

URBAN/RURAL DIFFERENCES IN THE LIKELIHOOD OF HEALTH PROFESSIONAL SHORTAGE AREA DESIGNATION IN COUNTIES WITH LARGE MINORITY POPULATIONS

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I. Introduction

Past research has shown that minority populations have reduced access to health care providers, even after controlling for variables which are highly correlated with lack of access, such as income and education (Kindig and Yan, 1993). In addition, minorities have been found to have higher rates of mortality, certain chronic health problems and adverse birth outcomes than their non-minority counterparts (Foster, et al., 1993). Even within the Medicare program, where financial barriers are similar across races, blacks are found to have a differential experience to whites for the same conditions, receive fewer services and have poorer outcomes (Gornick, et al., 1996; Kahn, et al., 1994).

Given the consistent body of evidence showing minority populations to be sicker and to have less access to the medical system, it is reasonable to expect that counties with a relatively high minority population as a percent of the total population (minority concentration) are likely to be areas with greater health need and increased barriers to access. While an explicit definition of medical underservice is not broadly agreed upon within the literature, places with high need, reduced access or both are generally seen as underserved areas (Taylor, et al., 1995).

The Federal government has a number of programs whose intent is to increase access to health services for areas that are considered to be medically underserved or suffering from a shortage of health care providers. For some of these programs, eligibility for receipt of programmatic assistance is based on an area being designated as a Health Professional Shortage Area (HPSA), although HPSA designation does not ensure receipt of resources. Table 1 lists these programs and the amount of money available through each in fiscal year 1994.

Table 1
Federal U.S. Programs Allocating Resources Using the HPSA Indicators

Programs requiring HPSA designation as medically underserved to apply for federal funds

Program	Benefit Provided	Num. of Individual Programs	Fiscal Year 1994 Funding
National Health Service Corps	Scholarships and Loan repayment for service in a HPSA	3	\$126,720,000
Medicare Incentive Payments Program	10% bonus payment on all Medicare billings in geographic HPSA	1	\$98,332,938
Community Scholarship Program	Grants to HPSA communities for health profession scholarships	1	\$478,000

Programs requiring HPSA, MUA, or other designation as medically underserved to apply for federal funds

Title VII/VII Health Professions Education & Training Grants	Training programs may provide preference or priority to schools placing graduates in underserved areas	24	\$151,834,000
Rural Health Clinic Program	Provides cost-based reimbursement for Medicare & Medicaid services provided by NP, CNM, & PA ^a	1	\$77,010,536
Indian Health Professions Scholarship Program	Scholarships for service in HPSA or other locale with large Indian population	1	\$7,702,000
Title III Mental Health Clinical Traineeship	Trainees perform obligated service in HPSA or other site with specific need for psych services	1	\$5,943,000
Title X Family Planning Services Training Program	Priority for grants to institutions that place providers in HPSAs	2	\$4,500,000
TOTAL		34	\$472,520,474

a: NP=Nurse Practitioners; CNM= Certified Nurse Midwife; PA= Physician Assistants

Source: U.S. General Accounting Office. Health Care Shortage Areas: Designations Not a Useful Tool for directing resources to the underserved. Washington, D.C.U.S. GAO, 1995

Although the HPSA designation method has recently been criticized for failing to accurately identify areas which are underserved, it remains a necessary first step to an area being eligible for receipt of certain remedial resources designed to improve access, and remains a key health policy tool in the United States (GAO 1995). The basic criteria for an area to be designated as a HPSA is for the area to have a population-to-primary care physician ratio of 3,500:1 or greater, although areas with ratios between 3,000:1 and 3,500:1 may be designated if they show evidence of high need or extreme isolation from adjacent services (Lee, 1979; GAO, 1995).

Given the differential experience of minorities in obtaining access and achieving satisfactory and similar health outcomes compared to other groups, it is likely that areas of high minority concentration can potentially benefit from the remedial resources available from the federal government that are allocated via the HPSA designation. However, it is possible that relatively less populous non-metropolitan areas with large minority populations lack the infrastructure necessary to successfully complete the designation process. If counties with relatively large minority concentrations that otherwise meet the criteria to be designated are not, in fact, designated as a HPSA, this may suggest a problem in the designation process. If areas needing assistance are not identified as eligible, inappropriate resource allocation and equity loss may result. This paper analyzes the relationship between HPSA designation, the percentage of the county's population which is minority, and whether the county is urban or rural, to see if counties with relatively high minority concentration differ in their likelihood of being designated as a HPSA when controlling for location and other selected county characteristics.

II. Background

Minority Populations, Medical Underservice, and Health Status

The relationship between medical underservice, poor health status, and minority populations has been

explored in several studies. Minorities are more likely to be uninsured, have limited choice of providers, and find themselves influenced by the cost of obtaining care (White-Means, 1995; The Commonwealth Fund, 1995). A study conducted by the Office of Surveillance and Analysis, National Center for Chronic Disease Prevention and Health Promotion, CDC (1995) shows that risks for chronic diseases were found to be higher among minorities, which are defined in that study as blacks, American Indians/Alaskan Native, Asians/Pacific Islanders, and Hispanics. These risks were indicated by the prevalence of three major chronic disease risk factors: current cigarette smoking, sedentary lifestyle, and being overweight. Further stratification of the racial/ethnic groups by level of education found the prevalence of risk factors varied inversely with the level of education within the five population groups. This suggests that socioeconomic status is important when examining racial/ethnic differences in health status.

