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Using Electronic Health Record Data to Evaluate Preventive Service Utilization Among Uninsured Safety Net Patients

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Abstract

Objective—This study compared the preventive service utilization of uninsured patients receiving care at Oregon community health centers (CHCs) in 2008 through 2011 with that of continuously insured patients at the same CHCs in the same period, using electronic health record (EHR) data.

Methods—We performed a retrospective cohort analysis, using logistic mixed effects regression modeling to calculate odds ratios and rates of preventive service utilization for patients without insurance, or with continuous insurance.

Results—CHCs provided many preventive services to uninsured patients. Uninsured patients were less likely than continuously insured patients to receive 5 of 11 preventive services, ranging from OR 0.52 (95% CI: 0.35–0.77) for mammogram orders to 0.75 (95% CI: 0.66–0.86) for lipid panels. This disparity persisted even in patients who visited the clinic regularly.

Conclusion—Lack of insurance is a barrier to preventive service utilization, even in patients who can access care at a CHC. Policymakers in the United States should continue to address this significant prevention disparity.

Keywords

health insurance; preventive services; community health centers; electronic medical records

Introduction

In the United States, people without continuous health insurance coverage have worse access to important health care services, report lower satisfaction with their health care, and are less likely to be up-to-date on recommended preventive health services, compared to those with continuous coverage.^{1–15} The association between continuous insurance coverage and the increased likelihood of preventive care receipt has been demonstrated across genders, age, race/ethnicity, and socioeconomic strata.^{1–15}

Even in populations with a usual source of primary care, prevention disparities persist between uninsured and insured patients. For example, patients with insurance and a usual source of care have a greater likelihood of receiving lipid screenings, blood pressure checks, breast cancer screenings, and pap smears than those with a usual source of care but no insurance.^{6,9} However, little is known about *which* specific preventive services uninsured patients are more or less likely to receive when they access primary care at community health centers (CHCs), where care is delivered regardless of insurance status.^{1,2} In part, this uncertainty is due to limitations in data typically used in these types of analyses. For example, claims datasets do not capture uninsured patients, and surveys are vulnerable to recall bias and health literacy limitations. To address these past limitations, and simultaneously address the paucity of data regarding preventive care received by uninsured patients compared to insured patients in the same clinics, this retrospective cohort study used electronic health record (EHR) data to compare preventive service utilization of uninsured CHC patients with that of continuously insured CHC patients.

Methods

Data Sources

We utilized two data sources for this analysis. First, we used EHR data from OCHIN (originally the Oregon Community Health Information Network but shortened to OCHIN as other states joined). OCHIN's centrally hosted and linked Epic[®] EHR contains data on >1 million patients served at >300 CHCs in several states.¹⁸ An estimated 80–90% of CHC patients in Oregon seek care at an OCHIN clinic and have relevant ambulatory care data in OCHIN's EHR; from 4/1/2013 through 3/31/2014, approximately 333,000 patients had a visit in an OCHIN clinic. (S. Cowburn, personal communication July 7, 2014)

Second, we linked Oregon Medicaid enrollment data to EHR insurance records to obtain longitudinal health insurance coverage information for the study population (Medicaid is the most common insurer in this population). Information on non-Medicaid insurance coverage (e.g., commercial coverage) was obtained from the EHR.

Study Population

The primary population of interest was all uninsured, non-pregnant adults (aged 19–64) who were alive throughout the study period, and had 1 visit during 2008 through 2011 at one of the 10 Oregon OCHIN CHCs with a fully-implemented EHR for 6 months prior to the study start (n=9,938 patients). A visit was defined as any face to face encounter in a primary care clinic, including lab and immunization encounters. We used one visit as inclusion criteria to be consistent with recent discussions in the primary care literature.¹⁹ We included only those patients with no documented insurance coverage based on EHR and Medicaid enrollment data. We chose a comparison group of all adults with continuous insurance during the study period, and the same age and visit characteristics (n=8,106). We included only those patients with documentation of continuous coverage. All CHCs in our study offered these preventive services.

Variables / Analysis

Independent Variables—Our primary independent variable was insurance status. We categorized patients as having either no insurance or continuous insurance throughout the study period. Continuously covered patients include those with private insurance, public insurance, or a combination of the two.

