Neighborhood Socioeconomic Disadvantage and Access to Healthcare[*]

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NEIGHBORHOOD SOCIOECONOMIC DISADVANTAGE AND ACCESS TO HEALTHCARE

ABSTRACT

Most research on access to healthcare focuses on individual-level determinants such as income and insurance coverage. The role of community-level factors in helping or hindering individuals in obtaining needed care, however, has not received much attention. We address this gap in the literature by examining how neighborhood socioeconomic disadvantage is associated with access to healthcare. We find that living in disadvantaged neighborhoods reduces the likelihood of having a usual source of care and obtaining recommended preventive services, while it increases the likelihood of having unmet medical need. These associations are not explained by the supply of healthcare providers. Furthermore, though controlling for individual-level characteristics reduces the association between neighborhood disadvantage and access to healthcare, a significant association remains. This suggests that when individuals who are disadvantaged are concentrated into specific areas, disadvantage becomes an "emergent characteristic" of those areas that predicts the ability of residents to obtain healthcare.

NEIGHBORHOOD SOCIOECONOMIC DISADVANTAGE AND ACCESS TO HEALTHCARE

Disparities in access to quality healthcare services are of growing concern to policy makers (Institute of Medicine 2001; U.S. Department of Health and Human Services 2000). Identifying and understanding factors that help individuals obtain needed medical care or that hinder them from doing so is therefore an important goal for researchers interested in the U.S. healthcare system and, ultimately, population health. To date, most research on access to healthcare has focused on individual-level determinants such as race, income, education, insurance status, and disability (Anderson, Rice, and Kominski 1996; Anderson and Davidson 2001; Berk, Shur, and Cantor 1995). The role of community-level factors in helping or hindering individuals in obtaining needed care, however, has not received much attention. Yet, community-level characteristics have been recognized as potentially important determinants of access (Donaldson et al. 1996). We address this gap in the literature by investigating whether neighborhood socioeconomic disadvantage is associated with access to healthcare net of individual level characteristics.

Though research on community-level correlates of access to healthcare is scarce, some research has shown that the utilization of healthcare services varies across communities. In particular, hospital utilization rates differ across communities with different levels of healthcare supply (Bindman et al. 1995; Roderick et al. 1999) and with different socioeconomic characteristics (Carlisle et al. 1995; Komaromy et al. 1996). Community-level variation in the use of ambulatory care has also been found (Cunningham and Kemper 1998). These studies, however, take an ecological approach

and do not control for individual-level characteristics in their analyses. Their findings, thus, may be a reflection of the composition of communities, rather than an indication that community characteristics themselves influence healthcare utilization. For example, because the U.S. population is highly segregated by income (Massey 1996), there may be lower levels of healthcare utilization in impoverished communities simply because such communities are composed of poor individuals who cannot afford care, regardless of the characteristics of the communities in which they live. To distinguish between associations that are due to community composition and those that are due to community-level factors, studies that examine individual-level and community-level characteristics simultaneously are needed. To date, only a few studies have done this.

One such study found that, among a sample of low income individuals living in the 100 largest metropolitan statistical areas (MSAs), those living in areas with high rates of poverty and unemployment were less likely to have seen a doctor in the previous year than those living in other areas (Anderson et al. 2002). The study also found that those living in areas with more federally funded health centers were more likely to have seen a doctor (Anderson et al. 2002). Another study found that women living in Kansas counties with high median incomes had higher rates of breast and cervical cancer screenings than those living in counties with lower median incomes (Engelman et al. 2002). Both of these studies controlled for several individual-level characteristics and thus suggest that there may be a relationship between community-level characteristics, such as socioeconomic status and healthcare supply, and healthcare utilization.

Though these studies make a valuable contribution by investigating the possibility of a relationship between community-level characteristics and healthcare use, they are limited in several important ways. Both studies use healthcare utilization as an indicator of access. If access to healthcare is conceptualized as the ability to obtain needed care, healthcare utilization is not a sufficient measure. For example, healthy individuals with generous health insurance plans and high incomes could have excellent access to healthcare but little or no utilization. In contrast, unhealthy individuals with no insurance and low incomes might have substantial healthcare utilization out of necessity, but still not be obtaining all the care they need. Other limitations of previous research pertain to the data used. Previous studies on the community-level correlates of access to healthcare use data from specific geographic areas or populations and, thus, it is not clear whether their findings apply to the U.S. population at large. Furthermore, community-level variables are measured at relatively high levels of aggregation (the county or MSA) and, thus, encompass very heterogeneous areas. Communities are likely to be approximated more accurately with smaller geographic areas. Finally, previous studies use data in which there is a time lag between individual-level characteristics and community-level social and economic data.

