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Health Care Markets, the Safety Net and Access to Care Among the Uninsured

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ABSTRACT

Objective: To quantify the relationship between access to care among the uninsured and the structure of the local health care market and safety net.

Data Sources/Study Setting: Nationally representative data from the 1996-2000 waves of the Medical Expenditure Panel Survey (MEPS) linked to data from multiple secondary sources.

Study Design: We separately analyze outpatient care utilization and medical expenditures among uninsured adults living in urban and rural areas. Safety net measures include distances between each individual and the nearest safety net providers as well as a measure of capacity based on public health expenditures. Other covariates include the managed care presence in the local health care market, the percentage of individuals who are uninsured in the area, and local primary care physician supply. We simulate utilization using standardized predictions.

Principal Findings: Distances between the rural uninsured and safety net providers are significantly associated with utilization. In urban areas, we find that the percentage of individuals in the area who are uninsured, the pervasiveness and competitiveness of managed care, and safety net capacity have a significant relationship with healthcare utilization.

Conclusions: Facilitating transport to safety net providers and increasing the number of such providers are likely to improve access to care among the rural uninsured. Our findings for urban areas suggest that the uninsured living in areas where managed care presence is substantial, and especially where managed care competition is limited, could be a target for policies to improve access to care. Policies oriented toward enhancing funding for the safety net and increasing the capacity of safety net providers are likely to be important to ensuring access among the urban uninsured.

Key Words: Uninsured, safety net, market, utilization

I. Introduction

Over the past fifteen years, roughly one in seven individuals in the U.S. (between 13.6 and 16.3 percent of the population) have been uninsured (U.S. Census Bureau 2004). For many of the uninsured, access to healthcare is heavily dependent on a "safety net" of providers. Such providers include traditional safety net providers—those who are legally obligated to provide care to persons who cannot afford it, such as public hospitals, federally funded community health centers, and local health departments—and mainstream providers—those who provide uncompensated care voluntarily or as part of their community-service obligation.

Previous research has documented wide variation in access to medical care among uninsured individuals living in different communities (Cunningham et al 1998) and various studies have linked these access differences to variation across areas in managed care penetration, the percent of the local population that is uninsured, safety net capacity, and the location of safety net providers (Long and Marquis 1999; Cunningham 1999; Hadley and Cunningham 2004a, 2004b; Cunningham and Hadley, 2004).

This research further explores the relationships between local health care market and safety net characteristics and access to care among the uninsured. It extends previous research in several important ways. First, with nationally representative data including a large sample of more than 12,000 uninsured, we are able to separately analyze uninsured individuals living in rural (non metropolitan) and urban (metropolitan) areas. Second, our data allow us to include a comprehensive set of individual-level health status measures which alleviate the potential impact of endogeneity related to health status that may otherwise bias results. Third, we analyze both safety net and health care market characteristics, providing the most comprehensive look at the relationship between these factors and use of care among the uninsured to date.

Conceptual Framework and Hypotheses

Economic models of the demand for medical care suggest that utilization of health services depends on how much an individual values health care and the price of health care relative to other goods. Individual characteristics such as health status, income, age, race, and gender are determinants of the value an individual places on health care. For the uninsured, the price of care is determined primarily by the costs associated with finding and qualifying for free or discounted care, such as time, effort and stigma. Characteristics of the local safety net and health care market are likely to be important determinants of these costs, and thus, in turn the price of health care.

An individual's location relative to safety net providers affects the direct and indirect costs associated with the travel required to obtain care, and for low-income individuals, these costs—especially time costs—may strongly influence the utilization of medical care (Acton 1977). Our expectation is that that travel costs increase with distance and that the farther individuals live from safety net providers, the lower will be utilization. We further anticipate that the greater are the resources of safety net providers, the greater will be their capacity to care for the uninsured, and the easier it will be for the uninsured to obtain care (e.g. shorter length of time between initial call and appointment date, shorter wait times at the medical office, more convenient hours of operation).

Other dimensions of the health care market are also likely to influence the price of care for the uninsured. A greater presence of managed care may limit the ability of mainstream providers to set prices for insured patients that will allow for cross-subsidization of free or discounted care for the uninsured. However, competition among managed care plans may erode

plans' bargaining power, reducing their control over prices. Thus, in competitive managed care markets, providers may be able to negotiate higher prices that enable them to subsidize discounted care for the uninsured.

Furthermore, uninsured individuals living in areas where a relatively large fraction of the population is uninsured may have to compete for limited healthcare resources. Thus, healthcare utilization may be lower in these areas for any given uninsured individual (IOM 2003). Finally, we expect that access to care among the uninsured is positively influenced by the local supply of primary care doctors.

Data and Methods

Data

We use data from the MEPS household component (HC) survey linked to data from numerous sources describing the safety net and healthcare market structure. The MEPS HC is a nationally representative survey with detailed information on health status and health services utilization. MEPS uses an overlapping panel design in which respondents are interviewed multiple times over a 30-month period to collect data spanning a two year period (Cohen et al. 1996/97).