It has been documented from the early part of the 20th century that mortality rates of black Americans are approximately 50 percent higher than the mortality rates for whites (Nickens, 1995; National Center for Health Statistics, 1993; DuBois, 1906). When comparing black mortality rates to whites for individuals age 1 through 65, the most adverse rates were for black Americans in their 20s, 30s, and 40s. Mortality rates continue to be higher for the black population until approximately the age of 80, where blacks have a lower mortality rate than whites. Although mortality data provide a limited perspective of health status, it is the most complete data source with respect to race and social class differentiations (Nickens, 1995). The 1985 Health and Human Services Secretary's Task Force on Black and Minority Health (U.S. Department of Health and Human Services, 1985) discovered six causes of excess deaths in minority populations. These six causes of excess deaths were found to be cancer, cardiovascular disease, chemical dependency, diabetes, infant mortality, and homicide. Also, coronary risk factors were higher among black Americans in comparison to whites. Black Americans were more likely to display an increase in coronary risk factors, including diabetes, obesity, hypertension, left ventricular hypertrophy, and use of cigarettes (Ford and

Cooper, 1995).

For most of the century, black American infant mortality rates have been approximately twice the rate of whites (Eberstein & Parker, 1984; Johnson, 1987; Kleinman et al., 1976; Kovar, 1977). However, in a recent study conducted by Holman et al. (1994), race was found to be insignificant in explaining infant mortality when other socioeconomic variables were present. The same result was found in a study conducted by Lieberman et al (1987). In contrast, Foster et al. (1993), in a synthesis of the literature, stated that even after controlling for socioeconomic factors, black women have a higher risk of delivering a low or very low birthweight infant.

In a study focusing only on rural areas, Kindig and Yan (1993) analyzed physician supply in areas with high minority populations. They found that in non-metropolitan counties where a very high proportion of the population is either black or Hispanic, there were fewer physicians per thousand than the national average. These findings suggest lack of access to health care services.

The evidence that Hispanic populations have lower than average health status is less convincing. Although the previously cited report by the CDC found higher risk of chronic illnesses in Hispanic populations, other studies have referred to Hispanic health status as the "epidemiologic paradox" (Nickens, 1995; Markides & Coreil, 1986) since that ethnic group exhibits mortality rates which are similar to that of whites, and much better than the black population, controlling for income.

Although past research has found that interactions of rurality, poverty, cultural beliefs and practices, and race increase the degree of health needs, many studies continue to focus only on race without the inclusion of other factors (Kindig & Yan, 1993). Race is often used as a proxy for socioeconomic factors due to the failure of large data bases to include the information needed for direct examination. Large data bases, such as Medicare and NHDS, do not provide information about income, financial worth, or educational attainment (Ford & Cooper, 1995). Without this information, the direct examination of the

relationship of minority populations, socioeconomic status, and health-related issues become difficult. Even with the best measures available, the interpretation of these results are often clouded. Health status disparities and income differences are certainly not coincidental. Social and structural conditions in society such as employment, housing, occupational hazards, and poverty certainly influence minority health (Giachello, 1994; Evans et al., 1994).

Health Profession Shortage Areas

Medical underservice has many definitions which are often transformed by those who attempt to operationalize this variable. "Underservice" has different meanings to planners, health professionals, and consumers, influenced not only by their profession, but their place of residence (Ricketts et al., 1994). In 1995, 47 million Americans, or 19% of the population, were estimated to be living in underserved areas (Shroeder & Beachler, 1995). In an effort to capture the meaning of underservice, various measures have been developed. Some of these measures look strictly at physician-to-population ratios while others are more complex, taking into consideration factors such as need and demand. One such methodology which is used by the federal government to identify underserved areas is the Health Professional Shortage Area (HPSA).

This indicator of underservice was developed as a tool to guide the federal government in determining medically underserved areas, with the designation as a HPSA resulting in eligibility for programmatic assistance. HPSAs have been demonstrated to be economically poorer, have higher unemployment rates, and have fewer white-collar jobs than areas which are not designated HPSAs (Taylor, et al., 1995).

In health professions policy the logic for creating underservice measures assumes that an insufficient number of primary care physicians is a condition coincident with or predictive of underservice, indicating a lack of availability of primary care (Taylor et al., 1995). A large research literature addresses the

inadequate supply of health professionals in rural and inner-city areas and its implications for access. In fact, a greater percentage of rural counties are designated as HPSAs as compared to urban counties. In 1992, 59% of non-metropolitan counties were designated as either whole or part county HPSAs, as compared to 50% of metropolitan counties. The simplest way to be designated a HPSA is for an area to apply based on the ratio of population-to-primary care physicians. If this ratio is 3,500:1 or greater, an area is defined as a HPSA. Physicians who are supported by the National Health Service Corps are not counted in the calculation of population-to-primary care physician ratio for HPSA designation purposes. As either a county or a sub-unit of a county can apply for designation, counties can fall into one of three categories--not designated, part of the county designated (part county HPSA), and the whole county designated (whole county HPSA).

There are exceptions in the designation formula that allow for areas with lower ratios to qualify for designation. Areas with population-to-primary care physician ratios of at least 3,000:1, but lower than the 3,500:1 designation threshold can be designated a HPSA if they can satisfactorily prove extreme high need for health care services, or extreme isolation from adjacent health services infrastructure. Measures used to demonstrate high need include infant mortality rate, poverty, and proportion elderly; extreme isolation is shown on a case by case basis. The onus for designation as a HPSA rests with the local community, regardless of what secondary data descriptors of an area may reveal. Although the singular reliance on population-to-primary care physician ratio as a designation criterion creates the appearance of a relatively simple process, application for a HPSA designation can be complex for those areas not meeting this areal based designation threshold, and requires persistence and understanding of the designation process as well as knowledge of health and population databases with which applications for exception designations must be supported (Taylor et al., 1995).