In this study, we contribute to the line of research described above in several important ways. First, we examine the effects of both community- and individual-level factors on access to healthcare simultaneously to distinguish between associations that are "compositional" in nature, versus "contextual". Second, we use several variables designed to measure access to healthcare explicitly, rather than making inferences about

access from utilization patterns. Third, we use data on a nationally representative sample of individuals from a large household survey. Fourth, we use individual- and community-level data that were measured in the same year, ensuring that information obtained regarding individuals' experiences with the healthcare system coincide with information on their communities. Finally, we use community-level data measured at the block group-level, the smallest geographic area for which social statistics are available from the U.S. Census (U.S. Census Bureau 2000). This enables us to assess the extent to which socioeconomic disadvantage is geographically concentrated more accurately than in previous studies.

THEORETICAL BACKGROUND

Though the relationship between community characteristics and access to healthcare has not received much attention from researchers until relatively recently, much research has established a link between community characteristics and health. In particular, neighborhood socioeconomic disadvantage is associated with a variety of health outcomes, net of individual characteristics, including self-rated health (Katz, Kling, and Liebman 2001; Malmstrom, Sundquist, and Johansson 1999; Ross and Mirowsky 2001), functional disability (Ross and Mirowsky 2001), mental health (Aneshensel and Sucoff 1996; Latkin and Curry 2003; Ross 2000; Ross, Reynolds, and Geis 2000; Schultz et al. 2000), and mortality (Huie, Hummer, and Rogers 2002; LeClere, Rogers, and Peters 1997; LeClere, Rogers, and Peters 1998). This research offers several explanations for the association observed between neighborhood disadvantage and health. In this study,

we extend these explanations to develop hypotheses on how neighborhood disadvantage may also affect access to healthcare.

One explanation offered for the relationship between neighborhood disadvantage and health is that disadvantaged neighborhoods suffer from unhealthy physical environments. Neighborhood resources, or lack thereof, impact characteristics of the physical environment such as quality of air and water and the prevalence of toxic waste (Bullard 1990; General Accounting Office of the United States 1983), and these constitute direct threats to health. The provision of municipal services such as policing, fire, and sanitation may also be less adequate in disadvantaged neighborhoods (Wallace and Wallace 1990). As a result of these environmental and service-related factors, researchers argue that living in disadvantaged neighborhoods is less conducive to health (Roberts 1998). We contend that the same environmental factors may also affect the convenience and safety with which individuals must travel to obtain medical care. For example, if a neighborhood has poorly maintained sidewalks and streets and poor public transit, traveling to obtain needed healthcare may be inconvenient and costly. Neighborhoods with poor physical environments may also be less attractive to healthcare providers, which would also make obtaining healthcare more difficult for residents. Because of these factors, we argue that living in disadvantaged neighborhoods is less conducive to obtaining healthcare, even net of individual characteristics.

Other explanations for the relationship between neighborhood socioeconomic disadvantage and health are based on classic social disorder theory (Ross 2000; Ross and Mirowsky 2001; Sampson and Groves 1989; Sampson and Laub 1993; Shaw and McKay

1969). For example, Ross (2000) and Ross and Mirowsky (2001) argue that disadvantaged neighborhoods may lack the informal social control needed to maintain social order. This may be due to limited economic opportunities (Wilson 1996), inadequate resources for ensuring the viability of social and civic institutions such as churches, schools, and voluntary organizations (Browning and Cagney 2002), and lack of social cohesion (Sampson and Groves 1989). Consequently, residents of disadvantaged neighborhoods are likely to experience noise, vandalism, drug trafficking, and violent crime more often than those in other neighborhoods. This promotes feelings of hopelessness, anxiety, and fatigue that contribute to higher rates of physical and mental illness (Ross 2000). We argue that the manifestations of social disorder common in disadvantaged neighborhoods not only put individuals at a higher risk of mental and physical illness, but also constitute barriers to accessing the healthcare system. Like certain physical characteristics of neighborhoods discussed earlier, crime and other manifestations of social disorder may make traveling to obtain healthcare inconvenient or even unsafe. Furthermore, confronting manifestations of social disorder on a daily basis may make obtaining healthcare seem less important relative to other activities to individuals in disadvantaged neighborhoods.