Dependent Variables—Our outcomes of interest were receipt of select preventive services at least once in the study period across all OCHIN CHCs during the study period of 2008–2011. We chose eleven services recommended by the United States Preventive Services Task Force²⁰, the Advisory Committee on Immunization Practices^{21, 22}, or the American Diabetes Association²³: blood pressure screening, tobacco use assessment, measurement of body mass index, lipid screening, glucose screening, mammography, cervical cancer screening with Papanicolaou (Pap) testing, influenza (flu) vaccination, pneumococcal vaccination, fecal occult blood testing (FOBT) for colorectal cancer screening, and chlamydia screening. Each preventive outcome was assessed in the subpopulation for which it is recommended in national guidelines (Relevant age/sex criteria

are in Table 2 footnotes). To obtain guideline-appropriate denominators for some preventive services, we identified diagnosis codes for diabetes, cardiovascular disease, and pulmonary disease.

Covariates—We included gender, age, race/ethnicity, primary language, household income as average percent of Federal Poverty Level (FPL) and number of visits in the study period as independent variables. Race/ethnicity categories other than Hispanic and non-Hispanic white were collapsed because of low overall numbers.

Analysis—We calculated descriptive statistics for the overall study population, and by insurance category. We then performed logistic mixed effects regression modeling, yielding odds ratios for receipt of each preventive service in the study period comparing insurance categories adjusted for covariates. We also conducted logistic mixed effects regression stratified by primary care office visit count (≤ 4 , >4) and report unadjusted percentages of receipt of each preventive service and adjusted odds ratios by strata. We chose a cutoff of four visits because this stratified our cohort into those seeking care on average yearly or less and those seeking care more than an average of once per year. Finally, we performed a stratified multivariable Poisson mixed effects regression model to estimate adjusted rates of services per person in the study period for each insurance group. For all regression models, we accounted for clustering of subjects within CHC by including a random intercept for clinic; patients were assigned to the clinic they frequented most often during the study period. We also performed a post-hoc sensitivity analysis, using a matched propensity score analysis in lieu of regression covariate adjustment. Analyses were performed using SAS version 9.3 and statistical significance was set at a type I error of 5%. The IRB of Oregon Health and Science University approved the study.

Results

Population Characteristics

The total study population was 18,044 patients (Table 1). Uninsured CHC patients were less likely than the continuously insured to be female, non-white Hispanic, English-speaking, from households earning $\leq 100\%$ of the federal poverty level (FPL), and to have ≥ 4 visits in the 4 year study period. Uninsured patients were more likely to be Hispanic, Spanish-speaking, and have household earnings $>100\%$ FPL.

Multivariable Regression

After adjustment for covariates, there were no significant differences between the insured and uninsured groups in odds of receipt of services in six of the eleven services of interest: blood pressure screening, body mass index assessment, smoking assessment, chlamydia screening, FOBT testing, and pneumococcal vaccination. Compared to continuously insured patients, the uninsured had significantly lower odds of receiving five of the eleven services: lipid screening, glucose screening, pap smears, flu vaccine, and mammography orders. Odds ratios ranged from 0.52 (95% CI: 0.35–0.77) for mammogram orders to 0.75 (95% CI: 0.66–0.86) for lipid panels. Figure 1 demonstrates these comparisons. Separating private from

public coverage did not yield different study results in this analysis; therefore Figure 1 includes those with private insurance in the continuously insured group.

Stratified Analysis by Number of Primary Care Office Visits

For patients who had >4 primary care office visits in the study period (i.e., more than once yearly on average), the uninsured still had significantly lower odds of receiving the same five services identified in the unstratified analysis. Among patients with 4 visits, the uninsured had lower odds of receiving glucose screening or pneumococcal vaccine, compared to the continuously insured. Table 2 shows these unadjusted percentages and adjusted odds ratios.

Adjusted Rates of Services in Stratified Analysis

Table 3 shows calculated rates of service utilization (number of services per patient in the study period), stratified by number of visits in the study period. In patients with 4 visits in the study period, rates of service receipt were lower than patients who had >4 primary care office visits. Among patients with 4 visits, there were no significant differences in service receipt between the two insurance groups. Among patients with >4 visits, the uninsured did not have significantly different adjusted rates of chlamydia testing, FOBT, lipid testing, pap smears, and pneumococcal vaccine, as compared to insured patients. There were significant differences between uninsured and insured patients in rates of blood pressure screening, body mass index assessment, smoking assessment, glucose screening, flu vaccine, and mammogram orders.

