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Primary Care Appointment Availability and Preventive Care Utilization: Evidence From an Audit Study

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Abstract
Insurance expansions under the Affordable Care Act raise concerns about primary care access in communities with large numbers of newly insured. We linked individual-level, cross-sectional data on adult preventive care utilization from the 2011-2012 Behavioral Risk Factor Surveillance System to novel county-level measures of primary care appointment availability collected from an experimental audit study conducted in 10 states in 2012-2013 and other county-level health service and demographic measures. In multivariate regressions, we found higher county-level appointment availability for privately-insured adults was associated with significantly lower preventive care utilization among adults likely to have private insurance. Estimates were attenuated after controlling for county-level uninsurance, poverty, and unemployment. By contrast, greater availability of Medicaid appointments was associated with higher, but not statistically significant, preventive care utilization for likely Medicaid enrollees. Our study highlights that the relationship between preventive care utilization and primary care access in small areas likely differs by insurance status.

Keywords
primary care, access, preventive care, community effects, audit study

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ABSTRACT

Insurance expansions under the Affordable Care Act raise concerns about primary care access in communities with large numbers of newly insured. We linked individual-level, cross-sectional data on adult preventive care utilization from the 2011-2012 Behavioral Risk Factor Surveillance System to novel county-level measures of primary care appointment availability collected from an experimental audit study conducted in 10 states in 2012-2013 and other county-level health service and demographic measures. In multivariate regressions, we found higher county-level appointment availability for privately-insured adults was associated with significantly lower preventive care utilization among adults likely to have private insurance. Estimates were attenuated after controlling for county-level uninsurance, poverty, and unemployment. By contrast, greater availability of Medicaid appointments was associated with higher, but not statistically significant, preventive care utilization for likely Medicaid enrollees. Our study highlights that the relationship between preventive care utilization and primary care access in small areas likely differs by insurance status.

Short running title: Primary Care Availability and Preventive Care

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INTRODUCTION

Access to primary care for adults is a longstanding concern in the United States (Bodenheimer & Pham 2010). Although the primary care workforce has grown steadily in recent years due largely to an increase of non-physician providers, (Goodell, Dower, & O'Neill 2011) primary care providers remain scarce in certain regions of the country, including many rural and inner-city areas (Carrier, Yee, and Stark 2011). Early implementation of the insurance coverage provisions of the Affordable Care Act (ACA) has intensified these concerns, since many areas that were projected to experience the greatest increases in insurance coverage under the ACA had a relatively limited supply of providers before the ACA (Huang & Finegold 2013). Limited data suggest that demand for care did not increase in months following early enrollment in 2014 (Gray 2014), but it remains uncertain how demand might change over the long-term as patients that are newly insured begin to learn more about their coverage options and begin the process of finding a provider. Because primary care providers render the large majority of wellness visits, immunizations, and screenings to non-elderly adults, access to primary care providers is often considered a prerequisite to increased utilization of preventive care – one of the objectives of the ACA.

Relatively few empirical studies have examined the relationship between provider supply and use of preventive care. Prior research has used the density of providers within areas (i.e. the primary care physician-to-population ratios) as a measure of provider supply. This literature yields mixed results. While some studies find that preventive care use is greater (Continelli, McGinnis, & Holmes 2010) and visits to the emergency department lower (Laditka 2004; Richman et al. 2007) in areas with higher provider density, other studies find no relationship (Pathman, Ricketts, & Konrad 2006).

In evaluating existing literature, three issues should be considered. First, measures of primary care physician density may not accurately represent the availability of care for different groups of patients. Due to lower reimbursement, many providers are less willing to accept adults with Medicaid as compared to private health insurance (Decker 2013). Second, to the extent that there is a positive relationship between higher provider density and preventive care utilization, this may also reflect factors related to demand for care, such as affluence and insurance coverage. While studies on primary care supply attempt to adjust for these factors, omitted variable bias remains a concern. Third, focusing exclusively on the supply of physicians (as most prior studies have done) does not account for the possible availability of care from non-physician providers (nurse practitioners and physician assistants). Our objective in this paper is to examine the association between directly measured availability of new patient appointments and actual use of primary care preventative services by patients likely to be enrolled in Medicaid versus private insurance. Our study helps to establish the size of these associations. This descriptive information is a necessary first step for hypothesis generation regarding access and preventive service use that could be applied to future work, including longitudinal assessments of how a changing health care access environment may influence use of care

New Contribution

We reexamine the relationship between primary care access and preventive care utilization among non-elderly adults. One major contribution is that we directly measure availability of primary care appointments using data from a large-scale audit study in which trained interviewers posed as new patients and called primary care clinics seeking appointments. The audit study experimentally manipulated the insurance status of the caller (Rhodes et al. 2014). Thus, we are able to separately examine appointment availability for populations with Medicaid and private insurance. The audit study also accounts for the fact that some patient appointments may be available from non-physician providers insofar as audit callers targeted their calls to practices with at least one practicing physician, but accepted appointments from any available provider (including nurse practitioners and physician assistants). We also examine area-level variables that could potentially mediate the relationship between access and preventive care use, including the poverty rate and the uninsured rate.

