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Medicaid enrollment policy increased smoking cessation among pregnant women but had no impact on birth outcomes

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Abstract

Prenatal cigarette smoking is an important cause of poor maternal and infant health outcomes in the Medicaid-eligible population that may be alleviated by access to timely, quality prenatal care. Using Pregnancy Risk Assessment Monitoring System data from 2004–2010, we examined the effects of state Medicaid enrollment policies on smoking cessation, preterm birth, and small for gestational age. We used a natural experiment to compare outcomes before and after state Medicaid policies' adoption. Presumptive eligibility, an optional enrollment policy that permits women to receive prenatal care while their Medicaid application is pending, led to a 7.7 percentage-point increase (95% CI: 3.7,11.6) in smoking cessation, but did not reduce adverse birth outcomes. The "unborn child" option, which permits states to provide coverage to women who cannot document citizenship or residency, was not significantly associated with any outcomes. Since Medicaid income eligibility thresholds are likely to remain higher for pregnant women relative to other adults, presumptive eligibility will continue to be an important policy to promote timely prenatal care and smoking cessation.

INTRODUCTION

Prenatal cigarette smoking accounts for a substantial portion of poor maternal and infant health outcomes and infant deaths.[1–3] Although the prevalence of prenatal smoking in the United States has declined in recent decades,[4] low-income women enrolled in Medicaid have nearly twice the prevalence of prenatal smoking compared with the population as a

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whole.[5] Since the late 1990s, many state Medicaid programs began providing more generous coverage of smoking cessation services for pregnant women.[6]

However, one barrier to obtaining smoking cessation services may be navigating the process of enrolling in Medicaid.[7] The Medicaid application process is complex, requiring documentation verifying income, residency, citizenship, and pregnancy, and may involve waiting weeks for a determination of eligibility.[8] States have several policy options to reduce barriers to Medicaid enrollment during pregnancy. One such policy is known as presumptive eligibility. Under presumptive eligibility, low-income pregnant women are presumed to be Medicaid-eligible when they present for care at participating organizations, and thus can immediately receive care while their Medicaid application is pending.[9] A second policy, known as the "Unborn Child" (UC) option, allows states to consider a fetus to be a "targeted low-income child" and provide coverage of prenatal care and delivery to low-income pregnant women even if they cannot provide documentation of citizenship or residency required for Medicaid's pregnancy eligibility category.[10] These optional enrollment policies can lead to a greater probability of Medicaid enrollment and earlier initiation of prenatal care, thus enabling women to access smoking cessation services earlier in pregnancy. In turn, smoking cessation early in pregnancy has been shown to reduce adverse birth outcomes.[11–13]

No published research has examined the effects of these two optional enrollment policies on prenatal smoking cessation or smoking-related adverse birth outcomes. In the context of a new requirement under the Affordable Care Act (ACA) that all state Medicaid programs provide coverage of counseling and pharmacotherapies for smoking cessation for pregnant women,[14] it is critical to understand how these optional state Medicaid enrollment policies can best promote access to smoking cessation services and improve birth outcomes.

We address this gap in the literature by examining the effects of optional state Medicaid enrollment policies on prenatal smoking cessation, preterm birth, and having a small for gestational age infant. We hypothesized that the two optional enrollment policies (presumptive eligibility, UC option) would lead to a significant increase in the probability of smoking cessation during pregnancy, and would lead to a significant decrease in the probability of preterm birth and having a small for gestational age infant. We also hypothesized that the effects of the two optional enrollment policies (presumptive eligibility, UC option) would be greater in states with more generous coverage of services for smoking cessation during pregnancy as opposed to states with less generous coverage.

STUDY DATA AND METHODS

Data Sources

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a state-representative survey pertaining to maternal health, behaviors, insurance, and health care before, during, and shortly after pregnancy.[15] States mail women a questionnaire two to four months after delivery, and those who do not respond to the mailed questionnaire are contacted by telephone. Respondents' answers to survey items are linked to birth certificate data. PRAMS research data are available for states that achieved a response rate of at least 70% previous to

2007, or a response rate of at least 65% from 2007 onward. Between 2004–2010, 19 of 35 participating states had sufficient response rates in all years and are thus included in our study.

