Managed Care Mandates and Birth Outcomes:

Who Benefits and Does the Model Matter*

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Abstract: The 2010 health reform seeks to expand health coverage to 30 million people and many will enroll in managed care plans. We exploit Medicaid manage care mandates in California to examine the effect of managed care on prenatal care access and birth and pregnancy outcomes. There is no improvement for the extremely disadvantaged, but access and birth outcomes improves for the moderately disadvantaged. The results suggest that a managed care option may be key for improving access to prenatal care and birth outcomes as health care is expanded to the near poor under the health care reform.

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Reducing the number of people in the U.S. without health insurance is one of the primary goals of the recent health care reform embodied in the 2010 Patient Protection and Affordable Care Act (ACA). To achieve this goal, the government expects to extend insurance to 30 million people through federal subsidies to families with income less than 400 percent of the federal poverty line and by expanding Medicaid eligibility. This expansion will largely affect the near poor whose incomes are just above the cut off for Medicaid and work in jobs that do not provide health care benefits. These newly insured are likely to be enrolled in managed care plans since managed care is a dominant form of health care in the US and covers more than 70 percent of Medicaid beneficiaires. Examining the effect of managed care on prenatal care and birth outcomes for these near poor is particularly important since having a healthy start to life may help reduce health problems and even poverty later in life. Past research shows managed care, as apposed to a traditional fee for service (FFS) system, has not been effective at improving prenatal care and birth outcomes for mothers most likely to be entrenched in welfare.[1] However, little is known about the effect of managed care on the health of the near poor, the group more likely to gain insurance through the ACA.

It is argued that compared to the traditional FFS system, managed care provides incentives to keep patients healthier and costs low, so health outcomes may be better under a managed care system. One way managed care may keep patients healthier is by changing the way providers are paid. Instead of reimbursing providers for each service, as happens under a FFS system, providers are paid a capitated fee—a fixed payment per patient in exchange for covering the health care needs of each patient. Capitation creates an incentive to provide fewer services and keep patients healthy through prevention. Manage care may further facilitate preventive care by assigning members a provider upon enrollment rather than allowing them to wait until they are sick to find a provider. In addition, manage care may improve quality of care over a FFS system as care is more easily coordinated across health care providers.[2] Managed care in general has been criticized, however, for restricting access to necessary care and providing insufficient preventive care in order to reduce costs. So the ability of managed care to improve outcomes over a FFS is an empirical question.

In this paper, we estimate the effect of Medicaid managed care (MMC) on prenatal care, birth outcomes, and pregnancy complications or outcomes. Using longitudinal birth record information from 1991-2001, we exploit California state mandates that required some counties to switch a portion of their Medicaid patients from FFS to managed care plans and examine the intent-to-treat effects by comparing counties mandated to use managed care with those in counties that were not using a double difference model. We include year and zip code fixed effects, specific county time trends, and mother and child characteristics to control for non–time-varying and time-varying characteristics. As a robustness check we also control for county level trends in mother's demographic characteristics, welfare expenditures, and employ a triple difference model that more robustly controls for differential non-linear secular trends between treatment and comparison counties.

We disaggregate the analysis for two groups: unmarried mothers with less than 12 years of education, and all other Medicaid mothers. Table 1 shows that Medicaid women aged 20-45 who are unmarried and have less education are poorer and have a lower employment rate than all

[1] See Duggan (2004), Kaestner, Dubay, and Kenny (2005), and Aizer, Currie, and Moretti (2007) for recent examples.

[2] A managed care plan may not find it profitable to provide preventive care if the beneficiaries are likely to change health care plans before the benefits of their improved health are reaped.

other Medicaid women. We refer to the first group as the "extremely disadvantaged" since on average their income falls below 100 percent of the federal poverty line and the latter as the "moderately disadvantaged" since on average their income is just above 100 percent of the federal poverty line at 119 percent. We break the analysis into these two groups since (1) less educated, poorer, and partnerless women are less likely to seek prenatal care and are at risk of worse birth outcomes so program effects may differ between the two groups (McDonald and Coburn 1988, Keily et al. 1994), and (2) as table 1 highlights, the socio-economic characteristics such as income, education, employment, and place of residence of the moderately disadvantaged Medicaid women are more similar to women who do not have health insurance. As a result, program effects for the moderately disadvantaged may better represent the population of uninsured likely to be covered through the health reform act. We also examine the results by race and ethnicity—black, white, Hispanic—since health outcomes are know to vary for these groups even holding constant demographic characteristics.

California experimented with different managed care models, and we examine two types: the County Organized Health System (COHS), that provides only the public plan to its' beneficiaries, and the Two Plan Model (TPM) that provides a choice of enrolling in the public or private managed care plan. Separating results by models may be important since competition between plans could affect the quality of health care, and the private plan may further improve quality of care by streamlining Medicaid beneficiaries into the same care as private patients.

Similarly to previous research, we find no positive effects of MMC for the extremely disadvantaged. However, there are some positive effects of MMC for the moderately disadvantaged. In particular, we find that the TPM model brought about an increase in access to prenatal care and improved some birth outcomes though mainly for whites.

This is not the first paper to examine the effects of MMC on prenatal care access and birth outcomes. However, this paper makes a number of important contributions. First, we look at the moderately disadvantaged and argue that California may be uniquely placed for examining effects of the MMC mandates on this group. This extension is important, as it allows us to examine a group that may be have benefitted more for managed care. Second, we examine effects by race and ethnicity since access, and birth and pregnancy outcomes are known to vary by race. Third, we separate effect by type of managed care model to determine if the model matters. Finally, we control for welfare reform, which overlapped with the introduction of managed care, and has been shown to negatively affect birth outcomes and health care utilization (Kaestner and Lee 2005, Bitler, Gelbach and Hoynes 2005).