Another mechanism through which neighborhood disadvantage may reduce access to healthcare is by making the transfer of health-related information less efficient. As previously mentioned, concentrated socioeconomic disadvantage may diminish resources necessary to maintain organizations such as churches, schools, and voluntary organizations (Browning and Cagney 2002). These institutions foster social ties through

which social control operates, but also through which information, including that related to obtaining healthcare, may be obtained. Information such as the location of facilities providing affordable or free healthcare services, the safest and most convenient means of getting to such facilities, the quality of care provided, and whether or not providers can communicate in a particular language may therefore be less widely available in disadvantaged neighborhoods than in other neighborhoods. If so, residents of disadvantaged neighborhoods may be less able to obtain needed healthcare.

In summary, we hypothesize that neighborhood socioeconomic disadvantage reduces access to healthcare for residents by creating physical, service, and social environments that make accessing the healthcare system more difficult. Consequently, we expect that any association between neighborhood socioeconomic disadvantage and access to care will persist even after controlling for the composition of individuals in neighborhoods. In other words, neighborhood disadvantage and access to healthcare are associated not simply because disadvantaged neighborhoods are composed of disadvantaged individuals, but because the characteristics of disadvantaged neighborhoods impact the ability of residents to obtain healthcare services, regardless of whether they themselves are disadvantaged.

DATA AND METHODS

Sources of Data

Data for this study come from three sources. Individual-level data come from one year of the Medical Expenditure Panel Surveys (MEPS). MEPS is a series of

longitudinal surveys based on clustered and stratified samples of households that provide nationally representative estimates of healthcare use, insurance coverage, and socio-demographic characteristics for the U.S. non-institutionalized population (Cohen 1996; Cohen 1997). We link individuals in the 2000 MEPS to information regarding the supply of healthcare providers at the county-level from the Area Resource File from the Bureau of Health Professionals (Bureau of Health Professionals 2001). Finally, to obtain neighborhood-level characteristics, we attached longitude and latitude figures to addresses in the 2000 MEPS sample (often referred to as 'geocoding'), which enabled us to link individuals to information from the 2000 Decennial Census regarding the block groups in which they live. Block groups are the smallest geographic area for which social statistics are available. They generally contain between 600 and 3000 people (U.S. Census Bureau 2000) and can be considered approximations of neighborhoods (Auchincloss, Van Nostrand, and Ronsaville 2001).

The 2000 MEPS data contain 25,096 individuals, 93% of whom were successfully linked to a census block group. Though differences between individuals with and without block group information were modest, individuals missing block group information were more often non-white, less educated, and poor. To minimize sample selection bias, our analyses initially contained imputed values for those with missing block group information and dichotomous variables to identify them. However, the dichotomous variables identifying the cases with imputed block group information were never significant in our analysis nor did our substantive findings change when such cases were removed (analysis available from authors upon request). We therefore exclude

individuals without block group information from our analyses, yielding a total sample size of 23,240.

Access to Healthcare

We conceptualize access to healthcare as the ability to obtain *needed* health-related services. Central to our conceptualization, services are 'needed' not just when one becomes ill but also to detect conditions before illness becomes apparent or to prevent illness altogether. We use three types of measures to gauge access to healthcare. The first measure is dichotomous and indicates whether an individual has a provider from whom they usually obtain medical care, often referred to as a 'usual source of care provider' (USC). Having a USC is an important gauge of access because it indicates whether an individual has a specific entry point into the healthcare system if some event necessitates it. Previous studies use this measure as a standard benchmark for whether an individual has access to ambulatory care (Zuvekas and Taliaferro 2003).

The second measure is a subjective assessment of access to healthcare. Individuals were asked whether they were unable to obtain healthcare in the previous year when they or a doctor thought it was necessary. A dichotomous variable indicates whether an individual answers in the affirmative to this question. We refer to this variable as 'unmet need.' Measures of access similar to this have been used widely in previous research on access to healthcare (Cunningham and Kemper 1998; Hendryx et al. 2002).