Conceptual Model

A long literature has sought to identify the determinants of service utilization. In the classical framework of Aday and Andersen (1974), utilization is the result of the complex interplay between characteristics of patient need for services (such as the presence of a chronic disease), factors such as community norms or attitudes that may predispose patients to seek care (predisposing factors), and the presence of resources that enable patients to obtain care (enabling factors). Inconvenience, search costs, and waiting times to see providers are all factors that can undermine patients' willingness or ability to seek care. Thus, a patient who may be willing to seek a vaccination or a colonoscopy in a market with broad availability of care might be unwilling to seek these same services in a market with very restrictive availability. In economic terms, these factors are all non-monetary costs that add to whatever out-of-pocket costs are associated with seeking care.

Many studies that relate provider practice locations to primary care utilization (Continelli, McGinnis, & Holmes 2010; Guagliardo 2004; Shi 2012) implicitly assume that markets with greater density of providers (i.e. where there are more physicians in the patient's community) are also areas where it would be easier for patients to locate a provider who could offer them an appointment. An additional provider in the community is an additional resource that members of the community have available. Additionally, increasing the number of providers in a community could increase competition for new patients, causing providers to increase customer service and ease of scheduling. All else equal, this “density-access hypothesis” posits that easier access to providers should increase the use of preventive care.

On the other hand, markets with a greater density of providers may differ in other ways that influence the behavior of both patients and providers, and may be unrelated to greater appointment availability for new patients. A “density-intensity” hypothesis would hold that provider density in markets does not increase access for new patients, but rather responds to demand from established patient populations (and arguably stimulates demand within this group). That is, providers in these communities are more likely to orient their practices toward providing more frequent care to patients that are already in the system.

While the mechanisms underlying either the density-access or density-intensity hypotheses cannot be established with cross-sectional data, this study provides important circumstantial evidence by examining the relationship between measured appointment availability for new patients and use of preventive care. It is also the first study, to our knowledge, to examine the separate relationship between provider acceptance of Medicaid versus privately-insured patients at a community level and use of care among patients likely to be in these populations.

METHODS

Measures of Primary Care Appointment Availability

Measures of primary care appointment availability for new patients were derived from an experimental audit study conducted in ten diverse states (Arkansas, Georgia, Iowa, Illinois, Massachusetts, Montana, New Jersey, Oregon, Pennsylvania, and Texas). Trained interviewers, posing as prospective new patients, called primary care clinics seeking appointments for a check-up or an evaluation of recently diagnosed hypertension. In Massachusetts, Arkansas, Montana, and Oregon, the audit sample included the full census of provider offices. In other states providers were randomly sampled in proportion to the population in each county with the relevant insurance type (the sample of Medicaid providers should therefore be representative of Medicaid-accepting providers in the 10 states, and similar findings should apply to providers accepting new privately-insured patients).

Callers were randomly assigned an insurance status: private insurance (the plan with the largest market share in the county), Medicaid (the most common managed care plan in states with high managed care penetration), or no insurance. Calls with the Medicaid scenario were placed only to clinics that had previously indicated that they participated in a Medicaid managed care or primary care case management program (PCCM), this information was collected as part of a non-deceptive survey of the provider offices conducted by the University of Chicago Survey Lab prior to the audit to help define the sampling frame. When there were multiple physicians at an office, callers asked for a visit with a randomly sampled physician, but accepted a visit with a different physician or mid-level practitioner if one was available.

Callers recorded whether a new appointment was scheduled. Appointments were classified as available if the appointment was offered within any time frame. The median appointment time in the audit study was less than one week, however, and time to appointment did not vary by insurance status. Appointment rates for the routine checkup and evaluation for hypertension scenario were combined for this analysis since these rates did not vary by clinical scenario.

Appointments were cancelled at the end of all calls. Additional details about the audit methodology, as well as state-level estimates, are reported elsewhere (Rhodes et al. 2014).

In total, 11,347 calls with useable data were completed in the ten states, from October 2012 to March 2013. For this study, we excluded the 1,703 calls representing uninsured callers, as there was insufficient sample size to evaluate appointment availability for uninsured callers at the county level. Of the remaining 9,644 calls, 9,254 (95%) were in counties covered by BRFSS. This included 5,187 calls for the private patient scenario placed in 515 counties and 4,059 calls for the Medicaid patient scenario in 525 counties (Table 1). We calculated separate county-averaged appointment rates for the overall percentage of callers with private or Medicaid insurance receiving a new visit.

Behavioral Risk Factor Surveillance System

We linked the county-level appointment measures to individual-level, cross-sectional data from the 2011 and 2012 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an annual survey of adult health fielded by the Centers for Disease Control and Prevention in partnership with states. The BRFSS data includes sample in about two-thirds of the ten state counties.