Although our study sample is not nationally representative, it is representative of women residing in these 19 states in each of these years. To assess how similar the 19 states included in the present study are to the U.S. population as a whole, we used the Census Bureau's Current Population Survey to examine key demographic and smoking-related characteristics, and data from the Kaiser Family Foundation to examine Medicaid program characteristics. As shown in Exhibit 1, the 19 states included in our study are similar on demographic characteristics to the U.S. population as a whole. Among states in our sample, 17% of women reported currently smoking, the same proportion as women in the U.S. population. A similar proportion of women in our sample reported a quit attempt in the past year, relative to the U.S. as a whole (34% and 33%, respectively). Among the 19 states in our study sample, fewer (51% vs. 63%) had presumptive eligibility in place at any time from 2004–2010 relative to the U.S., and more (32% vs. 25%) had the UC option in place at any time from 2004–2010.

Data on Medicaid presumptive eligibility and UC policies by state and year were collected from published annual surveys of state Medicaid officials regarding their states' eligibility and enrollment procedures for pregnant women.[16] Data on coverage of smoking cessation benefits by state and year were collected from published surveys of state Medicaid officials regarding their states' smoking cessation benefits for pregnant women.[17–22] We also included data on whether states' had prohibited smoking in worksites, bars, and restaurants,[23] and each state's excise tax on cigarettes in each state and year.[24] To identify relevant state Medicaid and tobacco control policies, we first calculated the year each respondent's pregnancy began based on the gestational age of the infant at birth. Then, state-specific Medicaid and tobacco control policy data were merged with PRAMS data based on each respondent's state of residence and year her pregnancy began.

We defined Medicaid eligibility for each respondent in her state and year her pregnancy began based on household income as a percentage of the federal poverty level. PRAMS asked about annual household income and the number of individuals in the household who depended on that income. Income data were measured in categories; we took the midpoint of each income category and counted it as the household income amount.[25] This income value was compared to the annual federal poverty guidelines[26] to calculate income as a percentage of the federal poverty level. Respondents with missing income values (7%) were defined as eligible for Medicaid if they reported being enrolled in Medicaid during prenatal care, or if they reported that Medicaid paid for their delivery. Examining this measure of Medicaid eligibility, we found state variation in Medicaid take-up rates that were consistent with prior literature using simulation models to estimate Medicaid eligibility and take-up.[27]

Our study included women ages 19–44 in 19 states who smoked any amount during the three months preconception, had a live single birth between 2004 and 2010, and were eligible for Medicaid coverage during pregnancy in their state in the year their pregnancy began. We excluded women who had multiples as preterm birth and small for gestational

age are more common in these cases. Because we were interested in studying the effects of Medicaid enrollment policies, which might differentially enroll women with different preconception smoking-related risk factors, our sample included all Medicaid-eligible women, rather than only those women who reported being enrolled in Medicaid during pregnancy. Likewise, women who were covered by Medicaid just prior to pregnancy were excluded.

Measures

The three outcomes of interest included prenatal smoking cessation, preterm birth, and having a small for gestational age infant. Prenatal smoking cessation was a binary variable, defined as women who reported smoking any amount in the three months preconception, but reported quitting smoking by the third trimester of pregnancy. Preterm birth was a binary variable indicating whether an infant was born before 37 weeks' gestation, based on birth certificate data. The PRAMS data contain two measures of small for gestational age: an infant weighing less than the tenth percentile for weight at a given gestational age, and an infant weighing two standard deviations below the mean weight at a given gestational age. We conducted analyses using both measures and observed qualitatively similar results. Because clinical practice guidelines define small for gestational age as infants who weigh less than the tenth percentile for weight at a given gestational age,[28] we present results using that outcome measure.