I. Previous Literature

While the early evidence on the impact of MMC did not adequately control for endogeneity issues, there are three notable exceptions. First, Duggan (2004) investigates the effect of MMC in California between 1993-1999. Applying an individual fixed-effect model to Medicaid expenditure data for welfare recipients, he finds that expenditures increased with MMC, but increased most in COHS counties. Using hospital discharge data on the entire Medicaid population, he finds no effects on preterm births or infant mortality. A follow-up study on the US also finds that MMC did not reduce spending (Duggan and Hayford 2011)

Second, Kaestner, Dubay, and Kenny (2005) examine the effect of switching from FFS to MMC on a national sample of unmarried mothers who have fewer than 12 years of education.

Using county and year fixed-effects, they find that MMC had either no effect or a negative effect on access to prenatal care and birth outcomes depending on race and ethnicity.

Third, Aizer, Currie, and Moretti (2007) examine the effect of switching from FFS to MMC in California. They restrict their sample to births to unmarried mothers born in the U.S. with 12 or less years of education and examine the effect on all mothers in this groups, not just on Medicaid. They further restrict their sample to mothers with at least two births over the period to control for unobservable mother characteristics with maternal fixed effects.[3] They find that MMC led to later initiation of prenatal care and worse birth outcomes, such as increased incidence of low birthweight, preterm babies, and neonatal death in both TPM and COHS counties. The population examined in Aizer, Currie, and Moretti (2007) may be worse off than the extremely disadvantaged group in this paper because the maternal fixed effects means that mothers had to remain unmarried and with low education for an extended period of time.

Both Kaestner, Dubay, and Kenny (2005) and Aizer, Currie, and Moretti (2007) as well other other papers in the literature on the effects of MMC limited their sample to unmarried mothers with less education (our "extremely disadvantaged" group) in order to restrict the sample of women to be more likely to be on welfare. They make this restriction because Medicaid receipients on welfare were forced to switch to managed care while many other Medicaid receipents stayed in the FFS system or could voluntarily move to managed care (see section IIB for more details). While in most of the country the vast majority of welfare recepients are unmarried,[4] this is not the case for California. According to the 2000 census, in California approximately 40 percent of mothers with a child under the age of one who received some welfare payments were married. Using 1993/94 Survey of Income and Program Participation data, McCurdy and O'Brien-Strain (1997) report that of families dependent on Aid to Families with Depending Children (AFDC – the cash welfare program) more than 30 percent were from married parent familes and that about half of the heads completed high school. This is not surprising since California's welfare program for married families with an unemployed parent (AFDC-UP) provided some of the most generous benefits nation wide and was the largest program of all states in the 1990s.[5] As such, California represents a unique opportunity to examine the effects of MMC on the moderately disadvantaged since many women in this group were on welfare and were mandated into managed care.

[3] Identification of MMC in the maternal fixed-effect model comes from differences in the outcome from the first and second births. The second birth likely took place after welfare reform when time limits for welfare and work requirements were in place and have been shown to negatively affect birth outcomes (Kaestner and Lee 2005). Welfare reform should be controlled for in their model by the comparison group (FFS counties) as long as mothers in FFS and managed care counties were affected similarly by the welfare reform.

[4] Prior to the 1990s, cash welfare has traditionally been for single-parent families.

[5] The 1994 Green Book indicates that more than half of all the expenditures for AFDC-UP programs nation wide went to California, that the AFDC-UP benefits were high in California compared to other states, and higher on average than those received by family on AFDC in California, and that in California more than 20 percent of all recipients on either AFDC or AFDC-UP were in AFDC-UP. In addition, California was one of 8 states to allow the main income earner of an AFDC-UP family to work more hours than the national norm (Committee on Ways and Means US House of Representatives, 1994).

II. Medicaid Managed Care Background

A. Medicaid Mananged Care Rollout in California in the 1990s

In 1993, the California Department of Health Services presented a plan for MMC adoption in "The Department of Health Service's Plan for Expanding Medical Managed Care" with a goal of enrolling 2.8 million beneficiaries or 50 percent of the Medicaid population into managed care by the end of 1996 (CDHS 1993).[6] The plan required 17 of the state's 58 counties to adopt managed care. The state decided which counties would be required to adopted managed care mainly according to the size of the county's Medicaid population (minimum of 45,000 Medicaid beneficiaries) and the availability of private managed care already in place (CDHS 1993). The fact that certain counties were mandated into managed care while other counties continued with FFS Medicaid provides a potential comparison group that is not self-selected. These mandates significantly increased the percent of Medicaid recipients on managed care, from less than 15 percent in 1991 to 52 percent (or over 5.8 million beneficiaries) by 2002.[7]

California has three main MMC models: the county organized health system (COHS), the two-plan model (TPM), and Geographic Managed Care (GMC). COHS is a noncommercial county-operated managed care system referred to as the local initiative. This plan was required to contract with the network of providers who traditionally provided care to Medicaid beneficiaries, and only served the Medicaid population (McCall et al. 2000). Federal legislation passed in 1991 limited the number of COHS to five and no more than 10 percent of the state's population (Draper, Gold and Hudman, 1999).

In an effort to improve access to mainstream health care and keep intact the traditional network of providers, the state created TPM. Under TPM, the county's Medicaid beneficiaries could choose between a commercial managed care plan or the local initiative. The county choose the commercial managed care plan through a competitive bidding process (McCall et al. 2000) and encouraged but did not require the plan to contract with the traditional network of providers. The commercial plan was included to introduce competition into the MMC market, but the two plans do not compete on price, just quality as the rates were set by the state.

Geographic Managed Care (GMC), contracts with several commercial managed care organizations. We do not examine this model since Sacramento was already piloting the GMC model prior to the mandates, and San Diego was originally designated as a TPM county, but community leaders lobbied for a GMC model.

The planning document stipulated that of the 17 counties mandated into managed care, three counties could adopt COHS (Orange, Santa Cruz, and Solano) and rest had to adopt TPM. The Solano COHS was later expanded to include Napa and the Santa Cruz COHS to include Monterey. Since Napa and Monterey were not in the strategy document we remove them as a robustness check. All counties were expected to have their MMC plans operational by 1996, though three counties missed this deadline (Contra Costa, Los Angeles, and Stanislaus). Table 2 provides information on the date each county started managed care, the type of managed care adopted, the total population and percent of Medicaid beneficiaries in managed care to 2000.

