NHSC has placed more than 1,500 dentists in over 900 underserved communities (Terri Cohen, personal communication, National Health Service Corps, March 1, 2001), there are no published studies describing dentists in the NHSC or analyzing the likelihood of NHSC alumni dentists to continue serving the underserved. This study strives to fill that gap.

The aims of this study were to identify characteristics of NHSC alumni dentists who continue working with the underserved populations, to examine factors influencing dentists' decisions to pursue a career in service to the underserved populations after fulfilling their NHSC obligation, and to describe retrospective impressions of

Send correspondence and reprint requests to Dr. Mofidi, Cecil G. Sheps Center for Health Services Research, University of North Carolina, 725 Airport Road, CB#7590, Chapel Hill, NC 27599-7590. E-mail: mofidi@mail.schsr.unc.edu. Web site: http://www.schsr.unc.edu/. Dr. Konrad is also with the Cecil G. Sheps Center for Health Services Research. Dr. Porterfield is with the North Carolina Department of Health and Human Services, Raleigh. Drs. Niska and Wells are with the Health Resources and Services Administration, Bethesda, MD. This study was supported in part by a National Research Service Award Postdoctoral Traineeship from the Agency for Healthcare Research and Quality sponsored by the Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, grant #T32 HS00032, and in part by the Robert Wood Johnson Clinical Scholars Program. In addition, survey data were collected from the Evaluation of the Effectiveness of the National Health Service Corps HRSA, contract #240-95-0038, conducted by Mathematica Policy Research and the University of North Carolina at Chapel Hill. This work reflects the opinions of the authors and not necessarily those of the Health Resources and Services Administration. This study was presented in part orally at a National Research Service Award annual meeting, Atlanta, GA, June 9, 2001. Manuscript received: 6/14/01; returned to authors for revision: 8/2/01; accepted for publication: 8/29/01.

dentists who served in the NHSC. Information gleaned from this study can help the NHSC to find effective ways to improve recruitment and long-term commitment of dentists to work with the underserved populations, and can provide program administrators with insight as they craft policies designed to address inadequate access to dental care.

Methods

This study represents part of a larger project, funded by the Health Resources and Services Administration, evaluating the NHSC. The larger study involved a retrospective, cross-sectional study design in which questionnaires were sent to a stratified random sample of 2,160 NHSC alumni who completed their service obligations between 1980 and 1997. The population was stratified based on the year the assignment began (which included three cohorts, 1980–84, 1985–90, and 1991–97); clinician type; and type of recruitment program: scholarship or loan repayment. Methods employed in our study closely parallel previous analyses utilizing the same survey data (8).

Survey Instrument and Implementation. The survey instrument contained both structured and open-ended questions dealing with six broad domains: (1) experience prior to NHSC service, (2) experience during NHSC service, (3) clinician's contributions to their communities during NHSC service, (4) satisfaction with practice setting during NHSC obligation, (5) career data, and (6) sociodemographic background. Prior to implementation, the survey was pretested twice using samples drawn from the NHSC files. The purpose of the second pretest was to assess the effectiveness of questions modified after the first pretest.

Current addresses of alumni were obtained from professional association files, commercial databases, and telephone directories. Surveys were first mailed in February 1998. Two follow-up mailings were sent to nonrespondents in March and April 1998. Of the 404 alumni dentists surveyed, 62 percent responded.

Outcome Variable. Continuing to care for the underserved populations was captured by the following question: "Please check the statement which best describes your career path since completing your last NHSC assignment: (a) I am no longer working with an underserved population; (b) I am working with a different underserved population than I worked with during my NHSC service; and (c) I am working with the same underserved population that I worked with during my NHSC service." Responses to choices (b) and (c) were combined to create a dichotomous outcome measure: dentists who have continued to work with the underserved versus dentists who have not. To validate this outcome measure, clinicians were asked to estimate the percentage of their patients covered by Medicaid. Also, ZIP codes of practice at the time of the survey were matched with 1990 ZIP code-level census data to determine the extent to which dentists who had reported they were working with an underserved population were located in communities with disadvantaged profiles, defined by such characteristics as race/ethnicity, family structure, income, education, and unemployment.