The primary independent variables of interest were state Medicaid policy variables. For each year, we created indicators of whether or not a state had adopted presumptive eligibility or the UC option; and whether a state had adopted either of the two enrollment policies. Additionally, in each year we created indicators of whether a state Medicaid program provided comprehensive smoking cessation services for pregnant women, defined as coverage of pharmacotherapies (any form of nicotine replacement therapy or bupropion for smoking cessation) and counseling (individual or group for smoking cessation) for smoking cessation.[29]

Individual control variables included maternal age, race/ethnicity, education, marital status, number of cigarettes smoked per day pre-pregnancy, whether or not alcoholic drinks were consumed during pregnancy, parity, pregnancy intention, number of stressors experienced during pregnancy (e.g., involuntary unemployment or a death in the family), preconception insurance status, and previous preterm birth. State-level control variables included whether or not a state prohibited smoking in worksites, bars, and restaurants; state excise taxes on cigarettes; state Medicaid income eligibility thresholds; and whether a state had a high, medium, or low proportion of Medicaid beneficiaries enrolled in a managed care organization. Models also included indicator variables for state and year. State indicator variables allowed us to control for time-invariant state characteristics, while year indicator variables allowed us to control for national-level secular trends.

Data Analysis

To estimate the effects of state Medicaid policies on prenatal smoking cessation, preterm birth, and having a small for gestational age infant, we took advantage of a natural

experiment based on state variation in the timing of adoption of optional Medicaid policies. Under this approach, regression models are run using pooled cross-sectional data and including the policy variables of interest, individual control variables, state control variables, and state and year indicators. This allows us to compare outcomes before and after the policies' adoption. States without the policies serve as the comparison group in order to control for secular trends in outcomes. This type of analysis can be conceptualized as a comparative interrupted time-series model with the policy intervention being implemented at different times.[30]

First, to examine the effects of Medicaid policies on the three outcomes, we employed multivariable logistic regression to estimate the effects of each of the state Medicaid enrollment policies on the odds of prenatal smoking cessation, preterm birth, and having a small for gestational age infant, comparing the rates before and after the implementation of the policies and accounting for secular trends. Next, to examine whether the enrollment policies' effects differed by states' generosity of coverage of smoking cessation services, we extended the models to include an interaction term between the state Medicaid enrollment policies (presumptive eligibility, UC option) and a variable indicating whether or not a state had comprehensive coverage of smoking cessation services. To examine the magnitude of the policies' effects on the probability of prenatal smoking cessation, preterm birth, and small for gestational age, we derived average marginal effects from the logistic regression models. Average marginal effects represent the percentage-point changes in outcomes due to the policies, and are helpful in interpreting the results of logistic regression models in a policy context.[31,32]

All models used PRAMS sampling weights, and robust standard errors were calculated to account for correlation within each state and year. This approach resulted in standard errors that were slightly larger than those obtained by clustering standard errors using the PRAMS sampling strata. Our results provide similar but somewhat more conservative estimates of the policies' effects than those using the survey sampling strata.

STUDY RESULTS

Our final analytic sample included 24,544 women in 19 states who responded to the PRAMS in 2004–2010. The majority of women (50.9%) were younger than 25, 34.6% were married; and 75.3% were white, 9.6% were black, 8.3% were Hispanic, and 6.8% were other races or ethnicities (Exhibit 2). The sample had low socioeconomic status, with a mean household income of 129.9% of the federal poverty level and 66.9% of respondents having a high school education or less. Additionally, 63.9% reported being uninsured just prior to conception. The majority (55.7%) of women reported smoking 10 or fewer cigarettes per day, on average, in the three months preconception, while 33% reported smoking 11–20 cigarettes, 8% reported smoking 21–40 cigarettes, and 3.3% reported smoking 41 or more cigarettes.