In our propensity score analysis (results not shown), balance checks suggested sufficient overlap in the distribution of propensity scores between continuously insured and uninsured groups. Odds ratios and rate ratios based on the matched sample were similar to those reported in the regression analysis.

Discussion

This evaluation of the association between insurance status and preventive service receipt is novel in that it uses an EHR dataset and follows patients for 4 years. The results show that Oregon CHCs provide many recommended preventive services to uninsured patients: odds of receipt were not significantly different between uninsured and continuously insured patients for most services routinely provided *during* a CHC visit (e.g., blood pressure screening, BMI, smoking assessment). These are important evidence-based services, and their robust provision in CHCs has not been previously demonstrated in such volume.

In contrast, uninsured CHC patients were less likely than the continuously insured to receive preventive services when those services required an order (such as a lab test) or a referral (such as a mammogram). The differential provision of most services that required an order or referral (and therefore a potential bill, separate from the office visit), demonstrates the persistent barrier that lack of insurance poses to delivery of quality care. Our stratified analyses further highlight the issue: even when patients access the clinic with some frequency, the uninsured still have lower utilization of preventive services. When patients access clinics infrequently (on average, less than once per year), they are less likely to

receive preventive services, regardless of their insurance status. It is likely that no difference was observed in chlamydia testing because this test is frequently done for diagnosis (to evaluate presenting symptoms) as well as for screening. Overall FOBT rates were low in all groups, making comparison between groups less useful. Uninsured patients in the adjusted analysis and in the >4 visit stratum had a lower odds of receiving pneumococcal vaccination; however, this result only approached significance. The health care of those needing this immunization (patients with diabetes, heart disease, etc.), is complex; we may not have been able to detect all relevant factors in their care. For example, immunizations given during hospitalizations (noted and entered by primary care providers), preventive measures administered during presentations for disease complications, and other issues could affect the rates of this service. This area needs further study.

Our uninsured group was disproportionately Hispanic/Latino and Spanish speaking. Although ethnic disparities in insurance status have been previously shown in studies that relied on self-report data and in smaller analyses, they have not previously been demonstrated in such great numbers or with EHR data. These findings have significant implications for policy and practice. The volume of services provided by CHCs demonstrates evidence of their persistent value to vulnerable communities. However, CHCs cannot, on their own, overcome population-level barriers to care posed by patients' lack of health insurance. Policymakers should continue to recognize the health care deficits experienced by uninsured populations, and the racial and ethnic disparities that accompany insurance disparities. They should continue to consider insurance, social service, and immigration reform that could improve the health of our communities. CHCs should also work to eliminate any health care system barriers to the receipt of preventive services among their uninsured patients.

Limitations

Our study had several limitations. Results were limited to CHCs in Oregon, so may not generalize to other settings. We could not confirm that services provided at other settings during the study period were documented in the EHR; patients may have migrated in or out of the clinic during the study period, affecting our results. However, the likelihood that we missed many services is low: CHCs provide more care to uninsured and low-income populations than private facilities do²⁴, and we previously demonstrated that the EHR data used in these analyses captures most services received by a similar CHC population.^{25–26} This aligns with a recent emphasis in the literature on using one visit to define a health care home.¹⁹ Therefore, we think the likelihood of missing significant numbers of services received at other facilities is low.

We did not specifically evaluate whether or not a patient was due for a service at any given point in the study period; however, our assessment of four years of data ensures that most of the services examined were due at least once during the study period. Further study is needed on how clinicians assess who in their patient panel is due for a service, and how those rates compare to national benchmarks. Our analysis was not designed to determine specific causes of differences in service utilization (*e.g.*, patient refusal vs. the service was not offered). Clinician judgment has been shown to be influenced by the insurance status of

the patient²⁷, but we were not able to consider clinician judgment that might have affected ordered or deferred services. It is also likely that patients refuse or do not follow through with recommendations because they cannot afford even nominal co-payments, or present to clinics only when they have an acute need that overshadow prevention efforts. Further research should elucidate these specific barriers and explore the complex factors that determine whether or not a patient in the health care safety net receives/utilizes a prevention service.

