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ABSTRACT

Despite plausible mechanisms, little research has evaluated potential changes in health behaviors as a result of the Medicaid expansions of the 1980s and 1990s for pregnant women. Accordingly, we provide the first national study of the effects of Medicaid on health behaviors for pregnant women. We exploit exogenous variation from the Medicaid income eligibility expansions for pregnant women and children during late-1980s through mid-1990s to examine effects on several prenatal health behaviors and health outcomes using U.S. vital statistics data. We find that increases in Medicaid eligibility were associated with increases in smoking and decreases in weight gain during pregnancy. Raising Medicaid eligibility by 12 percentage-points increased rates of any prenatal smoking and smoking more than five cigarettes daily by 0.7-0.8 percentage point. Medicaid expansions were associated with a reduction in pregnancy weight-gain by about 0.6%. These effects diminish at higher levels of eligibility, which is consistent with crowd-out from private to public insurance. Importantly, our evidence is consistent with ex-ante moral hazard although income effects are also at play. The worsening of health behaviors may partly explain why Medicaid expansions have not been associated with substantial improvement in infant health.

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I. Introduction

Between 1990 and 2010, the share of births in the U.S. covered by Medicaid increased from 28% to 44% (Curtin et al, 2013). Much of this increase is due to the expansion of Medicaid income eligibility thresholds for pregnant women that started in the late 1980s and continued through the early part of the 1990s. The purpose of expanding Medicaid coverage was to reduce the rate of uninsured pregnant women, increase use of timely medical care (e.g., prenatal care), and improve infant health and narrow socioeconomic disparities in infant health (National Commission to Prevent Infant Mortality 1988). While the logic of the argument underlying the expansion of Medicaid coverage for pregnant women is intuitive, the evidence to support its validity is not as strong. Generally, there is evidence that expanded Medicaid coverage increased the use of prenatal care, but evidence that Medicaid has improved infant health is less robust (Currie and Gruber 1996; Howell 2001; Centers for Disease Control and Prevention 2002; Hadley 2003; Levy and Meltzer 2004).

One possible explanation for this somewhat counterintuitive finding is that health insurance creates incentives to change health behaviors along with lowering the price of medical care. Insurance lowers the price of treating an illness, for example, an adverse medical outcome for either the mother or child, which may cause a reduction in maternal efforts to prevent the occurrence of such events (ex-ante moral hazard). In addition, Medicaid coverage entails an income effect from the saved out-of-pocket expenditures and from spending on health insurance premiums (in the case of substitution of private for public insurance). This income effect may be used to purchase goods that improve infant health, but also goods that may harm infant health (e.g., cigarettes).

Relatively little research has examined potential consequences of expanded Medicaid coverage on health behaviors of pregnant eligible women. Understanding these effects is of paramount importance given the large number of births covered under Medicaid and the long-term consequences of prenatal inputs for child health (Almond and Currie 2011). In this study, we examine the impact of Medicaid eligibility expansions on the prenatal behaviors and health indicators of pregnant women. The Medicaid income eligibility expansions for pregnant women and for children that occurred during the late 1980s through the mid-1990s provide plausibly exogenous variation in insurance coverage. We assess whether the expansion of Medicaid eligibility and its associated increase in Medicaid coverage changed pregnant women's health behaviors such as smoking and nutrition, as approximated by weight gain during pregnancy. We also examine other pregnancy-related health indicators that may reflect behavioral mechanisms such as gestational diabetes and anemia that are related to weight gain, diet and exercise.

Understanding whether the expansion of Medicaid affected health behaviors of pregnant women is particularly important given the documented links between prenatal (in utero) health and adult outcomes (Almond and Currie, 2011; Currie, 2009). The focus on Medicaid is especially salient because of relative disadvantage in terms of socioeconomic status and health of the Medicaid population. For instance, in the sample of women we study, the prevalence of prenatal smoking among low-educated unmarried mothers was 33% compared to 3% among higher-educated married mothers.

Our research also adds to the sparse literature on ex ante moral hazard and extends the analysis of the effects of Medicaid coverage on health behaviors. While *ex ante* moral hazard is nearly always mentioned as a theoretical consequence of health insurance (Cutler and Zeckhauser 2000; Kenkel 2000), relatively few empirical studies have assessed its importance and these few studies have not produced a consensus finding. Similarly, while there have been many studies of the effects of the Medicaid expansions on insurance coverage, health care use and health, there are only two studies that we are aware of that assess whether the expansions adversely affected health behaviors: the Oregon Medicaid Experiment (Baicker et al. 2013) and Bhattacharya et al (2011). Neither of these studies included pregnant women and neither addressed the potential problems in identifying the ex ante moral hazard effect from an income effect, or accounted for the indirect effect of health insurance on behaviors that works through greater contact with health care providers who provide health information and counseling. We provide the first national study of the effects of Medicaid on health behaviors, and the first such study for pregnant women.

Estimates from this study indicate that expansions in Medicaid eligibility were significantly associated with increases in smoking and decreases in weight gain during pregnancy. We also find some suggestive evidence of an increase in gestational diabetes, which may partly reflect behavioral pathways. Effects are stronger with eligibility expansions at lower income levels, consistent with the crowd-out effects from private to public coverage at higher income levels. Our effect sizes are relatively large, but are plausible given the size of the potential income and moral hazard effects that are likely mechanisms. However, income effects are not large enough to explain the entire effect and thus it is likely that there were insurance induced changes in behavior (i.e., *ex ante* moral hazard). Finally, we find no evidence that increased contact with health care providers affected health behaviors.

2. Relevant Literature

While the theory underlying ex ante moral hazard is well developed, the empirical literature is relatively thin, particularly with respect to health insurance, as there is a somewhat more developed literatures for other types of insurance. [1] There are no studies that we are aware of that address the issue of ex ante moral hazard in the context of pregnant women.

Courbage and Coulon (2004) examined the effect of having private health insurance coverage on smoking and exercise among British Households using both classical and instrumental variables regression approaches. The authors reported that there were no differences in health behaviors between the privately insured and those without such insurance. Card et al. (2008) used a regression discontinuity research approach to study the effects of obtaining Medicare at age 65 on various health behaviors and preventive healthcare utilization. They found no significant effects of Medicare on smoking, exercise, or obesity, nor did they find strong effects on preventive services such as a mammogram. In contrast, Klick and Stratmann (2007) evaluated whether state mandated private health insurance coverage for the treatment of diabetes was associated with body mass index among diabetics. Results from this state-level difference-in-differences study indicated that state mandates, which presumably lower the price of treating diabetes, was associated with higher body mass index.

Kelly and Markowitz (2009) and Bhattacharya et al. (2011) assessed whether health insurance coverage among working adults was associated with body weight. The two studies reached different conclusions: Kelly and Markowitz (2009) reported a small, positive, but not statistically significant effect of insurance on body mass index (BMI) and the probability of being

[1] See, for instance, studies relating prevention and accidents to automobile insurance (Chiappori 2000; Cohen and Dehejia 2004) and studies relating workplace injuries to workers' compensation benefits (Ruser 1985, 1991; Kaestner and Carroll 1997; Fortin and Lanoie 2000).

overweight whereas Bhattacharya et al. (2011) reported relatively large effects of insurance on bodyweight and obesity. Both of these studies used an instrumental variables (IV) approach to address the non-random selection into insurance coverage.[2] Stanciole (2008) also studied the association between insurance and behaviors and reported that insurance was significantly associated with greater smoking, less exercise, and more obesity.

Randomized experiments have also failed to find conclusive evidence. Findings from the Rand Health Insurance Experiment (RHIE), for instance, indicated that less generous health insurance did not have any significant or practical effect on health behaviors such as smoking, drinking, and exercise (Newhouse 1993). Less generous insurance was, however, associated with decreased use of preventive medical services (secondary prevention). While this latter finding contradicts the simple intuition that less insurance should cause an increase in prevention (Lilliard et al. 1986), it is consistent with less generous coverage (i.e., more cost-sharing) leading to a higher price of preventive medical care relative to primary prevention and self-protection.