III. Data and Methods

The unit of analysis for this study is the county. Although sub-units of counties and sub-populations within counties can receive a HPSA designation, demographic data that describes the context of HPSAs are only available at the county level (whole county, part county, and non-designated). The study sample contains all counties in the United States except for two, Yellowstone, Montana and Menominee, Wisconsin, which were deleted due to missing data. This results in a final sample of 3,078 counties. Data for this study were obtained from the 1993 Area Resource File (ARF) and the HPSA shortage designation tapes from the Bureau of Primary Health Care (BPHC), Health Resources and Services Administration (HRSA). The ARF provides county-level population estimates from the 1990 U.S. Census, including the total population, the percentage of the population that was black, and the percentage of the population that was Hispanic. 1990 primary care physician information necessary to construct population-to-primary care physician ratios was also obtained from the ARF. Primary care physicians include those in family practice, obstetrics-gynecology, pediatrics, and internal medicine.

Other relevant variables drawn from the ARF include per capita income, unemployment rate, percent of population with less than a ninth grade education, population density, commuting out of county for work, and whether or not a county is rural. A county was defined as rural if it was not in a metropolitan statistical area (MSA) in 1990. Population density was calculated by dividing 1990 Census population by 1980 Land Area Square Miles (from the County and City Data Code Book). 1990 per capita income was obtained from the 1993 Area Resource File based on the LAPI (Local Area Personal Income) Tape, Department of Commerce. The 1990 Census data was used to compute percentage of population with less than a ninth-grade education. The 1990 county unemployment rate data was from the Bureau of Labor Statistics. To calculate the percentage of persons working out of county, the number of persons working in-state but out-of-county was added to the persons working out-of-state. The denominator for this

equation was the total county civilian labor force as reported by the U.S. Bureau of Labor.

The HPSA shortage designation tapes from the Bureau of Primary Health Care (BPHC) were used to identify whether or not a county was designated as a HPSA in 1992. Socioeconomic data from 1990 are used to describe and compare counties with actual 1992 HPSA designations; the HPSA designation process takes time so there is a lag between when data is collected and the resulting designation.

For the purposes of this paper, “minority” will be defined in two ways--black, and Hispanic, as defined by the 1990 U.S. Census. It is important to note that these are not mutually exclusive categorizations¹, and that there are numerous possible definitions of minority that encompasses racial, ethnic, and cultural factors. The appendix provides an in-depth discussion of the history and difficulties of operationalizing these factors in health services research. Minority concentration of counties was calculated following the methodology used by Kindig and Yan (1993). Counties are categorized as “average black” if the percentage of the county’s population that was black was less than one standard deviation from the national mean percentage. “High black” is defined as those counties whose percentage of population that was black was between one and two standard deviations above the mean, and those with greater than two standard deviations above the mean of percentage black were categorized as “very high black”. There were no counties which were more than one standard deviation below the mean. The same categorization was applied to the percentage of population that was Hispanic.

Counties were also classified according to whether or not they could qualify for a whole county HPSA designation based solely on meeting the designation threshold for an entire county of a population-to-primary care physician ratio of 3,500:1 or worse. It is important to note that this is a theoretical categorization: not all counties which could qualify were actually designated as HPSAs, and some counties

¹ The 1990 census definition of black includes anyone whose mother is identified as black, regardless of country of origin. Therefore, the category “black” includes African-Americans, black Hispanics and others.

with population-to-primary care physician ratios which were lower than 3,500:1 were designated through other means. Among the 3,078 counties in the sample, 773 (25%) could qualify for designation based on the ratio. These counties were disproportionately rural, as 29% of rural counties qualified for designation on the ratio alone as compared to only 12% of urban counties.

In addition to the descriptive statistics, three main analyses are carried out. First, among those counties meeting the 3,500:1 population-to-primary care provider ratio threshold in 1990, actual HPSA status in 1992 is analyzed and stratified by county minority concentration and rurality. Second, counties not meeting the 3,500:1 whole county threshold are analyzed to ascertain if there is a differential influence of rurality or having a large minority concentration on the likelihood of being designated a HPSA. Finally, to test the hypothesis that urban and rural counties with similar socioeconomic characteristics do not differ in their likelihood of designation according to racial minority concentration, a multi-variable logit model is estimated. The model was initially estimated with interaction terms between place of residence and percent of the population that was minority. The interaction terms test whether or not there is a differential effect of being a high minority county in a rural as opposed to urban area. These variables were not significant and were not included in the final specification. The final model quantifies the impact of minority concentration on the probability of a county being designated as a whole-county HPSA, after controlling for other relevant socioeconomic factors, including rurality. Counties which had been designated as a part county HPSA were not used in this analysis: the majority of part county HPSAs are urban counties, where mean statistics for the independent variables of interest are unlikely to reflect the means for the portion of the county which was awarded the designation.

IV. Results

There are 2,643 counties which fell into the average black category. These counties have a mean

percent black population of 3.47 (5.33 std. dev.). The mean for the high black counties (n=218) is 25.59% (4.01 std. dev.) and the mean for very high black counties (n=217) is 49.47% (10.67 std dev.). A slightly higher percentage of rural counties are categorized as high or very high as compared to urban counties (Table 2). When categorizing by the percentage of the population that is Hispanic, few counties were more than one standard deviation above the mean. Average Hispanic account for 2,847 counties, with a mean percent Hispanic of 1.84 (std. dev. 2.73). Only 92 counties are high Hispanic, with a mean percent Hispanic of 21.02 (std. dev. 3.19) while 139 counties are classified as very high Hispanic, with a mean percent Hispanic of 48.28 (std. dev. 18.60). The percentage of counties classified as average Hispanic is almost identical across urban and rural counties.

