Access to Medical Care for Low-Income Persons: How Do Communities Make a Difference?

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This paper considers the impact of community-level variables over and above the effects of individual characteristics on healthcare acess for low-income children and adults residing in large metropolitan statistical areas (MSAs). Further, we rank MSAs' performance in promoting healthcare access for their low-income populations. The individual-level data come from the 1995 and 1996 National Health Interview Survey (NHIS). The community-level variables are derived from multiple public-use data sources. The outcome variable is whether low-income individuals received a physician visit in the past twelve months. The proportion receiving a visit by MSA varied from 63% to 99% for children and from 62% to 83% for adults. Access was better for individuals with health insurance and a regular source of care and for those living in communities with more federally-funded health centers. Children residing in MSA

Fundamentally, access to medical care depends on who people are (their individual characteristics) and where they live (community characteristics). We know that access to medical care for low-income persons in the United

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States is considerably less, on average, than for the rest of the population (Andersen and Davidson 2001). Numerous investigations have noted large inequities in access for low-income and minority populations regarding lack of health insurance coverage, lack of access to a regular source of care, gaps in receipt of preventive care, delays in obtaining needed care, and higher rates of morbidity, hospitalization, and mortality that could have been avoided with appropriate access to care (Institute of Medicine [IOM] 1993; Center for Health Economics Research 1993; Commonwealth Fund 1995; Collins, Hall, and Nebus 1999; Mayberry et al. 1999; Brown, Ojeda, et al. 2000).

An increasing body of empirical evidence indicates that community-level factors are also related to health care use. Small area variation studies beginning more than 25 years ago have shown that communities have quite different rates of hospital use (Alexander et al. 1999). Differences have been related to practice style of physicians (Wennberg and Gittelsohn 1982; Wennberg 1984; Wright et al. 1999), diagnostic categories (McMahon et al. 1993; Gittelsohn and Powe 1995), socioeconomic factors of the community (Carlisle et al. 1995; Komaromy et al. 1996), and supply of medical resources (Bindman et al. 1995; Roderick et al. 1999). Despite this relatively extensive field of study, much remains to be understood about community variation in hospital use (Alexander et al. 1999). Studies of community variation in access to primary care are more recent with even less attention to theoretical development (Davidson et al. forthcoming). As applied to low-income and uninsured populations, for example, Cunningham and Kemper (1998) found large differences among communities in the proportion of uninsured persons reporting difficulty obtaining medical care, ranging from 41.4 percent to 18.5 percent. Long and Marquis (1999), examining variation in access to physician services for uninsured children in 10 states, found that the average physician visit rate in the 3 states with the greatest safety net resources was 160 percent of that in states with the fewest safety net resources.

Community-level health care access inequities may exist for a variety of reasons. When federal and state participation is required to support health insurance programs for vulnerable populations (e.g., Medicaid, CHIP), uneven allocation of resources at the state and local levels can result. This uneven allocation of resources is likely to persist because care for uninsured persons is driven largely by state and local policy (Cunningham and Kemper 1998). In addition to government-sponsored health insurance programs, varying degrees of other support from state and local communities subsidize safety net services for low-income uninsured persons. Many are concerned that the viability of the safety net may be threatened due to changes occurring in the health care delivery system and welfare reform initiatives (Lipson and Naierman 1996; Norton and Lipson 1998; Baxter and Feldman 1999; IOM

2000). Differences in uninsurance rates and access to care for low-income persons may also be affected by market dynamics (Cunningham 1999; IOM 2000) and the strength of the local/regional economy (Andersen et al. 1983).

While a great deal of theoretical and empirical work has been done on individual determinants of access to primary care for low-income persons and increasing attention is being paid to the impact of community variables—less consideration has been given to a comprehensive theoretical approach that develops a classification system for community variables, integrates individual and community variables, and applies the theoretical approach to multivariate analysis of access to primary care for the low-income population.

NEW CONTRIBUTION

One avenue to improve access among low-income persons is to better understand why some low-income groups fare better in specific communities. Since many programs influencing access to care for the poor are community-based or locally based, this study examines the effect of individual and community characteristics on whether low-income children and adults in the National Health Survey visit a physician. It ranks metropolitan statistical areas (MSAs) according to their performance in promoting health care access for the poor. An added value of this article is its proposal and application of a comprehensive integrated framework to categorize and assess the importance of community as well as individual-level variables that enable access to medical care of low-income persons. It hypothesizes that access to primary care for the poor is enabled not only by individual factors, such as being insured, having a regular source of care and personal income, but, in addition, by community factors characterized as demand, support, structure, and market dynamics.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

The conceptual framework for this study shown in Figure 1 derives from Behavioral Model of Health Services Use stressing contextual or community variables (Andersen and Davidson 2001). The categorization of community variables is based on studies of safety net providers by the Urban Institute (Norton and Lipson 1998; Meyer et al. 1999) and the IOM (2000). To study how communities make a difference in access, we first adjusted community access rates for differences in predisposing characteristics and need for medical care of the residents in each community. Rates of physician use are influenced by individuals' predisposing characteristics (age, gender, education, and

ethnicity), as well as their need for services (health status). We take these factors into account before assessing how well and by what means enabling factors influence medical care access.