To describe the healthcare safety net and market structure in each individual's location, we derived variables from numerous sources including the American Hospital Association (AHA) Annual Survey of Hospitals, Area Resource File (ARF), the InterStudy Regional Market Analysis database, the Bureau of Primary Healthcare Physicians (BPHC) Uniform Data System, the Current Population Survey (CPS), Census of Governments, and the Census Bureau's Annual Survey of State and Local Government Finances. The public-use MEPS files do not contain the

geographic location of individuals. However, through an arrangement with the Agency for Healthcare Research and Quality (AHRQ), we were able to create a limited-use MEPS file that contains variables measured at more refined geographic levels.

Study Sample

Our analysis pools MEPS respondents who were uninsured for at least one full calendar year during the period from 1996 to 2000. Each observation represents a one year period of an individual being uninsured; thus, there are two observations for each respondent who was uninsured during both calendar years in which he/she was surveyed. We focus on the adult uninsured population (patterns of health services utilization, types of chronic health conditions, and health insurance availability all differ markedly for children compared to adults) and exclude from analysis respondents under the age of 18 or aged 65 or older, as well as individuals who were ineligible for all or part of the calendar year (such as those who died or were institutionalized during the year). In total, our data include 12,513 observations of full calendar-year episodes of uninsurance from 8,285 respondents. There are roughly two to three thousand observations from each year. All analyses are run separately for individuals living in metropolitan statistical areas (MSAs) and non-MSAs. We term the former "urban" uninsured and the latter "rural" uninsured.

Dependent Variables

We focus our analysis on outpatient measures of utilization, including number of office-based physician visits, number of office-based non-physician visits, and number of emergency room (ER) visits. Office-based visits include visits to physicians' private offices, to outpatient clinics associated with hospitals, and to community health centers; they do not include outpatient

department hospital services. We also analyze whether the individual has had any medical expenditures or charges (exclusive of dental and vision), which provides a measure of individuals' access to the health care system. The variable is positive if an individual has any expenditures for inpatient or outpatient care, pharmaceuticals, durable medical equipment, or other types of care (e.g. home health). In addition, the variable is positive if an individual had no expenditures but had positive charges, which indicates receipt of charity (free) care. Other natural candidates for analysis, such as usual source of care and extent of preventive care, were only asked sporadically in the MEPS. Table 1 provides descriptive statistics for the dependent variables.

Independent Variables.

As described in the *Conceptual Framework*, individuals' use of medical services is hypothesized to be influenced by their health status, demographic characteristics, and characteristics of the local safety net and healthcare market which bear on the price of care for the uninsured.

Our analysis of health care utilization includes demographic controls—education (high school degree, some college, and college degree; less than high school omitted), household structure (marital status and whether or not the individual lives alone), gender, age (18-24 years, 25-34 years, 45-64 years; 35-44 years omitted), gender-age interactions, race (non-Hispanic black, Hispanic; non-Hispanic white omitted), and family income as a percentage of the federal poverty line (100-200 percent, 200-400 percent, over 400 percent; <100 percent omitted).

We measure health status with a comprehensive set of variables spanning four domains: (1) functional, cognitive and social limitations (a single indicator for any such limitation) (2)

vision/hearing problems (single indicator for any such problem, including blindness or deafness), (3) self-rated health (dichotomous variables for categories very good, good, fair or poor; excellent omitted), and (4) chronic conditions. We constructed indicators for the presence or absence of 25 chronic conditions (such as diabetes, obesity, and asthma) and included specific indicator variables for a subset of those conditions and a summary indicator for the presence of any of the remaining conditions.[1]

We account for the location of (1) the closest migrant health center, community health center, or public housing primary care program; (2) closest public hospital; and (3) closest hospital with an emergency department. The first two distances can be thought of as measuring the (own) price of obtaining office-based care (which includes care received in a hospital outpatient clinic), and the distance to the nearest ER measures the (own) price of obtaining ER care. Each distance is included in the analysis of each dependent variable to allow for both own- and cross-price effects.

Distances between each individual and the nearest ER and public hospital were calculated using AHA data (from each year, 1996-2000) and represent the distance (great circle) in miles miles between the population centroid of the zipcode in which the individual resides and the exact hospital location based on street address. These distances were calculated using the longitude and latitude coordinates of each location.

We determined the distances between individuals and the nearest of one of three types of federally funded health providers (migrant health center, community health center, or public housing primary care program) using the longitude and latitude coordinates of both the population centroid of the zipcode in which the provider was located and individuals' zipcode. The data come from the Uniform Data System (UDS) of the Bureau of Primary Healthcare

(BPHC) and are available for 1997 and 1999; distances were imputed for other years. For the sake of brevity we will refer to these providers as "BPHC providers."

For sensitivity analyses, we created variables indicating the number of ERs, public hospitals, and BPHC providers within a given distance from individuals. For the urban uninsured, these radius-based measures are constructed using a 5 mile radius, and for those living in rural areas, the radius is 10 miles.