Table 2
Number of Counties in each Minority Classification, by Rural and Urban

	Rural		Urban	
Average Black	1,990	(85.0%)	653	(88.5%)
High Black	168	(7.2%)	50	(6.8%)
Very High Black	182	(7.8%)	35	(4.7%)
Total	2,340	(100.0%)	738	(100.0%)
Average Hispanic	2,168	(92.7%)	679	(92.0%)
High Hispanic	59	(2.5%)	33	(4.5%)
Very High Hispanic	113	(4.8%)	26	(3.5%)
Total	2,340	(100.0%)	738	(100.0%)

The actual 1992 HPSA status of all counties, stratified by urban/rural location and county black concentration is shown in Table 3. As the percentage of the population that is black increases, so do the proportion of counties that are designated. Among average black counties, 55% are designated as either a part or whole county HPSA. This designation rate increases to 61% for high black counties, while 79% of very high black counties are designated as either a part or whole county HPSA.

Table 3
Number of Counties in Each HPSA Designation
By Percentage Black Population Categorization

	Not HPSA	Part County	Whole County	Total
All Counties (n=3078)				
Average Black	1199 (45%)	897 (34%)	547 (21%)	2643 (100%)
High Black	84 (39%)	64 (29%)	70 (32%)	218 (100%)
Very High Black	45 (21%)	68 (31%)	104 (48%)	217 (100%)
Rural Counties (n=2340)				
Average Black	858 (43%)	625 (31%)	507 (26%)	1990 (100%)
High Black	64 (38%)	37 (22%)	67 (40%)	168 (100%)
Very High Black	37 (20%)	43 (24%)	102 (56%)	182 (100%)
Urban Counties (n=738)				
Average Black	341 (52%)	272 (42%)	40 (6%)	653 (100%)
High Black	20 (40%)	27 (54%)	3 (6%)	50 (100%)
Very High Black	8 (23%)	25 (71%)	2 (6%)	35 (100%)

Rural counties appear slightly more likely to be designated. While for rural counties average, high, and very high black have 57%, 62%, and 80% of counties designated respectively, for urban counties only 48% of average black counties are designated, with 60% and 77% designated for high black and very high

black. As would be expected, the majority of rural counties which receive some sort of designation are designated as whole county HPSAs, while the majority of designated urban counties are part county HPSAs.

Table 4 shows actual county HPSA status stratified on the categorization of average Hispanic, high Hispanic, and very high Hispanic.

Table 4
Number of Counties in Each HPSA Designation
By Percentage Hispanic Population Categorization

	Not HPSA	Part County	Whole County	Total
All Counties (n=3078)				
Average Hispanic	1260 (44%)	938 (33%)	649 (23%)	2847 (100%)
High Hispanic	43 (47%)	34 (37%)	15 (16%)	92 (100%)
Very High Hispanic	25 (18%)	57 (41%)	57 (41%)	139 (100%)
Rural Counties (n=2340)				
Average Hispanic	909 (42%)	653 (30%)	606 (28%)	2168 (100%)
High Hispanic	30 (51%)	15 (25%)	14 (24%)	59 (100%)
Very High Hispanic	20 (18%)	37 (33%)	56 (50%)	113 (100%)
Urban Counties (n=738)				
Average Hispanic	351 (52%)	285 (42%)	43 (6%)	679 (100%)
High Hispanic	13 (39%)	19 (58%)	1 (3%)	33 (100%)
Very High Hispanic	5 (19%)	20 (77%)	1 (4%)	26 (100%)

Across all counties, high Hispanic has the smallest proportion of counties designated at 53%. Average Hispanic counties do slightly better at 56%, while 82% of the very high Hispanic counties are designated as either a part or a whole HPSA. This pattern is repeated for rural counties, while for urban counties, the proportion of counties which are designated increases with the increase in the percentage of the population which is Hispanic.

In order to assess whether or not there are differences across rurality and minority concentration categories in how counties that meet the whole county designation threshold (population-to-primary care physician ratio of 3,500:1 or worse) actually are designated, the two-way frequencies were repeated for the 773 counties which meet this threshold. Table 5 shows that as the percentage of the population which is black increases, so do the percentage of counties which are actually designated as part or whole county HPSAs. Across all counties which meet the threshold, 71% of average black and 77% of high black counties are actually designated as either part or whole county HPSAs. An impressive 93% of all very high black counties are designated. Most of the counties are rural (only 88 of the 773 are urban), but in general it appears that rural counties which meet the threshold do a better job of actually getting designated.

Table 5
Number of Counties in Each HPSA Designation, By Percentage Black Population Categorization
Among Counties That Meet the Population-to-Primary Care Physician Ratio
Designation Threshold of 3,500:1

	Not HPSA	Part County	Whole County	Total
All Qualifying Counties (n=773)				
Average Black	189 (29%)	156 (24%)	307 (47%)	652 (100%)
High Black	12 (23%)	9 (17%)	31 (60%)	52 (100%)
Very High Black	5 (7%)	11 (16%)	53 (77%)	69 (100%)
Rural Qualifying Counties (n=685)				
Average Black	150 (26%)	142 (25%)	282 (49%)	574 (100%)
High Black	9 (20%)	7 (16%)	29 (64%)	45 (100%)
Very High Black	4 (6%)	9 (14%)	53 (80%)	66 (100%)
Urban Qualifying Counties (n=88)				
Average Black	39 (50%)	14 (18%)	25 (32%)	78 (100%)
High Black	3 (43%)	2 (29%)	2 (29%)	7 (100%)
Very High Black	1 (33%)	2 (67%)	0	3 (100%)

Comparisons across Hispanic categorizations for counties which meet the whole county designation threshold are shown in Table 6.