Independent Variables. Variables were examined for association with continuing to care for the underserved populations either because they had been found to be significant predictors in prior studies of health professionals (4-10) or because they had a plausible relationship with the outcome variable. Program variables included whether the dentist was part of the scholarship (pre-1988 and 1988 and later) or loan repayment program (which could include only those serving in 1988 and later). Site variables included urban or rural community, and type of clinic (e.g., Community/Migrant Health Centers) where dentists worked during the NHSC obligation. Individual variables included age at the time of starting NHSC service; sex; race/ethnicity; type of communities where participants grew up (urban, rural, or suburban); altruistic motivation to serve the underserved prior to NHSC service; belief in the importance of cultural competence in working with diverse populations; whether dentists had previous work experience with underserved populations while in dental school; and whether dentists completed a postgraduate dental training.

Indices were constructed from survey questions and were used to measure altruistic motivation and cultural competency. Site matching variables included the extent to which the NHSC site met the dentist's professional goals, and the extent to which respondents believed there was a match between the dentist's preferred service location and the communities in which the dentist was actually placed. The latter was measured using a two-item index. Also, several variables related to experiences during service obligation were tested. These included job satisfaction, satisfaction with compensation, family satisfaction, occupancy of a leadership position, and salary in the final year of the service period. Indices were employed to measure the various satisfaction variables. Family satisfaction was assessed on the dentists' perspectives on their spouse's and children's experiences in the community during the NHSC service. Leadership was defined as holding a specific leadership position at any time during the NHSC service. For salary, 1998 was used as the base year, adjusted for inflation.

Analysis. Descriptive statistics were used to present background characteristics of the sample. Bivariate statistics were employed to compare characteristics of those dentists who continued serving the underserved populations with those who did not. Bivariate analyses included a combination of *t*-test, ANOVA, and chi-square test. Multivariate logistic regression using backward selection (11) was then performed to select the best explanatory model. A *P*-value of .05 was used as the threshold for statistical significance. Data were analyzed using SAS for descriptive statistics and STATA for bivariate and the logistic models. Weighting was employed for all statistical analyses to adjust for differing selection probabilities and response rates.

To expand upon quantitative findings, responses to open-ended questions were explored. These queries asked respondents to provide comments on their overall experience with the NHSC and to explain why they chose a particular career path after completing their NHSC assignment. Quotes are used to provide the flavor of some of the opinions rendered.

Results

Sample Characteristics. Characteristics of the overall sample are presented in Table 1. The mean age at

which dentists started working at their first NHSC assignment was 29 years. Respondents were primarily males. Forty-two percent of dentists grew up in an urban community, 34 percent in a rural community, and 24 percent in a suburban community. Sixty-six percent of sample reported having had some experience working with the underserved populations during their dental school training. Respondents were more likely to serve their NHSC obligation in a rural practice setting (60%) than an urban one (40%). More than 80 percent identified themselves as being in the pre-1988 scholarship program. More than half (56%) of these dentists had worked at either a community/migrant health center or an Indian Health Service site during their NHSC experience.

Validating Dentists' Claim of Working with Underserved Populations. Overall, 47 percent of alumni dentists reported working with an underserved populations at the time they completed the survey. Of these dentists, 52 percent reported that they were currently working with an underserved population similar to the one they had during their NHSC experience, while 48 percent reported working with a different underserved population.

In validation of the self-reports, dentists who reported working with the underserved populations estimated that a much higher proportion of their patients were covered by Medicaid than did dentists who did not report working with the underserved [35% (95% CI=29%, 40%) vs 5% (95% CI=3%, 7%); $P<.0001$]. By way of comparison, the percentage of revenue by payer source in a national sample of self-reports by dentists was approximately 5 percent from government programs (Jon Ruesch, personal communication, American Dental Association, January 12, 2001).