The 19 states included in the study had considerable variability in terms of the number of years with Medicaid presumptive eligibility and UC option enrollment policies and coverage of smoking cessation benefits (Exhibit 3). Ten states had presumptive eligibility in place at

some point during the study period and seven states had the UC option in place at some point during the study time period. Seven states had comprehensive smoking cessation services coverage for the entire study time period, eight states had comprehensive coverage for some of the time period, and four states did not have comprehensive coverage until required by the ACA in October 2010.

Exhibit 4 shows average marginal effects of the state Medicaid policies on prenatal smoking cessation, preterm birth, and small for gestational age. States' adoption of presumptive eligibility led to a 7.7 percentage-point increase (95% CI: 3.7 to 11.6 percentage points, $p<0.01$) in the probability of prenatal smoking cessation. Presumptive eligibility did not lead to a significant reduction in preterm birth or small for gestational age. The UC option did not significantly affect prenatal smoking cessation, preterm birth, or small for gestational age. Having either enrollment policy (presumptive eligibility or the UC option) in place was associated with a 6.8 percentage point increase (95% CI: 3.0 to 10.5 percentage points, $p<0.01$) in the probability of prenatal smoking cessation. Although we observed negative relationships between a state adopting either enrollment policy and adverse birth outcomes, they were not statistically significant.

Next, to examine whether the effects of state Medicaid enrollment policies differed in states with different coverage of smoking cessation services during pregnancy, we calculated the average marginal effects of presumptive eligibility, the UC option, or either enrollment policy in states with and without comprehensive Medicaid coverage of smoking cessation services (Exhibit 5). The effects of presumptive eligibility on prenatal smoking cessation did not differ by states' generosity of coverage for smoking cessation services. Presumptive eligibility led to a 7.4 percentage-point increase in the probability of smoking cessation (95% CI: 3.5 percentage points to 11.3 percentage points, $p<0.01$) among women in states with comprehensive coverage and a 7.0 percentage point increase (95% CI: 1.7 to 12.4 percentage points, $p<0.01$) in states without comprehensive coverage. Presumptive eligibility did not have a significant effect on preterm birth or small for gestational age in states with different coverage of smoking cessation services.

In terms of the UC option, no significant effects of the policy were observed on prenatal smoking cessation, preterm birth, or small for gestational age among women in states with and without comprehensive Medicaid coverage of smoking cessation services.

Having adopted either enrollment policy increased prenatal smoking cessation both in states with (6.0 percentage points, 95% CI: 2.0 to 10.0 percentage points, $p<0.01$) and without (7.5 percentage points, 95% CI: 2.5 to 12.6 percentage points, $p<0.01$) comprehensive coverage of smoking cessation services. Adopting either enrollment policy was not significantly associated with reduced adverse birth outcomes, in states with and without comprehensive Medicaid coverage of smoking cessation services.

Sensitivity analyses

To test the robustness of these findings, we conducted several sensitivity analyses. First, to test the validity of our measure of Medicaid eligibility, we re-ran the analyses with more restrictive (classifying Medicaid eligibility as 10 percentage points lower than the eligibility

threshold) and less restrictive (classifying Medicaid eligibility as 10 percentage points greater than the eligibility threshold) definitions of Medicaid eligibility. Our results were unchanged. Second, we conducted the analyses including only women who had Medicaid coverage just prior to conception, among whom we would not expect to see a significant effect of any enrollment policy. As expected, there was no significant effect of presumptive eligibility or the UC option on outcomes among women who had Medicaid coverage before their pregnancy. Third, we conducted analyses to explore whether smoking cessation was driven by women receiving prenatal care in Medicaid in the three states (Colorado, Maine, and Ohio) that adopted presumptive eligibility in our study time period. We examined the effects of presumptive eligibility among women who reported being uninsured just prior to pregnancy, among whom presumptive eligibility would be most helpful in receiving prenatal care. In this subgroup, presumptive eligibility led to an 11.0 percentage-point increase (95% CI: 5.9 to 16.0 percentage points, $p<0.01$) in smoking cessation. Additionally, presumptive eligibility had a stronger association with smoking cessation in the three states that adopted the policy in our study time period relative to states that did not change their enrollment policies. (Results of sensitivity analyses are not shown but are available from the authors upon request).