Table 6
Number of Counties in Each HPSA Designation, By Percentage Hispanic Population Categorization
Among Counties that Meet the Population-to-primary Care Physician Ratio
Designation Threshold of 3,500:1

	Not HPSA	Part County	Whole County	Total
All Counties (n=773)				
Average Hispanic	191 (27%)	165 (23%)	356 (50%)	712 (100%)
High Hispanic	7 (39%)	4 (22%)	7 (39%)	18 (100%)
Very High Hispanic	8 (19%)	7 (16%)	28 (65%)	43 (100%)
Rural Counties (n=685)				
Average Hispanic	148 (24%)	147 (24%)	329 (53%)	624 (100%)
High Hispanic	7 (39%)	4 (22%)	7 (39%)	18 (100%)
Very High Hispanic	8 (19%)	7 (16%)	28 (65%)	43 (100%)
Urban Counties (n=88)				
Average Hispanic	43 (49%)	18 (20%)	27 (31%)	88 (100%)
High Hispanic	0	0	0	
Very High Hispanic	0	0	0	

The trend is similar to that seen in Table 4: high Hispanic qualifying counties actually have the smallest proportion of counties designated (61%). Among average Hispanic qualifying counties, 73% are actually

designated, while 81% of very high Hispanic qualifying counties are designated. Comparisons across the urban/rural strata are not possible, as there are no high or very high Hispanic urban counties. Comparing across Tables 5 and 6, a greater percentage of high and very high black counties that meet the threshold actually get designated as compared with high and very high Hispanic counties.

Among those counties that meet the designation threshold of a population-to-primary care provider ratio of 3,500:1 or greater, those not actually designated as a HPSA are typically better off than designated counties. Average per capita income for counties that meet the threshold but were not designated is \$15,059 as compared to \$13,761 in designated counties; the average unemployment rate is 5.88% as compared to 7.00% in designated counties; and, average percentage of the population with less than nine years of education is 14.6 as compared to 18.2 in designated counties (all significant at $\alpha=.01$). Counties which were not designated also have significantly lower percentage black population: 5.02% as compared to 10.20% in designated counties. Among the counties which meet the designated threshold but were not actually designated, 57% are either metropolitan counties or are adjacent to metropolitan counties.

The rate of HPSA designation is much smaller among the 2,305 counties which do not meet the threshold of a 3,500:1 population-to-primary care physician ratio. As shown in Table 7, only 71% of rural very high black counties that do not meet the threshold received a HPSA designation. Urban very high black counties do slightly better at 78%. Across both urban and rural counties, the proportion of counties which are designated increases as the percentage of the population which is black increases.

Table 7
Number of Counties in Each HPSA Designation,
By Percentage Black Population Categorization Among Counties That Do Not Meet the
Population-to-Primary Care Physician Ratio Threshold of 3,500:1

	Not HPSA	Part County	Whole County	Total
All Non-Qualifying Counties (n=2305)				
Average Black	1010 (51%)	741 (37%)	240 (12%)	1991 (100%)
High Black	72 (43%)	55 (33%)	39 (24%)	166 (100%)
Very High Black	40 (27%)	57 (39%)	51 (34%)	148 (100%)
Rural Non-Qualifying Counties (n=1655)				
Average Black	708 (50%)	483 (34%)	225 (16%)	1416 (100%)
High Black	55 (45%)	30 (24%)	38 (31%)	123 (100%)
Very High Black	33 (29%)	34 (29%)	49 (42%)	116 (100%)
Urban Non-Qualifying Counties (n=650)				
Average Black	302 (53%)	258 (45%)	15 (3%)	575 (100%)
High Black	17 (40%)	25 (58%)	1 (2%)	43 (100%)
Very High Black	7 (22%)	23 (72%)	2 (6%)	32 (100%)

When looking at Hispanic categorization, this pattern does not hold (Table 8).

Table 8
Number of Counties in Each HPSA Designation, By Percentage Hispanic Population Categorization
Among Counties that Do Not Meet the
Population-to-primary Care Physician Ratio Threshold of 3,500:1

	Not HPSA	Part County	Whole County	Total
All Counties (n=2305)				
Average Hispanic	1069 (50%)	773 (36%)	293 (14%)	2135 (100%)
High Hispanic	36 (49%)	30 (41%)	8 (11%)	74 (100%)
Very High Hispanic	17 (18%)	50 (52%)	29 (30%)	96 (100%)
Rural Counties (n=1655)				
Average Hispanic	761 (49%)	506 (33%)	277 (18%)	1544 (100%)
High Hispanic	23 (56%)	11 (27%)	7 (17%)	41 (100%)
Very High Hispanic	12 (17%)	30 (43%)	28 (40%)	70 (100%)
Urban Counties (n=650)				
Average Hispanic	308 (52%)	267 (45%)	16 (3 %)	591 (100%)
High Hispanic	13 (39%)	19 (58%)	10 (3%)	33 (100%)
Very High Hispanic	5 (19%)	20 (77%)	1 (4%)	26 (100%)

Although in urban counties the proportion of designated counties increases as the percentage of the population which is Hispanic increases, this is not true in rural counties, where high Hispanic counties are not as likely to be designated as average Hispanic counties.