The planning document is not clear on how the state decided which counties would adopt COHS and TPM. However, given that the state created TPM in part to circumvent the federal

[6] Prior to that time, California's Medicaid program operated predominately on a FFS basis, though Santa Barbara and San Mateo, had mandatory MMC in the 1980s as demonstration projects.

[7] Statistics calculated by author using the Medicaid Eligibles Extract File provided by the Medicaid Care Statistics Section at the California Department of Health Services.

limitations on the percent of Medicaid beneficiaries that could be covered under COHS, county characteristics are not necessarily correlated with model type. However, according to 2000 census data, on average the population for TPM counties was higher than COHS counties, and FFS counties at 1,705,475 compared to 732,712 and 114, 585. Though the median household income was higher for COHS counties than for TPM counties or FFS counties at $54,992 compare to $46,821 and $39,210. It is possible that managed care is more successful in areas with larger or denser populations so as a robustness check we drop small and large counties.

B. MMC Coverage

Not all Medicaid beneficiaries were mandated into managed care. According to an aid code chart from the California Department of Health (CDHS, 2007), welfare recipients, those who were recently on welfare but no longer qualified, and those whose financial resources quality them for welfare but are not on welfare, as well as some other smaller aid codes were mandated into managed care. Medicaid beneficiaries that stayed in the FFS system included pregnant women who were undocumented and those whose incomes were too high to receive any welfare benefits but income still below 200 percent of federal poverty line (FPL).

Exact information on the percent of births covered by managed care is not available. However, we can estimate the percent of births covered by managed care in TPM and COHS counties by combining information on the percent of births by aid codes from Rains (2002) with information on managed care status for each aid code from the aid code chart (CDHS, 2007).[8] We determine that in COHS counties about 77% of women who delivered a baby were mandated into managed care while the rest remained in FFS. In TPM counties, about 68% of all births were covered by managed care, 25% by FFS, and for 7% of births they are a mix of managed care, FFS or voluntary movement to managed care (See Appendix Table 1 for percent by aid category). A number of the aid codes related to children were designated as FFS or voluntary managed care enrollment. As a robustness check we drop all children so the percent covered by managed care will be higher, and the percent in voluntarily managed care is less than three percent.

C. Goals of Managed Care: Control Costs and Improve Health Outcomes

The state's objectives for introducing managed care were to control costs and to improve access and quality of care (McCall et al. 2000, CMMS 2010). There are a number of ways managed care might achieve these goals. The common argument is that capitation under managed care provides an incentive for providers to keep patients healthy, for example by improved preventive care, nutrition and smoking cessation programs, and early detection of illness. The hope is that if patients are paired with a physician who has an incentive to manage their care, they will get the preventive care they need, seek care earlier in an illness, and thereby improve health status and reduce the need for expensive curative care including hospitalization.

Another important aspect of managed care is that it changes who is responsible for finding a doctor. Under FFS Medicaid, it is the patient's responsibility to find a doctor. This can be a difficult task because many doctors don't participate in Medicaid or take only a limited number of patients since the reimbursement rate is relatively low. As a consequence, patients often forgo care or go to an emergency room. Under managed care, patients are automatically enrolled in the managed care system, and it is the plan's responsibility to ensure that every member has a

[8] Aid codes for the undocumented are not in the estimates, since foreign-born women are dropped from the sample.

primary care physician and access to a full range of specialty physicians. So patients may seek care earlier and have more preventive care, which may help them stay healthier.

In addition, Medicaid believed that patient care quality could be better assured and monitored in a managed care environment (CDHS, 1993) since managed care providers are systematically linked in a manner that allows quality of care to be rationally assessed and accountability for care to be monitored. As a condition of entering into a managed care contract, managed care plans agreed to quality assurance requirements beyond those in FFS plans (CDHS, 1993).

Finally, commercial managed care plans contracted in the TPM model could further improve quality of care by streamlining Medicaid beneficiaries into higher quality care provided to non-Medicaid beneficiaries. The quality of care may be higher in the private managed care plans if the demands from the non-Medicaid patients are higher (e.g. in terms of access of technology) or because reimbursement rates are higher for non-Medicaid patients.

D. Welfare Reform

Since Medicaid eligibility is in part tied to welfare eligibility, we need to understand the welfare reform that occurred in the middle of the study period. In 1996 Congress eliminated the Aid to Families with Dependent Children (AFDC) and replaced it with Temporary Assistance for Needy Families under the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). The timing of the welfare reform in California varied by county, though most counties finished transferring the AFDC caseload to the CalWorks program at some point in 1998 (Ebner et al. 1999) so the timing of welfare reform is correlated with MMC introduction.

This federal reform led to many changes, including lifetime limits for welfare assistance and stronger work requirements. CalWorks set a 60-month limit on cash assistance (adults only) starting in January 1998. However, new recipients are limited to 18 continuous months and AFDC recipients to 24 continuous months (Zellman et al. 1999). These changes may have led to changes in the composition of the population on welfare.

Work requirements are not new in California, but past job requirements applied to two-parent families or to families with no child under age six. Under CalWorks only single-parent households with a child between the ages of 12 weeks to a year (county decides) are exempt from the work requirements. This change in the work requirements for mothers with young children may affect the ability of mothers who have a child to seek regular prenatal care.[9]

Research indicates that PRWORA may have had a negative effect on prenatal care access and birth outcomes for the U.S. as a whole (Kaestner and Lee, 2005). Given that implementation of CalWorks was correlated MMC in some counties results may be biased. To test for this potential correlation, we control for county per-capita welfare expenditures.