Next, we examine the impact of enabling variables on access to care. These enabling variables are at both the individual and contextual or community level. The enabling variables are considered mutable or subject to change through policy with the objective of influencing access to care. Furthermore, we assume community-level enabling variables measure the direct impact of where people live on their medical care access beyond the impact of their individual characteristics. Community determinants investigated in this study as particularly relevant to the low-income population are categorized as demand, support, structure, and market dynamics (Norton and Lipson 1998; Meyer et al. 1999). The framework suggests these contextual variables influence the performance of the safety net in providing access in lower-income populations (Davidson et al. forthcoming)

INDIVIDUAL ENABLING VARIABLES

Our assumption is that the community has some control of individual enabling factors (i.e., health insurance coverage, regular source of care, and poverty level) through state and local policies, regulations, laws, and social programs. These are individual-level variables because their values will vary among low-income individuals within a given community.

Hypothesis 1: As individual enabling resources including having health insurance, having a regular source of care, and not being in poverty increase, the odds that low-income persons will see a physician increase.

COMMUNITY DEMAND VARIABLES

Whereas in the previous section, predisposing and enabling predictors of access are measured at the individual level, the community-level demand variables are measured at the aggregate level of analysis and reflect the average scores of a population residing in a geographic location. The demand for safety net services at the community level (e.g., primary care for low-income people) increases with increased numbers and proportions of people who are uninsured, have low-income, and have other characteristics requiring special provisions (Brown, Wyn, and Teleki 2000; IOM 2000; Lipson and Naierman 1996). At the same time, synthesizing the available literature suggests that access to primary care is reduced for individuals residing in geographic areas with larger proportions of uninsured (Holohan, Weinder, and Wallin 1998a;

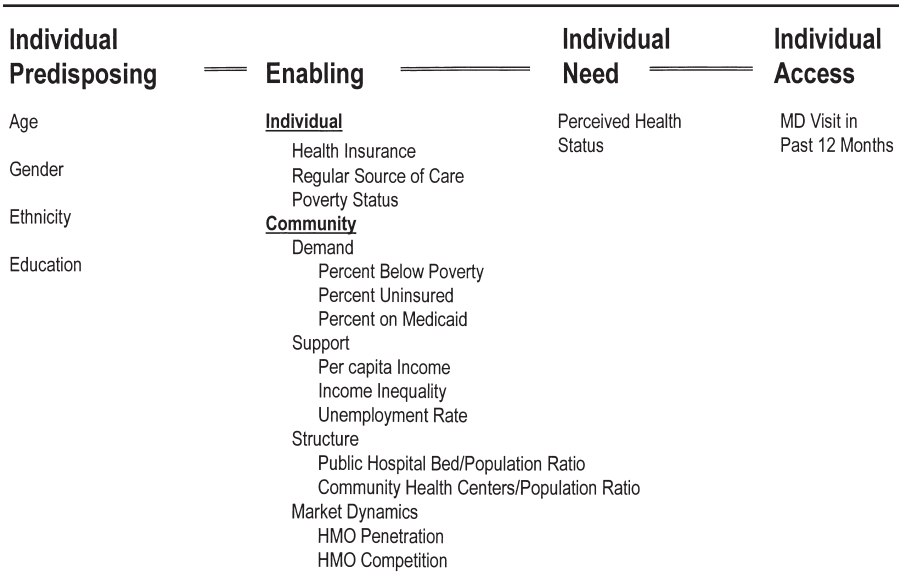

FIGURE 1 Individual and Community Predictors of Access to Medical Care for Low-Income Populations

Bindman et al. 1995), Medicaid beneficiaries (Laditka and Johnston 1999; Bierman et al. 1999), low-income persons (Laditka and Laditka 1999; Bierman et al. 1999; Billings, Anderson, and Newman 1996; Roblin 1996; Billings et al. 1993), lower educated persons (Roblin 1996; Bindman et al. 1995), and racial/ethnic minorities (Waidmann and Rajan 2000; Gaskin and Hoffman 2000; Bierman et al. 1999; Bindman et al. 1995; Billings et al. 1993). These findings lead to our second hypothesis.

Hypothesis 2: As the community demand for physician services for low-income persons increases (as measured by percentage below poverty, percentage uninsured, and percentage on Medicaid), the odds that low-income persons will see a physician decrease.

COMMUNITY SUPPORT VARIABLES

Community support includes resources within the community directly allocated to provide safety net services, community attitudes regarding such

services, and the general wealth of the community. Support varies on a community-by-community basis and is influenced broadly by federal legislation and more directly by state and local health policy and financing. Medicaid payment levels established by the states have been used not only to cover program beneficiaries but also to subsidize uncompensated care for the uninsured. In addition, state and local governments fund other public insurance programs and provide grants to subsidize uncompensated care for uninsured populations. Community attitudes and awareness may also influence the level of state and local support for health and welfare programs.

The vast majority of research results on safety net support variables have emerged from the qualitative literature. They suggest great variation in access for the poor due to differences in state and local policy and concern that market forces and growth of managed care will limit safety net services. The most consistent finding was reported in four population-based multivariate studies, indicated that expanding health insurance programs for low-income populations improved access (Szilagyi et al. 2000; Lave et al. 1998; Long and Marquis 1999; Cunningham and Kemper 1998). Our assumption about the relationship of general community wealth to support is that greater community wealth and its distribution (as measured by per capita income, percentage unemployed, and income inequality) would be associated with greater support for services for the low-income population.

Hypothesis 3: As community support for physician services for low-income persons increases, the odds that low-income persons will see a physician increase.