We focused on adults aged 18 to 64. In the 2011 and 2012 BRFSS, current health insurance coverage was assessed with a single question, but specific type of coverage was not assessed. We therefore simulated type of insurance coverage (Medicaid versus private/other) using a comparison sample from the Current Population Survey (CPS). Using a set of variables common to the CPS and the BRFSS – age, race, sex self-reported health status, family composition, marital status, income category, education, and metropolitan status – we estimated a logistic regression model for the probability of being enrolled in Medicaid among non-elderly adults with any current insurance coverage. Coefficients for the prediction equation are shown in Table 2. The pseudo R^2 for this model was 0.35. Using the predicted probabilities from this model, for our primary analyses we split our sample into a sample likely to be enrolled in Medicaid (N=15,781, 15.7% of total sample) and remaining individuals, likely to be enrolled in private insurance (N=85,017, 84.3% of total sample). The cutpoints for the predictions were based on the fractions of non-elderly adults with Medicaid as calculated from the CPS. This produced a range from 9.9% of the population likely to be in Medicaid in Georgia to 25.8% in Massachusetts. After classification, we verified that our prediction method was reliable by comparing the predicted enrollment against the actual enrollment in the CPS sample (Table 1, bottom panel). We obtained a c-statistic of 0.76 (a widely used guideline states that c-statistics greater than 0.70 show acceptable discrimination; Hosmer & Lemeshow 2004). The sensitivity of this measure was 59.4% and the specificity was 93.8%. All told, the prediction method correctly classified 89.9% of all cases.

The likely privately-insured BRFSS sample was used for all analyses where the main independent variable was appointment availability for privately-insured patients and the BRFSS Medicaid sample was used for all analyses where the main independent variable was appointment availability for Medicaid patients.

The 2011 and 2012 BRFSS include several measures related to access and preventive care: time since last visit to a doctor for a check-up; delayed care in the previous 12 months because of cost; having at least one personal doctor; and receiving an influenza vaccination in the previous 12 months. We also considered screening outcomes measured only in the 2012 BRFSS: colonoscopy (adults over age 50); pap smears (all women); mammograms (women over age 40); and prostate-specific antigen (PSA) screening (for men over age 40). Individuals were defined as having received each of these screenings if they had received them at any point in their lifetime.

Additional covariates included demographic information (age, sex, marital status, household composition, race/ethnicity) and socioeconomic status (income reported in eight categories, educational attainment, employment status). The BRFSS reports whether individuals reside in a city in a metropolitan statistical area (MSA), a suburb of an MSA, or outside an MSA.

Item non-response was less than 5% for most variables, and where data were missing we generally included an indicator for missingness. Income data were missing for 12% of the sample. We imputed missing income category using multivariable ordinal logistic regression; income category was imputed based on indicators for age, sex, education, marital, race/ethnicity, health status, state of residence, and MSA status.

County Covariates

In addition to the two measures (i.e. appointment availability for new privately-insured patients and Medicaid) from the audit study, we included three county-level measures of provider supply collected from the 2012 Area Resource File: the ratio of adult primary care physician (general practitioners, general internal medicine, and family practitioners) to the population; the ratio of adult specialist physicians to the population; and the ratio of hospital beds to the population. We also included socioeconomic characteristics that prior literature suggests may be important mediators of access to care: household poverty rate; unemployment rate; median household income; and adult uninsured rate.

Descriptive Analysis

We calculated means for the demographic characteristics of the study population stratified by likely insurance type. To describe our study counties, we first ranked them by the percent of privately-insured callers receiving new patient appointments in the county and used these rankings to divide the counties into four equally sized groups. Within each group, we calculated the mean provider supply and sociodemographic characteristics of the counties. We then regrouped our counties using the appointment availability rates for Medicaid-insured patients and calculated the same statistics as with the privately-insured.

Regression Analysis

We stratified our BRFSS sample by likely insurance type (Medicaid or private) and estimated individual-level, linear probability models separately for each outcome variable, in these models the main predictor was the county-level measure of appointment availability for individuals with that insurance type. We introduced groups of variables in stages in order to examine the potential explanatory role of those variables. Broadly speaking, these groups of variables reflect differences in the population characteristics (particularly need and predisposing characteristics) of populations in the counties that might independently explain use of preventive care and county contextual variables. Accordingly, our first specification adjusted for individual-level health status and demographic characteristics, but not for county context. Next, we added to the model contextual variables that are most closely aligned with provider supply (recognizing that these variables are also likely to be influenced by demand-side factors). Finally, we added to the model contextual variables related to county-level socio-demographics. This final set of variables attempts to represent aspects of the demand environment that may not be captured uniquely with individual-level variables. For example, the uninsured rate in a county, which may have spillover effects on the care-seeking patterns and resources available for other adults (Pauly & Pagán 2007).

The number of observations varied for each outcome (e.g. mammogram models were only estimated on the sample of females). Sample sizes are provided in the notes to Tables 6 and 7. We clustered standard errors at the county-level in the regression analysis. We weighted the data by the number of calls placed in the individual's county relative to the sample size of that county in the BRFSS. This method helps to account for the greater reliability of appointment rates calculated from counties with more sample in the audit study.