Results from the second method of validation indicate that, in contrast to dentists no longer working with underserved populations, those dentists still doing so at the time of the survey were practicing in areas with more disadvantaged profiles (Table 2). For example, dentists still working with the underserved populations are most likely to be in communities with disproportionate higher numbers of African Americans (19% vs 7%) and lower mean family annual income ($35,995

TABLE 1
Characteristics of Sample (n=249)

Characteristic	% or Mean (SD)
Mean age at time of NHSC enrollment (years)	29 (3.5)
Sex	
Male	80%
Female	20%
Race/ethnicity	
White	73%
African American	13%
Latino	6%
Other	8%
Background where dentists grew up	
Urban	42%
Suburban	24%
Rural	34%
Student rotation experience with underserved populations prior to NHSC	66%
NHSC program	
Scholarship (pre-1988)	83%
Scholarship (1988 and later)	1%
Loan repayment (1988 and later)	16%
Mean length of NHSC obligation (years)	2.8 (.8)
Postgraduate dental training	26%
Location of NHSC clinic site	
Rural	60%
Urban	40%
Type of NHSC site	
Community/Migrant Health Center of Indian Health Site	56%
Other (e.g., health departments, private practice)	44%

TABLE 2
Characteristics of Communities where NHSC Alumni Dentists Currently Serve

Characteristic	Communities where Dentists Are Not Serving Underserved (n=87)	Communities where Dentists Are Serving Underserved (n=89)	P-value*
Race/ethnicity (%)			
White	78	65	.0002
African American	7	19	.0002
Latino	10	9	.8146
Family structure			
Female-headed families as % of families with children	18	27	.0001
Income and poverty			
Mean family income ($)	47,248	35,995	<.0001
% households with public assistance income	7	12	<.0001
% elderly in povery	11	19	<.0001
% nonelderly in poverty	13	22	<.0001

*P-values are based on two sample t-tests. Data sources: All items in the above table are based on extracted data from the 1990 US Census (20).

TABLE 3
Results of Bivariate Analysis of Association* Between Dentists' Characteristics and Continued Care for Underserved Populations

	N	Not Working with Underserved Population % or Mean (SE)	Currently Working with Underserved Population % or Mean (SE)
Age at assignment ≥30 years	240	41	58
Race/ethnicity	242		
African American		27	73
Latino		41	59
White		59	41
Other		62	38
Altruistic motivation to work with underserved prior to NHSC (3-item index, 1–5)	243	3.1 (.09)	3.6 (.09)
Site met professional needs and goals (1 item, 1–5)	240	3.6 (.08)	4 (.08)
Importance of location in matching process (2-item index, 1–5)	237	3.2 (.11)	2.7 (.12)
Cultural competency (4-item index, 1–5)	242	3.4 (.06)	3.7 (.06)
Leadership position (yes/no)	236	45	55
Final salary during NHSC service (mean)	243	$49,971 (1,418)	$55,959 (2,096)

*Only statistically significant bivariate associations reported ($P<.05$). Also, ANOVA was used for continuous variables; chi-square was used for categorical variables.

TABLE 4
Final Multivariate Regression Model: Independent Factors Associated* with Continued Care for Underserved Populations

Variable	Odds Ratio	95% Confidence Interval
African American	3.2	1.5, 7.2
Altruistic motivation to serve underserved	1.3	1.1, 1.6
Final salary at NHSC service	1.2	1.03, 1.3

*$P<.05$.

vs $47,248).

Bivariate and Multivariate Relationships. In bivariate analyses, eight variables were found to be statistically significantly associated with continuing to care for the underserved populations (Table 3). Dentists who work with the underserved populations were more likely to be a minority and older at the time of NHSC service. Dentists who reported working with the underserved populations had a higher mean value for the composite score measuring altruistic motivation to care for the underserved than those not working with underserved populations (3.6 vs 3.1). Similarly, dentists who held a leadership position during their NHSC assignment and those with a higher ending salary reported that they were still working with the underserved populations. Compared with dentists no longer serving the underserved populations, those who continued to serve placed greater emphasis on cultural competency. Final salary income during their NHSC service was significantly associated with the outcome variable, with mean income of dentists continuing to serve underserved populations at $55,959, and those not continuing to serve at $49,971.