DISCUSSION

This study examined the effects of state Medicaid enrollment policies on prenatal smoking cessation, preterm birth, and having a small for gestational age infant. The adoption of presumptive eligibility, an optional Medicaid enrollment policy that permits women to receive prenatal care while their application is pending, led to a 7.7 percentage-point increase in prenatal smoking cessation. The adoption of the UC option, a Medicaid enrollment policy that permits states to expand or simplify enrollment for vulnerable groups, was not significantly associated with prenatal smoking cessation, preterm birth, or having a small for gestational age infant. Adopting either of the two enrollment policies led to a 6.8 percentage-point increase in prenatal smoking cessation, but did not reduce adverse birth outcomes. We observed no differences in the effects of presumptive eligibility, the UC option, or having either policy by states' generosity of coverage of smoking cessation services.

These findings suggest that states' adoption of presumptive eligibility promotes prenatal smoking cessation via early initiation of prenatal care, as the policy allows women to receive care while their Medicaid application is pending. Previous literature found an association between adoption of presumptive eligibility and earlier initiation of prenatal care and increased receipt of adequate prenatal care.[33] Adopting presumptive eligibility, however, requires states to formally amend their Medicaid programs with the federal government and enlist participating organizations (e.g., health clinics) to enroll women. Therefore, the policy also may reflect an increased level of cooperation between state Medicaid agencies and providers who serve Medicaid beneficiaries.

In contrast to presumptive eligibility, the UC option expands prenatal coverage to low-income women who would not qualify for Medicaid due to lack of documentation of citizenship or residency. Although the UC option may significantly increase Medicaid

enrollment, it might not necessarily lead to improved care for smoking cessation, especially if women are not enrolling early in pregnancy. Our findings suggest that UC option may not increase the quality of prenatal care among women who are enrolling in Medicaid.[34]

It is discouraging that the two optional enrollment policies did not reduce preterm birth or having a small for gestational age infant. However, birth outcomes are influenced by a number of other biological and behavioral factors in addition to smoking, suggesting that smoking cessation interventions may need to be combined with additional interventions to significantly reduce adverse birth outcomes.[35,36] Expanded Medicaid coverage to non-pregnant adults under the ACA could be used to provide interventions to reduce preconception and postpartum smoking as a strategy to improve birth outcomes.[37,38]

Contrary to our expectations, we did not observe significantly greater effects of the two enrollment policies in states with more generous Medicaid coverage of smoking cessation services. This finding is consistent with recent research finding that state Medicaid coverage of smoking cessation services had no significant effects on prenatal smoking cessation or infant birth weight among women who enrolled in Medicaid during pregnancy.[39] Use of pharmacotherapies or counseling for smoking cessation during pregnancy may be low;[40,41] although the PRAMS core questionnaire does not include items about the use of cessation aids, limiting our ability to quantify use of cessation services.

This study has several important limitations. First, our measure of Medicaid eligibility is imperfect. The PRAMS does not ask about certain Medicaid eligibility criteria, such as types of income that states might disregard (e.g., child support payments) when determining eligibility, so we were unable to take these criteria into account. Additionally, household income is measured in categories, which might lead to misclassification in our definition of eligibility. However, our findings were consistent in sensitivity analyses using different definitions of Medicaid income eligibility.

Second, prenatal smoking cessation was based on self-report rather than biochemical validation, which tends to overestimate reported cessation in pregnancy.[42] It is not clear that such over-reporting of cessation would differ by state or across time, however, meaning that this limitation would have the practical effect of biasing our results toward the null. Third, we lack data on whether states required cost-sharing or prior authorization for smoking cessation services, which could provide a barrier to receiving these services. Combining enrollment simplification policies with reductions in these barriers could potentially lead to greater reductions in prenatal smoking. Finally, our estimates of the effects of presumptive eligibility are driven by policy changes in three states (Colorado, Maine, and Ohio), and although our study sample is representative of women in the 19 states included, results may not be generalizable nationally.