The Oregon Health Insurance Experiment (Baicker et al. 2013), which enrolled a group of uninsured low-income adults into Oregon's Medicaid program by lottery, found increased used of many preventive medical services, which likely reflects the lower cost of these services as a result of insurance. However, the study finds no statistically significant impacts on measures of primary prevention including the probability of being a current smoker and of being obese. The magnitude of the smoking effect is relatively large (6 percentage points, 13%), positive and

[2] Kelly and Markowitz (2011) utilize firm size as IVs and also supplement their identification strategy with internal heteroscedasticity-dependent IVs. Bhattacharya et al. (2011) use firm size, supplemented with state expansions in the Medicaid eligibility between 1989 and 2004, as IVs.

suggestive of an increase in smoking prevalence subsequent to Medicaid coverage. The p-value is relatively close to being marginally significant (p=0.18).[3]

Dave and Kaestner (2009) is the only study we are aware of that has tried to separate out the direct *ex ante* moral hazard effect of insurance from the indirect effects of health insurance on health behaviors operating through increased contact with healthcare professionals and shifts in health information and knowledge. Dave and Kaestner (2009) study the elderly and exploit the age eligibility of Medicare. The authors reported that after accounting for the effects of greater physician contact, obtaining Medicare was associated with a worsening of health behaviors, as measured by lower rates of smoking cessation, reduced physical activity and increased alcohol use.

In this study, we add to the sparse literature on ex ante moral hazard, and extend the analysis of the effect of health insurance on health behaviors by examining the impact of Medicaid on the prenatal behaviors of pregnant women. In particular, we assess effects of Medicaid on maternal smoking and weight gain during pregnancy, in addition to behavior-related health indicators during pregnancy such as gestational diabetes, pregnancy-associated hypertension, and anemia. This represents the first national study of Medicaid effects on health behaviors among pregnant women.

We exploit the plausibly exogenous variation over time and between states in the Medicaid expansions in income-based eligibility for pregnant women and for children that occurred during the late 1980s through the mid 1990s. Moreover, we account for the effect of

[3] The confidence interval for the treatment effect on current smoking prevalence ranged from -2.5 to 13.7, and that for obesity ranged from -7.9 to 8.7.

insurance on health behaviors that works through greater contact with health care providers, and we assess heuristically whether an income effect can account for our findings.

3. Conceptual Framework

The model we use to examine the effect of Medicaid on health behaviors is based on the choices of a mother who cares about consumption, leisure, and child health. There are two periods that span the pre- to post-birth period.[4] In this model, child health in the post-birth period is uncertain. With probability (π), the child may experience an adverse health shock (z) that lowers child health and can be offset (repaired) with medical care (m_1). Medical care in the first period can also be used to alter the probability of an adverse health event in period two.[5] First-period maternal consumption, for example, nutrition and smoking, may also affect the probability of an adverse health shock in period two. Health insurance is particularly important because it is used to buy medical care after the birth in the case of an adverse outcome..

A woman's expected utility is a function of consumption, leisure and child health:

(1) $$E(U) = u_0(x_0, l_0) + \beta\{[1-\pi(m_0, x_0)][u_1(x_1, l_1, c)] + \pi(m_0, x_0)[u_1(x_1, l_1, c - z(m_1))]\}$$

Equation (1) reflects the fact that there are two periods: prior to birth (t=0) and after birth (t=1). Utility is a function of consumption (x), leisure (l) and child health (c) in each period,

[4] We assume that Medicaid has no effect on the pregnancy decision, which is consistent with some previous literature. DeLeire et al. (2011) find no discernible effects on fertility from Medicaid expansions using Natality data from 1985-1996. Zavodny and Bitler (2010) find little evidence that the expansions had any effect on abortion or pregnancy rates examining state-level birth and abortion rates between 1982-1996. In contrast, Joyce et al. (1998), using pooled cross-sections of states, find that expansions in the income thresholds for Medicaid eligibility between 1987-1991 are associated with a 5% increase in the birthrate among white women but not among black women.

[5] We do not treat medical care in the first period, for example maternal prenatal care, as uncertain and affected by insurance because such care is preventive and its effects are assumed known—i.e., there is no uncertainty. Including Medicaid coverage for maternal care prior to birth would not change any of the predictions described below.

although in period 0 the child is not born and so child health does not enter the utility function. The discount rate is denoted by (β).

The woman's budget constraint is given by:

(2) $$x_0 + p_m m_0 + \frac{x_1}{1+r} + \pi(m_0)\frac{p_m(\alpha)m_1}{1+r} + \frac{f}{\alpha}\frac{1}{1+r} = w(\alpha)(1-l_0) + \frac{w(\alpha)(1-l_1)}{1+r} = W$$

Lifetime income is spent on: consumption (x) in periods 0 and 1; medical care (m) in periods 0 and 1 with price of medical care denoted by p_m; and the quantity of health insurance (α) in period one. The interest rate is denoted by (*r*). Health insurance reduces the price of medical care and is financed out of earnings (w). The cost of health insurance also includes a loading charge (f/α) where f is a fixed cost of administering health insurance.

The constrained choice problem is given by:

(3) $$\begin{aligned} L &= u_0(x_0,l_0) + \beta\{[1-\pi(m_0,x_0)][u_1(x_1,l_1,c)] + \pi(m_0,x_0)[u_1(x_1,l_1,c-z(m_1))]\} \\ &\quad -\lambda[x_0 + p_m m_0 + \frac{x_1}{1+r} + \pi(m_0)\frac{p_m(\alpha)m_1}{1+r} + \frac{f}{\alpha}\frac{1}{1+r} - w(1-l_0) - \frac{w(\alpha)(1-l_1)}{1+r} \end{aligned}$$

The first order condition for consumption in first period is given by:

(4) $$\begin{aligned} \frac{\partial L}{\partial x_0} &= U_0 - \beta\frac{\partial \pi}{\partial x_0}(\tilde{u}_1 - u_1) - \lambda[\frac{\partial \pi}{\partial x_0}\frac{p_m(\alpha)m_1}{1+r}] = 0 \\ U_0 &= \beta\frac{\partial \pi}{\partial x_0}(\tilde{u}_1 - u_1) + \lambda[\frac{\partial \pi}{\partial x_0}\frac{p_m(\alpha)m_1}{1+r}] \end{aligned}$$

Equation (4) is the usual equilibrium condition. The left hand side is the benefit of first period consumption and the right hand side is the cost, which includes the higher probability of lower second period utility because of an adverse health shock to child caused by first period consumption and the greater spending on second period medical care due to a higher probability of an adverse health shock ($\tilde{u}_1$ denotes period 1 utility if sick).

Equation (4) also illustrates the problem of ex ante moral hazard. Health insurance (α) lowers the price of medical care, and a lower price of medical care reduces the cost of first period consumption that works through the probability of a child health shock. With insurance, a mother has to incur less cost to treat an adverse event (for her or her child) associated with a birth. Therefore, health insurance may influence first period consumption that may adversely affect child health. Importantly, for Medicaid, there is no cost of insurance so the *ex ante* moral hazard problem is not eliminated through changes in insurance premiums. Of course, there is also an income effect associated with the lower price of health insurance and Medicaid that may increase consumption.

The first order conditions for medical care are given by:

$$\frac{\partial L}{\partial m_0} = \beta \frac{\partial \pi}{\partial m_0}(\tilde{u}_1 - u_1) - \lambda[p_m(\alpha) + \frac{\partial \pi}{\partial m_0}\frac{p_m(\alpha)m_1}{1+r}] = 0$$

$$\beta \frac{\partial \pi}{\partial m_0}(\tilde{u}_1 - u_1) = \lambda[p_m(\alpha) + \frac{\partial \pi}{\partial m_0}\frac{p_m(\alpha)m_1}{1+r}]$$

(5)

$$\frac{\partial L}{\partial m_1} = -\beta\pi \frac{\partial u_1}{\partial c}\frac{\partial z}{\partial m_1} - \lambda\pi \frac{p_m(\alpha)}{1+r} = 0$$

$$-\beta\pi \frac{\partial u_1}{\partial c}\frac{\partial z}{\partial m_1} = \lambda\pi \frac{p_m(\alpha)}{1+r}$$

First-period medical care is valued because it reduces the probability of an adverse event and raises expected utility in the second period ($\tilde{u}_1$ denotes period 1 utility if sick). A lower probability of an adverse event also reduces second-period medical expenditures. Both of these marginal benefits are equated to the price of medical care. Second-period medical care raises utility by improving child health and this marginal benefit is equated to the price of medical care.