RESULTS

BRFSS Sample Characteristics

Table 3 provides mean, unweighted characteristics of the BRFSS sample separately for individuals likely to be enrolled in private/other insurance and Medicaid. For both groups, more than half the respondents were female and did not currently have children in the household. Compared to the private/other sample, the Medicaid sample was much less likely to be college educated, non-Hispanic white, and in excellent or very good health. The Medicaid sample was also skewed toward the younger ages (more likely to be younger than 40).

Some measures of access and preventive care were similar between the private/other group and Medicaid group: access to a personal doctor (89.8% and 86.6%, respectively), 12-month rates of check-ups (74.0% for privately insured, 78.1% for Medicaid), and 12-month flu shots (40.8% and 38.7%, respectively). By contrast, cost-related barriers were substantially higher among the Medicaid sample versus the privately-insured (18.6% versus 8.4%) and receipt of screenings such as colonoscopies, PSA tests, mammograms, and pap smears was lower.

Characteristics of Study Counties

Table 4 provides mean characteristics of sample counties, stratified by the privately-insured appointment availability quartile. The mean private new patient appointment rate in the lowest quartile (Q1) was 62.7%, and in the highest quartile (Q4) was 98.5%. The new patient appointment rate for Medicaid patients in these counties followed a similar and consistent pattern, with the lowest rate in Q1 (42.9%) and the highest in Q4 (62.7%). The density of primary care providers, by comparison, was inversely related to the appointment availability rates. Q1 had an average of 77.3 primary care providers per 100,000 people, whereas Q4 had an average of 46.4 PCPs. The adult uninsurance rate was also inversely related to the availability rates for privately insured adults: 11.0% in Q1, compared to 18.1% in Q4.

Table 5 provides mean characteristics of sample counties, ranked by the appointment availability for Medicaid patients. Appointment availability for Medicaid patients differed widely across counties – there was more than a threefold difference between the appointment availability for Medicaid patients in Q1 versus Q4 (26.7% versus 85.4%). The relationship between the appointment availability for Medicaid patients and other measures (including the PCP to population ratio and uninsured rate) had a similar direction of association as these same measures did for the for privately insured patients reported in Table 3, but the relationship was less consistent and less marked across quartiles.

Regression Analysis

Table 6 provides coefficients from linear probability models that regress different measures of preventive care use among adults in the private/other insurance group on the county-level new appointment availability for privately insured patients collected in the audit study. These coefficients represent the marginal effect, in percentage points, of a ten percentage point increase in the county-level availability for privately insured patients on the probability of utilizing each measure of preventive care. As reference, ten percentage points is roughly the average difference between each quartile of county-level appointment availability for privately insured patients. To provide a measure of model fit, we also include the corresponding $\underline{R}^2$ statistic for each model.

Adjusting only for individual-level characteristics (Model 1), higher county-level availability for privately insured patients was significantly associated with lower use of most measures of preventive care. For example, adults were 1.0 percentage points less likely to have visited the doctor for a checkup in the prior year in counties where appointment availability for privately insured was ten percentage points higher for privately insured callers. Relative to the baseline rate of 74.0% (reported in Table 2), this represents a roughly 1.3% difference. Significant negative associations were found for having a personal doctor, receiving a flu shot, receiving a colonoscopy, and receiving a pap smear. Privately-insured adults in counties with higher appointment availability for private patients had higher probabilities of experiencing cost-related barriers to care. Only one variable was positively signed (but not statistically significant): receiving a PSA test among older men.

Some, but not all coefficients changed after further adjusting for provider supply (Model 2). For example, adjusting for provider supply reduced the association between the county-level new appointment rate and flu shot receipt from -0.91 to -0.73. The biggest change was further adjusting for the socio-demographic characteristics of the county (Model 3). Adjusting for demographics substantially attenuated the association between appointment availability for privately insured patients and all of the access measures except for mammograms. In sensitivity analysis, we found that the strong attenuating effect was mainly attributable to adjusting for the uninsurance rate in counties, since counties with higher uninsured rates also had higher new patient appointment availability for privately insured patients. Despite this attenuation, we found that including these county-level variables only minimally improved model fit (generally increasing the R^2 by no more than about 10%).

Table 7 provides regression estimates for the same outcomes as in Table 6, this time using the appointment availability for Medicaid insured adults as the main predictor and focusing on the population likely to have Medicaid. As with Table 5, estimates are presented as the effect of a ten-percentage point increase in the county Medicaid appointment availability rate.

Whereas for the privately-insured group shown in Table 6 the association between appointment availability and preventive care was generally negative, the picture is more mixed for the Medicaid population (Table 7) and most coefficients are not statistically significant after adjusting for individual-level variables (Model 1). The one exception was receipt of a mammogram – in counties that were 10 percentage points above the mean in Medicaid new appointment rates, women were 0.81 percentage points more likely to receive a mammogram. Adjusting for provider supply did not change the statistical significance or magnitude of any of the Medicaid coefficients, nor did it improve model fit (Model 2). Further adjusting for county demographics (Model 3) actually increased the positive relationship for check-ups, flu-shots, and mammograms.