COMMUNITY STRUCTURE VARIABLES

Delivery system structure is the third category of community variables relevant to this study. Delivery system variables measure potential access for a low-income population in a geographic area (Andersen and Davidson 2001). They may represent the availability of services in the delivery system as a whole, for example, the number of hospital beds or doctors per capita. Or structure determinants can include variables more specific to safety net providers and the low-income populations they serve. The core safety net providers delivering care to low-income patients include a varying mix of public hospitals; urban teaching hospitals (Gaskin and Hadley 1997; Siegel 1996; www.naph.org); not-for-profit hospitals with a charitable care mission (Baxter and Feldman 1999); physician offices (Forrest and Whelan 2000); federally qualified and other community health centers serving migrants, homeless, and other special needs populations (Davis, Collins, and Hall 1999;

www.nachc.com); and local health departments (Wall 1998; Martinez and Closter 1998). Cunningham et al. (1999) showed solo and two-physician practices and those practicing family medicine were more likely to provide charity care hours than larger practices and specialty groups. Analyzing data from national data sources, Forrest and Whelan (2000) concluded that expanding community health centers would likely improve access to primary care for vulnerable populations. Generally, we expect that a greater supply of facilities and personnel and a greater concentration of safety net services in a community will be associated with improved access for low-income people.

Hypothesis 4: As the overall supply of health services and the emphasis on safety net providers in a community increase, the odds that low-income people will see a physician increase.

COMMUNITY MARKET DYNAMICS VARIABLES

The final category of contextual variables is market dynamics. Qualitative studies warn of the potential adverse effect of market competition on the safety net and access for the low-income population (Holahan, Weiner, and Wallin 1998a; Holahan, Zuckerman, et al. 1998; Norton and Lipson 1998; Baxter and Feldman 1999; Lipson and Naierman 1996; Baxter and Mechanic 1997; Steinberg and Baxter 1998; Ku and Hoag 1998). When commercial contractors are granted Medicaid contracts, safety net providers lose market share (Holahan, Weiner, and Wallin 1998b; Gaskin 1998). Higher commercial HMO penetration has been shown to be correlated with lower patient volumes in hospitals serving minorities (Gaskin 1997). This results in smaller profit margins with less excess in operating budgets to subsidize care for uninsured persons. In the multivariate literature, competitive market forces (commercial and Medicaid managed care penetration and HMO competition) have shown a negative effect on access for low-income and uninsured persons (Cunningham 1999; Gaskin and Hadley 1997; Davidoff et al. 1999). Provision of charity care was found to be significantly lower among physicians who practice in high managed care penetration communities (Cunningham et al. 1999), and low-income uninsured persons were found to have less access to care in states with high Medicaid managed care penetration (Cunningham 1999).

Hypothesis 5: As HMO penetration and competition increase in a community, the odds that low-income people will see a physician decrease.

METHOD

POPULATION DATA SOURCE

Data from the 1995 and 1996 National Health Interview Survey (NHIS), a stratified, multistage survey of the noninstitutionalized population of the United States, was used for this study. The analysis is restricted to low-income persons younger than age 65 in 29 MSAs represented in the sample with populations of 500,000 or more. Low-income is defined as having family income less than 250 percent of the poverty level. Four MSAs with populations exceeding 500,000 (Boston, Cincinnati, Denver, and Portland) included in the NHIS sample were excluded from the analyses because the MSA identifier has not been released due to confidentiality concerns. The low-income sample for this study had limited access to medical care and greater need for care compared to higher income persons in the same MSAs. Seventy-six percent of low-income persons had a regular source of care, 69 percent saw a physician within a year, and 15 percent reported fair or poor heath. For higher income persons, 76 percent had regular care, 86 percent saw a physician, and 6 percent reported fair or poor heath—all significantly different ($p < .01$) from the low-income group. Separate analyses were performed for children 18 years of age and younger and adults 19 to 64. Data sources for the community-level variables are listed in the Variable Definitions section below.

VARIABLE DEFINITIONS

Access to care and individual predisposing, enabling, and need variables were measured for each individual. For community enabling variables, low-income individuals living in the same MSA were given the same value for each variable.

Dependent variable. Access is measured by whether a physician was visited in the year preceding the interview date. Visits could be to a physician's office, clinic, outpatient department, or emergency room. Telephone calls to a physician were not counted.

Individual predisposing variables. These included age (categories for children were 0 to 5 and 6 to 18 and for adults were 19 to 39 and 40 to 64), gender, ethnicity (Latino, black, Asian, white, other), and education (did not complete high school, completed high school, more than a high school education)—education of household head was used for the children's analysis and own education was used for adults.

Individual enabling variables. These included health insurance coverage (private, Medicaid, other, uninsured), regular source of care (no regular source, had source), and poverty status measured by family income as a percentage of the federal poverty level (50 percent or less, 51 to 100 percent, 101 to 150 percent, 151 to 200 percent, greater than 200 percent).

Individual need variable. These included perceived health status (excellent/very good/good, fair/poor)—self-reported for adults and reported by a knowledgeable family adult for young children.

Community demand variables. These included percentage of population below poverty (Current Population Survey [CPS] 1997), percentage of population uninsured (CPS 1997), and percentage of population on Medicaid (CPS 1997).

Community support variables. These included unemployment rate and per capita income—1996 data from the Area Resource File (1999), as reported by the U.S. Department of Labor and the U.S. Department of Commerce, respectively—and Gini index of income inequality—computed using an average of 1995 and 1996 estimates from the March CPSs (1996 and 1997, respectively). The higher the score on the Gini index (varying between 0 and 1), the greater was the discrepancy in personal income among persons living in the MSA (Stiglitz 1988).

Community structure variables. These included the number of public hospital beds per 1,000 population—constructed from 1996 data from the American Hospital Association's (1996) Annual Survey and the March CPS (1997), which provides information on MSA population size—the number of community health centers per 1,000 population—constructed using 1996 data from the Health Resources and Services Administration (1997) and the March CPS (1997).