Dave and Kaestner (2009) raise another issue that is relevant, but not explicit in equation (4), and that is the possibility that the greater use of medical care that comes with insurance may affect the information available about the effect of consumption on the probability of an adverse health shock to child. For example, Medicaid may be associated with greater prenatal care, and during these visits the physician may discuss health behaviors and the value of prevention that causes a mother to change behaviors.

Finally, we assume an insurance market that allows a woman to choose an optimal amount of insurance:

(6)
$$\frac{\partial L}{\partial \alpha} = -\lambda[\pi \frac{\partial p_m}{\partial \alpha}\frac{m_1}{1+r} - \frac{f}{\alpha^2}\frac{1}{1+r} - \frac{\partial w}{\partial \alpha}\frac{(1-l_1)}{1+r}] = 0$$
$$-\pi \frac{\partial p_m}{\partial \alpha}\frac{m_1}{1+r} = \frac{f}{\alpha^2}\frac{1}{1+r} - \frac{\partial w}{\partial \alpha}\frac{(1-l_1)}{1+r}$$

According to (6), a woman chooses insurance to equate the expected medical expenditures to the cost of insurance, which is the wage offset plus loading cost. Again, the expansion of Medicaid makes insurance free and there is an income effect associated with this change.[6] Additionally, there are no changes in premiums to reflect the behavioral responses of Medicaid beneficiaries to the price change of medical care.

The upshot of this theoretical discussion is that the net effect of Medicaid coverage for pregnant women and their children on prenatal preventive activities is a priori ambiguous. Gaining insurance is associated with: 1) the pure ex ante moral hazard effect, which will tend to worsen health behaviors; 2) an income effect that is likely to increase behaviors that are a form of consumption including unhealthy behaviors such as smoking; and 3) an "informational"

[6] The income effect may also be driven by Medicaid-induced shifts in labor supply. Dave et al. (forthcoming) find that Medicaid expansions for pregnant women led to a decrease in their employment and labor force participation.

effect that comes from the greater contact with the medical system induced by the lower price of medical care.

4. Research Design

Our analysis is motivated by the incentives described above for pregnant women to potentially change their primary prevention activities in response to Medicaid coverage. To address this issue empirically, we exploit plausibly exogenous variation from the Medicaid income eligibility expansions for pregnant women during the late-1980s through mid-1990s taking advantage of the differences in expansions over time between states as a quasi-experiment. We use data from the vital statistics natality files for births occurring from 1989 through 1997, the period that spanned the largest expansions in Medicaid eligibility for pregnant women and children.

The research design is a difference-in-differences approach focusing on the intention-to-treat parameter associated with expanded Medicaid eligibility. For each type of health behavior, we estimate the following regression specification:

(7) $$H_{ikjt} = \alpha_{kj} + \theta_{kt} + \delta ELIG_{kjt} + X_{ikjt}\Gamma + Z_{jt}\Psi + G_{mjt}\Omega + \mu_{ikjt}$$

In equation (7), H denotes a specific health behavior (smoking or weight gain) or outcome (gestational diabetes, hypertension, and anemia) for pregnant woman *i* in state *j* and year *t*. ELIG is the fraction of women in group k, which is defined by race and age (18-24, 25-29, 30-34, 35-39), in state *j* and year *t* that are eligible for Medicaid. The vector X represents individual characteristics of the pregnant woman such as age, education, marital status, race/ethnicity, and interactions between race and education; and Z represents a vector of time-varying state-level confounding factors including the unemployment rate (contemporaneous and the one-year lag and lead) to capture economic conditions., state excise tax on cigarettes (in models for smoking), and the fraction of single males with incomes below 200% of the federal poverty line (FPL) with private insurance in state *j* and year *t* to capture trends in private insurance among the low-income population.[7]

All specifications control for state (α) and year (θ) fixed effects to capture unobserved time-invariant area heterogeneity and national trends, and we allow these trends to vary by the race and age categories used to define the fraction of eligible women (ELIG). In order to control for other time-varying state-level unobservable variables, we also include in all models the prevalence (or mean) of the specific health behavior in question for college-educated married (denoted by the subscript *m*) pregnant women between the ages of 25-39 (G_m), who are generally not Medicaid eligible and thus would not be impacted by the policy shift, for state *j* and year *t*.[8] Standard errors are adjusted for arbitrary correlation within state cells. The parameter of interest is δ, which captures the reduced-form, marginal effect of the expansions in Medicaid eligibility on prenatal behaviors, operating through the three channels described earlier.

The use of the fraction of women eligible for Medicaid in each state and year to measure Medicaid eligibility follows the innovation of Currie and Gruber (1996) and Cutler and Gruber (1996). The key to this measure is that it records the fraction of a fixed sample of

[7] The fraction of single males with income below 200% of the FPL who are privately insured in each state/year is computed from the March Current Population Surveys (CPS).

[8] Note that this does not amount to using college-educated married pregnant women as a direct comparison group since we are not constraining the coefficient to be one, that is we are not assuming (as would be the case in a difference-in-differences context) that for every one-percentage point change in the outcome among higher-educated married pregnant women there would be, in the absence of any changes in Medicaid eligibility, an equal change in the outcome for low-educated unmarried pregnant women. Our models confirm that this assumption of one-to-one proportional trends is not justified as the coefficient on the group mean for college-educated married pregnant women is significantly less than one in all specifications.

women who would be eligible for Medicaid if they were pregnant and lived in each state in each year and avoids the endogenous relationship between Medicaid eligibility of an individual mother and her health and health behaviors. To form the measure, we selected a national sample of women aged 18 to 39 from the 1989 to 1997 March Current Population Surveys (CPS) (covering data from 1988-1996). We adjusted all financial variables for price changes such that incomes are deflated (inflated) from the actual year (e.g., 1988,..,1996) to the policy year (e.g., 1991) for which eligibility will be calculated. Using the "inflation-adjusted" sample and the Medicaid eligibility rules in a state in a specific year, we assigned eligibility to the fixed national sample so that eligibility is calculated using the same sample of women in each year for a given state. We then calculated the proportion of women aged 18 to 39 within a race-age-state-year cell that would be eligible for Medicaid if they became pregnant.[9]

The variation in both of these measures comes from program rules alone -- after adjusting for inflation and state fixed effects, the only way the percent eligible in this fixed sample changes is due to changes in the state eligibility rules. As documented in Currie and Gruber (1996), federal mandates during the late 1980s and early 1990s resulted in substantial increases for all states in the fraction of pregnant women and their children who would be eligible for Medicaid, though the magnitude of the increase varied widely according to initial

[9] We chose to define the group cells for Medicaid eligibility by race and age (in addition to state and year) because of the large racial and age-related differences that exist in insurance coverage and health behaviors. Furthermore, the race- and age-specific samples exploit differences in the income distribution across these factors. If there is a different distribution of income by race, then that variation helps identify the association between Medicaid eligibility and outcomes and results in more precise estimates. For instance, a given shift in federal poverty line (FPL)-based eligibility in a specific state may lead to differential shifts for different races due to differences in race-specific and age-specific income distributions. Thus, Medicaid eligibility constructed for race- and age-specific samples provides a measure of the policy instrument with greater and more accurate variation when matched to individual records, which raises the precision of estimates.

eligibility limits and state options regarding whether to offer coverage beyond the federally mandated minimum eligibility increases.

We modify the basic empirical model described above in several ways to address specific issues. First, in supplementary models we include state-specific time trends to adjust for the potentially less than perfect nature of the natural experiment. Inclusion of state-specific time trends (set of state fixed effects that are interacted with a linear measure for time in years) adjusts for the potential endogeneity of the Medicaid expansions if states with greater expansions have correlated linear time trends in health behaviors for other reasons. Note that these trends are in addition to other time-varying, state-specific controls in the model including the unemployment rate and health behaviors of college-educated married women. As we show later, adding state-specific trends has virtually no effect on estimates bolstering the plausibility of our research design.