Finally, we use three measures based on adherence to United States Preventive Task Force (USPTF) guidelines. We constructed dichotomous variables indicating whether an individual complied with the following three USPTF guidelines for preventive care.

(a) Blood pressure screening: received within the past 2 years for all individuals

(b) Cholesterol screening: received within the past 5 years for those 35 and over

(c) Influenza vaccine: received within the past year for those 65 and over

We examined a number of preventive care guidelines in addition to those listed above, including recommendations for bowel, breast, and cervical cancer screenings. Results from the analyses on these measures are consistent with those presented in this paper. We chose to present results on recommendations pertaining to blood pressure, cholesterol, and influenza vaccination because they applied to a broad segment of the population. Note that because the recommendations are age-specific, the sample sizes for our analyses vary accordingly.

Neighborhood Disadvantage

Our main independent variable is neighborhood socioeconomic disadvantage. Disadvantaged neighborhoods are those with a shortage of resources, either in the form of economic or human capital. Our measure is a scale consisting of three items: the percent of residents in a block-group under 125% of the federal poverty line, the percent of residents over 16 who are unemployed, and the percent of residents over 18 with no high school diploma or GED. The neighborhood disadvantage scale is the sum of these items

divided by 10 (alpha = 0.73). This scale is similar to measures used in previous research on neighborhood disadvantage and health (Ross 2000; Ross and Mirowsky 2001).

The Supply of Healthcare

An association between neighborhood socioeconomic disadvantage and access to healthcare could be in part due to differences in the supply of healthcare providers available to residents of different neighborhoods. To test the extent to which this is the case, we include the number of practicing physicians per 1000 county residents and the number of hospitals per 100,000 county residents in our analysis. The county is a more appropriate level at which to operationalize the supply of healthcare services than the block group because of geographic size. For example, even if few physicians are available in a particular block group, there may be ample physicians in neighboring block groups who are within a reasonable traveling distance. If there is a dearth of physicians in a county, however, residents are more likely find it difficult to locate and travel to them.

Control Variables

In order to distinguish the 'compositional' effect of neighborhood disadvantage from its 'contextual' effect, it is important to control for individual characteristics that might be associated both with obtaining needed medical care and with the likelihood of residing in a disadvantaged neighborhood. Among the most important individual characteristics with respect to access to healthcare is socioeconomic status (SES). An

association between neighborhood disadvantage and access to healthcare may exist simply because low SES individuals are likely to live in disadvantaged neighborhoods and, at the same time, likely to be unable to afford healthcare. We measure individual-level SES using dichotomous variables on household income relative to the federal poverty line (less than 125%, 125-200%, 200-400%, or 400% or more) and educational attainment (no high school degree or GED, a high school degree only, a college degree, a graduate or professional degree, or under the age of 25).

Health status is another important predictor of access that may be related to the likelihood of living in a disadvantaged neighborhood and of being able to obtain needed healthcare. Because health and income are positively related, poor health may be positively associated with the likelihood of living in a disadvantaged neighborhood. The effect of health on the likelihood of receiving needed care is, however, less clear. On one hand, those who have chronic conditions or disabilities are likely to maintain close contact with the healthcare system out of necessity. They therefore may be more likely to have a USC and more likely to obtain preventive services. On the other hand, individuals in poor health may be more likely to report unmet need because their needs are great. We measure health status using the following three variables: subjective health status, the presence of chronic conditions, and the presence of functional limitations. Subjective health status is captured with a battery of dichotomous variables indicating whether individuals rate their health as excellent, very good, good, fair, or poor. The variable on chronic conditions indicates the number of diagnosed conditions a person has out of the following: angina, asthma, coronary heart disease, diabetes, emphysema, hypertension,

heart attack, and stroke. Disability is measured with a variable that indicates whether individuals need help or supervision with personal care such as bathing, dressing, or getting around the house.

Insurance status is another individual-level variable that is important to control for in our models. Compared to individuals with private health insurance, those with public health insurance or no insurance coverage may be more likely to live in disadvantaged neighborhoods. Because insurance status is also related to the ability of persons to obtain needed care, any association between neighborhood disadvantage and access may simply be a reflection of a neighborhood's composition with respect to health insurance status. Because nearly all persons over age 65 in our sample are insured publicly through Medicare, our measure of insurance status is age-specific. We measure insurance status using five dichotomous variables to indicate whether individuals are: age 65 or above and insured exclusively by Medicare; age 65 or above and insured by Medicare plus some private supplemental insurance plan; under age 65 and uninsured; under age 65 and insured by a public plan; or under age 65 and insured by a private plan. Those who had both public and private insurance during the year were grouped with individuals having private insurance exclusively.