We use the level of local expenditures for health and hospitals based on data from the Census of Governments and the Annual Survey of State and Local Government Finances as a measure of the financial status and general capacity of local safety net providers (Long and Marquis 1999; Marquis, Rogowski and Escarce 2004). This measure is only available for MSAs and thus was not included in the rural specification. Expenditures were converted to 2000 dollars using the medical component of the consumer price index and scaled to the low-income population (within 200 percent of the poverty line) in the MSA using data from the March CPS. The measure captures expenditures for categorical health programs, maternal and child health care, immunization programs, outpatient health clinics and public hospitals. Two limitations of this variable are first, that it also includes some elements that may be unlikely to be related to safety net capacity such as money spent to gather vital statistics and conduct health-related inspections; and second, that it is measured at the MSA level, whereas the level of safety net resources available more locally may be an important determinant of care. Despite these limitations and because better measures of safety net capacity were unavailable, we included the variable, but as a test of robustness, we performed sensitivity analyses excluding the public health expenditure variable.[2]

As described in the *Conceptual Framework*, dimensions of the health care market other than the location and financial status of traditional safety net providers are also likely to influence the price of care for the uninsured, including aspects of managed care in the area and the insurance coverage of the local population. We describe managed care in the area with an MSA-level HMO penetration rate and MSA-level index of HMO competitiveness derived from InterStudy data, and calculate the percentage of individuals who are uninsured in each MSA using a three-year moving average derived from CPS data. Data on insurance coverage and HMO penetration rates are not available for non-MSAs. The penetration measure indicates the percentage of the population that is in an HMO and the competition measure is one minus the sum of each HMO's market share squared. The competition measure ranges from 0 to 1 where a value near 1 indicates a very competitive market and a value near 0 indicates little competition.

Finally, we measure the local supply of primary care physicians with several variables. First, we include a county level measure of the number of primary care doctors (family practitioners, internists, and general care practitioners) per thousand people in the county based on ARF data. To capture within county modulation in physician supply, we include zip code tabulation area (ZCTA)-level variables that measure socio-demographic characteristics that are likely to be correlated with physician location: percent minority, percent educated at a high school level or beyond, and percent of households with income less than the federal poverty line (FPL). We expect relatively high concentrations of low income, less-educated, and minority populations to be associated with a smaller physician supply.

Measuring variation in physician supply across relatively small areas is important methodologically because of the possible endogeneity of the location of safety net providers. Specifically, government decisions about where to locate safety net providers or target safety net

resources in particular areas may be related to the local populations' access to mainstream (i.e., non-safety net) providers such as private physicians. In general, we expect that the availability of safety net services will be greater in small areas (e.g., neighborhoods) where people have less access to mainstream providers. Analysis that does not account for the location of mainstream providers may thus produce downwardly biased results. [3]

Tables 2 and 3 provide descriptive statistics for individual-level and market level independent variables, respectively.

Estimation

All regressions were weighted and adjusted for the complex design of the MEPS survey (Cohen et al. 1996/1997; Cohen, DiGaetano, and Goksel 1999). The number of office-based physician and non-physician visits, and ER visits assume small, nonnegative integer values (i.e., 0,1,2,3,…), also called "count data." We model these outcomes with a negative binomial regression model (Keeler et al. 1988; Hausman, Hall, and Griliches 1984; Cameron and Trivedi 1986; Kilpatrick 1977). The negative binomial allows for the "overdispersion" that is frequently observed in count data (i.e., the variance conditional on particular values of the independent variables exceeds the conditional mean). We use a logistic regression model for any medical expenditures or charges.

Simulations

We simulated values for the various kinds of utilization using standardized predictions. We performed separate simulations for a range of values of the rural- or urban-specific distribution of each of the variables describing the safety net or healthcare market structure.

Rural and urban simulation values are summarized in Table 4. We first obtained parameter estimates using the actual data. We then substituted the simulation value for the actual value of the simulation variable, while retaining the values of all other variables, and predicted utilization with the resulting data. Standard errors for the predictions were calculated using the delta method (Bishop, Feinberg, and Holland 1975). We used the significance of the coefficient on the simulation variable to determine the significance of differences among predictions.

Results

Descriptive Data

Uninsured individuals living in rural areas were more likely to have some versus none of each type of utilization (Table 1) compared to those in urban areas. However, the intensity of use conditional on any use was consistently lower among the rural uninsured. In terms of the safety net, as expected, mean distances between the rural uninsured and the nearest safety net providers were larger than those for the urban uninsured (Table 3). Our sensitivity measure of the number of safety net providers within a given radii was also smaller for the rural compared to the urban uninsured, even considering 10 mile radii for those in rural areas and 5 mile radii for those in urban locales.

Multivariate Analyses

Tables 5 and 6 show predicted annual utilization among the rural and urban uninsured, respectively, for simulation values of each of the safety net and healthcare market variables. (Full regression results are available from the authors upon request). As an example of how to interpret the values in these tables, the first row of Table 5 indicates that if all uninsured

individuals living in rural areas had an emergency room approximately a mile away (the 25th percentile value of the distribution), the average number of annual physician visits would be 1.78. By comparison, if the rural uninsured all lived significantly farther away from the ER (13 miles, the 75th percentile value), annual physician visits would average 1.60. Tables 7 and 8 report predictions for sensitivity analyses using radius-based measures of the availability of safety net providers.