Second, we limit the main analyses low-educated single mothers since this subgroup of the population is relatively more likely to be affected by the Medicaid eligibility expansions. Low-educated, single mothers have far higher Medicaid take-up rates and experienced larger shifts in insurance coverage relative to those with more education or those who are married (Dave et al. 2011, 2014).[10] In the same spirit, and as a placebo test, we estimate the model using a sample of higher-educated married pregnant women since they are far less likely to be affected by the expansions in Medicaid eligibility. Here too results suggest a valid research design, as almost all estimates for this group are not statistically significant and small.

[10] Medicaid participation among less-than-high-school educated pregnant women is 2.4 times greater relative to higher educated pregnant women, and 6.1 times greater among unmarried pregnant women relative to those who are married, based on the CPS.

Third, we allow the eligibility measure to have non-linear effects, which may be likely given that higher levels of eligibility are affecting women and children at increasingly higher income levels and with increasingly higher rates of private insurance and lower rates of being uninsured. At higher levels of eligibility, part of the increase in public coverage reflects a crowd-out of private coverage (see Dubay and Kenney 1997; Gruber and Simon 2008; Dave et al. 2011). In this instance, we expect progressively smaller effects on health behaviors because at higher levels of Medicaid eligibility, Medicaid take-up is associated greater shifts from private to public insurance, in which case there should be minimal changes in individual incentives, and smaller shifts from no insurance to insurance.

Fourth, we supplement the analyses and explicitly control for prenatal care visits and the adequacy of prenatal care in order to disentangle the direct ex ante moral hazard effect, which implies a reduction in healthy behaviors, from greater insurance-induced contact with the medical care community, which implies an increase in healthy behaviors, as shown in the theoretical framework above. In models that do not control for prenatal care, the estimated effect would conflate both of these counteracting effects.

5. Data

Our main analyses are based on individual birth records from the Vital Statistics Natality Files (NF). Detailed information on all individual births occurring in the 50 states and D.C. are submitted by hospitals to state vital registration offices, which is then reported to the National Center for Health Statistics (NCHS). Information on each birth includes date and place of birth along with the demographic characteristics of the mother such as age, race, education, marital status, and parity. We employ NF data for the years 1989 through 1997, covering pregnancies which started from 1988 through 1996, as this period enveloped some of the major Medicaid income eligibility expansions that took place and because earlier years did not contain information on certain prenatal behaviors. The primary sample is limited to women, with a high-school degree or less, between the ages of 18 to 39. This yields up to 18.6 million births for the main analytical sample. We employ additional checks in a sample of higher-educated married women contributing up to 6.3 million births.

We specifically measure two sets of health behaviors: 1) two measures of prenatal smoking (prenatal smoking participation, smoking more than 5 cigarettes daily on average); and 2) weight gain during pregnancy. The latter outcome captures decisions related to nutrition, caloric intake, and physical activity. Between 1970 and 1990, guidelines recommended a weight-gain of 20-25 pounds during pregnancy, for normal-weight mothers, to ensure adequate caloric intake and a healthy normal-weight infant (Institute of Medicine 2009). Revised guidelines in 1990 called for even greater weight-gain for some groups (25-35 pounds for pregnant women with normal pre-pregnancy body mass index, for instance).[11] Since we cannot observe pre-pregnancy weight in the natality data over our sample period, we also employ the two thresholds of weight gain that no one should fall outside regardless of their weight gain, which would be 15-40 pounds.

We also study three maternal health indicators during pregnancy that are related to health behaviors such as nutrition and physical activity. These are gestational diabetes[12],

[11] These guidelines were revised in 2009, in reflection of the obesity epidemic, for pre-pregnancy obese women, recommending their pregnancy-related weight gain to be limited to 11-20 pounds. They were in recognition of the fact that heavier women could gain less weight and still deliver a normal-weight infant.

[12] Prior to states using revised birth certificates starting in 2003, the data did not differentiate between pre-pregnancy and gestational diabetes. However, based on disaggregated data, almost 90% of these diabetes cases represent gestational diabetes.

anemia, and hypertension. While gestational diabetes is not explained by behaviors in many cases, its risk increases with being overweight/obese and with poor management of pre-pregnancy and prenatal blood sugar levels (at prediabetic-levels), which are linked to diet and physical activity. Furthermore, management of gestational diabetes involves modification of diet (e.g. meal spacing), reduced sugar intake, monitoring blood sugar before meals, exercise, and weight gain monitoring and control. Similarly, hypertension risk during pregnancy is increased by unhealthy diets (e.g. consumption of salty/fatty foods and caffeine), overweight/obesity, low/no exercise, smoking, and alcohol consumption. Anemia can be prevented or treated by consuming iron and folate containing supplements and by eating iron and folate rich foods such as spinach and meat.

We utilize two measures of prenatal care to account for insurance effects on health information through doctor contacts. The first captures the total number of prenatal care visits over the pregnancy period. The second is a measure of the adequacy of prenatal care based on the Kotelchuck adequacy criteria, which combines the timing of prenatal care initiation with the recommended number of visits adjusted for gestation. Specifically, a woman is considered to receive adequate prenatal care if she initiated care by the end of the 4^{th} month of her pregnancy and received at least 80% of the recommended number of visits during the time between initiation and delivery (Kotelchuck 1994).

Using the birth records from 1989-1997, we impute the year of pregnancy inception based on birth year and gestation, thus yielding pregnancies which were started between 1988-1996. We match Medicaid eligibility to the birth records by state, age group, race, and year of pregnancy.[13] All other time-varying state variables are matched based on state and year of pregnancy.

Table 1 presents means for all years and for the baseline period (1989), for all births and for subgroups based on maternal marital status and education. The prevalence of prenatal smoking is 33.2% among low-educated (below high school) unmarried mothers, compared to 2.9% among college-educated married mothers. On average, weight gain among higher-educated married mothers is about two pounds higher (31.1 pounds) compared with the lower-educated sample (29.2 pounds), supporting our premise that a decline in weight gain on average in response to Medicaid expansions would represent an adverse outcome. Higher-educated married mothers are also more likely to receive adequate prenatal care (88.8% versus 47%) and to have 3 more prenatal visits (average of 12.4 versus 9.3 visits) relative to lower-educated unmarried mothers. All of these differences are statistically significant. On average, 28.3% of pregnant women were eligible for Medicaid coverage over 1988-1996; this eligibility increased from 20% in 1988 to over 32% by 1996 (see Figure 1). We exploit these expansions across states and over time to assess how public insurance coverage may impact low-educated pregnant women's prenatal behaviors.

6. Results

6.1 Estimates for among Low-educated Mothers

[13] We match Medicaid eligibility based on year of pregnancy, rather than year of birth, for those records where gestation straddles adjacent years since prenatal smoking is most responsive during the first trimester (Colman, Grossman, and Joyce 2003; Colman and Joyce 2003). That is, if a woman continues to smoke beyond the first trimester upon learning that she is pregnant, then it is highly unlikely that her smoking status during later stages of her pregnancy would respond to Medicaid. Given that gestation in the birth records is likely measured with error, we also alternately imputed pregnancy year based on birth year and a standard gestation of 38 weeks for all births. Results are not sensitive to using this alternate measure.

Table 2 presents estimates of the reduced-form effect of expanding Medicaid eligibility for pregnant women on the prenatal smoking measures, pregnancy weight gain, and behavior-related health indicators of low-educated (high school graduate or less) pregnant women. For each health behavior, we estimate models without and with state-specific linear trends. Results are virtually the same, so we present only those without state-specific trends in the text (panel A) and include estimates with state-specific trends in the Appendix. It is reassuring that the direction and magnitudes of the estimates are not at all sensitive to these controls and evidence of a valid research design.[14]

Models in columns 1-2 suggest that Medicaid eligibility is positively and significantly associated with smoking. Specifically, estimates indicate that a 12 percentage-points increase in Medicaid eligibility, which is the approximate change that occurred over 1988-1996, is associated with a 0.8 percentage-point increase in the probability of prenatal smoking and a 0.7 percentage-point increase in the probability of smoking more than 5 cigarettes daily.[15] These effects are statistically significant, and the magnitudes represent approximately a 3% increase relative to the baseline mean smoking rates.[16] All models for smoking control for the state

[14] Estimates are also robust to controlling for state-specific quadratic trends (results available upon request).