Community market dynamics variables. These included HMO penetration (Interstudy 1997), constructed by dividing the HMO enrollment numbers by the total MSA population; index of HMO competition (Interstudy 1997), constructed by subtracting from 1 the sum of the squared percentage of total HMO market share for each of the HMOs operating in a particular MSA. A value close to 1 indicates several nearly equal competitors; a value close to 0 indicates a monopoly.

STATISTICAL APPROACH

Data from the 1995 and 1996 NHIS were combined for these analyses. The data from 1995 NHIS consisted of interviews conducted during 12 months,

and the 1996 NHIS data consisted of interviews conducted during 6 months. Accordingly, the samples were weighted as two thirds for 1995 and one third for 1996. We used the hot deck procedure to impute missing values for four independent variables: education, poverty, health status, and usual source of care.

To test our hypotheses about how communities make a difference in access for low-income individuals, we employed logistic regression. We used a two-stage approach. In the first stage, we entered the individual predisposing and need variables. In the second stage, we added the enabling variables.

This approach allowed us to estimate the independent effects of the enabling variables—both individual and community—after controlling for predisposing and need differences. The individual enabling variables poverty, insurance, and regular source of care were forced into the second stage. The community enabling variables—percentage poverty, percentage uninsured, and percentage enrolled in Medicaid—were dropped from the final analysis because of their high correlation with the corresponding individual-level variables and because of their high intercorrelations with other community enabling variables. For the remaining community enabling variables, we used stepwise logistic modeling selection, using a .05 criteria for entry or elimination into the second-stage model. The data were analyzed for children 0 to 18 and adults 19 to 64 separately because the determinants of access may vary considerably for the different age groups.

Finally, to better estimate the impact of community and to provide some ranking of MSAs' ability to promote access for their low-income populations, we will show the odds ratio between each MSA and an "imagined" comparison MSA that has the mean values across all MSAs for all the contextual variables. The interpretation is the odds ratio of the outcome, seeing a physician within a year, for the "same" individual with exactly the same individual characteristics in each MSA versus the comparison MSA. The appendix shows the formulas used in this analysis.

RESULTS

DESCRIPTIVE STATISTICS

Table 1 describes the characteristics of the low-income children and adult samples. The low-income people are younger than the general population and are about equally divided between females and males. Racial/ethnic subgroups predominate in these samples, especially among the children, where 29 percent are Latino and 26 percent are black. The educational level reported

TABLE 1 Population Characteristics and Utilization of Physician Services by Low-Income Persons, Ages 0 to 64 in 29 Study Metropolitan Statistical Areas

	0 to 18 years	*19 to 64 years*
Predisposing		
Mean age	8.3	36.6
Percentage female	49.4	54.4
Race/ethnicity		
Percentage Latino	29.4	26.1
Percentage black	26.4	22.0
Percentage Asian	5.3	6.5
Percentage other	0.9	1.2
Percentage white	37.9	44.2
Education of household head		
Percentage less than high school	24.1	20.3
Percentage high school	40.7	40.4
Percentage greater than high school	35.2	39.3
Enabling		
Poverty		
Less than 50 percent FPL	16.9	12.2
50-99 percent FPL	22.7	19.0
100-149 percent FPL	22.9	23.3
150-200 percent FPL	16.2	19.7
More than 200 percent FPL	21.3	25.8
Health insurance		
Percentage uninsured	21.6	34.8
Percentage Medicaid	31.6	14.1
Percentage other	3.3	4.0
Percentage private	43.6	47.1
Percentage no regular source of medical care	9.5	24.3
Need		
Percentage fair or poor health	3.9	15.5
Utilization (dependent variable)		
Mean M.D. visits in past 12 months	3.4	4.6

Source: 1995-1996 National Health Interview Survey.
Note: FPL = federal poverty level.

in Table 1 for children is for the household head. Only a minority of the household heads for children (35 percent) and the adults (39 percent) reported educational attainment greater than high school. Within the low-income population, two fifths of the children and 31 percent of the adults have family income

below the federal poverty level (< 100 federal poverty level). More than one fifth of the children (22 percent) and one third of the adults (35 percent) are uninsured. Almost one third of the children (32 percent) are covered by Medicaid compared to 14 percent of the adults. One tenth of the children and about one quarter (24 percent) of the adults report having no regular source of care. Four percent of the children and 15 percent of the adults were reported to have fair or poor health status. Eighty-three percent of the children and 70 percent of the adults saw a physician in the past 12 months.

Table 2 presents the average value and range for the community enabling variables for the 29 MSAs in the study (data sources are listed in the Variable Definitions section). It shows considerable range across these MSAs for all types of community variables including those representing demand, for example, percentage of the population below the poverty line ranges from 6 to 25; support, for example, per capita yearly income ranges from $19,000 to $41,000; structure, for example, community health centers per 1 million people ranges from none to 11; and market dynamics, for example, HMO penetration ranges from 15 percent to 57 percent.

Table 3 shows the observed percentage of low-income children and adults who had a physician visit in the past 12 months for each MSA, unadjusted for any factors in our model. It also shows the sample size for children and adults in each MSA. There is considerable variation in the observed proportion of children with a physician visit, from a high of 99 percent in Philadelphia to a low of 63 percent in Ft. Worth–Arlington. Low-income adults were less likely than children to see a physician in every MSA. While there was considerable variation across MSAs for adults, it was less than for children. The percentage of adults seeing a physician ranged from a high of 83 percent in Philadelphia to a low of 62 percent in San Jose and San Francisco.

MODELING INDIVIDUAL AND COMMUNITY DETERMINANTS OF VISITING A PHYSICIAN

How is it that communities make a difference in low-income persons' access to physician services? Table 4 shows the variables included in the two-stage logistic regression model. The first stage includes only the predisposing and need variables. The second stage adds the individual and community-enabling variables, allowing us to test the hypotheses of the study.