Finally, we control for other basic demographic characteristics, namely, gender, age, marital status, race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, or non-Hispanic and some other race), and whether individuals reside in an urban versus rural area (MSA or non-MSA). All of these characteristics are associated with access to healthcare and may also be associated with the type of

neighborhoods in which individuals live. Table 1 displays coding and descriptive statistics for all the variables included in the analysis.

-- Table 1 about here --

Analytical Approach

We estimate three logistic regression models for each of the five dependent variables. In the first models, we include only the variable on neighborhood disadvantage, thereby investigating the bivariate association between neighborhood disadvantage and access to care. In the second models, we add the variables measuring the supply of healthcare to the first models. These models give a sense of how much of the crude association between neighborhood disadvantage and access is driven by the supply of healthcare. In the final models, we control for all individual-level, county-level, and neighborhood-level variables. All point estimates are calculated using weights and standard errors are adjusted for the complex sample design of MEPS using the survey estimation procedures in Stata, version 7 (Levy and Lemeshow 1999; Statacorp 2001). Adjusting for sample clustering in this way also provides a correction for the problems with statistical inference associated with the use of multilevel data, thus making an explicit hierarchical linear modeling approach unnecessary (Goldstein 1999).

RESULTS

In Tables 2 and 3, we present odds ratios and t-statistics from fifteen logistic regression models. More specifically, Table 2 shows results for the models pertaining to the likelihood that individuals have a USC and experience unmet need. Table 3 shows

results for the models pertaining to adherence to USPTF guidelines on blood pressure screenings, cholesterol screenings, and influenza vaccination.

The results from the first model for each dependent variable provide a description of the crude association between neighborhood disadvantage and the access measures. Consistent with our expectations, the results indicate that residents of disadvantaged neighborhoods are significantly less likely to have a USC, more likely to experience unmet need, and less likely to comply with USPTF guidelines, compared to those in other neighborhoods. Specifically, the odds ratios from Model 1 shown in Table 2 indicate that a unit increase in the neighborhood disadvantage scale is associated with a decrease of 21% in the odds of having a USC, and an increase of 68% in the odds of experiencing unmet need. The results from Model 1 shown in Table 3 indicate that a unit increase in the neighborhood disadvantage scale is associated with a 28% decline in the odds of adherence to USPTF guidelines for blood pressure screenings, an 18% decline in the odds of adherence for cholesterol screenings, and a 30% decline in the odds of adherence for annual influenza vaccination.

--Tables 2 and 3 about here --

In our second models, we include the healthcare supply variables (i.e., doctors per 1000 and hospitals per 100,000 county residents). The associations observed in Model 1 remain statistically significant across all of our dependent variables and the magnitudes of the odds ratios change very little. These results imply that virtually none of the association between neighborhood disadvantage and access to healthcare is attributable to differences in the supply of healthcare providers across counties.

In our final models, we include all individual-level variables to test whether the associations between neighborhood disadvantage and our access measures are attributable to differences in the composition of individuals within neighborhoods. Odds ratios for the individual-level control variables shown in this third set of models are frequently significant and are generally in the expected directions. Despite the inclusion of individual-level variables, however, our results indicate that neighborhood disadvantage remains significantly associated with all measures of access to healthcare, though the magnitudes of the associations are reduced. Odds ratios from Model 3 in Table 2 indicate that, net of individual-level variables, a unit increase in the neighborhood disadvantage scale is associated with a 10% decrease in the odds of having a USC and a 20% increase in the odds of experiencing unmet need. Odds ratios from Model 3 in Table 3 indicate that a unit increase in the neighborhood disadvantage scale is associated with a decrease of 10% in the odds of adhering to USPTF recommendations regarding blood pressure screenings, a 9% decrease in that for cholesterol screenings, and a 19% decrease in that for influenza vaccinations. These results indicate that the associations observed between neighborhood socioeconomic disadvantage and access to healthcare go beyond what would be expected given the composition of individuals in neighborhoods; neighborhood socioeconomic disadvantage itself seems to have an effect.