[15] This effect includes both the intensive and extensive margins. With respect to the average number of cigarettes smoked daily (not reported), estimates suggest a significant increase of 0.8 cigarettes per day (associated with a 100% increase in Medicaid eligibility), with almost all of this effect being realized at the extensive margin.

[16] In theory, the increase in prenatal smoking can reflect a decrease in the likelihood of cessation among women who smoked prior to pregnancy as well as any increase in initiation. However, it is very unlikely that the results are driven by initiation. The majority of low-educated female smokers initiate daily smoking prior to age 18, and virtually all initiate prior to age 21. Our results are robust to excluding pregnant women ages 18-20 from the analyses. Furthermore, very few women start smoking during pregnancy. Hence, the increase in prenatal smoking should be interpreted symmetrically as a decrease in the likelihood of quitting smoking during pregnancy among women who were smokers prior to their pregnancy.

excise tax on cigarettes, and show significant negative effects of taxes associated with prenatal smoking consistent with the literature (Colman, Grossman, and Joyce 2003).[17]

Columns 3-5 present results for weight gain during pregnancy. These estimates suggest a decrease in weight gain of about 1.12 pounds (associated with a 100% increase in Medicaid eligibility) or approximately a 0.14 pound statistically significant decrease in weight gain associated with a 12 percentage-points increase in Medicaid eligibility for pregnant women; this translates to a 0.5% decline relative to the baseline mean for low-educated mothers. The expansions also appear to be associated with a leftward shift of the weight-gain distribution, as evidenced by the increase in the prevalence of women who are gaining below the minimum recommended threshold (15 pounds) and a decrease in the prevalence of women gaining above the maximum recommended threshold (40 pounds).

Estimates in columns 6-8 suggest an increase in behavior-related adverse gestational health indicators, though only the effect on diabetes is statistically significant. The effect magnitudes, for models with and without state trends, suggest a 3% increase in the prevalence of gestational diabetes associated with a 12 percentage-points increase in Medicaid eligibility.

Panel B of Table 2 assesses whether there are non-linear effects of Medicaid eligibility. Given that higher levels of eligibility are affecting individuals with increasingly higher income and rates of private insurance and lower rates of no insurance, Medicaid take up at these rates is likely to capture a shift in type of coverage rather than individuals becoming newly insured. Thus the incentives underlying ex ante moral hazard and changes in the information set due to physician contact should be much less affected if the individual is simply substituting public for

[17] The tax elasticity for prenatal smoking among pregnant women with a high education or below is estimated at -0.05.

private coverage.[18] We therefore expect effects on behaviors to diminish with expansions in eligibility. Estimates in panel B indicate significant non-linear effects and generally confirm this prediction, as evidenced by the negative coefficient of the quadratic eligibility terms.

Estimates in panel B, for instance, suggest that the marginal increase in the likelihood of prenatal smoking is 0.45 percentage point when eligibility is 0.20 but declines to 0.14 when eligibility is 0.30. Thus, the adverse effects of expanded coverage on health behaviors are stronger at lower levels of eligibility, which is consistent with the fact that more individuals are shifting from being uninsured to being insured at these levels (Dubay and Kenney 1997; Dave et al. 2011). The non-linear effects on the other smoking measures, weight gain, and gestational hypertension are also significant, and the inflection points for all of these effects generally occur at eligibility levels greater than 0.30, suggesting that, at least for the range of the expansions observed over the sample period, Medicaid is associated with adverse effects with respect to these outcomes. With respect to diabetes, the non-linearity is similarly suggestive of diminishing effects at higher levels of Medicaid eligibility, though these estimates are not statistically significant.

6.2 Estimates for Less-than-High School Educated Single Mothers

The above analyses pertain to all pregnant women with at most a high school education. Among this group, it was predominantly the *lowest-educated single* mothers who experienced the highest Medicaid take-up rates and the largest changes in insurance coverage, and are relatively more likely to be affected by the Medicaid eligibility expansions. The models in Table

[18] There may still be some shifts in incentives due to differences in cost-sharing, provider access, and other components between private insurance and Medicaid. The potential effects of these differences in program components are mixed. On the one hand, Medicaid coverage is much more generous than private insurance and typically involves no cost-sharing. However, provider networks for Medicaid may be more limited than private insurer networks due to lower reimbursement.

3 therefore restrict the sample to less-than-high school educated single mothers. Assuming a similar behavioral response, we expect the intention-to-treat estimates in Table 3 to be larger than those in Table 2 because of the larger "first stage" effect on coverage.

Comparing estimates in Table 3 with those in Table 2, we indeed find that the expansions increased smoking more among the lowest-educated single mothers relative to low-educated mothers in general and implicitly low-educated married mothers, who are less likely to be Medicaid eligible. Specifically, a 12 percentage-points increase in eligibility raises prenatal smoking by 1.2 percentage-points among less-than-high school educated single mothers; this compares to a corresponding 0.8 percentage points increase among mothers with a high-school degree or less. Similarly, the estimates for average weight gain (1.5 pounds increase associated with a 100% increase in Medicaid eligibility, corresponding to 0.2 pound or 0.6% increase associated with a 12 pct. points increase in eligibility) and gaining above/below the recommended thresholds are noticeably larger for this sub-population.

As the linear specification of eligibility may mask considerable heterogeneity over the observed range of the Medicaid expansions, Panel B in Table 3 presents the non-linear effects for the lower-educated single mothers. Specifically, we find that at an eligibility level of 0.20 (which roughly corresponds to the level in effect at the beginning of the sample period), the marginal increase is 0.6 for prenatal smoking, 0.4 for smoking more than 5 cigarettes daily, and 3.1 cigarettes for daily smoking consumption. All of these marginal effects are expectedly higher for this group of lower-educated single mothers relative to those reported in Table 3.

6.3 Adjusting for Prenatal Care

Estimates presented so far capture the reduced-form effect of the eligibility expansions for pregnant women on their health behaviors, which operates through both a potential ex ante moral hazard channel, an income effect and through counteracting shifts in the patient's perceptions regarding their illness probability and the productivity of self-protection due to insurance-induced contact with physicians. Models in Table 4 for low-educated mothers attempt to account for this latter pathway by directly controlling for the adequacy of prenatal care and the number of prenatal care visits over the pregnancy. These estimates, both linear and non-linear specifications of eligibility, are virtually unchanged from those in Table 2, which do not control for the measures of prenatal care. The implication is that the adverse effects of Medicaid on healthy behaviors are not offset by insurance-induced prenatal care and contact with healthcare professionals. Similar results are found when limiting the sample to single mothers who have not graduated from high school.[19]

While controlling for potential confounding factors (in this case, prenatal care) is a standard practice, Angrist and Pischke (2009) note that including such "mediators" in the specification is problematic because these mediators are themselves endogenous, and hence would lead to biased estimates. Thus, as an alternate to controlling for prenatal care, we also directly estimated the effect of the eligibility expansions on the joint probability between the

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[19] This contrasts with the study by Dave and Kaestner (2009), who find that insurance improves health behaviors through greater physician contact. Part of the reason why there may not be strong counteracting effects in our case relates to the difference in study populations. Dave and Kaestner (2009) investigate the effects of Medicare and their population of interest is the elderly upon receiving public insurance at age 65, whereas we study the Medicaid-eligible population of low-educated single mothers ages 18-39. For instance, Dave et al. (2008) study the direct effects of these expansions on prenatal care and find that a 20 percentage-points increase in eligibility is associated with an insignificant 0.06 additional prenatal visit, about half a percentage point increase (also statistically insignificant) in the probability of receiving adequate care, and a significant 0.3 percentage point decrease in late (3rd trimester) prenatal care initiation, among low-educated mothers. Hence, it does not appear that the expansions resulted in significantly higher contact between pregnant women and the medical care community, at least for the average mother, which may explain why the results are not sensitive to controlling for prenatal care.

various health behaviors and measures of prenatal care adequacy, via multinomial logit models (MNL). The marginal changes in these joint probabilities allow us to pick up potential interactions between these behaviors and contact with the medical profession, and assess both unconditional and conditional (on prenatal care) effects of the eligibility expansions on prenatal behaviors. These results (not presented) are qualitatively and quantitatively consistent (nearly the same) with those presented above.[20] Hence, our results do not indicate that prenatal care had any meaningful effects on smoking

6.5 Placebo tests

We estimated models for college-educated married mothers between the ages of 18-39, for whom the expansions in Medicaid eligibility should have minimal to null effects. Estimates are presented in Table 5. Notably, we do not find any economically meaningful or statistically significant effects of the expansions on their prenatal smoking or weight gain behaviors. This adds to other evidence (e.g., the absence of state-trends to matter) supporting the research design and bolsters the plausibility of our approach.