Rural Uninsured

The analyses of utilization among the rural uninsured provide support for both own-price and cross-price effects of distances to various safety net providers on utilization. First, we observe an own price effect of distance to the closest migrant health center, community health center or public housing primary care program (BPHC provider), with a longer distance resulting in fewer office-based physician visits and fewer office-based non-physician visits. The results are consistent with our hypothesis that a higher time-price of obtaining care from a safety net provider decreases utilization of healthcare among the uninsured. In the continuous-distance specification, distance to the nearest BPHC provider is associated with a lower probability of any medical expenditures or charges and the statistical significance reaches the .10 but not the .05 level. In the regressions using radius-based measures, a greater number of BPHC providers within a 10 mile radius is associated not only with more office-based visits but also with a higher probability of any medical expenditures or charges.

Second, we find a cross-price effect of distance to the nearest ER on physician visits. We observe an inverse relationship, with longer distances to the ER associated with fewer physician visits, suggesting that office-based visits are complementary with use of the ER. Individuals

may follow-up an ER visit with a physician visit, perhaps because an ER doctor refers a patient to a provider. The own-price association we observe of distance to the nearest ER on ER visits is consistent with our a priori expectation (longer distances associated with fewer ER visits), but surprisingly, the relationship is not statistically significant. However, the regression using the radius-based measures shows the statistically significant finding that a greater number of ERs within 10 miles is associated with more ER visits.

We also find that primary care physician supply is inversely related to ER visits, with greater availability of physicians associated with fewer ER visits (significant in the radius regression at the .05 level and in the continuous specification at the .10 level). This finding suggests that the timing of ER and physician visits affects their relationship. A physician visit may diminish the probability of a later ER visit (perhaps by preventing a medical condition from spiraling into a health emergency), while ER visits may result in a referral to a physician for follow-up care.

Urban Uninsured

In contrast to the rural uninsured, we find more limited associations between distances to safety net providers and healthcare utilization among the urban uninsured. In the continuous-distance specification, we find no association between distance to the closest ER and any type of utilization, and no association between distance to the closest BPHC provider and utilization. However, in the radius regressions, we do find that a greater number of BPHC providers within a 5 mile radius is associated with a greater number of non-physician visits. We find that a longer distance to the nearest public hospital is associated with more ER visits, suggesting substitution

of ER-based care for office visits received in clinics associated with the public hospital or for inpatient care received through a public hospital.

A key finding for the urban uninsured is the association between the level and nature of managed care in the local market and utilization among the uninsured. The relationship appears across numerous types of utilization, including physician visits (the greater is HMO penetration, the fewer are visits), non-physician visits (the greater is HMO penetration, the more such visits), and any medical expenditures or charges (greater HMO penetration associated with a lower probability of any expenditures or charges). Our results suggest that greater managed care presence shifts utilization among the uninsured away from office-based physician visits and towards non-physician providers. One possibility is that the uninsured are less able to find charity or discounted care from physicians in areas where managed care limits their ability to set prices for insured patients. The uninsured in areas with greater HMO presence, facing relatively high prices for physician care, substitute less expensive care from non-physicians for physician care.

However, the relationship between HMO penetration and physician and non-physician office-based visits is attenuated by the competitiveness of the HMO market; specifically, holding HMO penetration constant, more competition is associated with *more* physician visits and *fewer* non-physician visits. In competitive managed care markets, doctors may be better able to negotiate prices and thus more able to subsidize discounted care for the uninsured. Facing lower prices for physician care, the uninsured may not engage in the same level of substitution of non-physician for physician care.

Other aspects of healthcare market structure are also related to utilization. First, the percentage of the population that is uninsured is inversely related to ER visits ($p<.05$ in radius

regressions; $p<.10$ in continuous-distance specification). This finding suggests that uninsured individuals living in areas with many uninsured may compete for limited resources; in particular, emergency room crowding may be a severe problem in areas with many uninsured (Grumbach, Keane, and Bindman 1993; Solberg et al. 2003). Second, greater safety net capacity, as measured by public health expenditures, is associated with more non-physician visits. This result is consistent with our hypothesis that greater safety net capacity promotes higher levels of healthcare utilization by the uninsured. Third, we find that primary care physician supply is associated with a greater probability of any medical expenditures or charges.

Additional Sensitivity Analyses

For the urban uninsured, we compared the reported analyses to those omitting the HMO index of competition and to analyses where public health expenditures, and percent uninsured were omitted separately and together. Our results were robust to these exclusions.

Conclusions

We find that among the rural uninsured, the location of safety net providers is a key factor related to healthcare use. Our results also suggest an asymmetrical relationship between ER and office-based visits—a physician visit appears to diminish the probability of a later ER visit—while ER visits may result in a referral to a physician for follow-up care. For the urban uninsured, we confirm and extend earlier work (Cunningham and Kemper 1998) reporting lower access to care among the urban uninsured living in areas where managed care penetration is high. Our study finds that the uninsured have more limited access to physicians in areas where HMO penetration is high, but that substitution of (less expensive) non-physician care for physician care

may occur in these areas. We further find that the influence of managed care is diminished, and correspondingly levels of health services use among the uninsured are higher, in more versus less competitive managed care markets. In addition, we find less use of emergency services among the uninsured living in urban areas where a relatively large fraction of the population is also uninsured, corroborating recent IOM work on the effects of uninsurance on communities (IOM 2003). Finally, we find that greater safety net capacity is positively related to the ability of the uninsured to obtain care in urban areas.