In the initial logistic model, the race/ethnicity variable represented by four categories (white, African American, Latino, and other) was not significant. Noting that a high proportion of African-American dentists provide care to the underserved populations in the bivariate analyses, the race/ethnicity variable was dichotomized into African Americans and others, and entered into the model. The final backward selection procedure resulted in a model containing three variables including the dichotomized race variable (Table 4). The analyses indicate that African-American dentists were 3.2 times more likely (OR=3.2; $P<.004$) than non-African Americans to continue providing dental care for underserved populations. Altruistic motivation to work with the underserved populations prior to entering the NHSC (OR=1.3; $P<.01$) and final salary (in $10,000 increments) during the NHSC service (OR=1.2; $P<.01$) were also significantly associated with continuing to care.

Qualitative Impressions. Alumni NHSC dentists who have dedicated themselves to working with the underserved populations manifest a deep desire to continue to practice among such populations. These dentists generally seem to possess a strong service ethic, feel responsible for pro-

viding care for the underserved populations, and derive personal satisfaction from helping people who may not have any other option for obtaining dental care. One dentist characterized the continued service as "vital" to helping the community, and another said, "Who will take care of my patients?"

Among dentists who no longer work with the underserved populations, reasons included inadequate financial compensation, lack of lifestyle compatibility, and desire to grow professionally. "Pay was poor," "I like to be able to feed, house, and clothe my family," and "It does not pay the bills" were typical comments indicating dissatisfaction with financial compensation. Regarding inadequate Medicaid reimbursements, one dentist said, "I was forced to stop seeing Medicaid patients. The reimbursement level was so low I could not make ends meet." Another provider commented, "I could not afford to have 50–60 percent of my practice not paying for my services." Lifestyle characteristics associated with underserved communities also posed obstacles for some dentists: "I would have been very happy to stay and practice in that location, but the social needs of my spouse and educational/cultural needs of my children could not be ignored."

Other factors explaining the decision to not continue to serve an underserved population were the professional needs of some dentists seeking more technically challenging and rewarding practice opportunities. One dentist who valued his time with the NHSC nevertheless expressed that "After three years of doing basic dentistry, I was anxious to move on professionally to more sophisticated and challenging clinical procedures and techniques."

Discussion

This study demonstrates that a small number of factors appear to influence dentists' decisions to provide continued care to the underserved populations upon completing their NHSC assignment. The decision to provide care to the underserved is likely to be influenced by dentists' individual characteristics, i.e., whether or not he or she is an African American and has an interest in caring for the underserved prior to entering the NHSC (altruistic motivation). It is also affected by dentists' salaries in the final year of the NHSC.

Findings from this study parallel, in some respects, data on alumni NHSC physicians (4-10). For example, Porterfield et al. (8) found altruistic motivation and final salary to be significant factors in influencing a physician's commitment to work with the underserved populations after NHSC obligation. In addition, a 47 percent reporting of continued care for the underserved among alumni dentists is consistent with a range of 45 percent to 60 percent among NHSC physicians. However, in contrast with findings to NHSC physicians, data from this study did not show type of communities where dentists grew up, financial aid obligations, job satisfaction, or age at NHSC service as significant factors.

The finding that African-American dentists were significantly more likely than other race/ethnic groups to continue to care for the underserved populations is consistent with data on non-NHSC physicians (12,13) and supports recent observations that the lack of minority dentists in the workforce may be a factor in the access difficulties that minority populations experience in the United States (14). Studies examining the relationships between race of a physician and care for the underserved populations reveal that minority physicians have a high propensity to serve underserved groups such as the uninsured, those on Medicaid, or minorities. The association between race of health professionals and their long-term commitment to care for the underserved deserves closer examination, especially as it relates to issues of access, disparities, and health workforce diversity.

It has been found that poor people and disadvantaged minority populations experience more dental health problems, including both unmet dental needs and those related to access, than other segments of the population (1,2). It has also been suggested that, similar to minority physicians, minority dentists are more likely than their counterparts to provide care for minority and disadvantaged populations (15,16).

Whereas African Americans comprise 13 percent of the overall US population, only 2.2 percent of active dentists are African-American, resulting in a marked underrepresentation of African Americans in the dental profession (1). A continuing underrepresentation of African Americans in dentistry, coupled with increasing growth of minorities in the general population, may exacerbate problems of access and disparities. This backdrop highlights the importance of the NHSC as a program with the potential to increase access and reduce disparities. Clearly, the NHSC is able to attract a high percentage of African-American dentists (13%)—one that is similar to proportion of African Americans in the population. Those dentists are more likely than others to work in communities with more pronounced disadvantaged profiles and in practices with higher percentages of Medicaid patients. These findings bear certain policy implications.