The effects of predisposing and need variables. Columns 1 and 3 of Table 4 show the effects of predisposing and need variables for low-income persons before the enabling variables are added. Age is significant but with opposite effects for children and adults. The youngest children, less than 6 years of age, have

TABLE 2 Mean and Range for Community Enabling Variables,[a] 29 Study Metropolitan Statistical Areas

	Mean	*Range*
Demand		
Percentage population below poverty line	12.95	5.86-24.57
Percentage nonelderly population uninsured	18.73	9.38-31.11
Percentage nonelderly population on Medicaid	8.51	3.35-20.56
Support		
Unemployment rate per 100	4.94	3.12-8.20
Per capita income	$26,143	$19,139-$40,978
Income inequality (Gini)	0.41	0.363-0.497
Structure		
Public beds per 1,000	0.36	0.00-0.80
Community centers per 1,000,000[b]	4.8	0.00-11.3
Market dynamics		
HMO penetration	32.1	14.7-56.6
HMO competition	0.77	0.530-0.887

a. Refer to Variable Definitions section in text for data sources.
b. Health centers per 1,000,000 population. Table 4, reporting multivariate results, uses community health centers per 1,000 population.

more than 6 times the odds of seeing a physician compared to those ages 6 to 18. However, for adults, the younger persons 19 to 39 have lower odds of seeing a physician than those 19 to 64. Gender is not significant for children, but the odds of female adults seeing a physician are more than twice those for males. Ethnicity has similar significant effects for children and adults. Latino and Asian low-income persons have lower odds of seeing a physician compared to non-Latino whites, while blacks have greater odds than non-Latino whites. Less education of adults and of the household head for children is associated with significantly lower odds of seeing a physician. Both children and adults in fair or poor health have much greater odds (almost 3 times) of seeing a physician compared to persons in excellent or good health.

Testing the hypotheses concerning the effects of individual and community enabling variables. Columns 2 and 4 of Table 4 show the additional impact of enabling variables controlling for predisposing and need characteristics of low-income persons. One gross measure of marginal impact of the enabling variables is the increase in the pseudo R^2 between the first and the second stages of the model. There was considerable increase in this value for both children and adults: from .108 to .173 for children and from .087 to .173 for adults.

TABLE 3 Percentage of Low-Income Children (0-18) and Adults (19-64) Having an MD Visit in the Past Year, by Metropolitan Statistical Area

Metropolitan Statistical Area (Sample Size: Children/Adults)	*Children*	*Adults*
Atlanta, GA (190/245)	89.2	77.3
Austin, TX (106/175)	74.9	69.6
Baltimore, MD (167/203)	90.9	79.3
Bergen-Passaic, NJ (51/89)	79.5	68.8
Chicago, IL (321/473)	83.7	69.4
Dallas, TX (136/212)	75.9	69.5
Detroit, MI (181/194)	84.1	76.8
Ft. Worth–Arlington, TX (98/122)	62.7	65.0
Houston, TX (221/342)	81.9	65.4
Kansas City, MO-KS (104/153)	81.1	71.3
Los Angeles–Long Beach, CA (1,713/2,144)	78.1	63.2
Miami, FL (242/430)	78.4	68.1
Minneapolis–St. Paul, MN-WI (148/177)	87.5	72.3
Nassau-Suffolk, NJ (77/114)	87.2	68.9
New York, NY (863/1,205)	90.8	76.6
Newark, NJ (118/165)	80.1	66.3
Oakland (112/176)	87.1	75.8
Orange County, CA (157/210)	74.3	63.7
Philadelphia, PA-NJ (239/361)	99.1	82.5
Phoenix-Mesa, AZ (186/273)	78.3	71.2
Pittsburgh, PA (105/203)	87.9	77.2
Riverside–San Bernadino, CA (389/411)	78.1	63.5
San Antonio, TX (189/290)	74.8	67.6
San Diego, CA (240/291)	79.4	67.7
San Francisco, CA (60/128)	72.3	62.1
San Jose, CA (131/137)	76.3	62.4
St. Louis, MO (128/209)	78.7	73.0
Tampa–St. Petersburg–Clearwater, FL (96/181)	68.8	69.8
Washington, DC-MD-VA (142/219)	89.3	74.5

Hypothesis 1, that the presence of individual enabling factors would increase the odds that low-income persons would get physician care, received considerable support. For both children and adults, the odds of having a physician visit were only about one half compared to those with private insurance. However, low-income persons with Medicaid had greater odds of getting care than those with private insurance. Having a regular source of care

TABLE 4 Multivariate Logistic Regression Analyses Odds Ratios for Visiting the Physician in the Past Year for Low-Income Children (0-18) and Adults (19-64)

	Children		*Adults*	
Variable (Excluded Category)	*1: Model Including Predisposing/ Need*	*2: Model Including Predisposing/ Need/Enabling*	*3: Model Including Predisposing Need*	*4: Model Including Predisposing/ Need/Enabling*
Predisposing				
Age				
0-5	6.465***	6.091***		
(6-18)				
19-39			0.753***	0.868**
(40-64)				
Female (Male)	1.084	1.047	2.655***	2.255***
Ethnicity				
Latino	0.595***	0.705***	0.700***	0.815**
Black	1.226*	1.018	1.258***	1.117
Asian	0.610***	0.589***	0.624***	0.629***
Other	1.166	1.202	0.967	1.039
(White)				
Education				
Not high school graduate	0.555***	0.593***	0.625***	0.733***
High school graduate	0.671***	0.696***	0.778***	0.808***
(Beyond high school)				
Need				
Fair-poor health	3.211***	2.995***	2.767***	2.513***
(Excellent-good)				