DISCUSSION

We examined the relationship between county-level primary care appointment availability for new patients with private and Medicaid insurance, and utilization of preventive care services among non-elderly adults residing in those counties likely to have either of those insurance types. The ability to get a new primary care appointment is the first step toward establishing care with a provider and receiving screening and preventive care. However, there has been little evidence about whether areas where it is easier for patients to schedule appointments are also areas where patients are more likely to receive preventive care.

We found that the relationship between new patient appointment availability and preventive care likely differs for privately-insured and Medicaid patients. For privately-insured adults, the association between new patient appointment availability and use of preventive care is consistently negative. Although the density-access hypothesis posits that areas where it is harder to receive a new patient appointment would be areas with lower density of providers, we find that adjusting for provider density has only a modest and inconsistent effect in attenuating the relationship between new patient appointment availability and utilization. By comparison, socio-demographic factors (especially the uninsured rate in a county) play a larger role in attenuating the inverse relationship between preventive care use and appointment availability for the privately-insured (in sensitivity analysis, we reversed the order in which we introduced the covariates and confirmed that attenuation was only due to introduction of the socio-demographic factors).

Counties with lower rates of preventive care may also be counties where individuals with private insurance are more likely to have difficulty affording medical care because of either limited financial means or less comprehensive health insurance. Employer sponsored health insurance has generally tended to have greater generosity (i.e. plans with a greater actuarial value) in states with higher-income and better educated workers (Gabel et al. 2006). Individuals with greater cost-sharing may be more reluctant to seek care, leading to lower demand overall in the market, and greater ability for individuals to establish care as a new patient. It is therefore not surprising that in our analysis greater appointment availability in a county is associated with a higher proportion of individuals likely to have private insurance reporting that they experienced cost-related barriers to receiving care in the prior year.

By contrast, there is a positive, but not statistically significant, association for Medicaid patients between new patient appointment availability and use of some forms of preventive care. This underscores that the factors that mediate the relationship between appointment availability and use of preventive care are likely to be different for Medicaid populations. The provider markets for Medicaid and privately insured populations are known to be segregated and the propensity of providers to accept new patients in these markets are likely to be driven by different incentives (Fossett & Peterson 1989; Perloff et al. 1997). Greater appointment availability for Medicaid patients may be an indicator of a stronger provider market driven by better reimbursement for providers, whereas greater appointment availability for new privately-insured patients may indicate that demand for primary care is weaker, since providers are not able to fill their panels with privately-insured patients. For Medicaid patients there are policy interventions that may be effective in increasing preventive care use for Medicaid enrollees using payment incentives to providers (Blumenthal et al. 2013) or through programs to increase the supply of Medicaid-serving providers in underserved areas (Pathman et al. 2000).

The question of how primary care supply relates to care for different patient populations is central to understanding the distributional effects of provider location on patient welfare, particularly in the context of the ACA, which has increased the number of newly insured patients. Adding physician supply to a county can either lead to a more equitable distribution of care for all patients by increasing access for new patients, or it can exacerbate relative inequality by increasing the intensity of care to subgroups with already established providers without creating supply for patients with no established provider. The fact that provider density is inconsistently related with use of preventive care in counties could suggest that other aspects of the provider environment, which may difficult to directly observe, may alter the relationship between provider supply and access across regions. For example, high supply regions have been shown to also be areas with greater intensity of care for Medicare patients, suggesting potential differences in practice norms in these provider markets (Yasaitis, Bynum, & Skinner 2013). While our study does not establish what the possible causal mechanisms are that may be influencing whether providers offer new appointments, and how that availability may shape access for new patients, this descriptive information does suggest that preventive care use is as likely to be marker of service demand that may drive supply factors as it is as an outcome of access to care. This is a critical step in research to develop a better understanding of the potential mediating role of appointment availability in preventive care during a period of rapid Medicaid and private insurance expansion under the ACA (Kenney et al. 2013)

Limitations

Several limitations should be considered. First, although our study raises important hypotheses about the relationship between area characteristics, provider supply, and use of preventive care, we were unable to disentangle these mechanisms using available data. It is difficult to find plausibly exogenous measures of the supply environment – including variation in practice styles, use of mid-level providers, and intensity of treatment – and the demand environment – including patient preferences for care – required to isolate different causal pathways.

Second, counties are the smallest geography that we are able to examine using data from the BRFSS, yet it is possible that patient use of preventive care may be more responsive to variation in appointment availability within smaller areas, such as neighborhoods or towns, particularly in socio-demographically diverse counties. Mismeasurement of area level effects could cause us to underestimate the true effect of appointment availability on preventive care use.

Third, our study is designed to focus on appointment availability for new patients, which may not generalize to availability for patients that already have an established provider. Given that for privately-insured patients there is greater use of preventive care in counties with lower new patient appointment availability, it would be illuminating to compare whether the same relationship held for appointment availability for established patients. Indeed, the density-intensity hypothesis posits that there are likely to be tradeoffs between access for these patient populations. Future work might therefore try to directly measure appointment availability for established patients.