Targeting minorities in general and African-American students in particular by the NHSC may likely increase the number of dentists deployed to underserved areas and may also increase the number of dentists who will continue to have underserved practices following their NHSC service. However, the marked underrepresentation of minorities entering dental school will likely hamper the NHSC's ability to recruit more minority dentists. What is needed is for dental schools and professional dental organizations not only to recruit more minority students, but also to craft and implement community programs designed to nurture interest among minorities to pursue dentistry (14). In this regard, affirmative action programs can play an important role in encouraging minorities to enter the dental profession (17).

Despite the many formidable financial and nonfinancial barriers that make the provision of dental care to the underserved a challenging enterprise, almost half (47%) of dentists surveyed were located in practices that provide a substantial amount of care for underserved populations, such as those with above-average proportions of patients with Medicaid. It appears these dentists were continuing to make important contributions to increasing access for the underserved populations for a long time after their NHSC experience. For example, among alumni dentists who reported they were continuing to serve underserved populations, on average they had completed their NHSC assign-

ments almost 10 years before the survey. The significant percentage of Medicaid patients being cared for by dentists still working with the underserved—far above the self-reported Medicaid levels conducted in national surveys of general dentists—and the finding that dentists claiming to be practicing in underserved areas are actually serving in communities with disproportionate disadvantaged profiles, reveal a strong sense of service on the part of dentists who have elected to work with the underserved populations.

It appears that the desire to serve the underserved populations predates the NHSC service, a notion supported by our finding of altruistic motivation as a significant correlate of continued care to the underserved and by a prior physician study examining multiple predictors of a generalists' care of underserved populations (18). From a policy standpoint, it is clear that as part of its identification and recruitment strategies, the NHSC needs to target dental students, irrespective of race and ethnicity, who evidence a strong sense of service toward caring for the underserved populations. Similarly, as a strategy to increase the number of dentists to provide care for the underserved populations, efforts could be made by dental schools to identify and recruit applicants exhibiting interest to serve underserved populations.

As the results of this study indicate, salary during the final year of the NHSC service is a significant correlate for continued work with the underserved. Accordingly, the NHSC needs to encourage the sponsoring practice organization—e.g., community health centers—to reevaluate their salary structures and substantially increase the salary of NHSC dentists in their final year. Ideally, such an increase would approximate the salary of private sector dentists who have been practicing in the same region for the same amount of time as the NHSC dentists. Without substantial increases, it is unrealistic to expect dentists to continue to care for the underserved unless their salaries are competitive with that of other alternatives, namely, private practice. This strategy may encourage NHSC dentists to remain in their assigned community, especially if the community proves economically viable for the establishment of a private practice after the NHSC service. In addition, it is likely that greater numbers of NHSC dentists would consider staying in underserved areas if they were assured of a competitive salary from such public dental safety net providers as community health centers.

The qualitative findings show that, for at least some individuals, insufficient pay was a decisive factor in the decision to discontinue caring for the underserved populations. This finding is hardly surprising, given the financial risk involved in setting up practices in underserved communities in which there are many people who cannot afford private insurance or are covered by Medicaid. Many dentists indicate that they lose money, or at best, can cover only their overhead costs when treating a large percentage of Medicaid-insured patients (19). Clearly, attention must be given to reducing financial risks so that more NHSC dentists are encouraged to provide continued care to the underserved populations. In this regard, policy options directed at increasing Medicaid reimbursements may prove beneficial, as would financial incentives in the form of tax credits and bonuses that could be extended to providers who make a commitment to actively participate in the Medicaid program.