While our results suggest that there is an association between neighborhood socioeconomic disadvantage and access to healthcare, it is possible that this association is not the same across all individuals. For example, personal resources such as income or health insurance may enable some individuals to overcome neighborhood-level barriers

to obtaining healthcare. To address this possibility, we estimated models with a variety of interaction terms. These include interactions between neighborhood disadvantage and gender, age, race, income, and insurance status. The magnitudes of these interactions were small and not statistically significant. This indicates that the association between living in a disadvantaged neighborhood and having poor access to healthcare is not moderated by individual characteristics. In other words, we find little evidence that personal resources such as income or health insurance coverage protect individuals from the deleterious effects of living in disadvantaged neighborhoods.

DISCUSSION

Most previous studies on access to healthcare focus on individual-level determinants such as income and insurance coverage. The role of community-level factors in helping or hindering individuals in obtaining needed care, however, has not received much attention. To address this gap in the literature, the current study investigated the association between neighborhood socioeconomic disadvantage and access to healthcare. We found that living in disadvantaged neighborhoods is associated with reduced likelihoods of having a usual source of care and of obtaining recommended preventive care, and with an increased likelihood of experiencing unmet medical need. Furthermore, these associations are reduced but not eliminated when the composition of individuals within neighborhoods is held constant. We speculate that the above associations exist because socioeconomic disadvantage at the neighborhood-level gives rise to physical, service, and social environments that hinder residents from traveling to

healthcare, make healthcare a lower priority for individuals, and reduce the transfer of health-related information through social networks.

One limitation of the study is that we are not able to test explicitly the mechanisms through which neighborhood disadvantage is linked to healthcare access. While our findings are consistent with the explanations we outline, they need to be investigated directly in future research. To make this possible, more detailed data on neighborhood environments and information on how residents perceive and respond to their environments is needed. For example, information on the availability and cost of public transportation and other travel-related variables would be useful for testing the mechanisms outlined in our study. Variables that measure social disorder directly, such as neighborhood crime rates and residents' perception of crime, the scope and density of networks in neighborhoods and the type of information residents obtain from their networks would also be helpful. Though some of this information is available in certain data sets (Ross and Mirowsky 2001; Ross et al. 2000), it is not available together with detailed individual-level information on healthcare access and utilization.

Another limitation of this study has to do with the possibility of omitted variables. There may be variables at the individual- and neighborhood-level that are not included in our study that are associated with both neighborhood disadvantage and access to healthcare. If important individual-level variables are omitted, our findings could be a reflection of the composition of individuals in a neighborhood, rather than an actual neighborhood-level effect. If important neighborhood-level variables are omitted, the association we observe could be due to some other neighborhood characteristic, rather

than neighborhood-level socioeconomic disadvantage. Because we have included most individual- and neighborhood-level variables identified by previous research as being important to healthcare access, we believe that any bias due to unobserved variables in our study is minimal. Nevertheless, the possibility should be considered when interpreting our results.

Despite these limitations, this study contributes to knowledge on access to healthcare by identifying neighborhood socioeconomic disadvantage as a possible determinant. Our findings suggest that when individuals who are disadvantaged are concentrated into specific areas, disadvantage becomes an "emergent characteristic" of those areas that predicts the ability of residents to obtain needed healthcare. This implies that disparities in access to healthcare might persist even if disparities across individual-level characteristics are eliminated. Given that the U.S. is highly segregated by a number of social and economic characteristics, and given that a major goal of U.S. health policy is to reduce disparities in access to healthcare (Institute of Medicine 2001; U.S. Department of Health and Human Services 2000), more research on how community-level characteristics affect the ability to obtain needed medical care is needed.