III. Data

We exploit 1991 to 2001 vital statistics data from the Birth Statistical Masterfile available from the California Department of Health Services, Office of Health Information and Research.[10] The birth statistics dataset contains information on all live births reported on birth certificates in California. It includes information on the race, education, residential zip code of the mother, and mother's state of birth, as well as child information such as county of birth, sex, birth date, and birth order. Welfare status and income data are not available. Lastly, the data provide

[9] See Kaestner and Lee (2005) for a longer description of the possible effects of PRWORA.
[10] We use the unidentified version that does not include personal identifiers.

information on insurance status for prenatal care and delivery separately. This allows us to restrict our sample to mothers who were insured by Medicaid for both prenatal care and delivery.

Information on county-level welfare expenditures and county population data are from the Bureau of Economic Analysis Regional Economic Accounts (http://www.bea.gov/regional/spi/). Family assistance expenditures (henceforth referred to as welfare expenditures) in this data set include county expenditures for AFDC/TANF and emergency assistance programs that receive federal matching funds. Supplemental security income is measured separately and not included in the measure of welfare expenditures. Since the payment structure is similar across counties in California, higher/lower welfare expenditures represent a higher/lower beneficiary caseload.

A. Analysis Sample

We restrict our sample to singleton births, since multiple births are likely to be preterm or low birthweight for reasons unrelated to use of prenatal care or the introduction of managed care. We exclude all births to mothers whose residential zip code was not in California or who worked for the Armed Forces. In addition, we restrict the sample to mothers who were covered by Medicaid for both prenatal care and delivery, and drop births for which the switch to managed care came during pregnancy; this allows us to focus on the effect of managed care on birth outcomes for which both prenatal care and delivery were provided under a managed care system. Finally, since undocumented women are not mandated into MMC, and are not eligible for federal health benefits under the new health reform act, we only examine the effect of MMC on native-born women. While not all foreign-born women are undocumented, it was estimated that approximately 39 percent of all Medicaid birth were to undocumented women in 2000, and that more than 50 percent of births to Hispanic mothers were to undocumented mothers the same year (Rains, 2002). This leaves us with a total of 913,77 births to Medicaid mothers with non-missing information on either education or marriage status. Of these births, 26 percent are in the extremely disadvantaged group and 73 percent in the moderately disadvantaged group. The breakdown of births by managed care model is 66 percent in TPM counties, 7 percent in COHS[11] counties, 15 percent in FFS counties and 12 percent in GMC counties. The breakdown of extremely and moderately disadvantaged is similar across managed care models. Note we do not use GMC counties in the main analysis due to selection issues but do in a robustness check.

B. Outcome measures

We examine the effects of MMC access to prenatal care, birth outcomes, and pregnancy complications or outcomes. We measure access to care by the percent of women who received their first prenatal care visit in the first trimester of their pregnancy (*First Trimester*). Timeliness of the first visit is important, since providers gather baseline data on maternal weight, abdomen growth, and blood pressure and give information on the effects of good nutrition and smoking on the health of the baby so positive behaviors can begin earlier.

We investigate three birth outcomes as well as a number of pregnancy complications that we use as a proxy for prenatal care quality. The birth outcomes are low birthweight (*LBW*, less than 2500 grams at birth), preterm delivery (*Preterm Birth*, delivery before 37 gestational weeks), and fetal distress during labor.[12] The pregnancy complications include indicator variables for smoking, anemia, diabetes, and pre-eclampsia during pregnancy (a marker for high blood

[11] Santa Barbara and San Mateo are not included in COHS since they began managed care before the mandates.
[12] Fetal distress during labor is is commonly used to describe low oxygen levels of the fetus during birth process.

pressure), and herpes during labor.[13] These are fairly standard pregnancy complications monitored during pregnancy and are generally preventable and/or treatable with quality prenatal care. We use these pregnancy complications as a proxy for prenatal care quality. These complications are also risk factors for preterm delivery and low birthweight.[14] However, it is unclear whether improvements in these risk factors or an increase prenatal care will lead to changes in preterm delivery or low birthweight since the actual causes of preterm delivery and low birthweight are not well understood, and there is not a consensus in the medical literature on the effectiveness of prenatal care (Institute of Medicine 2007, Bitler and Currie 2005). We create a pregnancy complication index that is simply the number of complications, but present results for each component of the index when we find significant results for a particular subgroup. The index ranges from 0-5 and higher values represent more complications.

C. Descriptive Statistics

The means of the dependent variables and demographic characteristics for mothers with Medicaid insurance in 1991 are presented in Table 3 by insurance type for the extremely and moderately disadvantaged. On the whole, the moderately disadvantaged were more likely to initiate prenatal care in the first trimester and had a lower incidence of LBW, preterm births, fetal distress, and pregnancy risk factors than the extremely disadvantaged.

Interestingly, comparing insurance types, while the TPM group was more likely to initiate care in the first trimester, than COHS and FFS counties, the incidence of LBW, pre-term births and fetal distress was slightly higher in these counties prior to the introduction of managed care.

The control variables highlight that within the extremely and moderately disadvantaged groups, that mothers in the three insurance models were similar except for the percent married in the moderately disadvantaged group and their racial composition. In particular, for the moderately disadvantaged counties there are more unmarried mothers in TPM and COHS counties than FFS counties. In both the extremely and moderately disadvantaged group FFS counties have a higher percent of white mothers than the other groups, TPM a higher percent of black mothers than the other two groups, and TPM and COHS a higher percent of Hispanic mothers than FFS. To help control for this heterogeneity, and any change to this heterogeneity over time, we include controls, present results separately for white, black and Hispanic mothers, and as a robustness check interact mother characteristics with county time trends.

IV. Identification and Estimation Strategy

A. *Variation Used for Identification*

To estimate the effect of MMC on prenatal care access, birth outcomes and pregnancy complications, we exploit the variation of the managed care mandates across counties and use those counties that were not subject to the mandates, the FFS counties, as a comparison group. Identification is also aided by the phasing in of the mandates over time within counties. One concern is that counties that were chosen for the managed care mandates differ from the counties that were not chosen, in ways that may be correlated with the outcomes. In particular, we know that counties with larger and denser populations were mandated to switch to MMC. If

[13] Herpes during labor is used as a proxy for management of sexually transmitted diseases (STDs) during prenatal care. We do not use presence of STDs or genital herpes during prenatal care as it is possible that the mother started prenatal care with the disease.