Several limitations of this research should be noted. First, this study analyzed individuals who were uninsured for a full calendar year. From other research, we know that the population of uninsured individuals is heterogeneous, with some "chronically" uninsured and some individuals who quickly transition between insured and uninsured states (Swartz and McBride 1990; Monheit and Schur 1988). Whether patterns of utilization differ for these different groups of uninsured is an open question, as is whether the relationships between features of the healthcare market and safety net and utilization vary amongst these groups of uninsured. Methodologically, the calculation of individual-specific distances to safety net providers is an important contribution of this research. It represents a step in understanding the link between characteristics of the local community and individual specific outcomes like utilization. But, a limitation is our ability to capture travel time for the urban uninsured. Distance in miles to providers may be a reasonable proxy for travel time for the rural uninsured, but it may be less so for the urban uninsured, where travel times are likely to depend heavily on traffic patterns and the service areas of mass transit systems.

A well-developed literature shows that lack of health insurance has substantial repercussions on both access to healthcare and health status (IOM 2002). Among the findings

are that, compared to the insured, the uninsured are less likely to visit a physician, have a usual source of care, or be admitted to a hospital; are more likely to receive care in hospital outpatient department or emergency room, to have unmet medical needs; and have lower annual medical expenditures and higher mortality (Cunningham 1999; Newachek et al 1998; Marquis and Long 1994/95; Hafner-Eaton 1993; Franks, Clancy, Gold 1993; Spillman 1992; Weissman, Gatsonis, and Epstein 1992 ; Hadley, Steinberg, and Feder 1991; Young et al 1991; Weissman et al 1989; Lurie et al. 1984).

Absent the universal provision of health insurance, policy approaches to alleviating the barriers to access facing the uninsured include incremental efforts to increase the affordability and availability of public or private health insurance as well as measures to increase the accessibility of healthcare for the remaining uninsured. Our findings shed light on areas of focus for the latter class of measures. Specifically, facilitating transport to safety net providers and increasing the number of such providers are likely to improve access to care among the rural uninsured. By contrast, the HMO findings for urban areas suggest that particular attention be paid to the uninsured living in areas where many of those insured are covered by managed care, and especially so where little competition among managed care organizations exists. Ironically, the "backlash" against managed care may result in improved access to care for some uninsured (Robinson 2004), although the salutary effects would be offset to the extent that the backlash also results in increasing healthcare costs, greater numbers of uninsured, and more competition for healthcare resources. In addition, policies oriented toward enhancing funding for the safety net and increasing the capacity of safety net providers are likely to be important to ensuring access among the urban uninsured. Researchers have reported a relatively stable trend in safety net capacity in the late 1990s through 2001 (Felland et al 2003), but the absolute level of

capacity has been shown to vary widely across communities (Marquis et al 2004), and some research suggests that those disparities may be widening over time (Hoadley, Felland, and Staiti 2004). Increasing budgetary pressures at the federal level and in many states are likely to pose an increasing threat to safety net funding.

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NOTES

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[1] Compared to other datasets (e.g. CTS) which contain only a single self-rated health measure, MEPS contains a rich set of health status descriptors. Adequately controlling for health status is especially important because the location of safety net providers may be related to the health status of the local population. For instance, the government may place safety net providers where unmet need is greatest or individuals with health problems may themselves attempt to locate close to a safety net provider. The detailed controls for health status alleviate the possibility of misattributing the association between health status and the location of safety net providers to that between location of safety net providers and utilization.

[2] Other researchers have measured safety net funding with information on grant revenues for federally qualified health centers (FQHCs) or organizations that serve as grantees for FQHCs (Cunningham and Hadley, 2004; Hadley and Cunningham, 2004a). The measure appears to be more localized (describing grant revenues for grantees within a five mile radius of the centroid of each individual's zipcode); in fact, however, grant revenues are recorded at the grantee level and grantees often provide care at several sites, some of which may be distant from the grantee. As such, grant revenues must be imputed across zipcodes served.

[3]An instrumental variable (IV) approach is alternative way to deal with the possibility that the location and capacity of safety net providers is related to the location of mainstream providers. In practice, however, finding appropriate and valid instruments is often extremely challenging

and we were not able to identify an adequate instrument. Hadley and Cunningham (2004a) use the population density in a county and a county-level physician- to-population ratio to instrument for the capacity of local safety net providers. But these variables are inappropriate because they are expected to be correlated with access to care. A greater physician-to-population ratio is likely to make obtaining care more convenient for insured or uninsured patients. Likewise, population density is likely to be independently correlated with utilization if it is associated with improved communication between uninsured individuals and sharing of information on where to obtain safety net care. Moreover, both instruments are measured at the county level, but the endogenous explanatory variable for which these variables are instruments—grant revenues within a five-mile radius of a zip code's population centroid—is measured at a much smaller geographic level. Using instruments at the county level negates the effort of constructing the safety net measures based on five-mile radii, since these instruments can only capture differences in grant revenues across counties. Other instruments such as voting patterns in the county, generosity of the state AFDC benefit, and the number of medical school faculty in the county failed empirical tests for appropriateness. These measures offered better identifying power in other research (Hadley and Cunningham 2004b) when used to instrument for the location of safety net providers. But, these are also likely to be correlated with access to care, and are also county and state level instruments, which cannot capture within-county or within-state variation in the instrumented variable.