Enabling individual				
Health insurance				
Uninsured		0.529***		0.535***
Medicaid		1.409***		1.528***
Other		1.468		1.250
(Private)				
No regular source of care		0.434***		0.349***
(Has regular source)				
Poverty status				
Less than 50 percent FPL		1.155		1.145
50-99 percent FPL		0.888		1.072
100-149 percent FPL		0.796*		0.864*
150-200 percent FPL		1.355**		1.019
(Greater than 200 percent FPL)				
Enabling community				
Percentage population unemployed				0.961*
Per capita income		1.030***		
Gini index of income		2.009***		1.432***
Community health centers		1.029*		1.025**
HMO competition		0.372*		
Pseudo R^2	.108	.173	.087	.173

Note: FPL = federal poverty level.
*$p < .05$. **$p < .01$. ***$p < .001$.

was also an important contributor to getting care as persons with a regular source had odds of only .3 or .4 of getting a visit compared to those with a regular source. Poverty status showed a more complex relationship to receipt of care. The lowest-income groups did not have significantly lower odds of a visit. Rather, it is the children and adults from 101 to 150 percent of poverty who have significantly lower odds of a physician visit than those of incomes of 201 to 250 percent of poverty.

Hypothesis 2, that higher values for community demand variables including percentage below poverty, percentage uninsured, and percentage with Medicaid would lead to decrease in the proportions seeing a physician, was not supported. All of these variables were screened out as not significant in preliminary analyses before the final models were run for both children and adults.

Hypothesis 3, that greater community support as measured by higher per capita income, lower percentage unemployed, and greater dispersion of wealth (indicated by a lower Gini coefficient) would lead to an increase in proportion seeing a physician, received mixed support. Higher per capita income in the community increased the odds that low-income children would see a physician, in support of the hypothesis. Also, a higher community unemployment rate was associated with lower odds of low-income adults' seeing a physician. However, as the Gini index for the community increased (indicating greater wealth concentration), the odds that low-income children and adults would see a physician also increased. We had assumed that greater wealth dispersal in the community would promote services for low-income persons, but our findings, with respect to seeing a physician, are the opposite. Low-income persons in communities with greater wealth concentration have greater odds of seeing a physician.

Hypothesis 4, that a health services structure with a greater supply of health facilities and personnel, especially safety net providers, would increase the odds that low-income persons would see a physician, was supported. For both children and adults, a higher ratio of community health centers MSA population was associated with greater odds of low-income persons seeing a physician.

Hypothesis 5, that community market dynamics as measured by greater HMO penetration and competition would lead to lower odds of low-income persons seeing a physician, received some support. The odds that low-income children would see a physician declined significantly as HMO competition increased. However, the variable HMO competition was not significant for low-income adults.

COMPARING COMMUNITY INFLUENCE BY MSA

Table 5 shows the odds ratios for the same low-income person (defined according to the individual predisposing, enabling, and need characteristics of the model defined in Table 4) having a physician visit in each of the MSAs compared to a standard MSA (based on mean values across all MSAs for each community variable in the model defined in Table 4). This approach allows us to estimate and rank the effects that MSAs might have in determining whether their low-income residents have access to medical care. Table 5 ranks the MSAs for both children and adults according to how much higher or lower the odds are that people will see a physician in that MSA compared to the standard MSA. Thus, the odds that a low-income child in New York (the top-ranked MSA) would see a physician were 2.2 times those for that child in the standard MSA. And the odds of a low-income adult in New York seeing a physician were 1.3 times those for the adult in the standard MSA. Conversely, the odds that a low-income child in Ft. Worth–Arlington (the lowest-ranked MSA for children) was 0.6 times that in the standard MSA, and the odds that a low-income adult in Bergen-Passaaic (the lowest-ranked MSA for adults) was 0.8 times that for the standard MSA. MSAs with the same apparent odds ratios in Table 5 were ranked before the odds ratios were rounded for presentation in Table 5.

Many of the odds ratios in Table 5 were significant ($p < .05$). Of the 29 MSAs, 9 for children and 11 for adults had odds of seeing a physician that were significantly higher than for the standard MSA. Nine sites for children and 7 for adults had odds significantly lower than the standard MSA. Of the 9 sites with significantly higher odds for children, 8 also had significantly higher odds for adults. There was less overlap among sites with lower odds—of the 8 sites with significantly lower odds for children, 3 also had significantly lower odds for adults.

To provide some examples of how significant community enabling variables might be working at the MSA level, we have listed in Table 6 the highest three and lowest three ranked MSAs for children from Table 5. The MSA values are listed for all the community enabling variables that were significant ($p < .05$) in either or both of the children and adult models.