Several limitations of this study merit comment. First, the study measures the outcome variable as a snapshot in time, that is, dentists' self-reports of continued care for the underserved populations were made at the time the survey was completed (spring 1998). A follow-up study would benefit from the use of survival analyses to measure continued care over time. Second, because the study relies on self-reports to measure a number of variables, and also to measure and validate the outcome variable, the validity of such measurements should be interpreted with caution. For example, one note of caution would be whether the response to the outcome variable of continued care is valid, given that it is entirely based on dentists' self reports. Using two methods, as described in the methods section, to validate the accuracy of these self-reports of continued care, findings are interpreted as evidence that dentists' self-reports are valid measures of service to underserved populations. Third, relying on a retrospective design raises the possibility of recall bias, especially given the varying length of recall periods. It should be noted, however, that as with our study, all previous studies of the NHSC have employed cross-sectional or retrospective cohort designs. To eliminate bias, future studies should employ a prospective cohort design. Finally, nonresponse bias needs to be considered when interpreting findings.

Acknowledgments

The authors would like to thank Julian Garro, MS, and Carol Porter, BS, for their assistance in this study.

References

1. US Department of Health and Human Services. Oral Health in America: a report of the Surgeon General. Rockville, MD: US Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research, 2000.
2. US General Accounting Office. Oral health: dental disease is a chronic problem among low-income populations. Washington, DC: US General Accounting Office, 2000; pub no GAO/HEHS-00-149.
3. Marwick C. National Health Service Corps faces reauthorization during a risky time. JAMA 2000;283:2461-2.
4. Pathman DE, Konrad TR, Ricketts TC. The comparative retention of National Health Service Corps and other rural physicians: results of a 9-year follow-up study. JAMA 1992;268:1552-8.
5. Pathman DE, Konrad TR, Ricketts TC. Medical education and the retention of rural physicians. Health Serv Res 1994; 12:366-77.
6. Singer JD, Davidson SM, Graham S, Davidson HS. Physician retention in community and migrant health centers: who stays and for how long? Med Care 1998;36:1198-213.
7. Rosenblat RA, Saunders G, Shreffler J, Larson EH, Hart LG. Beyond retention: National Health Service Corps participation and subsequent practice locations of a cohort of rural family physicians. J Am Board Fam Pract 1996;9:23-30.
8. Porterfield D, Konrad TR, Leysieffer K, et al. Caring for the underserved: current practice of alumni of the National Health Service Corps. J Health Care Poor Underserved (in press).
9. Cullen TJ, Hart ME, Whitcomb RA, Rosenblatt RA. The National Health Service Corps: rural physician service and retention. J Am Board Fam Pract 1997;10:272-9.
10. Xu G, Veloski J, Hojat M, Politzer HK, Rabinowitz HK, Rattner SL. Factors influencing primary care physicians' choice to practice in medically underserved areas. Acad Med 1997;72(Suppl 1): S109-11.
11. Lomax RG. Statistical concepts. Mahwah, NJ: Lawrence Erlbaum Associ-

ates, 2001.
12. Moy E, Bartman BA. Physician race and care of minority and medically indigent patients. JAMA 1995;273:1515-20.
13. Komaromy M, Grumbach K, Drake M, et al. The role of black and Hispanic physicians in providing health care for underserved populations. N Engl J Med 1996; 334:1305-10.
14. W. K. Kellogg Foundation. The big cavity: decreasing enrollment of minorities in dental schools. Battle Creek, MI: W. K. Kellogg Foundation, 2001.
15. Montoya R, Hayes-Bautista D, Gonzales L, Smeloff E. Minority dental school graduates: do they serve minority communities? Am J Public Health 1978;68: 1017-19.
16. Center for Policy Alternatives. Oral health for all: policy for available, accessible, and acceptable care. Washington, DC: Center for Policy Alternatives, 1999.
17. Garza H. Speaking in one voice: the response of higher education to affirmative action threats. J Dent Educ 1999;63:753-8.
18. Rabinowitz HK, Diamond JJ, Veloski JJ, Gayle JA. The impact of multiple predictors on generalist physicians' care of underserved populations. Am J Public Health 2000;90:1225-8.
19. North Carolina Institute of Medicine. North Carolina Institute of Medicine task force on dental care access: report to the North Carolina General Assembly and to the Secretary of the North Carolina Department of Health and Human Services. Chapel Hill, NC: North Carolina Institute of Medicine, 1999.
20. Servais M, Browne M. Guide to the 1970, 1980, and 1990 census extract data: panel survey of income dynamics. Ann Arbor: University of Michigan, 1998.