7. Discussion

[20] Specifically, we assessed movement of the probability density across four categories comprising combinations of adequate prenatal care and prenatal smoking (1: 1st trimester care + No smoking; 2: 1st trimester care + Smoking; 3: No 1st trimester care + No smoking; 4: No 1st trimester care + Smoking), and similar combinations of adequate prenatal care and weigh gain thresholds. With respect to smoking, the marginal effect suggest an increase in the joint probability of prenatal care and smoking (category 2) and the probability of prenatal care and no smoking (category 1) relative to the other two categories – thus an increase in early initiation, conditional on smoking. A 12 percentage-points increase in eligibility would move about 1.5% late initiators into early care, based on the MNL estimates. We also find that the expansions are associated with an increase in the probability of prenatal care and smoking (category 2) and the probability of no prenatal care and smoking (category 4) relative to the other two categories; thus Medicaid is associated with an overall increase in prenatal smoking (and, of more than 5 cigarettes daily), and it is validating that these effect magnitudes are highly similar to the OLS estimates (0.07 and 0.1) in Tables 2 and 3 for the two sub-populations. Turning to the MNL models that assess non-linear effects of eligibility, we find as before that the patterns and effect magnitudes diminish at higher levels of eligibility. MNL estimates are not reported, and results are available from the authors upon request.

Assessing the effects of the Medicaid program on health behaviors is important since state and federal governments have dramatically expanded Medicaid over the past two decades to provide insurance for an increasingly large proportion of poor and near-poor persons. The rationale for these expansions is to decrease the population that is uninsured, and consequently to increase the use of healthcare services and improve population health. However, besides anticipated effects on health services use, insurance coverage expansions may also result in meaningful unintended changes in health behavior, some of which reflect a worsening in primary prevention effort and an increase in risky behaviors. No previous research has directly evaluated the effect of Medicaid on behaviors among pregnant women. We provide the first such evaluation based on quasi-experimental variation in Medicaid expansions between states and over time in the late 1980s through mid 1990s.

Economic theory suggests three main effects of gaining health insurance coverage on health behaviors. One effect is a reduction in primary prevention activities because insurance reduces the price of curative medical care and therefore lowers the financial costs of illness (ex ante moral hazard). Another effect is from income gain through reduced out-of-pocket expenditures. Finally, insurance could alter health behaviors through greater contact with health providers.

We find robust evidence that Medicaid expansions were associated with an increase in prenatal smoking and a reduction in pregnancy weight gain for low-educated mothers. These effects are found whether we account for increases in prenatal care services or not suggesting no/little indirect effect of insurance on health behaviors because of increased contact with prenatal care providers. Specifically, an increase in Medicaid eligibility of 12 percentage points for pregnant women (approximately the magnitude of the expansion over the sample period) raised the likelihood of smoking during pregnancy by approximately 0.8 percentage point or 3% relative to the baseline mean. This is an average effect that masks considerable heterogeneity over the eligibility distribution. The marginal increase is larger (3 percentage points) at an eligibility level of 0.2, which is approximately the level that was in effect at the beginning of the sample period.

We note that these effects are intent-to-treat (ITT) effects since Medicaid take-up rates are typically far less than 100%. For instance, if we assume a Medicaid take-up rate of 50% (25%), then the above ITT estimate (for a 12 percentage point change in eligibility) needs to be scaled upwards by a factor of 16 (32) in order to derive the structural treatment-on-the-treated (TOT) effect of gaining Medicaid coverage. Doing so implies that actual Medicaid coverage for a low-educated mother who was previously uninsured raised the likelihood of prenatal smoking by about 12 (24) percentage points, or approximately 36% (67%) of the 1989 baseline prevalence among low-educated mothers. Implicit TOT effects rescaled in this manner should be interpreted with caution because small changes in the denominator (in this case the Medicaid take-up rate) and the underlying estimates can lead to large differences. Nevertheless, our finding is consistent with Baicker et al. (2013), who find that randomly-assigned Medicaid eligibility in Oregon is associated with an increase in smoking of about 6 percentage points with a confidence interval (-2.5 to 13.7 percentage points) that includes our back-of-the-envelope imputed treatment-on-the-treated estimate.

We also find consistent evidence that the expansions were associated with a decrease in pregnancy-related weight gain. The implications of this finding for maternal and infant health are a priori mixed because guidelines recommend a weight gain of 25 to 35 pounds for a woman who is normal weight pre-pregnancy, but at the same time gaining too much weight during pregnancy, especially for pre-pregnant overweight or obese women, may be risky for the mother and the infant. The average female in 1990 was overweight with a mean BMI of approximately 27, and current guidelines recommend pregnancy weight gain of 15-25 pounds for such women. Based again on a Medicaid take-up rate of 50% (25%), our estimates suggest that Medicaid coverage for a previously uninsured low-educated pregnant woman could lead to a decrease in weight gain by about 2 (4) pounds. Given that the average pregnant woman in our sample experienced a weight gain of about 30 pounds at baseline, this reduction may still place the pregnancy weight gain within or above recommended guidelines.

The adverse effects that we observe result from both ex ante moral hazard and income effects (as there is no evidence for an effect due to greater care). Reductions in out-of-pocket spending on healthcare as a result of Medicaid coverage will increase consumption of both risky and healthy behaviors. Gruber and Yelowitz (1999) find that expanding Medicaid eligibility for pregnant women and all children between 1984-1993 raised overall consumption expenditures, and Leininger et al. (2010) find similar increases in consumption spending due to the reduction in the family's out-of-pocket medical spending associated with expansions in the State Children's Health Insurance Program (SCHIP).

On average, reduction in out-of-pocket spending with switching from uninsured to Medicaid coverage is $700, [21] which represents a 9% increase in income.[22] Kenkel et al. (2014)

[21] These estimates are based on average out-of-pocket spending for non-Medicare Medicaid/publicly insured families with a health problem of $250, compared to about $1100-1200 with employer/other private coverage, and $550 without coverage (Tables 6 & 8 of http://www.commonwealthfund.org/~/media/files/publications/fund-report/2002/jun/family-out-of-pocket-

estimate an income elasticity of smoking at the extensive margin of 3.6 among low-income adults. While this is clearly a large estimate, we use it to assess the maximum amount of the smoking effect that may be due to income. Combining these estimates suggests that the potential income effect associated with the Medicaid expansion would lead to an increase in smoking by as much as 8.7 percentage points (or 26% of baseline mean in this group). This compares to the imputed TOT of 12 percentage points. So part of the increase in smoking, perhaps a large part of it, may be due to an income effect, but there remains an ex ante moral hazard effect too. Moreover, the potentially large income effect bolsters the plausibility of our estimate, which at first appears quite large. In fact, it is reasonable given the change in income and possible ex ante moral hazard effects.

The results from this study suggest that the Medicaid eligibility expansions may have reduced prevention efforts of low-educated pregnant women and increased their participation in unhealthy behaviors. These results highlight the importance of providing incentives to maintain prevention efforts, for instance by encouraging visits to the doctor, removing cost-sharing for preventive care, or capitalizing on the patient-physician contact to probe and encourage healthy behaviors, when designing public insurance program expansions in order to reduce unintended adverse behavioral effects. Most importantly, our results may explain why Medicaid expansions have not been associated with substantial improvement in infant health.