While CHCs provide a large volume of preventive services, research is needed to better understand why mere access alone to a safety net clinic does not mean equal utilization of preventive services, if one is not insured. We did not assess utilization of individuals with sporadic insurance coverage and thus were not able to examine graded effects of uninsurance. The complexity of service use in this population and concerns about data quality placed this issue outside the scope of our analysis, and the health care utilization of this group has been studied elsewhere.^{14, 28–20} Finally, it is possible that some patients deemed to have coverage gaps may have actually had continuous coverage and were excluded unnecessarily.

Conclusion

Uninsured patients receive many recommended preventive services at their primary care CHCs, often at rates equivalent to those among patients with continuous insurance. There were some recommended services that uninsured patients had lower odds of receiving, even when they had primary care visits with some frequency. These missed services were those that usually require an order or a referral. Policymakers should consider the future health and societal implications of reduced access to preventive services for the estimated 12 million persons who will not gain coverage with the Affordable Care Act³¹, despite some of the legislation's early successes.³² CHCs will continue to provide vital services to uninsured and insured populations, but will need help from policymakers in order to remove cost barriers faced by uninsured patients who are unable to utilize certain preventive services at rates similar to their insured counterparts.

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Highlights

- Community health centers provide numerous preventive services to uninsured patients.
- Uninsured patients receive less preventive services requiring a provider order or referral.
- This disparity persists even when uninsured patients have regular visits.
- Uninsured patients in community health centers are more likely Hispanic/Latino.