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Table 1: Utilization Among Full-Year Uninsured Adults by Location

	Rural		Urban	
Type of Utilization	**Mean**	**Std Err**	**Mean**	**Std Err**
# office-based physician visits	1.49	(0.07)	1.44	(0.06)
Proportion with any office-based physician visit	0.42	(0.01)	0.36	(0.01)
# office-based physician visits given >0	3.54	(0.15)	3.96	(0.14)
# office-based non-physician visits	0.69	(0.07)	0.76	(0.06)
Proportion with any office-based non-physician visits	0.18	(0.01)	0.13	(0.00)
# office-based non-physician visits given >0	3.86	(0.35)	5.90	(0.41)
# emergency room visits	0.17	(0.01)	0.15	(0.01)
Proportion with any emergency room visit	0.13	(0.01)	0.11	(0.00)
# emergency room visits, given >0	1.31	(0.05)	1.37	(0.03)
Proportion with any medical expenditures or charges	0.61	(0.01)	0.52	(0.01)

Table 2: Individual Level Independent Variables

	Rural		Urban	
Individual Level Variable	**Mean**	**Std Err**	**Mean**	**Std Err**
Less than high school	0.33	(0.01)	0.31	(0.01)
High school graduate or GED	0.44	(0.01)	0.40	(0.01)
Some college	0.17	(0.01)	0.19	(0.01)
College graduate	0.06	(0.01)	0.11	(0.00)
Married	0.47	(0.01)	0.37	(0.01)
Widowed/divorced/separated	0.23	(0.01)	0.20	(0.01)
Live alone	0.15	(0.01)	0.18	(0.01)
Aged 18-24	0.18	(0.01)	0.21	(0.01)
Aged 25-34	0.26	(0.01)	0.28	(0.01)
Aged 35-44	0.27	(0.01)	0.25	(0.01)
Aged 45-64	0.30	(0.01)	0.26	(0.01)
Female	0.47	(0.01)	0.43	(0.01)
Black	0.13	(0.01)	0.17	(0.01)
Hispanic	0.11	(0.02)	0.29	(0.01)
Other (non-White)	0.03	(0.00)	0.05	(0.01)
Income <poverty	0.25	(0.01)	0.21	(0.01)
Income 1-2x poverty	0.33	(0.01)	0.30	(0.01)
Income 2-4x poverty	0.29	(0.01)	0.30	(0.01)
Income >4x poverty	0.13	(0.01)	0.19	(0.01)
Nonorganic psychoses	0.02	(0.00)	0.02	(0.00)
Arthropathies	0.04	(0.00)	0.03	(0.00)
Asthma	0.03	(0.00)	0.03	(0.00)
Depression	0.06	(0.01)	0.06	(0.00)
Diabetes	0.03	(0.00)	0.03	(0.00)
Disease of lipoid metabolism	0.02	(0.00)	0.02	(0.00)
Hypertension	0.08	(0.01)	0.06	(0.00)
Migraine	0.03	(0.00)	0.02	(0.00)
Thyroid disorder	0.01	(0.00)	0.01	(0.00)
Other chronic condition	0.04	(0.00)	0.03	(0.00)
Functional limitation	0.09	(0.01)	0.06	(0.00)
Social limitation	0.04	(0.00)	0.03	(0.00)
Cognitive limitation	0.03	(0.00)	0.02	(0.00)
Hearing problem	0.05	(0.01)	0.04	(0.00)
Vision problem	0.08	(0.01)	0.05	(0.00)
Excellent self-rated health	0.28	(0.01)	0.28	(0.01)
Very good self-rated health	0.26	(0.01)	0.30	(0.01)
Good self-rated health	0.30	(0.01)	0.29	(0.01)
Fair self-rated health	0.12	(0.01)	0.10	(0.00)
Poor self-rated health	0.04	(0.00)	0.03	(0.00)
1996	0.21	(0.02)	0.20	(0.01)
1997	0.21	(0.02)	0.20	(0.01)
1998	0.20	(0.02)	0.20	(0.01)
1999	0.18	(0.02)	0.20	(0.01)
2000	0.20	(0.03)	0.21	(0.01)