Fourth, there are limitations inherent to the use of data from the BRFSS. Strengths of the BRFSS include a large sample size (including the recent addition of a cellular telephone sample, which is also included in our analysis), detailed measures of preventive care utilization, and detailed measures of socioeconomic status and demographics. Since most of the BRFSS measures do not distinguish between care received in a doctor's office and care received in other settings, it is possible that some of the screening and preventive care reported took place outside of a doctor's office. However, location of influenza vaccination is reported, and we were able to confirm that very similar effects exist when considering vaccinations received in a doctor's office specifically (not shown). Additionally, most of our screening measures pertain to care received at any point in time. This could bias our results to the extent that receipt of these screenings several years prior may have taken place when the local primary care access environment for new patients was different. A major limitation is that the BRFSS measures insurance status with a single item, and does not distinguish between public and private insurance. This prevents us from directly assessing the impact of appointment availability for new patients with Medicaid versus private insurance for adults with those insurance types. However, as noted, we were able to indirectly assess Medicaid participation using our prediction method with the Current Population Survey data. Finally, although the BRFSS is the largest annual population health survey in the United States, our sample sizes and statistical power to detect differences were more limited when considering effects within the likely Medicaid samples.

CONCLUSIONS

Our study provides a new vantage point to view the relationship between primary care access and use of preventive care. Higher availability of primary care appointments for privately insured patients does not, by itself, appear to promote greater use of preventive care among privately-insured non-elderly adults overall. For the privately-insured, use of preventive care is likely to be mediated by the economic resources of patients to pay for care (even among the privately-insured). For Medicaid populations, although the relationship between appointment availability and receipt of preventive care was often positive, the estimated relationship was relatively small and generally not significant. Rather than exclusively focusing on increasing provider supply, policy might also focus on changing the distribution of primary care resources within markets, including steps to shift resources away from intensively providing care to established patients and increasing access for patients who do not have an established provider – including the growing population of newly-insured adults under the ACA.

TABLES

Table 1. Sample Sizes for Audit Study and BRFSS Survey Sample

Number of Counties	
Total in 10 States	883
Total in BRFSS sample	636
That can be linked with at least 1 private scenario call	515
That can be linked with at least 1 Medicaid scenario call	525
Audit Sample	
Total number of audit calls	11,347
Total calls excluding uninsured scenario	9,644
Total calls linkable to BRFSS	9,254
Private scenario calls	5,187
Medicaid scenario calls	4,059

Number of Calls Per BRFSS Study County	
Mean, Private	10.1
Median, Private	3
Mean, Medicaid	7.7
Median, Medicaid	3

Table 2. Coefficients from Model Predicting Medicaid Enrollment and Performance of Model-Based Predictions versus Actual Medicaid Enrollment in the Current Population Survey Sample

Predictor Variables	O.R.	95% CI	P-Value
Number of children in household (continuous)	1.32	(1.3, 1.35)	***
Educational Attainment (less than H.S. omitted category)			
High School	0.66	(0.62, 0.7)	***
Some College	0.42	(0.4, 0.45)	***
College Graduate	0.29	(0.28, 0.32)	***
Age (continuous)	0.97	(0.97, 0.98)	***
Race/Ethnicity (white is omitted)			
non-Hispanic black	1.47	(1.38, 1.57)	***
non-Hispanic Asian	0.97	(0.88, 1.06)	
non-Hispanic other	1.33	(1.13, 1.57)	***
Hispanic	1.42	(1.34, 1.51)	***
Marital status (Married is omitted)			
Divorced	1.14	(1.06, 1.22)	***
Widowed	0.85	(0.74, 0.98)	*
Separated	1.22	(1.09, 1.37)	***
Never Married	1.42	(1.34, 1.51)	***
General Health (Excellent is omitted)			
Very good	1.29	(1.21, 1.37)	***
Good	2.08	(1.96, 2.21)	***
Fair	3.96	(3.67, 4.26)	***
Poor	6.08	(5.52, 6.70)	***
Sex (Male is omitted)			
Female	1.17	(1.12, 1.22)	***
Employment Status (Employed is omitted)			
Unemployed	2.67	(2.48, 2.88)	***
Not in labor force	2.71	(2.58, 2.84)	***
State (Arkansas is omitted)			
Georgia	1.05	(0.93, 1.20)	
Illinois	2.42	(2.15, 2.72)	***
Iowa	1.89	(1.67, 2.15)	***
Massachusetts	6.44	(5.69, 7.30)	***
Montana	1.4	(1.20, 1.63)	***
New Jersey	2.18	(1.91, 2.48)	***
Oregon	1.90	(1.67, 2.17)	***
Pennsylvania	2.01	(1.79, 2.27)	***
Texas	1.13	(1.00, 1.26)	*
Income (< $10,000 omitted)			