[14] See for example Goldenberg et al. (2008), Iams et al. (2008).

unobservable characteristics that confound identification vary across counties but are fixed over time, we can control for these non–time-varying unobservables by estimating a double difference model that compares the change in outcomes in MMC counties to FFS counties.

As outlined in section 2B not all Medicaid beneficiaries were mandated into managed care. Approximately 77 percent of birth in COHS counties and 68% in TPM counties were covered by managed care. So we essentially estimate intent-to-treat program effects. Since a lower percent of pregnant women were mandated into managed care in the TPM counties, the intent-to-treat program effects may be more diluted in these counties. As shown in Table 3 and discussed in section 2b, a number of the aid codes that relate to children were designated as FFS or voluntary managed care enrollment. As a robustness check we drop all children from the analysis so the percent of those covered by managed care will be higher, and there will be few Medicaid beneficiaries who could voluntarily switch into managed care.

We compute double difference estimates using a linear regression of the form

$$(1) \qquad Y_{ijct} = \alpha_j + t_t + \beta_1 TPM_{ct} + \beta_2 COHS_{ct} + \lambda_c(t * \theta_c) + \sum_k \delta_k X_{itk} + \varepsilon_{it},$$

where Y_{ijct} is the outcome for birth i in zip code j in county c in year t. Zip-code fixed effects, α_j, control for zip-code-level factors that do not change over time, and t_t are year fixed effects, to control for changes over time that are similar between all areas. TPM_{ct} and $COHS_{ct}$ are binary variables indicating whether or not TPM or COHS managed care was available in county c in year t. The double difference intent-to-treat effects are measured by the βs. Finally, child and mother controls, X_{it}, and county specific time trends, $(t * \theta_c)$, are included to control for any time varying characteristics that vary by county. Standard errors are clustered at the county level.

We examine the effect of the MMC mandates separately for the extremely disadvantaged (unmarried mothers with less than 12 years of educations) and the moderately disadvantaged (all other Medicaid mothers). As discussed in Section I, the ability to examine the effects of the MMC mandates on the moderately disadvantaged is somewhat unique to California. This is because the percent of women who receive cash welfare and who are married and/or are better educated is high in California in part due to California having a larger cash welfare program for married families with an unemployed parent (AFDC-UP) than other states.

B. Comparison Group Validity

The identifying assumption of the double difference model is that the change in the comparison group is an unbiased estimate of the counterfactual (i.e. the trends in the comparison group are the same as the treatment group, had the treated not been treated). While we cannot directly test this assumption, we can test whether the preintervention trends in the comparison group are the same as in the treatment group before MMC began. If the secular trends are the same before the intervention, then it is likely that they would have been the same after it if the treated counties had not been offered managed care.

We implement this test on the preintervention observations using the following regression:

$$(2) \qquad Y_{ijct} = \alpha_j + \lambda_1 t + \lambda_2 t * TPM_c + \sum_k \delta_k X_{itk} + \varepsilon_{it},$$

where TPM_c, as distinct from TPM_{ct}, is a binary variable indicating whether the birth took place in a county that will eventually offer TPM managed care. All other variables are defined above. We estimate separate models for the COHS and TPM groups and use preintervention data only

for the years before the first county switched to managed care (1994 for COHS and 1996 for TPM counties). The λ_2 measures the difference in the time trend in the preintervention period between those counties that switch to MMC and those that do not.

The results in Table 5 show that λ_2 is essentially zero for all groups indicating that Medicaid beneficiaries in intervention and nonintervention counties had similar preintervention trends. However, while small, some effects are significant (which isn't surprising with such large sample sizes) so we include specific county time trends in the analysis. Furthermore, as a robustness check use a triple difference model to control for possible non-linear time trends.[15]

V. Results

A. Overall Program Effects

The double difference intent-to-treat effects are presented in table 5 panel A for the extremely disadvantaged and panel B for the moderately disadvantaged. In TPM counties, the results show that MMC led to improvements mainly for the moderately not the extremely disadvantaged. The program had no statistically significant effects on the extremely disadvantaged, except a reduction in fetal distress of .006 (15 percent) that is significant at the 10 percent level. For the moderately disadvantaged the program led to a statistically significant 4 percent increase in prenatal care initiation in the first trimester, a reduction in fetal distress of 25 percent, and a decline in preterm births of 4 percent that is significant at the 10 percent level.

There were no improvements due to the program for extremely or moderately disadvantaged mothers in COHS counties. In fact, quality of care declined for both groups as indicated by the 39 percent increase in the pregnancy complication PCI index for the extremely disadvantaged and a 19 percent increase among the moderately disadvantaged, though the latter is only significant at the 10 percent level. In addition, there was an increase in pre-term births of 7 percent for the moderately disadvantaged again only significant at the 10 percent level. So overall, we find statistically significant improvements in access and birth outcomes for the moderately disadvantaged in TPM counties, but almost no significant effects for the extremely disadvantaged in TPM counties, and a worsening of the PCI index in COHS counties.

To better understand the worsening of the PCI index for the extremely disadvantaged, we present the components of the index in Table 6. The point estimates are positive for each of the components, but show significant increases in smoking, anemia, and herpes.

B. Effects by Race and Ethnicity

Tables 7 and 8 present results for mothers who are white, black, and Hispanic for the moderately and extremely disadvantaged. Results for the moderately disadvantaged highlight that white mothers mainly benefited from managed care in TPM counties. They experienced a 4 percent increase in prenatal care initiation in the first trimester and a reduction in fetal distress of 30 percent significant. In COHS counties, black and Hispanic mothers were worse off in the moderately disadvantaged group. Black mothers experienced an 8 percent reduction in prenatal care in the first trimester and a 76 percent increase in fetal distress, while Hispanic mothers experienced a 10 percent increase in preterm births and a 41 percent increase in the PCI index.

[15] Examining trends by race show similarly small and mainly insignificant differences in trends.