Among the counties which do not meet the population-to-primary care provider threshold of 3,500:1 there are significant socioeconomic differences ($\alpha=.01$) between counties which were designated and those which were not. Counties which received HPSA designations are poorer on average (\$15,089 average per capita income as compared to \$16,154), have higher unemployment rates (6.43% as compared to 5.62%), and have a greater percentage of the population with less than nine years of education (14.30% as compared to 12.92%). Designated counties also have higher percentage minority populations: the average percentage black is 9.78 and the average percentage Hispanic is 5.56. These rates are significantly higher (at $\alpha=.01$) than in the non-designated counties, which have an average percentage black of 7.09 and Hispanic of 3.23.

As there clearly is a relationship between rurality, socioeconomic characteristics, and the likelihood of being designated a HPSA, a multi-variable logit was estimated to see if the percentage of a county's population which was black or Hispanic, and whether or not a county was rural had a significant independent effect on the probability of being designated as a whole county HPSA (Table 9). After controlling for socioeconomic factors and minority population, there is no significant relationship between rurality and the probability of being designated. Although there is a highly significant and positive relationship between the probability of being designated and the percentage of the population which is black, percentage of the population which is Hispanic is not significant at the $\alpha=.05$ level. Per capita income and population density both have a significant and negative impact on the probability of being designated; the higher the per capita income and the higher the population density, the less likely the county is to be designated. Other significant independent variables are the percentage of residents with

less than 9 years of education and the percentage of a county's workforce which is employed outside of the county. Less educated counties and counties with more out-migration are more likely to be designated as whole county HPSAs.

Table 9
Logistic Regression Results, Probability of being a Whole County HPSA

Independent Variable	Coefficient	Standard Error	P-value
Percent of population that is black	.0226	.0085	0.008
Percent of population that is Hispanic	.0117	.0062	0.057
Rural county	.3525	.2838	0.214
Per capita income	-.0002	.0001	0.000
Percent unemployment	.0380	.0253	0.133
Percent of residents with less than 9 years of education	.0573	.0196	0.003
Natural log of Population density	-.9018	.0632	0.000
Out-migration for employment	.0439	.0043	0.000
Constant	1.9989	1.0241	0.051
Number of Observations = 2049			
Pseudo R ² = 0.3042			
Log Likelihood = -924.728			

The magnitude of the coefficients in logit regression models can best be interpreted relative to some defined state. Although the coefficient on the percentage of the population that is black achieved statistical significance, it is important to see whether or not there is any substantive impact when the value of this variable is changed. The probability of being a whole county HPSA was calculated for two base cases, one rural and one urban. In each of these cases, the values of all independent variables were set at the rural or

urban mean. The probability of being designated was then calculated three more times for each strata, using the mean for average black counties, then high black counties and finally using the mean for very high black counties. The results of this analysis are shown in Table 10.

Table 10
Probability of Whole County HPSA Designation

	Urban	Rural
Base case -- all variables at their means	.03	.34
Mean value for average black	.03	.31
Mean value for high black	.05	.45
Mean value for very high black	.06	.56

In general, the probability of an average urban county being a whole county HPSA is very small and does not vary much across percentage black categories. In contrast, rural counties with average socioeconomic characteristics have a .34 probability of being designated a whole county HPSA. For those counties who fall into the very high black category, this increases to .45 on average, and for those who are near the mean of the very high black category, the probability of being designated a whole county HPSA rises to .56, after controlling for the relevant socioeconomic characteristics.

V. Discussion

Designation as a whole or part county HPSA is a requirement for participation in several different Federal programs whose intent is to increase access to health care services. It is likely that areas with a high minority concentration suffer from reduced access, so it is of interest to know the extent to which these areas are being designated as HPSAs, and whether there is any differential effect of rurality. There is

a strong trend towards designation as a HPSA as the percentage of a county's population which is black increases. The multi variate analysis shows that this trend persists even after controlling for relevant socioeconomic variables, with a particularly strong effect in rural counties. For rural counties, this trend is most sharply seen in the whole county designation, while for urban counties the increase in designations is largest for part county designations.

When comparing the black and Hispanic categorizations, counties that are high or very high black are more likely to be designated than counties that are high or very high Hispanic. Overall, the relationship between Hispanic population concentration and HPSA designation is less clear than for black population concentration, as fewer high Hispanic counties were designated as compared to average Hispanic. Further, the multivariable analysis showed no significant relationship between the percentage of the population which is Hispanic and the probability of being designated a whole county HPSA. The lack of finding is not surprising when one considers the lack of consensus in the literature regarding the link between Hispanic populations and health status.

Among counties that meet the population-to-primary care provider designation threshold of 3,500:1, counties with high or very high black populations are doing a good job of getting designated, particularly in rural areas. Of particular interest is the finding that among counties meeting the threshold, those with a high or very high black population are actually doing a better job of getting designated than those with only average black population concentration. To the extent that race is related to medical underservice, and there is a substantial body of evidence to suggest that it is, these findings are reassuring in that they suggest that the present HPSA designation process is effective at designating the most severely underserved areas, especially in rural counties.