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spending-for-health-services--a-continuing-source-of-financial-insecurity/merlis_oopspending_509-pdf.pdf).

[22] Average annual personal income from all sources over the sample period was $7,650 for low-educated pregnant women identified in the CPS.

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Figure 1
Fraction of Pregnant Women Eligible for Medicaid Coverage
Natality Files: 1988 - 1996

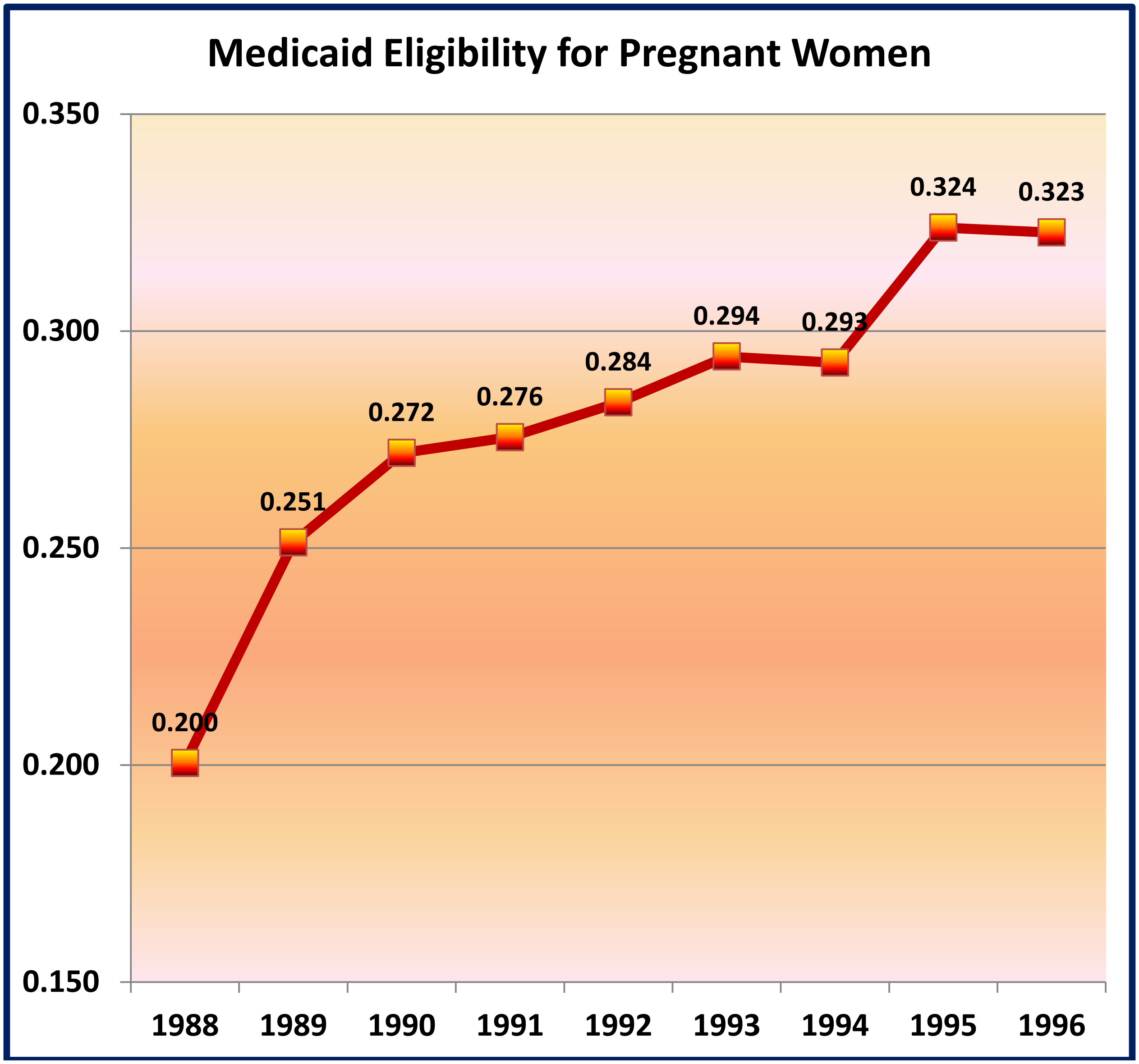

Table 1
Sample Means
Mothers Ages 18-39

Sample: Births	**1989-1997 All**	**1989-1997 High School & Below**	**1989-1997 Below High School & Unmarried**	**1989-1997 College & Above Married**	**1989 High School & Below**	**1989 Below High School & Unmarried**
Any prenatal smoking	0.160	0.226	0.332	0.029	0.263	0.402
Smoking > 5 cigarettes daily	0.119	0.171	0.249	0.019	0.204	0.311
Number of cigarettes smoked per day (including 0 for non-smokers)	1.891	2.752	4.027	0.279	3.370	5.177
Weight gain	30.520	30.116	29.182	31.062	29.779	28.453
Weight gain < 15 pounds	0.080	0.097	0.123	0.042	0.087	0.122
Weight gain > 40 pounds	0.167	0.174	0.171	0.140	0.155	0.150
Gestational diabetes	0.025	0.024	0.017	0.025	0.020	0.014
Gestational hypertension	0.031	0.029	0.022	0.030	0.027	0.021
Gestational anemia	0.019	0.021	0.027	0.013	0.021	0.029
Adequate prenatal care	0.726	0.644	0.470	0.888	0.606	0.384
Prenatal care visits	11.306	10.721	9.262	12.408	10.374	8.441
Medicaid eligibility for pregnant women	0.283	0.300	0.342	0.235	0.240	0.285
Age	26.968	25.346	23.242	30.731	25.170	23.137
Some high school education	0.196	0.343	1	0	0.326	1
High school graduate	0.375	0.657	0	0	0.674	0
Some college	0.224	0	0	0	0	0
College or above	0.205	0	0	1	0	0
Married	0.720	0.611	0	1	0.663	0
White	0.799	0.777	0.673	0.878	0.772	0.631
Black	0.153	0.181	0.293	0.054	0.189	0.334
Other Race	0.048	0.042	0.034	0.068	0.039	0.035
Hispanic	0.162	0.228	0.352	0.045	0.185	0.305
State unemployment rate	6.123	6.203	6.333	6.004	5.518	5.504
State private insurance rate among single males with incomes below 200% FPL	0.592	0.586	0.578	0.602	0.609	0.602
State excise tax on cigarettes, in cents per pack	29.024	28.511	29.504	29.738	19.788	19.880
Observations	33,685,308	18,632,637	3,175,277	6,309,269	2,100,145	312,725

Notes: Observations listed represent the maximum number of observations for the given sample. Some variables have fewer observations due to missing information. Samples represent births occurring over the period denoted for pregnancies commencing between 1988-1996.

Table 2
Mothers 18 - 39, High School Educated or Below
Effects of Medicaid Eligibility for Pregnant Women on Health Behaviors
Linear and Non-Linear Effects

Outcome	Smoke	Smoke >5 Cigarettes Daily	Weight Gain (pounds)	Weight Gain < min. recommended	Weight Gain > max. recommended	Hyper-tension	Anemia	Diabetes
Model	1	2	3	4	5	6	7	8
Panel A								
Eligibility	0.0688***	0.0580***	-1.1234***	0.0163*	-0.0177***	0.0015	0.0049	0.0048*
	(0.0222)	(0.0195)	(0.3140)	(0.0090)	(0.0065)	(0.0024)	(0.0040)	(0.0024)
Adj. R2	0.111	0.103	0.034	0.022	0.015	0.004	0.009	0.009
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B								
Eligibility	1.0419***	0.7367***	4.9791***	0.0441***	0.2349***	0.0297***	-0.0114	0.0200
	(0.1349)	(0.1124)	(0.7905)	(0.0147)	(0.0233)	(0.0065)	(0.0072)	(0.0131)
Eligibility-squared	-1.5035***	-1.0483***	-9.5612***	-0.0437**	-0.3961***	-0.0454***	0.0264*	-0.0245
	(0.2011)	(0.1667)	(1.1951)	(0.0188)	(0.0387)	(0.0103)	(0.0143)	(0.0185)
Adj. R2	0.113	0.103	0.034	0.022	0.015	0.004	0.009	0.009
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,183,083	13,028,195	12,901,579	12,754,657	12,754,657	17,154,866	17,154,866	17,154,866

Notes: All models control for maternal age, education, race, indicators for education* race, ethnicity, state unemployment rate (contemporaneous, lag, lead), state private insurance rate among low-income (<200% FPL) single males, outcome mean among college-educated married pregnant women between the ages of 25-39, and state*race, state*age category (18-24, 25-29, 30-34, 35-39), year*race, and year*age category effects. Models for weight gain also control for indicators for gestation in weeks. Standard errors are clustered within state cells and reported in parentheses. Asterisks denote statistical significance as follows: ***p-value ≤ 0.01; **0.01 < p-value ≤ 0.05; *0.05 < p-value ≤ 0.10.