For the extremely disadvantaged results by race show that is COHS counties the PCI index increased for all race and ethnicity groups. The increase by component of the PCI index for each sub-group mimics the results in table 6.

C. Robustness Analysis

In this section, we explore a number of threats to interpreting the estimates as a causal impact of managed care. First, one concern with the double differences model is that it is possible that the secular trends in the outcome variables are different in the treatment counties than in the comparison counties. A common method of controlling for the differing trends over time is to include a separate linear time trend for each county, as we have in our main results. This method relies strongly on the linearity assumption. We examine if non-linear trends may also be biasing the results by taking advantage of the mothers with commercial insurance in treatment and comparison counties and estimate the difference between counties using a triple difference model in table 9. This method estimates non-linear trends within a county by using the commercial insurance group. The double difference results are remarkably similar to the triple difference results, highlighting that non-linear trends that are common between the Medicaid and commercial population are not likely to be biasing the results. In TPM counties, there are improvements for the moderately disadvantaged in births in the first trimester, pre-term births and fetal distress. The point estimates on first trimester, and fetal distress are smaller but still significant. In COHS counties, like the double difference model, the triple difference model shows few program effects and only a worsening of outcomes. The negative effects are more significant in the triple difference model, and for the moderately disadvantaged, in addition to an increase in preterm births, there is also an increase in fetal distress.

Second, welfare reform may confound effects. To the extent that the outcomes were similarly affected by welfare reform in all counties, the year fixed effects will control for welfare reform. However, unemployment rates and job types may not be the same between counties creating different opportunities for going off welfare, so including specific county trends is important. In addition, we control for welfare reform by including county per-capita welfare expenditures (in 1000s of dollars) in table 10. Since welfare reform was similar across managed care and FFS counties, including the payment structure, the expenditures proxy for beneficiary caseload and allow us to control for changes in number of welfare recipients over time. The inclusion of this control leaves the results essentially unchanged. However, there is now a marginally significant decrease in the PCI index of 19 percent for the moderately disadvantaged in the TPM counties indicating that women experienced less prenatal care complications.

Third, it is possible that the characteristics of mothers changed over time, perhaps due to welfare reform. We have already shown effects by race and ethnicity, which control for any compositional changes with respect to these characteristics, so effects are not driven by racial compositional changes. We further interact county time trends with specific mother characteristics such as being married, a teen mother, having fewer than 12 year of education, and being black or Hispanic to better control for these changes over time. Again, the point estimates are similar though there is a lost in significance for a few outcomes (Appendix Table 2).

Fourth, since children were not mandated into managed care in a number of the aid code categories, we exclude less than 18 year olds. The results are again similar (Reviewers Table 3).

Fifth, we drop small and large counties, and those that were phased in late to check they are not driving the results. Following Aizer, Currie and Moretti (2007) we drop the 15 smallest FFS

counties since they are unlikely to ever be mandated into managed care,[16] Santa Cruz (a COHS county) because it was small and did no have the required 45,000 Medicaid beneficiaries by 2002, the two largest counties (Los Angeles and Orange county), and the two counties that were phased-in late (Santa Cruz and Monterey). The results are qualitatively the same in TPM counties, though there is a reduction in significance that is not surprising given the loss of observations. Results are similar, however, among the moderately disadvantaged in COHS counties the worsening of birth outcomes is larger and more significant, and there is a reduction in initiation of care that is significant at the 10 percent level (Appendix Table 4).

To improve the population and wealth balance between MMC and FFS counties, we further restrict the sample to counties with populations greater than 150,000 and less than 1,000,000 in 2000. Population and wealth in 2000 are much closer at 652,174 and $43,490 for TPM, 500,350 and $45,442 for COHS, and 285,612 and $47, 806 for FFS. Again, results are qualitatively the same, but there is a further loss of significance. Two exceptions are an improvement in prenatal care initiation for the extremely disadvantaged in TPM counties, and an increase in fetal distress among the moderately disadvantaged in COHS counties (Appendix Table 5).

Six, it is possible that welfare mothers changed counties in response to MMC. If more disadvantaged or unhealthy women moved to FFS counties and healthier women to managed care counties, this could be the cause for the positive MMC effects. Due to data limitation we cannot examine endogenous mobility. However, Aizer, Currie, and Moretti (2007) do not find that endogenous mobility biases their findings.

Finally, we examine if the effects vary over time. With the exception of receiving prenatal care in the first trimester in COHS counties, program effects did not vary over time. However, while COHS counties did eventually help women start prenatal care earlier, there were no commensurate improvements in birth outcomes (Appendix Table 6).

VI. Discussion

This paper investigates whether the expansion of managed care for California's Medicaid population during the 1990s improved access to prenatal care, birth outcomes, and pregnancy complication for the extremely and moderately disadvantaged. We find that MMC led to improvements in initiation of care and birth outcomes over FFS for the moderately disadvantaged in TPM counties but not for the extremely or moderately disadvantaged in COHS counties. Specifically, the moderately disadvantaged in TPM counties experienced a 4 percent increase in initiation of prenatal care in the first trimester, a 4 percent decrease in preterm births, and a 25 percent reduction in fetal distress during labor. Analysis by race and ethnicity showed that these improvements were concentrated among white mothers. A robustness check controlling for welfare reform also showed that these mothers experienced less pregnancy complications. In COHS counties, there was an increase in pregnancy complications.

Finding few improvements in outcomes among the extremely disadvantaged, and that pregnancy complication worsened, is consistent with the previous literature on managed care that focused on the extremely disadvantaged. This group of women are very poor, unmarried and relatively uneducated and their health care utilization behaviors and health care issues more intractable than more educated or married women. In TPM counties, they may also be less likely

[16] We drop Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, and Trinity counties.

to take advantage of the main stream commercial option since the choice of providers in this model makes it a relatively more complicated model to navigate (Draper, Gold, Hudman, 1999).