$10001-$15000	0.92	(0.85, 1.01)	
$15001-$20000	0.58	(0.53, 0.63)	***
$20001-$25000	0.40	(0.37, 0.44)	***
$25001-$35000	0.31	(0.29, 0.33)	***
$35001-$50000	0.20	(0.19, 0.22)	***
$50001-$75000	0.11	(0.10, 0.12)	***
>$75000	0.06	(0.05, 0.06)	***
MSA status (Central city omitted)			
Outside central city in MSA	1.02	(0.97, 1.08)	
Non-metro	1.33	(1.24, 1.43)	***
Constant	0.3	(0.25, 0.36)	***
pseudo R^2	0.35		

Diagnostic Statistics Comparing Simulated and Actual Medicaid Enrollment	
C-statistic	0.77
Sensitivity	59.36%
Specificity	93.82%
Correctly classified	89.90%

Note: *P<.05, **P≤.001, ***P≤0.0001

Table 3. Socio-Demographic Characteristics, Preventive Care, and Access Measures of BRFSS Sample

	Likely to be Privately Insured		Likely to be Medicaid Insured	
	Percent	S.E. of %	Percent	S.E. of %
Sex, Marital Status, Parental Status, Education				
Female	57.9	0.3	64.7	0.8
No children in household	59.8	0.5	56.9	1.0
Married	64.7	0.7	17.9	0.6
College degree or higher	51.7	1.1	18.9	1.0
Race/Ethnicity				
Non-Hispanic white	78.9	1.3	49.3	2.9
Non-Hispanic black	8.9	1.0	17.9	2.6
Asian/Pacific Islander	4.7	0.4	3.5	0.3
Hispanic	1.5	0.1	2.6	0.2
Unknown Race	6.1	0.6	26.7	1.8
Age Group				
18-24	4.9	0.2	15.1	0.5
25-29	5.2	0.2	9.3	0.2
30-34	7.5	0.2	10.1	0.3
35-39	9	0.1	8.5	0.3
40-44	11.3	0.2	8.9	0.3
45-49	13	0.2	10.4	0.3
50-54	15.6	0.2	12.8	0.3
55-59	16.4	0.2	12.7	0.3
60-64	17	0.3	12.1	0.4
General Health Status				
Excellent	24.7	0.5	10.2	0.4
Very Good	39	0.3	18.5	0.6
Good	27.1	0.3	27.9	0.7
Fair	7.3	0.2	25.6	0.6
Poor	1.9	0.1	16	0.7
Preventive Care and Access				
Personal doctor	89.8	0.4	86.6	0.6
Cost-related barrier to care in year	8.4	0.2	18.6	0.8
Check-up in last year	74	0.6	78.1	1.0

Flu shot in last year	40.8	0.7	38.7	1
Colonoscopy in lifetime*	69.9	0.8	63.3	1.4
PSA test in lifetime*	45.5	0.7	36.4	1.6
Mammogram in lifetime*	74.9	0.5	60.2	0.9
Pap smear in lifetime*	88.8	0.5	80.9	0.7

Notes:*Colonoscopy applies to adults over age 50, PSA test for men over age 40, mammograms to women over age 40, and pap smears to women only.

Authors' analysis of the Behavioral Risk Factor Surveillance System 2011-2012

Likely Privately-Insured and Medicaid-Insured based on simulation using Current Population Survey data

Table 4. County Characteristics, Stratified by Quartiles of Primary Care Appointment Availability for New, Privately-Insured Patients

	Counties Ranked by New Patient Appointment Rate for Privately-Insured			
	1 (Lowest)	2	3	4 (Highest)
Appointment Rate, Private (%)	62.7	81.2	91.4	98.5
Appointment Rate, Medicaid (%)	42.9	54.5	59.5	67.7
PCP-pop. ratio (per 100k)	77.3	73.5	70.8	46.4
Specialist-pop. ratio (per 100k)	271.1	282.3	250.0	133.7
Uninsured Rate (%)	11.0	14.6	16.7	18.1
Unemployment Rate (%)	8.8	8.5	8.8	8.4

Sources: Appointment rates are derived from the audit study, all other measures from the 2013 Area Health Resource File (http://arf.hrsa.gov/)

Table 5. County Characteristics, Stratified by Quartiles of Primary Care Appointment Availability for New, Medicaid-Insured Patients

	Counties Ranked by New Patient Appointment Rate for Medicaid			
	1 (Lowest)	2	3	4 (Highest)
Appointment Rate, Private (%)	68.8	82.9	87.4	91.2
Appointment Rate, Medicaid (%)	26.7	54.3	66.2	85.4
PCP-pop. ratio (per 100k)	65.2	76.3	72.6	52.4
Specialist-pop. ratio (per 100k)	177.7	319.6	271.6	147.3
Uninsured Rate (%)	14.1	13.4	17.9	17.0
Unemployment Rate (%)	9.1	8.3	9.4	8.7

Sources: Appointment rates are derived from the audit study, all other measures from the 2013 Area Health Resource File (http://arf.hrsa.gov/)

Table 6. Regression Estimates for Primary Care Appointment Availability and Preventive Care Use Among Adults Likely to Be Privately Insured