This study found that presumptive eligibility, an optional Medicaid enrollment policy to promote early initiation of prenatal care, led to a significant increase in prenatal smoking cessation among Medicaid-eligible women. Given that Medicaid income eligibility thresholds are likely to remain higher for pregnant women relative to other adults,[43] particularly in states that opt not to participate in the Medicaid expansion authorized under

the ACA, presumptive eligibility will continue to be an important policy to promote timely prenatal care. Findings that the enrollment policies' effects did not differ by states' generosity of Medicaid coverage of smoking cessation services merit future research to explore patterns of prescribing and use of pharmacotherapies and counseling for smoking cessation during pregnancy. As states are now required to cover these services for pregnant women, it is important to understand the perceived risks and benefits both among patients and providers. Additional research is also needed on the effectiveness of combining smoking cessation interventions with interventions targeting other risk factors to reduce adverse birth outcomes in the Medicaid-eligible population.

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Exhibit 1

Characteristics of 19 states in the study sample and United States population as a whole

	19 states (Mean or %)	US Population (Mean or %)
Demographic characteristics		
Mean Age	36	36
Race		
White	78	79
Black	14	13
Asian	5	5
Am. Ind./AK or HI Native	1	1
Other/multiple races	3	2
Hispanic ethnicity	11	16
Educational attainment[a]		
Less than high school	14	16
High school diploma	24	23
Some college/College degree	34	33
Advanced degree	7	6
Smoking characteristics		
Women who smoke cigarettes[b]	17	17
Women who made a quit attempt in prior year	34	33
Medicaid coverage		
Mean income eligibility threshold for pregnant women	197	188
State residents enrolled in Medicaid	20	21
Presumptive eligibility for pregnant women	51	63
'Unborn Child' option	32	25

[a] Educational attainment is calculated only among adults.

[b] Cigarette smoking is defined as having ever smoked 100 cigarettes and currently smoking every or some days.

Notes: Demographic characteristics are from the Current Population Survey's Annual Social and Economic Supplement, 2004–2010, employing survey weights. Smoking characteristics are from the Current Population Survey's Tobacco Use Supplement, 2006–2007, employing survey weights. Characteristics of Medicaid coverage were collected from surveys published by the Kaiser Family Foundation.

SOURCE: Authors' analysis of Current Population Survey Annual Social and Economic Supplement, 2004–2010 (demographic characteristics); Current Population Survey Tobacco Use Supplement, 2006–2007 (smoking characteristics); Kaiser Family Foundation State Health Facts and other published surveys (Medicaid coverage).

Exhibit 2

Weighted descriptive characteristics of Medicaid-eligible women in 19 states who smoked prior to pregnancy and were not enrolled in Medicaid prior to pregnancy, 2004–2010

	Mean or % (95% CI)
N	24,544
Weighted N	781,643
Demographic characteristics	
Maternal age	
19–24	50.9 (49.2,52.5)
25–34	42.3 (40.9,43.8)
35–44	6.8 (6.0,7.6)
Race and ethnicity	
White	75.3 (72.9,77.6)
Black	9.6 (8.1,11.1)
Asian	1.2 (1.0,1.6)
Am. Indian/AK or HI Native	3.3 (2.2,4.5)
Other/Multiple races reported	2.3 (1.8,2.8)
Hispanic	8.3 (6.8,9.9)
Married	34.6 (32.6,36.6)
Mean household income (% FPL)[a]	129.9 (126.1,133.5)
Maternal education	
Less than high school	21.5 (20.0,23.0)
High school diploma	45.4 (44.0,46.7)
Some college	28.0 (26.3,29.7)
College graduate or more	5.1 (4.4,5.9)
Health factors	
No. cigarettes smoked preconception[b]	
<1–10	55.7 (53.5,57.9)
11–20	33.0 (31.4,34.5)
21–40	8.0 (7.1,8.9)
≥41	3.3 (2.8,3.9)
No. alcoholic drinks during pregnancy[c]	
0	93.9 (93.3,94.5)
<1–3	5.5 (5.0,6.0)
≥4	1.0 (0.38,1.0)
No. stressors before/during pregnancy[d]	
0	11.1 (10.2,12.1)
1–2	32.1 (31.0,33.2)
3–5	40.1 (38.9,41.4)
≥6	16.7 (15.6,17.7)
Pregnancy intention	