Table 3
Mothers 18 - 39, Less-than-High School Educated, Unmarried
Linear & Non-Linear Effects

Outcome	Smoke	Smoke >5 Cigarettes Daily	Weight Gain (pounds)	Weight Gain < min. recommended	Weight Gain > max. recommended	Hyper-tension	Anemia	Diabetes
Model	1	2	3	4	5	6	7	8
Panel A								
Eligibility	0.0959***	0.0814**	-1.4610***	0.0249*	-0.0286**	0.0009	0.0073	0.0007
	(0.0323)	(0.0308)	(0.5032)	(0.0142)	(0.0127)	(0.0036)	(0.0077)	(0.0036)
Adj. R2	0.186	0.185	0.048	0.026	0.022	0.004	0.011	0.011
Panel B								
Eligibility	1.2313***	0.8021***	2.8662**	0.0130	0.1578***	-0.0015	-0.0162	-0.0366***
	(0.2157)	(0.1769)	(1.4215)	(0.0192)	(0.0418)	(0.0060)	(0.0105)	(0.0106)
Eligibility-squared	-1.5236***	-0.9661***	-5.9116***	0.0164	-0.2547***	0.0034	0.0346*	0.0549***
	(0.2706)	(0.2229)	(1.7811)	(0.0307)	(0.0529)	(0.0082)	(0.0190)	(0.0142)
Adj. R2	0.187	0.186	0.048	0.026	0.022	0.004	0.011	0.011
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,086,831	2,051,850	1,962,883	1,933,615	1,933,615	2,927,940	2,927,940	2,927,940

Notes: See Table 2.

Table 4
Mothers 18 - 39, High School Educated or Below
Linear & Non-Linear Effects
Controlling for Prenatal Care

Outcome	Smoke	Smoke >5 Cigarettes Daily	Weight Gain (pounds)	Weight Gain < min. recommended	Weight Gain > max. recommended	Hyper-tension	Anemia	Diabetes
Model	1	2	3	4	5	6	7	8
Panel A								
Eligibility	0.0673***	0.0576***	-1.2543***	0.0175*	-0.0208***	0.0015	0.0040	0.0046*
	(0.0212)	(0.0193)	(0.3525)	(0.0088)	(0.0072)	(0.0023)	(0.0040)	(0.0024)
Adj. R2	0.114	0.105	0.041	0.024	0.019	0.005	0.010	0.014
Panel B								
Eligibility	1.0179***	0.7208***	5.0999***	0.0428***	0.2363***	0.0259***	-0.0119	0.0244*
	(0.1329)	(0.1102)	(0.8875)	(0.0146)	(0.0250)	(0.0065)	(0.0075)	(0.0126)
Eligibility-squared	-1.4745***	-1.0283***	-9.9802***	-0.0397**	-0.4042***	-0.0457***	0.0256*	-0.0319*
	(0.1991)	(0.1641)	(1.3404)	(0.0185)	(0.0418)	(0.0107)	(0.0147)	(0.0179)
Adj. R2	0.116	0.106	0.041	0.024	0.019	0.009	0.010	0.014
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,692,164	12,550,251	12,553,016	12,412,200	12,412,200	16,413,761	16,413,761	16,413,761

Notes: All models control for the number of prenatal care visits, and the adequacy of prenatal care based on the number of visits and initiation/timing (using the Kotelchuck criteria). Also see notes to Table 2.

Table 5
Mothers 18 - 39, College Educated & Above, Married
Effects of Medicaid Eligibility for Pregnant Women on Health Behaviors

Outcome	Smoke	Smoke >5 Cigarettes Daily	Weight Gain (pounds)	Weight Gain < min. recommended	Weight Gain > max. recommended	Hyper-tension	Anemia	Diabetes
Model	1	2	3	4	5	6	7	8
Panel A								
Eligibility	-0.0094	-0.0091	0.0822	-0.0015	0.0041	0.0095*	-0.0032	0.0046
	(0.0114)	(0.0114)	(0.5014)	(0.0063)	(0.0124)	(0.0054)	(0.0064)	(0.0043)
Adj. R2	0.011	0.013	0.015	0.018	0.006	0.003	0.005	0.004
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B								
Eligibility	-0.0326	-0.0293	0.4362	-0.0060	0.0067	0.0129**	-0.0045	-0.0023
	(0.0199)	(0.0203)	(0.3627)	(0.0065)	(0.0092)	(0.0055)	(0.0070)	(0.0046)
Adj. R2	0.014	0.018	0.016	0.018	0.007	0.003	0.005	0.004
State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State specific trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C								
Eligibility	-0.0300	-0.0272	-0.5215	0.0032	-0.0065	0.0143***	-0.0033	0.0070
	(0.0200)	(0.0204)	(0.4143)	(0.0067)	(0.0091)	(0.0052)	(0.0064)	(0.0044)
Adj. R2	0.014	0.018	0.015	0.018	0.007	0.003	0.005	0.004
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State specific trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,666,321	4,657,208	4,752,414	4,728,756	4,728,756	5,747,146	5,747,146	5,747,146

Notes: See notes to Table 2.

Appendix
Mothers 18 - 39, High School Educated or Below
Effects of Medicaid Eligibility for Pregnant Women on Health Behaviors
Controlling for State-specific Trends

Outcome	Smoke	Smoke >5 Cigarettes Daily	Weight Gain (pounds)	Weight Gain < min. recommended	Weight Gain > max. recommended	Hyper-tension	Anemia	Diabetes
Model	1	2	3	4	5	6	7	8
Panel A								
Eligibility	0.0833***	0.0573***	-0.9184**	0.0194**	-0.0050	0.0019	0.0009	0.0047**
	(0.0193)	(0.0161)	(0.4155)	(0.0080)	(0.0081)	(0.0024)	(0.0032)	(0.0021)
Adj. R2	0.111	0.103	0.034	0.022	0.015	0.004	0.010	0.009
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State specific trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B								
Eligibility	1.0912***	0.7653***	5.2775***	0.0482***	0.2508***	0.0294***	-0.0183*	0.0202
	(0.1315)	(0.1100)	(0.8719)	(0.0143)	(0.0240)	(0.0067)	(0.0102)	(0.0125)
Eligibility-squared	-1.5838***	-1.1122***	-9.8560***	-0.0459**	-0.4072***	-0.0450***	0.0314*	-0.0253
	(0.2011)	(0.1691)	(1.2120)	(0.0172)	(0.0371)	(0.0110)	(0.0168)	(0.0184)
Adj. R2	0.113	0.104	0.034	0.022	0.015	0.004	0.010	0.009
State*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Race	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State specific trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,183,083	13,028,195	12,901,579	12,754,657	12,754,657	17,154,866	17,154,866	17,154,866

Notes: All models control for maternal age, education, race, indicators for education* race, ethnicity, state unemployment rate (contemporaneous, lag, lead), state private insurance rate among low-income (<200% FPL) single males, outcome mean among college-educated married pregnant women between the ages of 25-39, and state*race, state*age category (18-24, 25-29, 30-34, 35-39), year*race, and year*age category effects. Models for weight gain also control for indicators for gestation in weeks. Standard errors are clustered within state cells and reported in parentheses. Asterisks denote statistical significance as follows: ***p-value ≤ 0.01; **0.01 < p-value ≤ 0.05; *0.05 < p-value ≤ 0.10.