	Model 1 Individual-level covariates				Model 2 Individual and county provider supply				Model 3 Individual, county provider supply, and socio-demographics			
Outcome	Estimate	P Value	95% CI	R^2	Estimate	P Value	95% CI	R^2	Estimate	P Value	95% CI	R^2
Personal doctor	-0.94	***	(-1.25, -0.63)	.066	-0.86	***	(-1.15, -0.56)	.066	-0.36	**	(-0.62, -0.1)	.072
Cost-related barrier to care	0.25	**	(0.08, 0.43)	.079	0.16		(-0.01, 0.33)	.079	-0.09		(-0.28, 0.1)	.080
Check-up in last year	-1.01	**	(-1.63, -0.4)	.040	-1	**	(-1.64, -0.36)	.040	-0.6		(-1.21, 0.01)	.044
Flu shot	-0.91	**	(-1.58, -0.25)	.037	-0.73	*	(-1.32, -0.15)	.038	-0.62	*	(-1.19, -0.06)	.041
Colonoscopy	-2.23	***	(-2.91, -1.55)	.093	-1.81	***	(-2.44, -1.18)	.095	-1.43	***	(-2.1, -0.77)	.096
PSA test	0.58		(-0.21, 1.36)	.092	0.28		(-0.49, 1.04)	.094	-0.13		(-0.96, 0.69)	.096
Mammogram	-0.02		(-0.38, 0.33)	.178	-0.11		(-0.48, 0.26)	.178	-0.32		(-0.76, 0.11)	.180
Pap smear	-0.61	**	(-1.04, -0.17)	.068	-0.55	*	(-1.02, -0.09)	.068	-0.38		(-0.89, 0.14)	.070

Note: *P<.05, **P<.001, ***P<0.0001, all models restricted to non-elderly adults likely to have private insurance. Estimates represent the effect, in percentage points, of a 10 percentage point increase in the county appointment availability for privately insured adults. Individual-level models adjust for age, race/ethnicity, employment status, general health status, marital status, and number of children. County provider supply measures are PCP-pop ratio, specialist-pop ratio, and hospital bed-pop ratio. Socio-demographics include adult uninsured rate, unemployment rate, and poverty rate. Standard errors are clustered at the county. Sample sizes varied by outcome: personal doctor, N=84,844; cost-related barriers, N=84,881; check-up, N=83,878; flu shot= 80,956; colonoscopy N= 19,119; PSA test N= 11,264; mammogram, N= 22,860; pap smear N= 19,086.

Table 7. Regression Estimates for Primary Care Appointment Availability and Preventive Care Use Among Adults Likely to Be Medicaid Insured

	Model 1 Individual-level covariates				Model 2 Individual and county provider supply				Model 3 Individual, county provider supply, and socio-demographics			
Outcome	Estimate	P Value	95% CI	R^2	Estimate	P Value	95% CI	R^2	Estimate	P Value	95% CI	R^2
Personal doctor	-0.18		(-0.63, 0.27)	.073	-0.09		(-0.53, 0.34)	.073	0.04		(-0.4, 0.48)	.077
Cost-related barrier to care	0.13		(-0.32, 0.59)	.062	0.04		(-0.49, 0.57)	.065	-0.21		(-0.67, 0.25)	.071
Check-up in last year	0.45		(-0.23, 1.12)	.062	0.43		(-0.24, 1.11)	.065	0.66	*	(0.15, 1.18)	.071
Flu shot	0.43		(-0.15, 1.01)	.045	0.55		(-0.04, 1.13)	.049	0.69	**	(0.18, 1.2)	.051
Colonoscopy	0.21		(-1.1, 1.51)	.069	0.25		(-1.14, 1.65)	.070	0.32		(-0.9, 1.53)	.075
PSA test	-0.3		(-1.63, 1.02)	.075	-0.33		(-1.67, 1.01)	.079	0.16		(-1.24, 1.56)	.082
Mammogram	0.81	*	(0.1, 1.53)	.232	0.83	*	(0.1, 1.56)	.232	0.96	*	(0.21, 1.71)	.238
Pap smear	-0.34		(-1.23, 0.55)	.073	-0.37		(-1.36, 0.62)	.074	-0.37		(-1.34, 0.6)	.078

Note: *P<.05, **P≤.001, ***P≤0.0001, all models restricted to non-elderly adults likely to have Medicaid insurance. Estimates represent the effect, in percentage points, of a 10 percentage point increase in the county appointment availability for Medicaid insured adults. Individual-level models adjust for age, race/ethnicity, employment status, general health status, marital status, and number of children. County provider supply measures are PCP-pop ratio, specialist-pop ratio, and hospital bed-pop ratio. Socio-demographics include adult uninsured rate, unemployment rate, and poverty rate. Standard errors are clustered at the county. Sample sizes varied by outcome: personal doctor, N= 15,680; cost-related barriers, N= 15,709; check-up, N= 15,450; flu shot= 14,349; colonoscopy N= 2,772; PSA test N= 1,465; mammogram, N= 4,728; pap smear N= 3,892.

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