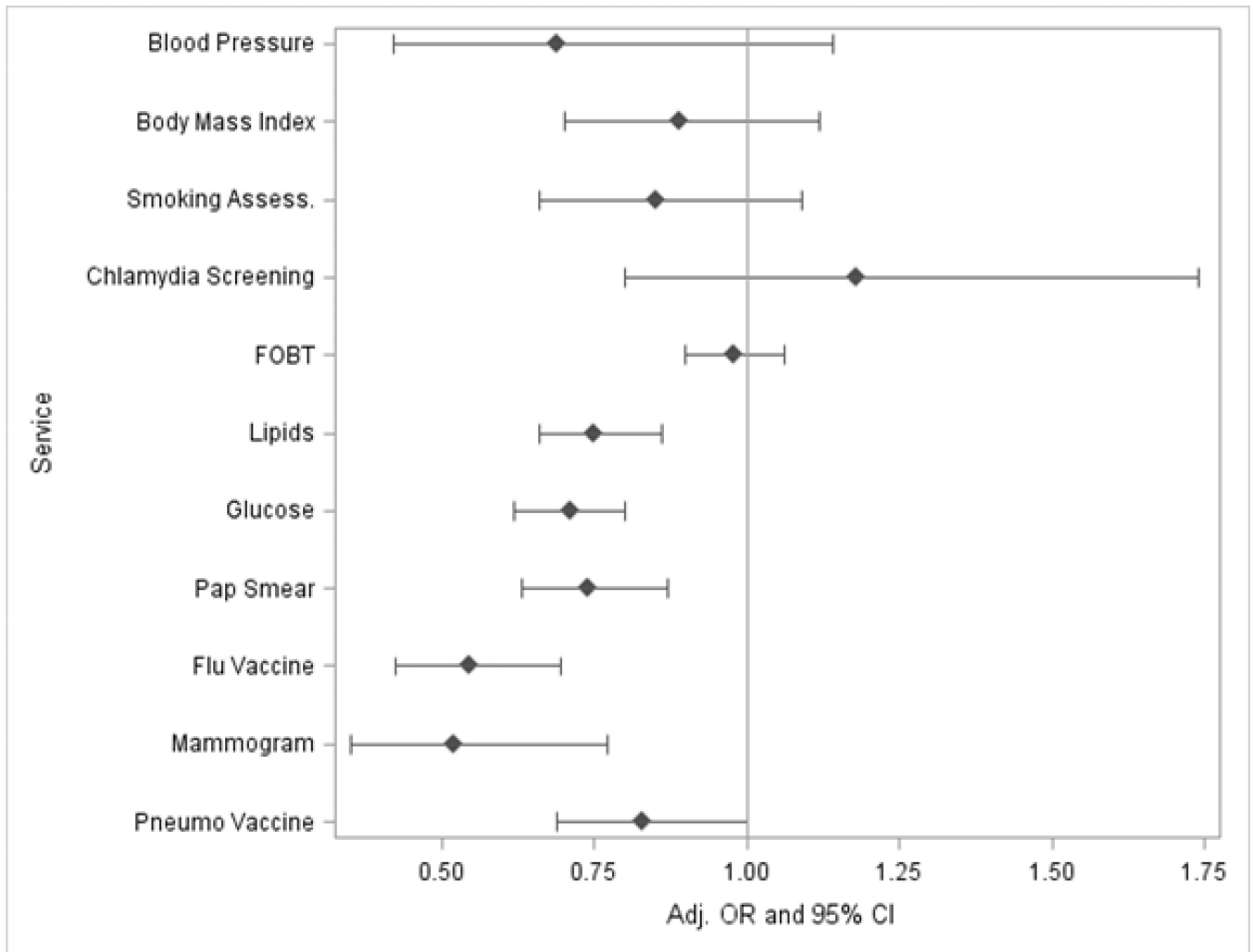


Figure 1.
 Adjusted Odds Ratios for Having Ever Utilized Service in the Study Period, Continuously Uninsured versus Continuously Insured (Reference Standard)
 Vertical reference line represents the continuously insured comparison group
 Adj OR = Adjusted odds ratio
 CI = Confidence interval
 Covariates in Adjustment: sex, age category at start of study, race/ethnicity, FPL category and visit strata, clustering by clinic.

Table 1

Characteristics of Study Population: Total and by Insurance Category

Characteristics	Total	Continuously Uninsured	Continuously Insured	p -value
N	18,044	9,938	8,106	
# w/ some private coverage	1,314	NA	1,314	
Gender (%)				<0.001
Female	57.5	54.5	61.2	
Male	42.5	45.5	38.8	
Age at start of study				
Mean (SD)	40.6 (11.3)	39.1 (11.1)	42.4 (11.3)	<0.001
19–29 (%)	20.5	23.4	17.0	
30–39 (%)	26.2	29.8	21.8	
40–49 (%)	27.0	25.6	28.7	
50–64 (%)	26.2	19.4	29.9	
Race/Ethnicity				<0.001
Hispanic	23.1	37.8	5.0	
Non-Hispanic, White	55.7	43.1	71.2	
Non-Hispanic, Other	14.6	11.3	18.8	
Missing/Unknown	6.6	7.8	5.1	
Primary Language				<0.001
English	65.4	48.7	86.0	
Spanish	20.0	34.3	2.4	
All others	8.0	7.3	8.7	
Unknown	6.6	9.7	2.9	
Average household income				<0.001
<=100% of FPL	61.4	53.0	71.8	
>100% of FPL	33.4	41.7	23.3	
Unknown	5.1	5.3	4.9	
Total Visits				
Mean	15.0	8.6	22.8	<0.001
Median	8.0	5.0	16.0	
IQR	3.0–19.0	2.0–11.0	7.0–30.0	
% <=4 visits	32.6	46.8	15.2	
% >4 visits	67.4	53.2	84.8	

Patients receiving care in 2008–2011 at Oregon community health centers using the OCHIN EHR

P-values comparing demographic characteristics between insurance categories for age and visit numbers are computed from two-sample t-tests; all others from chi-square tests.

Table 2

Adjusted Odds Ratios and Unadjusted Percent of Patients Who Ever Utilized Service During Study Period, Stratified by Number of Visits.