When considering counties not having a 3,500:1 population-to-primary care physician ratio, those which have high or very high black concentration are more likely to be designated as a HPSA than are

counties of average concentration. However, a significant portion of these high and very high mostly rural black counties are not designated. To the extent that a large black population in and of itself is associated with medical underservice this is worrying; it suggests that those areas of relatively higher minority concentration which cannot qualify for designation based on the population-to-primary care provider ratio threshold alone are either not attempting to have portions of their county designated or are not successful in doing so. There is some evidence that relying on local initiative for designation of HPSAs may mean that some who would otherwise qualify for designation are not designated because they lack the resources, leadership, or both to navigate the designation process (Taylor et al., 1995) However, the extent to which non-designation in any specific county with relatively high minority concentration is due to inadequate resources to apply rather than lack of need remains unknown. Although on average it is reasonable to assume that there is a link between large minority populations and underservice, this may not be the case for a given county.

The role of racial variables in health policy is controversial. How or if racial variables should be used *per se* in the designation of underserved areas in order to make them eligible for programmatic assistance is not clear. Although racial variables have been consistently shown to be powerful covariates of negative outcomes in many studies, they are also very crude means of determining what problems high minority concentration areas might experience. These variables could be marking racism, poverty, less attractive areas for physicians to locate, other unspecified cultural factors, or some combination of all of these. A challenge for the health policy and research community is to start to be more specific and investigate the underlying factors that are captured when it is reported that minority status is related to negative outcomes. This is the first step to more effective policy designed to respond to the specific problems minority populations face. However, this will require more investigation of the basic relationship between minority status and other variables associated with access and health outcomes. Meanwhile, for counties not

designated as HPSAs, racial variables are a useful proxy for underservice that could identify counties which deserve further investigation to see if they should be made eligible for remedial resources.

References

- Area Resource File (ARF). 1993. Office of Data Analysis and Management, Bureau of Health Professions, US Department of Health and Human Services; March.
- Cooper, R. And R. David. "The Biological Concept of Race and Its Application to Public Health and Epidemiology." *Journal of Health Politics, Policy and Law*. 1986, 11(1):97-116.
- DuBois, W.E.B. *Health and Physique of the Negro American*. 1906. Atlanta, GA: Atlanta University Press.
- Eberstein, I. W., and J. R. Parker. "Racial Differences in Infant Mortality by Cause of Death: The Impact of Birth Weight and Maternal Age." *Demography*, 1984; 21:309-321.
- Evans, R. G., M.L.Burer, and T. R. Murmor. *Why are Some People Healthy and Others Not?* 1994. New York: Aldine de Gruyter.
- Ford, E. S. and R. S. Cooper. "Racial/Ethnic Differences in Health Care Utilization of Cardiovascular Procedures: A Review of the Evidence." *Health Services Research*, April 1995 (Part II);30(1):237-252.
- Foster, H.W., J. Thomas, K.A. Semanya, and J. Thomas, "Low Birthweight in African Americans: Does Intergenerational Well-being Improve Outcome?" *Journal of the National Medical Association*, 1993; 85(7):516-520.
- Giachello, A. L. "Issues of Access and Use." In: Molina, C. and M. Molina, eds. *Latino Health in the U.S.: A Growing Challenge*. 1994. Washington, DC: American Public Health Association.
- Giachello, A. L. "Maternal/Perinatal Health." In: Molina, C. and M. Molina, eds. *Latino Health in the U.S.: A Growing Challenge*. 1994. Washington, DC: American Public Health Association.
- Gornick, M.E., P.W. Eggers, T.W.Reilly, R.M. Mentnech, L.K. Fitterman, L.E. Kucken and B.C. Vladeck. "Effects of Race and Income on Mortality and Use of Services Among Medicare Beneficiaries." *New England Journal of Medicine*. 1996; 335(11):791-798
- Holman, S.M., F.L. Farmer, R.S. Kirby and B. L. Dixon. "Antecedents of Infant Mortality: An Analysis of Risk Factors in Rural and Urban Arkansas." *Southern Journal of Rural Sociology*. 1994; 10(1):75-90.
- Johnson, J. H. "U.S. Differentials in Infant Mortality: Why Do They Persist?" *Family Planning Perspectives*, 1987; 19:227-232.
- Jones, C. P., T. A. LaVeist, and M. Lillie-Blanton. "'Race' in the Epidemiologic Literature: An Examination of the American Journal of Epidemiology, 1921-1990." *American Journal of Epidemiology*, 1991; 134(10): 1970-84.

- Kahn, K.L., et al. "Health Care for Black and Poor Hospitalized Medicare Patients." *Journal of the American Medical Association*, 1994; 271:1169-74.
- Kindig, D. A. and G. Yan. "Physician Supply in Rural Areas with Large Minority Populations." *Health Affairs*, (Summer 1993):177-184.
- Kleinman, J. C., J. J. Feldman, and R. H. Mugge. "Geographic Variations in Infant Mortality. *Public Health Reports*, 1976; 91:423-432.
- Kovar, M. G. "Mortality of Black Infants in the United States." *Phylon: The Atlanta University Review of Race and Culture*, 1977; 38:370-397.
- Last, J. M. "A Dictionary of Epidemiology." 2D ed. New York: Oxford University Press.
- LaVeist, T.A. "Beyond Dummy Variables and Sample Selection: What Health Services Researchers Ought To Know about Race as a Variable." *Health Services Research*. 1994; 29(1) 1-16.
- Lee, R. Designation of Health Manpower Shortage Areas for Use by Public Health Service Programs. *Public Health Reports*. 1979; 91(1), 48-59.
- Lieberman, E., K. J. Ryan, R. R. Monson, and S. C. Schoenbaum. "Risk Factors Accounting for Racial Differences in the Rate of Premature Birth." *The New England Journal of Medicine*, 1987; 317(12):743-48.
- Lillie-Blanton, M. and S.C. Hoffman. "Conducting an Assessment of Health Needs and Resources in a Racial/Ethnic Minority Community." *Health Services Research*, April 1995 (Part II);30(1):225-236.
- Markides, K. S., and J. Coreil. "The Health of Hispanics in the Southwestern United States: An Epidemiologic Paradox." *Public Health Reports*, 1986; 101(3):253-65.
- Montagu, A. *An Introduction to Physical Anthropology*. 1960. Springfield, IL: C. C. Thomas.
- National Center for Health Statistics. 1994. *Health, United States, 1993*. Hyattsville, MD: U.S. Public Health Service.
- National comparative survey of minority health care*. New York, NY: The Commonwealth Fund; 1995 March.
- Nickens, H. W. "The Role of Race/Ethnicity and Social Class in Minority Health Status." *Health Services Research*, April 1995 (Part II);30(1):151-162.
- Office of Surveillance and Analysis. 1995. Use of Race and Ethnicity in Public Health Surveillance: Summary of the CDC/ATSDR Workshop. *Morbidity and Mortality Weekly Report: Recommendations and Reports*. 1993; 42:44-10.