	Mean or % (95% CI)
Wanted pregnancy then	28.3 (27.0,29.5)
Mistimed (wanted sooner/later)	55.7 (54.2,57.2)
Did not want pregnancy	16.1 (14.9,17.3)
At least one previous live birth	53.2 (51.6,54.8)
Previous preterm birth[e]	13.1 (12.1,14.1)
Insurance and WIC	
Insurance prior to pregnancy	
Uninsured	63.9 (61.7,66.1)
Insured (not Medicaid)	36.1 (33.9,38.3)
Insurance during pregnancy	
Enrolled in Medicaid	71.9 (69.9,74.0)
Not enrolled in Medicaid	28.0 (26.0,30.1)
WIC during pregnancy[f]	74.5 (72.7,76.2)

[a] Income shown as a percentage of the Federal Poverty Level.

[b] The number of cigarettes smoked pre-pregnancy is defined as self-reported amount smoked per day, on average, in the 3 months prior to pregnancy.

[c] Alcoholic drinks is defined as the self-reported average number of drinks consumed each week during the third trimester of pregnancy.

[d] Stressors include 13 events that occurred in the 12 months before birth, such as involuntary job loss, death of a close friend or family member, divorce/separation, and homelessness.

[e] Previous preterm birth shown among women with at least one prior live birth.

[f] Special Supplemental Nutrition Program for Women, Infants and Children (WIC)

Notes: Medicaid eligibility was defined within each state and year, based on self-reported income for the previous 12 months and household size. Smoking prior to pregnancy was defined as smoking any amount in the three months prior to pregnancy.

SOURCE: Authors' analysis of Pregnancy Risk Assessment Monitoring System data.

Exhibit 3

State Medicaid enrollment policies and coverage of smoking cessation services in 19 states, 2004–2010

State	No. of years with Presumptive Eligibility	No. of years with 'Unborn Child' option	No. of years with comprehensive smoking cessation coverage[a]
Arkansas	7	0	7
Alaska	0	7	5
Colorado	5	0	6
Georgia	7	0	1
Hawaii[b]	0	0	0
Maine	3	0	7
Maryland[c]	7	0	4
Minnesota	0	7	7
Nebraska	7	6	3
New Jersey[b]	7	0	0
New York	7	0	7
Ohio[b,c]	4	0	0
Oklahoma	7	3	5
Oregon	0	3	7
Rhode Island	0	7	6
Utah	7	0	7
Vermont[b]	0	0	0
Washington	0	7	6
West Virginia	0	0	7

[a] Comprehensive coverage of smoking cessation services defined as coverage of both pharmacotherapies (any nicotine replacement therapy or bupropion) and counseling for smoking cessation. As of Oct. 2010, federal law required all states to cover both pharmacotherapies and counseling for smoking cessation among pregnant women.

[b] These states did not have comprehensive coverage until required by the Affordable Care Act as of Oct. 2010.

[c] Although Maryland and Ohio don't have formal Presumptive Eligibility, they have adopted Presumptive Eligibility-like processes.

Notes: Medicaid eligibility was defined within each state and year, based on self-reported income for the previous 12 months and household size. Smoking pre-pregnancy was defined as smoking any amount in the three months prior to conception.

SOURCE: Authors' analysis of Medicaid policy data from the Kaiser Family Foundation and MMWR reports.