Services	4 Visits /4 yrs		>4 Visits/4 yrs	
	Continuously Uninsured	Continuously Insured	Continuously Uninsured	Continuously Insured
<i>Blood Pressure</i>				
% Receipt	94.7	97.5	99.8	99.9
OR (95% CI)	0.59 (0.31–1.10)	Ref.	0.94 (0.34–2.53)	Ref.
<i>Body Mass Index</i>				
	68.2	67.8	88.6	90.3
	0.96 (0.78–1.19)	Ref.	0.81 (0.63–1.04)	Ref.
<i>Smoking Assess</i>				
	79.4	84.4	95.8	97.6
	0.87 (0.68–1.12)	Ref.	0.76 (0.58–1.00)	Ref.
<i>Chlamydia Screen¹</i>				
	38.3	31.1	64.4	52.6
	1.22 (0.76–1.96)	Ref.	1.12 (0.72–1.73)	Ref.
<i>FOBT²</i>				
	19.2	12.8	48.3	48.6
	1.43 (0.97–2.11)	Ref.	0.93 (0.85–1.01)	Ref.
<i>Lipids</i>				
	26.1	27.5	64.2	70.1
	0.97 (0.84–1.12)	Ref.	0.68 (0.59–0.77)	Ref.
<i>Glucose</i>				
	36.0	39.2	79.1	85.8
	0.87 (0.76–0.99)	Ref.	0.60 (0.51–0.70)	Ref.
<i>Pap Smear³</i>				
	34.5	24.4	64.6	60.5
	0.97 (0.75–1.24)	Ref.	0.71 (0.59–0.84)	Ref.
<i>Flu Vaccine⁴</i>				
	21.0	16.6	52.1	68.6
	1.19 (0.78–1.82)	Ref.	0.47 (0.36–0.62)	Ref.
<i>Mammogram⁵</i>				
	20.9	22.1	50.3	67.0
	0.87 (0.54–1.39)	Ref.	0.49 (0.34–0.70)	Ref.
<i>Pneumo Vaccine⁶</i>				
	11.2	16.1	33.2	35.2
	0.61 (0.44–0.83)	Ref.	0.84 (0.70–1.02)	Ref.

Patients receiving care in 2008–2011 at Oregon community health centers using the OCHIN EHR

OR adjusted for subject sex, age, race/ethnicity average FPL, and random effect of clinic Bolded ORs indicate statistically significant differences

¹Women 19–24

²Adults 50

³Women 21–64

⁴Adults 50

⁵Women 40

⁶Those with diabetes, chronic lung disease, or cardiac disease on the problem list or documented 2 times in encounter diagnoses during the study period

Table 3

Adjusted Rate of Service Receipt in Study Period, stratified by Number of Visits (Number of services, per patient, in the study period)

Services	4 Visits		>4 Visits	
	Continuously Uninsured	Continuously Insured	Continuously Uninsured	Continuously Insured
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
<i>Blood Pressure</i>	1.62 (1.46–1.79)	1.87 (1.71–2.04)	5.42 (4.25–6.91)	10.53 (8.80–12.89)
<i>Body Mass Index</i>	0.96 (0.86–1.07)	1.04 (0.92–1.17)	3.64 (2.97–4.45)	6.43 (5.30–7.81)
<i>Smoking Assess.</i>	1.13 (1.05–1.22)	1.30 (1.18–1.42)	2.93 (2.26–3.78)	5.04 (4.16–6.10)
<i>Chlamydia</i>	0.40 (0.30–0.53)	0.39 (0.28–0.55)	0.82 (0.44–1.50)	0.95 (0.53–1.70)
<i>FOBT</i>	0.21 (0.14–0.31)	0.16 (0.13–0.20)	0.91 (0.70–1.17)	0.95 (0.71–1.26)
<i>Lipids</i>	0.26 (0.22–0.32)	0.28 (0.23–0.34)	1.05 (0.88–1.25)	1.48 (1.25–1.74)
<i>Glucose</i>	0.36 (0.29–0.44)	0.41 (0.33–0.49)	1.51 (1.22–1.86)	2.50 (2.05–3.00)
<i>Pap Smear</i>	0.29 (0.25–0.35)	0.32 (0.27–0.37)	0.75 (0.63–0.89)	0.97 (0.80–1.18)
<i>Flu Vaccine</i>	0.41 (0.28–0.57)	0.38 (0.24–0.60)	1.51 (1.18–1.93)	2.72 (2.28–3.23)
<i>Mammogram</i>	0.24 (0.18–0.32)	0.30 (0.19–0.48)	0.70 (0.56–0.88)	1.20 (0.91–1.57)
<i>Pneumo Vaccine</i>	0.17 (0.10–0.27)	0.24 (0.17–0.35)	0.53 (0.39–0.71)	0.59 (0.47–0.73)

Rates adjusted for subject sex, age, race/ethnicity, average FPL, and random effect of clinic

Bolded rates indicate statistically significant differences