Examination of the effect of MMC on the moderately disadvantaged is new. The fact that MMC led to improvements in intiation of care and brith outcomes in TPM counties for the moderately disadvantaged is consistent with past research that shows increased access to private over public hospitals for delivery reduced neonatal mortality and low birth weight (Aizer, Lleras-Muney, Stabile 2005). The finding that benefits accrued more to white mothers is also consistent with previous literature showing that white children in Medicaid better utilized health services (Currie and Thomas 1995). The moderately disadvantaged women in TPM counties may have benefited more from MMC for a number of reasons. These women may have health issues or behaviors that are more easily addressed by preventive care, coordination and better quality prenatal care, or they may take better advantage of the preventive care or the commercial option since they are more educated. The availability of a second managed care option provided by commercial plans may have been a driving force since provider competition on quality and access could provide an additional mechanism through which managed care might improve outcomes. Moreover, in the case where Medicaid beneficiaries take up the commercial option, they also have access to the same quality of care as high income families. This may again lead to improvements in quality, including access to preventive programs, if the quality of commercial services is better than the traditional network of providers that served COHS and FFS counties.

The difference in results between TPM and COHS for the moderately disadvantaged are stricking. For both models, the health insurance plan was paid on a capitated rate but the plan could choose how to pay doctors. It is possible that the plans paid doctors in a different manner under the two models driving the difference in results, or there is another difference between the two models that we are unaware of. Inspite of this shortcoming, the fact that the plan with competition between providers, TPM, had positive impacts on outcomes and the one without competition had none coupled with Duggan's (2004) results that the TPM model is more efficient, is important as much of the recent health care reform debate was about competition and the role of government in the provision of health insurance. However, the results in general for the moderately disadvantaged suggest that a managed care option may be key for improving prental care access and birth outcomes for the near poor under the health care reform act.

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Tables

TABLE 1—2010 MEAN SOCIO-ECONOMIC CHARACTERISTICS FOR US: WOMEN AGED 20-45 WITH HOUSEHOLD INCOME LESS THAN 400 PERCENT OF THE FPL

	Medicaid		No Health Insurance
	Extremely disadvantaged: Unmarried & <12 years of education	Moderately disadvantaged: All other Medicaid	
Age	31	31	31
Married (=1)	0.00	0.35	0.32
Less than primary education (=1)	0.14	0.02	0.08
Less than secondary education (=1)	1.00	0.09	0.27
Family income per capita	5,523	7,453	11,260
Percent FPL	85	119	158
Employed (=1)	0.26	0.41	0.60
Live in a city (=1)	0.29	0.24	0.20
Moved state in past year (=1)	0.02	0.03	0.05

Source: American Community Survey 2010. Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database]. Minneapolis: University of Minnesota, 2010.
Notes: Means are weighted to account for survey sampling. FPL refers to the federal poverty line. The means are similar if we restrict the sample to native-born women as we do in our analysis sample.

TABLE 2—MEDICAID MANAGED CARE INITIATION DATE AND PENETRATION RATE -COULD PUT AVERAGE COUNTY SIZE HERE.

County	Plan Type	Date Managed Care Began	Total Population (2000)	Medicaid Beneficiaries as of January 2002	
				Number	% in MMC
Alameda	TPM	Jan-96	1,443,741	186,533	51
San Joaquin	TPM	Feb-96	563,598	119,137	58
Riverside	TPM	Sep-96	1,545,387	226,370	54
San Bernardino	TPM	Sep-96	1,709,434	314,532	53
Santa Clara	TPM	Oct-96	1,682,585	165,391	42
Fresno	TPM	Nov-96	799,407	235,991	64
Kern	TPM	Jul-96	661,645	162,118	59
San Francisco	TPM	Jul-96	776,733	113,556	36
Contra Costa	TPM	Feb-97	948,816	89,468	51
Los Angeles	TPM	Apr-97	9,519,338	2,271,306	54
Stanislaus	TPM	Oct-97	446,997	97,228	27
Tulare	TPM	Feb-99	368,021	115,410	52
Santa Barbara	COHS	Sep-83	399,347	54,486	82
San Mateo	COHS	Dec-87	707,161	47,741	81
Solano	COHS	May-94	394,542	45,106	91
Orange	COHS	Oct-95	2,846,289	301,928	80
Santa Cruz	COHS	Jan-96	255,602	27,248	85
Napa	COHS	Mar-98	124,279	10,492	80
Monterey	COHS	Oct-99	401,762	63,953	75
Sacramento	GMC	Apr-94	1,223,499	245,761	64
San Diego	GMC	Nov-98	2,813,833	319,683	54

Sources: Dates of managed care initiation are from McCall et al. 2000. Statistics on Medicaid beneficiaries were calculated by the authors from aggregated data from the Medicaid Eligibility Files provided by the California Department of Health Services.
Notes: All other counties are used as FFS counties. Yolo adopted managed care in 2001 so is included as a FFS county. Santa Barbara and San Mateo are not included in any analyses.

TABLE 3—MEANS OF DEPENDENT AND CONTROL VARIABLES
FOR WOMEN WITH MEDICAID INSURANCE BY COUNTY TYPE, 1991

	Moderately disadvantaged			Extremely disadvantaged		
	TPM	COHS	FFS	TPM	COHS	FFS
Dependent Variables						
First Trimester	0.65	0.61	0.64	0.59	0.53	0.56
LBW	0.07	0.05	0.05	0.08	0.05	0.05
Preterm Birth	0.10	0.07	0.07	0.11	0.08	0.09
Fetal Distress (Distress)	0.05	0.03	0.03	0.05	0.04	0.03
Pregnancy Complication Index (PCI)	0.10	0.11	0.15	0.10	0.12	0.20
Control Variables – Characteristics of the Mother and Child						
Child Male	0.51	0.51	0.51	0.51	0.50	0.52
Child First born	0.36	0.44	0.38	0.44	0.52	0.47
Unmarried	0.56	0.47	0.39	1.00	1.00	1.00
Teen mother	0.26	0.27	0.28	0.56	0.58	0.55
Age 20-29	0.64	0.64	0.63	0.43	0.44	0.45
Age 30-34	0.13	0.13	0.13	0.06	0.05	0.06
Age 35 plus	0.05	0.05	0.06	0.02	0.02	0.02
No High school	0.15	0.16	0.18	1.00	1.00	1.00
High school	0.64	0.60	0.59	0.00	0.00	0.00
Some college	0.22	0.24	0.23	0.00	0.00	0.00
white	0.69	0.85	0.92	0.76	0.88	0.90
black	0.29	0.11	0.04	0.22	0.07	0.04
Hispanic	0.30	0.26	0.22	0.47	0.50	0.33

Notes: All variables are binary with the exception of the PCI. For this variable lower numbers represent improvement in quality.