Exhibit 4

Average marginal effects of state Medicaid policies on prenatal smoking cessation, preterm birth, and having a small for gestational age infant, among Medicaid-eligible women in 19 states who smoked preconception

	Prenatal Smoking Cessation	Preterm Birth	Small for Gestational Age[a]
	Percentage-point change (95% CI)	Percentage-point change (95% CI)	Percentage-point change (95% CI)
Presumptive Eligibility	7.7 (3.7,11.6)**	1.0 (−1.9,3.9)	1.8 (−1.7,5.3)
'Unborn Child' option	−2.1 (−7.2,3.0)	0.16 (−2.7,3.0)	2.8 (−1.3,7.0)
Either enrollment policy	6.8 (3.0,10.5)**	−1.4 (−4.7,2.0)	−3.3 (−6.5,0.37)

*p<0.05

**p<0.01

[a]Small for gestational age defined as birth weight of less than the 10th percentile at a given gestational age.

Notes: Individual control variables included maternal age, race/ethnicity, education, marital status, number of cigarettes smoked per day pre-pregnancy, whether or not alcoholic drinks were consumed during pregnancy, parity, pregnancy intention, number of stressors experienced during pregnancy, preconception insurance status, and previous preterm birth. State-level control variables included whether or not a state had a ban on worksite smoking; state excise taxes on cigarettes; state Medicaid income eligibility thresholds; and whether a state had a high, medium, or low proportion of Medicaid beneficiaries enrolled in a managed care organization. Models also included indicator variables for state and year.

SOURCE: Authors' analysis of Pregnancy Risk Assessment Monitoring System data.

Exhibit 5

Average marginal effects of state Medicaid enrollment policies on prenatal smoking cessation, preterm birth, and having a small for gestational age infant, stratified by state coverage of smoking cessation services, among Medicaid-eligible women in 19 states who smoked preconception

	Prenatal Smoking Cessation	
	Percentage-point change (95% CI)	Percentage-point change (95% CI)
	Comprehensive coverage[a]	*Non-comprehensive coverage*
Presumptive Eligibility	7.4 (3.5,11.3)**	7.0 (1.7, 12.4)**
'Unborn Child' option	−2.1 (−7.3,3.0)	1.0 (−5.1, 7.2)
Either enrollment policy	6.0 (2.0, 10.0)**	7.5 (2.5,12.6)**
	Preterm Birth	
	Percentage-point change (95% CI)	Percentage-point change (95% CI)
	Comprehensive coverage	*Non-comprehensive coverage*
Presumptive Eligibility	1.9 (−1.4,5.2)	1.2 (−2.2,4.7)
'Unborn Child' option	−0.10 (−2.8,2.7)	2.5 (−3.1,8.0)
Either enrollment policy	−2.2 (−5.9,1.5)	1.3 (−2.4,5.1)
	Small for Gestational Age[b]	
	Percentage-point change (95% CI)	Percentage-point change (95% CI)
	Comprehensive coverage	*Non-comprehensive coverage*
Presumptive Eligibility	1.1 (−2.2,4.3)	2.4 (−2.1,7.0)
'Unborn Child' option	4.1 (−1.3,8.4)	−0.56 (−5.1,3.9)
Either enrollment policy	0.81 (−2.0,3.6)	2.1 (−1.9,6.1)

*Significantly different from zero, p<0.05

**Significantly different from zero, p<0.01

[a]Comprehensive coverage of smoking cessation services defined as coverage of both pharmacotherapies (any nicotine replacement therapy or bupropion) and counseling for smoking cessation.

[b]Small for gestational age defined as birth weight of less than the 10th percentile at a given gestational age.

Notes: Individual control variables included maternal age, race/ethnicity, education, marital status, number of cigarettes smoked per day pre-pregnancy, whether or not alcoholic drinks were consumed during pregnancy, parity, pregnancy intention, number of stressors experienced during pregnancy, preconception insurance status, and previous preterm birth. State-level control variables included state Medicaid income eligibility thresholds and whether a state had a high, medium, or low proportion of Medicaid beneficiaries enrolled in a managed care organization. Models also included indicator variables for state and year.

SOURCE: Authors' analysis of Pregnancy Risk Assessment Monitoring System data.