- Ricketts, T.C., L.A. Savitz, W.M. Gesler, and D.N. Osborne. *Geographic Methods for Health Services Research*. 1994, Lanham, MD:University Press of America.
- Schroeder, S.A., and M. P. Beachler. "Physician Shortages in Rural America." *The Lancet*, 1995; 345:1001-1002.
- Schulman, K.A., L.E.Rubenstein, F.D. Chesley, and J.M. Eisenberg. "The Roles of Race and Socioeconomic Factors in Health Services Research." *Health Services Research*, April 1995 (Part II);30(1):179-195.
- Taylor, D.H., T.C. Ricketts, J.T. Kolimaga, and H.A. Howard. "The Measurement of Underservice and Provider Shortage in the United States: A Policy Analysis." June, 1995, North Carolina Rural Health Research Program.
- U.S. Department of Health and Human Services. *Report of the Secretary's Task Force on Black and Minority Health*, 1985; vol. 1. Washington, D.C.:DHHS
- U.S. General Accounting Office. Health Care Shortage Areas: Designations Not a Useful Tool for directing resources to the underserved. Washington, D.C.U.S. GAO, 1995.
- Watt, E. S. "The Biological Race Concept and the Diseases of Modern Man." In *Biocultural Aspects of Disease*, edited by H. R. Rothchild. New York: Academic Press, Inc.
- White-Means, S.I. "Conceptualizing Race in Economic Models of Medical Utilization: A Case Study of Community-Based Elders and the Emergency Room." *Health Services Research*, April 1995 (Part II);30(1):207-224.
- Williams, D.R. "The Concept of Race in Health Services Research: 1966 to 1990. *Health Services Research*. 1994; 29(3):261-274.

Appendix

In order to develop an understanding of the complexity of using race within the health services context, this appendix reviews earlier research on race and research. References to race begin to appear in the literature of biology in 1749, mainly as a convenient label for skin color differentiation (Shulman et al., 1995; Montagu, 1964). Data on race has been collected by the U.S. Census Bureau from the first decennial Census which was taken in 1790 and since 1940, vital statistics in the United States have been classified by race (Jones et al., 1991). Although there is a consensus that data on race should be collected and analyzed, a scientifically accepted definition of race or ethnicity has not been adopted (Shulman et al., 1995).

Historically, race, culture, and society have been difficult to define. LaVeist (1994) compared twelve differing definitions which are presented in various dictionaries. Some of the terms were defined as biological while others addressed the social and political aspects of race. These definitions range from "a phenotypically and/or geographically distinctive subspecific group, composed of individuals inhabiting a defined geographic and/or ecological region, and possessing characteristic phenotypic and gene frequencies that distinguish it from other such groups" to "persons who are relatively homogeneous with respect to biological inheritance".

Not only does the definition of race differ between various dictionaries, but also among scholars. Their positions range from one extreme which support races as being biological entities with roots in the evolutionary past (Schulman et al., 1995; Last, 1988) to accepting the idea that race is a reference to a person's membership in a group which is defined by society, not biology (Schulman et al., 1995; Watt 1981; Cooper and David 1986). Other researchers pose the hypothesis that race is a composite measure of social, psychological, biological, and genetic influences on one's life, not just a simple correlate with economic variables which are often included in medical utilization models (White-Means, 1995).

Race in health services research has been used primarily to distinguish between blacks and whites. From 1966-1990, it was found that 54.5 percent of the studies in *Health Services Research* used this distinction . However, this trend appears to be declining over time, due to an increase of Hispanic studies. It should be noted that even in recent years, Asian American groups are seldom included in studies (Williams, 1994).

The race variable is used in health services research to represent ethnicity, skin color, and nationality. This not only results in some degree of measurement error, but the lack of conceptual clarity opens the door for errors in the interpretations of the study as well. In a review conducted by David Williams (1994), 64 percent of articles published from 1966 - 1990 in *Health Services Research* included race in their analysis, but the definition of race/ethnicity or justification for its use was found in only 13 percent of the articles. Often, race is conceptualized as a proxy for other variables that are known to correlate with race, but are left unmeasured. Examples of these variables include socioeconomic status, discrimination, cultural factors, and unspecified biological differences among race groups (LaVeist, 1994). Using race as a proxy, the precise nature of a problem can be masked and consequently, the most appropriate interventions have the potential of being overlooked (Lillie-Blanton & Hoffman, 1995; Jones et al., 1991).