Table 3: Market Level Independent Variables

	Rural		Urban	
Market Level Variable	**Mean**	**Std Err**	**Mean**	**Std Err**
Miles to nearest ER	8.88	(0.47)	3.68	(0.09)
Miles to nearest public hospital	24.54	(1.24)	17.49	(0.57)
Miles to nearest BPHC provider	30.93	(1.48)	12.61	(0.58)
# ERs within 5 miles (urban) / 10 miles (rural)	0.71	(0.02)	3.12	(0.08)
# public hospitals within 5 miles (urban) / 10 miles (rural)	0.29	(0.03)	0.43	(0.02)
# BPHC providers within 5 miles (urban) / 10 miles (rural)	0.36	(0.05)	3.64	(0.17)
# of primary care doctors per 1k persons	0.38	(0.01)	0.63	(0.07)
HMO penetration rate	*		0.31	(0.01)
HMO index of competition	*		0.71	(0.01)
Public health $ per low income population	*		$744	(22)
Percent uninsured	*		0.20	(0.00)
Percent of households with income<FPL	0.17	(0.00)	0.15	(0.00)
Percent minority	0.16	(0.01)	0.33	(0.01)
Percent with a high school education or more	0.72	(0.01)	0.75	(0.00)

*Not applicable

Table 4: Simulation Values for Rural and Urban Uninsured

Simulation Variable	Value	Rural	Urban
Distance to nearest ER	25th percentile	1.31	1.33
	75th percentile	12.98	4.43
Distance to nearest public hospital	25th percentile	6.71	4.71
	75th percentile	34.38	23.12
Distance to nearest BPHC provider	25th percentile	13.35	2.35
	75th percentile	44.68	15.66
# ERs within 5 miles (urban)/ 10 miles (rural)	25th percentile	0	1
	75th percentile	1	4
# public hospitals within 5 miles (urban)/10 miles (rural)	25th percentile	0	0
	75th percentile	1	1
# BPHC providers within 5 miles (urban)/ 10 miles (rural)	25th percentile	0	0
	75th percentile	1†	3
Primary care doctors per 1k	25th percentile	0.26	0.46
	75th percentile	0.49	0.74
HMO penetration rate	25th percentile	*	0.22
	75th percentile	*	0.43
HMO index of competition	25th percentile	*	0.67
	75th percentile	*	0.83
Percent uninsured	25th percentile	*	0.15
	75th percentile	*	0.25
Public health expenditures (per low income population)	25th percentile	*	307
	75th percentile		900

* Not applicable.

† 80th percentile value; 75th is identical to 25th.

Table 5: Predicted Utilization for Simulated Scenarios, Rural Uninsured

Simulation Variable	Simulation Value	Physician Visits			Non-Physician Visits			ER Visits		Any Expenditures	
		Mean	Std Err		Mean	Std Err		Mean	Std Err	Mean	Std Err
Distance to ER	25th pctile	1.78	(0.55)	*	0.69	(0.41)		0.19	(0.08)	0.61	(0.06)
	75th pctile	1.60	(0.49)	*	0.71	(0.42)		0.16	(0.07)	0.60	(0.06)
Distance to public hospital	25th pctile	1.66	(0.51)		0.61	(0.35)		0.18	(0.08)	0.60	(0.06)
	75th pctile	1.67	(0.51)		0.74	(0.43)		0.17	(0.07)	0.61	(0.06)
Distance to BPHC provider	25th pctile	1.81	(0.55)	**	0.80	(0.47)	**	0.18	(0.08)	0.62	(0.06)
	75th pctile	1.52	(0.46)	**	0.64	(0.38)	**	0.17	(0.07)	0.60	(0.06)
Primary care physicians per 1k	25th pctile	1.65	(0.50)		0.70	(0.41)		0.19	(0.08)	0.61	(0.06)
	75th pctile	1.68	(0.51)		0.71	(0.41)		0.16	(0.07)	0.60	(0.06)

NOTES:
** $p<.01$ for difference between 25th percentile and 75th percentile
* $p<.05$ for difference between 25th percentile and 75th percentile

Table 6: Predicted Utilization for Simulated Scenarios, Urban Uninsured

Simulation Variable	Simulation Value	Physician Visits		Non-Physician Visits		ER Visits		Any Expenditures	
		Mean	Std Err	Mean	Std Err	Mean	Std Err	Mean	Std Err
Distance to ER	25th pctile	1.95	(0.57)	0.94	(0.48)	0.16	(0.05)	0.52	(0.04)
	75th pctile	1.88	(0.54)	0.97	(0.49)	0.15	(0.05)	0.52	(0.04)
Distance to public hospital	25th pctile	1.85	(0.54)	0.97	(0.50)	0.14	(0.04) **	0.51	(0.04)
	75th pctile	1.90	(0.55)	0.97	(0.49)	0.15	(0.05) **	0.52	(0.04)
Distance to BPHC provider	25th pctile	1.93	(0.56)	0.97	(0.50)	0.15	(0.05)	0.52	(0.04)
	75th pctile	1.88	(0.54)	0.97	(0.49)	0.15	(0.05)	0.52	(0.04)
Primary care physicians per 1k	25th pctile	1.86	(0.54)	1.01	(0.51)	0.15	(0.05)	0.51	(0.04) **
	75th pctile	1.91	(0.55)	0.94	(0.48)	0.15	(0.05)	0.53	(0.04) **
HMO penetration rate	25th pctile	2.02	(0.59) **	0.90	(0.46) *	0.15	(0.05)	0.53	(0.04) *
	75th pctile	1.71	(0.50) **	1.09	(0.56) *	0.15	(0.05)	0.51	(0.04) *
HMO index of competition	25th pctile	1.87	(0.54) **	0.98	(0.49) *	0.15	(0.05)	0.52	(0.04)
	75th pctile	2.03	(0.59) **	0.86	(0.44) *	0.15	(0.04)	0.52	(0.04)
Public health expenditures	25th pctile	1.95	(0.57)	0.84	(0.43) **	0.15	(0.04)	0.52	(0.04)
	75th pctile	1.86	(0.54)	1.02	(0.52) **	0.15	(0.05)	0.52	(0.04)
Percent uninsured	25th pctile	1.84	(0.54)	0.93	(0.47)	0.16	(0.05)	0.52	(0.04)
	75th pctile	1.94	(0.57)	1.03	(0.53)	0.14	(0.04)	0.52	(0.04)