Table 1. Means and Standard Deviations of all variables

	Mean	SD
Access Variables		
Do you have a USC (yes)?	0.82	0.40
Unmet need (yes)	0.07	0.27
USPTF Guidelines for:		
Blood pressure screening	0.88	0.34
Cholesterol screening	0.67	0.47
Influenza Vaccine	0.27	0.44
County-level supply variables		
Doctors per 1000 residents	2.69	1.89
Hospitals per 100,000 residents	1.89	1.83
Neighborhood Socioeconomic disadvantage		
Socioeconomic disadvantage scale	1.25	1.01
Scale Components:		
Proportion 16 and older who are unemployed	0.04	0.04
Proportion 18 and older with no high school diploma or GED	0.20	0.17
Proportion below the Federal Poverty Line	0.14	0.13
Individual-level independent variables		
MSA resident	0.82	0.42
Gender		
Male	0.49	0.50
Female	0.51	0.50
Age in years	35.48	22.42
Marital status (Married)	0.41	0.49
Race/ethnicity		
Non-Hispanic White	0.71	0.49
Non-Hispanic Black	0.13	0.35
Hispanic/Latino	0.12	0.43
Non-Hispanic Asian	0.03	0.16
Other race/ethnicity	0.01	0.08
Educational Attainment		
No high school diploma or GED	0.10	0.34
High school diploma or GED	0.37	0.47
College degree	0.11	0.28
Graduate/professional degree	0.05	0.21
Under 25, in applicable	0.36	0.49
Income relative to the Federal Poverty Line		
Less than 125%	0.16	.41
125%-200%	0.13	.37
200%-400%	0.32	.46
More than 400%	0.38	.46

Table 1, continued

Self-rated Health		
Excellent	0.32	0.46
Very good	0.34	0.47
Good	0.24	0.44
Fair	0.07	0.27
Poor	0.03	0.16
Needs help with ADL	0.01	0.12
Number of chronic conditions	0.44	0.86
Insurance status		
Under 65, insured by a private plan	0.66	0.49
Under 65, insured by a public plan	0.11	0.35
Under 65, no insurance	0.12	0.36
Over 65, Medicare only	0.05	0.22
Over 65, Medicare plus private	0.07	0.24

Table 2. Odds ratios and t-statistics from logistic regressions on general access measures

	Do you have a USC? (yes)			Unmet Need		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Neighborhood socioeconomic disadvantage	0.79	0.77	0.90	1.68	1.67	1.20
	(6.82)**	(7.55)**	(2.92)**	(11.69)**	(11.19)**	(2.84)**
County-level supply variables						
Physicians per 1000 county residents		0.99	1.02		0.97	0.99
		(0.40)	(1.47)		(1.04)	(0.51)
Hospitals per 100,000 county residents		1.09	1.05		1.02	1.02
		(3.39)**	(2.30)*		(0.66)	(0.77)
Individual-level variables						
Resides in an MSA			0.80			1.07
			(1.88)			(0.42)
Gender (Reference: female)						
Male			0.61			1.02
			(10.13)**			(0.33)
Marital status (Reference: Unmarried)						
Married			1.44			0.87
			(6.30)**			(1.07)
Age in years			1.00			0.99
			(0.69)			(1.52)
Race/ethnicity (Reference: Non-Hispanic White)						
Non-Hispanic Black			0.78			0.54
			(2.64)**			(3.58)**
Hispanic			0.63			0.74
			(5.01)**			(1.90)
Non-Hispanic Asian			0.65			0.78
			(2.51)*			(0.72)
Other non-Hispanic			0.98			1.12
			(0.05)			(0.27)
Highest degree obtained (Reference: High school diploma or GED)						
No high school diploma/GED			0.97			1.22
			(0.39)			(1.94)
College graduate			0.87			0.99
			(2.06)*			(0.07)
Professional/graduate degree			1.02			0.96
			(0.17)			(0.19)

Table 2, continued

Highest degrees obtained, continued						
Inapplicable, under 25			2.23			1.02
			(6.64)**			(0.12)
Income as a percent of Federal Poverty Line (Reference: Over 400%)						
Under 125%			0.91			3.45
			(0.83)			(5.64)**
125%-200%			0.64			4.34
			(4.33)**			(7.60)**
200%-400%			0.87			3.16
			(1.63)			(7.17)**
Self-rated Health (Reference: Excellent)						
Very good			1.20			1.08
			(2.53)*			(0.70)
Good			1.24			1.43
			(2.77)**			(2.92)**
Fair			1.65			2.15
			(4.21)**			(5.28)**
Poor			1.93			3.64
			(3.15)**			(7.23)**
Help with ADL (Reference: No)			2.54			1.25
			(2.31)*			(0.62)
Number of serious conditions			1.74			1.12
			(10.29)**			(2.14)*
Insurance Status (Reference: Under 65, private)						
Under 65, public insurance			1.16			2.60
			(1.23)			(6.18)**
Under 65, uninsured			0.27			3.57
			(16.31)**			(10.31)**
65 or over, Medicare only			2.82			0.37
			(6.00)**			(3.86)**
65 or over, Medicare plus private			1.79			0.81
			(3.13)**			(0.84)
Observations	22890	22890	22724	23020	23020	22843
Absolute value of t-statistics in parentheses						
* significant at 5%; ** significant at 1%						