Most striking here are the following: (1) The sites with the highest odds ratios that children would see a physician, New York (2.2) and San Francisco (1.7), also had among the highest per capita incomes of all MSAs in the study—New York, $33,356, ranked fourth and San Francisco, $40,987, ranked first. Conversely, the three sites with odds significantly lower than both low-

TABLE 5 Odds Ratios of Low-Income Persons Seeing a Physician in Different Metropolitan Statistical Areas

Metropolitan Statistical Area	*Children 0-18*		*Adults 19-64*	
	Odds Ratio[a]	*Rank*	*Odds Ratio*[a]	*Rank*
New York, NY	2.2*	1	1.3*	1
San Francisco, CA	1.7*	2	1.2*	5
Philadelphia, PA	1.4*	3	1.1*	7
Miami, FL	1.3*	4	1.2*	4
Baltimore, MD	1.3*	5	1.2*	2
Los Angeles–Long Beach, CA	1.2*	6	1.0	18
San Diego, CA	1.2*	7	1.1*	6
Washington, DC-MD-VA	1.2*	8	1.1*	10
Tampa–St Petersberg–Clearwater, FL	1.1*	9	1.2*	3
Newark, NJ	1.1	10	0.9	22
Pittsburgh, PA	1.1	11	1.1*	8
Chicago, IL	1.0	12	1.0	17
Nassau-Suffolk, NY	1.0	13	0.9+	26
Detroit, MI	1.0	14	1.0	12
Phoenix-Mesa, AZ	1.0	15	1.1*	9
Orange County, CA	1.0	16	0.9	23
San Jose, CA	0.9	17	0.9+	25
Houston, TX	0.9	18	1.0	19
Oakland, CA	0.9	19	0.9+	24
Atlanta, GA	0.9+	20	1.1*	11
Bergen-Passaic, NJ	0.9	21	0.8+	29
Kansas City, MO-KS	0.9+	22	1.0	13
Dallas, TX	0.9+	23	1.0	16
Minneapolis–St. Paul, MN-WI	0.8+	24	0.9+	21
Austin, TX	0.8*	25	1.0	14
St. Louis, MO-IL	0.8+	26	0.9	20
San Antonio, TX	0.7+	27	1.0	15
Riverside–San Bernardino, CA	0.7+	28	0.8+	28
Ft. Worth–Arlington, TX	0.6+	29	0.8+	27

a. The odds ratio of a person with exactly the same individual characteristics getting a physician visit within a year in each metropolitan statistical area versus getting a physician visit in a standard metropolitan statistical area defined with mean values based on all metropolitan statistical areas for each community variable.

*The odds of getting a physician visit in the metropolitan statistical area are significantly higher ($p < .05$) than the odds in the comparison metropolitan statistical area.

+The odds of getting a physician visit in the metropolitan statistical area are significantly lower ($p < .05$) than the odds in the comparison metropolitan statistical area.

TABLE 6 Mean Values of Community Enabling Variables for Selected Metropolitan Statistical Areas with Odds for a Child Seeing a Physician Highest and Lowest Compared to the Standard Metropolitan Statistical Area

Metropolitan Statistical Area	*Odds Ratio*	*Community Enabling Variable*[a]				
		Per Capita Income	*Gini Index of Income*[b]	*Percentage Population Unemployed*	*Community Health Centers*[c]	*HMO*[d] *Competition*
Odds highest, higher than standard metropolitan statistical area						
New York	2.2	$33,356	.50	6.9	.0054	.82
San Francisco	1.7	$40,978	.41	3.8	.0103	.73
Philadelphia	11.4	$28,816	.44	5.3	.0065	.76
Odds lowest compared to the standard metropolitan statistical area						
San Antonio	0.7	$19,896	.40	3.5	.0040	.78
Riverside–San Bernardino	0.6	$19,139	.40	7.7	.0020	.83
Ft. Worth–Arlington	0.6	$21,822	.38	4.2	.0000	.73
All metropolitan statistical areas		$26,143	.41	4.9	.0048	.77

a. Variables included were significant ($p < .05$) in one or both of children and adult regressions.
b. Higher score indicates greater income discrepancy.
c. Numbers of centers per million population.
d. Higher score indicates greater competition.

income children and adults would see a doctor than for the standard MSA—San Antonio, Riverside–San Bernardino, and Ft. Worth–Arlington—all had per capita incomes ($19,896, $19,139, $21,822, respectively) considerably lower than the mean per capita income for all MSAs ($26,143). (2) The three sites with high odds ratios also had Gini index scores (.41-.50) equal to or greater than the value for all MSAs (.41), while all three sites with lower odds ratios had Gini scores (.38-.40) less than the mean values for all MSAs. Higher scores indicate greater wealth concentration on this index. (3) All three MSAs with high odds ratios had more community health centers per million population (.0054-.0113) than the mean for all MSAs (.0048), while all three MSAs with lower odds ratios had fewer community health centers (.0000-.0043) than the mean for all MSAs.

LIMITATIONS

There are a number of limitations with our work. The ability to provide estimates at the MSA level is very attractive, yet the relatively small sample sizes in some MSAs limit the precision of our estimates and our ability to detect significant differences. The definition of "community," geographically defined at the MSA level, is a very inclusive one. Using other definitions would restrict the size and heterogeneity of the community, possibly leading to some different conclusions about the influence of community enabling variables. These findings are based on low-income residents of larger urban MSAs (greater than 500,000 population) and may not be applicable to smaller urban and rural communities. Whether people see a physician in a year is a fundamental measure of access to care, but multiple measures of access need to be examined to provide a more comprehensive picture of how low-income persons fare in different communities. Self-reported health status used to measure need has been shown in this study and in much of the literature during several decades to be a key determinant of people seeing a physician. However, additional measures would improve our ability to control for health status as we consider the impact of individual- and community-level enabling factors. Finally, while we have explored the impact of a number of community-level measures, the inclusion of additional variables in the model representing community demand, support structure, and market dynamics might add to our understanding of how communities make a difference.

CONCLUSIONS

This article expands our understanding of how communities make a difference in achieving medical care access in the following ways. The study

presents a model and methodology for using data from the NHIS to rank MSAs according to the medical care access they provide for their low-income populations, adjusted for the differential predisposing and need characteristics of these populations. Low-income children and adults who were Latino and Asian, and those with lower educational attainment, were at greater risk for not having medical care access. Among adults in the sample, younger age (19 to 39) and male gender also were risk factors for not visiting a physician in the past year. While these predisposing factors do not specifically point to ways to improve access for the low-income population, they do highlight subgroups of special risk who should be the targets of community programs to improve access. Furthermore, when attempting to rank communities according to how well they provide for low-income populations, adjustments need to be made for those facing the special challenges of having larger proportions of these high-risk subgroups.