NOTES:

** $p<.01$ for difference between 25th percentile and 75th percentile

* $p<.05$ for difference between 25th percentile and 75th percentile

Table 7: Predicted Utilization for Simulated Scenarios, Rural Uninsured, Radial Specification

Simulation Variable	Simulation Value	Physician Visits		Non-Physician Visits		ER Visits		Any Expenditures	
		Mean	Std Err	Mean	Std Err	Mean	Std Err	Mean	Std Err
# ERs within 10 miles	25th pctile	1.49	(0.47) *	0.80	(0.46)	0.13	(0.05) **	0.61	(0.07)
	75th pctile	1.76	(0.54) *	0.63	(0.35)	0.19	(0.08) **	0.60	(0.06)
# public hospitals within 10 miles	25th pctile	1.71	(0.53)	0.73	(0.41)	0.18	(0.08)	0.61	(0.06)
	75th pctile	1.58	(0.51)	0.55	(0.32)	0.16	(0.07)	0.59	(0.07)
# BPHC providers within 10 miles	25th pctile	1.59	(0.49) *	0.71	(0.40)	0.18	(0.08)	0.59	(0.06) *
	75th pctile	1.78	(0.55) *	0.60	(0.34)	0.17	(0.07)	0.63	(0.06) *
# primary care physicians per 1k	25th pctile	1.67	(0.52)	0.70	(0.39)	0.19	(0.08) *	0.61	(0.06)
	75th pctile	1.67	(0.52)	0.69	(0.38)	0.16	(0.07) *	0.61	(0.06)

NOTES:
a $p<.01$ for difference between 25th percentile and 75th percentile
b $p<.05$ for difference between 25th percentile and 75th percentile

Table 8: Predicted Utilization for Simulated Scenarios, Urban Uninsured, Radial Specification

Simulation Variable	Simulation Value	Physician Visits		Non-Physician Visits		ER Visits		Any Expenditures	
		Mean	Std Err	Mean	Std Err	Mean	Std Err	Mean	Std Err
# ERs w/in 5 miles	25th pctile	1.88	(0.55)	1.03	(0.53)	0.16	(0.05)	0.53	(0.04)
	75th pctile	1.89	(0.55)	0.95	(0.49)	0.14	(0.04)	0.52	(0.04)
# public hospitals w/in 5 miles	25th pctile	1.89	(0.55)	1.05	(0.54)	0.15	(0.05)	0.52	(0.04)
	75th pctile	1.88	(0.56)	0.86	(0.45)	0.15	(0.05)	0.52	(0.04)
# BPHC w/in 5 miles	25th pctile	1.89	(0.55)	0.94	(0.48) *	0.15	(0.04)	0.52	(0.04)
	75th pctile	1.89	(0.55)	1.02	(0.52) *	0.15	(0.05)	0.52	(0.04)
#primary care doctors per 1k	25th pctile	1.85	(0.54)	1.03	(0.53)	0.15	(0.05)	0.51	(0.04) **
	75th pctile	1.91	(0.56)	0.97	(0.49)	0.15	(0.05)	0.53	(0.04) **
HMO penetration rate	25th pctile	2.01	(0.58) **	0.93	(0.48)	0.15	(0.05)	0.53	(0.04) *
	75th pctile	1.72	(0.50) **	1.10	(0.57)	0.15	(0.05)	0.51	(0.04) *
HMO index of competition	25th pctile	1.86	(0.54) **	1.00	(0.51)	0.15	(0.05)	0.52	(0.04)
	75th pctile	2.04	(0.60) **	0.89	(0.45)	0.15	(0.04)	0.52	(0.04)
Public health expenditures	25th pctile	1.95	(0.57)	0.85	(0.44) **	0.15	(0.05)	0.52	(0.04)
	75th pctile	1.85	(0.54)	1.05	(0.54) **	0.15	(0.05)	0.52	(0.04)
Percent uninsured	25th pctile	1.85	(0.54)	0.94	(0.48)	0.17	(0.05) *	0.52	(0.04)
	75th pctile	1.92	(0.56)	1.07	(0.55)	0.14	(0.04) *	0.52	(0.04)

NOTES:
** $p<.01$ for difference between 25th percentile and 75th percentile
* $p<.05$ for difference between 25th percentile and 75th percentile