Table 3. Odds ratios and t-statistics from logistic regression models on adherence to USPTF guidelines

	Blood pressure screening			Cholesterol screening, 35+			Influenza vaccine, 65+		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Neighborhood socioeconomic disadvantage scale	0.72	0.72	0.90	0.82	0.85	0.91	0.70	0.71	0.81
	(9.62)**	(10.26)**	(2.45)*	(6.50)**	(5.29)**	(2.14)*	(5.89)**	(5.84)**	(3.09)**
County-level supply variables									
Physicians per 1000 county residents		1.01	1.03		1.05	1.05		1.02	1.05
		(0.42)	(1.41)		(2.69)**	(2.47)*		(0.70)	(1.71)
Hospitals per 100,000 county residents		1.04	1.00		0.96	0.95		1.01	0.98
		(1.71)	(0.11)		(2.55)*	(2.79)**		(0.17)	(0.47)
Individual-level variables									
Resides in an MSA (Reference: non-MSA)			0.91			0.99			0.86
			(0.91)			(0.07)			(0.85)
Gender (Reference: Female)									
Male			0.36			0.71			0.98
			(15.89)**			(6.05)**			(0.28)
Marital Status (Reference: Unmarried)									
Married			1.55			1.25			1.43
			(6.18)**			(3.45)**			(3.47)**
Age in years			1.01			1.04			1.04
			(1.52)			(8.70)**			(4.45)**
Race/ethnicity (Reference: Non-Hispanic White)									
Non-Hispanic Black			0.89			1.73			0.38
			(1.11)			(4.81)**			(5.80)**
Hispanic			0.74			1.68			0.72
			(3.05)**			(4.68)**			(1.85)
Non-Hispanic Asian			0.46			0.72			0.74
			(3.95)**			(1.83)			(0.92)
Other non-Hispanic			0.90			0.71			0.46
			(0.34)			(0.91)			(0.94)
Highest degree obtained (Reference: High school diploma/GED)									
No high school diploma/GED			0.66			0.69			0.93
			(3.97)**			(4.45)**			(0.68)
College graduate			1.46			1.33			1.32
			(3.50)**			(2.96)**			(1.54)
Professional/graduate degree			1.80			1.32			1.01
			(3.58)**			(2.51)*			(0.03)

Table 3, continued

Highest degree obtained, continued									
Inapplicable, under 25			1.04			N/A			N/A
			(0.32)						
Income as a percent of Federal Poverty Line (Reference: Over 400%)									
Under 125%			0.79			0.61			0.81
			(2.03)*			(4.20)**			(1.30)
125%-200%			0.83			0.66			0.82
			(1.64)			(3.97)**			(1.27)
200%-400%			0.83			0.76			0.72
			(2.68)**			(3.79)**			(2.31)*
Self-rated Health (Reference: Excellent)									
Very good			1.43			1.20			1.26
			(5.30)**			(2.42)*			(1.72)
Good			1.53			1.17			1.37
			(5.12)**			(1.91)			(2.01)*
Fair			1.97			1.26			1.41
			(4.47)**			(2.04)*			(2.00)*
Poor			2.33			1.48			1.87
			(3.68)**			(2.27)*			(2.46)*
Help with ADL (Reference: No)			2.00			0.73			0.68
			(1.61)			(1.16)			(1.66)
Number of serious conditions			2.49			1.84			1.18
			(11.82)**			(11.56)**			(3.57)**
Insurance Status (Reference: Under 65, private)									
65 or over, Medicare only			1.21			0.94			0.70
			(0.95)			(0.35)			(0.35)
65 or over, Medicare plus private			0.95			0.70			0.74
			(0.25)			(2.07)*			(0.30)
Under 65, public insurance			0.92			0.85			N/A
			(0.65)			(0.98)			
Under 65, uninsured			0.44			0.56			N/A
			(9.74)**			(6.05)**			
Observations	16348	16348	16246	11248	11248	11178	2630	2630	2606

Absolute value of t-statistics in parentheses
* significant at 5%; ** significant at 1%

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