In addition, the study illustrates how enabling variables measured at the individual level help to explain the differential access to physician services of moderate low-income persons. Having health insurance and a regular source of care greatly increase the odds that they will visit a physician at least once in the year. Communities can and do directly influence these enabling conditions. For example, more generous Medicaid eligibility criteria, vigorous enrollment efforts under the Healthy Children's Program, and opportunity to cover parents of children in the Healthy Children's program increase the coverage of low-income persons. Furthermore, community support for safety net providers as demonstrated in New York City may have a substantial impact on low-income persons having a regular source of care.

Most important, this study demonstrates that communities matter, even after adjusting for individual predisposing and need characteristics as well as individual enabling characteristics. Our findings show that the odds that a low-income child or adult will see a physician vary greatly among MSAs regardless of their individual characteristics. A low-income child or adult who resides in an MSA with more federally funded community health centers and a less equal distribution of income has better access to medical care. Also, a child in an MSA with less HMO competition and a higher per capita income and adults in an MSA with lower unemployment rates have higher odds of seeing a physician. The evidence seems quite clear that communities can improve access for their low-income populations by promoting and supporting community health centers. These centers are a source of care for the uninsured population that is disproportionately low income. Our results suggest that low-income people may have better access in wealthier communities and in communities with stronger economies. In retrospect, this may not be a particularly surprising finding, and the health policy implications may be

limited. However, it does point to the vulnerability of low-income populations in communities in times of less prosperity.

The findings regarding income inequality (Gini index) seem curious at first. One possible explanation may be that greater income inequality characterizes MSAs with relatively more impoverished people who qualify for Medicaid or other service programs that would increase their access to physician services. It might also be that MSAs with greater income inequality also generate more support for charitable and/or public sector services for their moderate- and low-income population. Future studies should explore in greater detail the relationship between income inequality and other contextual variables and their influence on health care access in the community.

Future research should attempt to replicate these findings using additional data from NHIS and other national data sources to increase the number of measures included in the model. Our measure of need was limited to only one variable, self-perceived health status, and our access measure was limited to the relatively gross measure of whether a physician was visited in the past year. Future studies should examine the individual and community determinants of having a usual source of care, a potential access measure, and the determinants of delayed or forgone care, a realized access measure. Finally, those communities with relatively good or limited access for their low-income populations, who are not accounted for by enabling variables in this model, should be studied in more detail to gain insight into how they achieve the observed results.

APPENDIX
Formulas for Calculating the Odds Ratios of Low-Income Persons Seeing a Physician in Different Metropolitan Statistical Areas (MSAs) in Table 5

Let x_1, x_2, and x_3 be individual-level variables and z_1, z_2, and z_3 be MSA-level variables. β_1, β_2, and β_3 are regression parameters associated with individual-level variables, and γ_1, γ_2, and γ_3 are regression parameters associated with MSA-level variables.
Let p be the probability of seeing a physician, so ODD = p / (1 – p) is the odd of seeing a physician.

From the logistic model, we have

$$\text{Log(ODD)} = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \gamma_1 z_1 + \gamma_2 z_2 + \gamma_3 z_3. \quad (1)$$

Assume two identical individuals; person 1 lives in New York (or any other MSA), and person 2 lives in the standard MSA. Their individual-level variables are the same, and MSA-level variables differ.

From (1), we have for person 1,

$$\text{Log}(\text{ODD}_1) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \gamma_1 z_{1,\text{NY}} + \gamma_2 z_{2,\text{NY}} + \gamma_3 z_{3,\text{NY}}. \quad (2)$$

For person 2,

$$\text{Log}(\text{ODD}_2) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \gamma_1 z_{1,\text{ST}} + \gamma_2 z_{2,\text{ST}} + \gamma_3 z_{3,\text{ST}}. \quad (3)$$

To compare the Standard MSA and New York let us subtract (2) from (3), since the individual level variables are same so they are canceled out from the equation. Then we have

$$\text{Log}(\text{ODD}_2) - \text{Log}(\text{ODD}_1) = \gamma_1 z_{1,\text{LA}} + \gamma_2 z_{2,\text{LA}} + \gamma_3 z_{3,\text{LA}} - (\gamma_1 z_{1,\text{ST}} + \gamma_2 z_{2,\text{ST}} + \gamma_3 z_{3,\text{ST}}).$$

So the log odds ratio of ST to NY is

$$\text{Log}(\text{ODD}_2/\text{ODD}_1) = \gamma_1 z_{1,\text{ST}} + \gamma_2 z_{2,\text{ST}} + \gamma_3 z_{3,\text{ST}} - (\gamma_1 z_{1,\text{NY}} + \gamma_2 z_{2,\text{NY}} + \gamma_3 z_{3,\text{NY}}),$$

and the odds ratio is

$$\text{ODD}_2/\text{ODD}_1 = \text{EXP}[\gamma_1 z_{1,\text{ST}} + \gamma_2 z_{2,\text{ST}} + \gamma_3 z_{3,\text{ST}} - (\gamma_1 z_{1,\text{NY}} + \gamma_2 z_{2,\text{NY}} + \gamma_3 z_{3,\text{NY}})].$$

The interpretation for this is the ratio of odd for the same individual to see a physician in New York to that in the Standard MSA.

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