TABLE 4 —DIFFERENCES IN PREINTERVENTION TRENDS

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A – Extremely Disadvantaged					
Year*TPM	-0.0000	0.0000**	-0.0000	-0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	113,242	114,409	109,054	114,301	114,286
Adjusted R^2	0.021	0.012	0.007	0.025	0.108
Year*COHS	-0.0003**	-0.0000	-0.0000+	-0.0001*	-0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
Observations	14,277	14,413	13,757	14,344	14,339
Adjusted R^2	0.025	-0.002	0.001	0.027	0.137
Panel B – Moderately Disadvantaged					
Year*TPM	0.0000	-0.0000	-0.0000	-0.0000	-0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	272,582	274,782	263,917	274,538	274,480
Adjusted R^2	0.025	0.016	0.011	0.022	0.072
Year*COHS	0.0000	0.0001**	0.0001**	-0.0000	-0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	45,070	45,359	43,675	45,201	45,181
Adjusted R^2	0.043	0.008	0.005	0.014	0.087

Notes: Standard errors are clustered at the county level. See equation (2) for full specification of regression. . "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include mother and child controls presented in Table 2. PCI stands for Pregnancy Complication Index.

TABLE 5—DOUBLE DIFFERENCE (DD) PROGRAM EFFECTS

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Extremely Disadvantaged					
TPM	0.003	-0.001	-0.001	-0.006+	0.009
	(0.016)	(0.003)	(0.003)	(0.003)	(0.014)
COHS	-0.001	-0.004	-0.004	-0.003	0.043**
	(0.014)	(0.003)	(0.005)	(0.005)	(0.012)
Observations	216,157	219,137	206,595	219,075	219,057
Adjusted R^2	0.032	0.011	0.006	0.025	0.106
Mean TPM	0.63	0.08	0.11	0.04	0.09
Mean COHS	0.57	0.06	0.09	0.03	0.11
P-value TPM=COHS	0.75	0.14	0.44	0.60	0.00
Panel B – Moderately Disadvantaged					
TPM	0.027*	-0.002	-0.004+	-0.010**	-0.007
	(0.012)	(0.002)	(0.002)	(0.004)	(0.010)
COHS	0.002	0.001	0.005+	0.002	0.019+
	(0.012)	(0.002)	(0.003)	(0.004)	(0.011)
Observations	576,323	582,980	554,466	582,901	582,832
Adjusted R^2	0.035	0.013	0.009	0.020	0.070
Mean TPC	0.70	0.07	0.09	0.04	0.09
Mean COHS	0.67	0.05	0.07	0.03	0.10
P-value TPM=COHS	0.06	0.04	0.00	0.05	0.01
Difference Extremely Disadvantaged & Moderately disadvantaged (TPM)	-0.024+	0.001	0.003	0.004	0.016+
Difference Extremely Disadvantaged & Moderately Disadvantaged (COHS)	-0.003	-0.006+	-0.009	-0.005	0.024*

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. The mean is for Medicaid beneficiaries before Medicaid managed care was introduced. PCI stands for Pregnancy Complication Index, and an increase represent more pregnancy and birth complications. The difference in the point estimates between the extremely and moderately disadvantaged and the level of significance are provided in the last two rows of the table.

TABLE 6—DD PROGRAM EFFECTS BY COMPONENT OF THE PCI INDEX FOR THE EXTREMELY DISADVANTAGED

	Smoke	Pre-eclampsia	Diabetes	Anemia	Herpes
TPM	0.003	0.003+	0.000	0.003	0.000
	(0.010)	(0.002)	(0.002)	(0.005)	(0.000)
COHS	0.026**	0.003	0.001	0.013*	0.002**
	(0.009)	(0.003)	(0.002)	(0.006)	(0.000)
Observations	219,202	219,202	219,202	219,202	219,075
Adjusted R^2	0.130	0.010	0.010	0.031	0.004
Mean TPC	0.07	0.01	0.01	0.01	0.002
Mean COHS	0.06	0.02	0.01	0.02	0.002

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

TABLE 7—DD PROGRAM EFFECTS BY RACE AND ETHNICITY
MODERATELY DISADVANTAGED

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Black Mothers					
TPM	0.012	-0.007	-0.010	0.005	-0.004
	(0.010)	(0.006)	(0.009)	(0.005)	(0.010)
COHS	-0.048**	0.007	0.005	0.023**	0.004
	(0.010)	(0.005)	(0.011)	(0.006)	(0.020)
Observations	113,597	115,123	109,032	115,233	115,219
Adjusted R^2	0.033	0.010	0.007	0.022	0.055
Mean TPC	0.72	0.12	0.13	0.06	0.08
Mean COHS	0.63	0.10	0.11	0.03	0.13
Panel B – White Mothers					
TPM	0.028*	-0.001	-0.002	-0.009**	-0.006
	(0.013)	(0.002)	(0.002)	(0.003)	(0.011)
COHS	0.006	0.000	0.005	-0.001	0.020+
	(0.012)	(0.002)	(0.003)	(0.003)	(0.011)
Observations	441,951	446,827	425,564	446,660	446,609
Adjusted R^2	0.035	0.003	0.004	0.018	0.074
Mean TPC	0.69	0.05	0.08	0.03	0.11
Mean COHS	0.66	0.05	0.07	0.03	0.10
Panel C – Hispanic Mothers					
TPM	0.003	0.000	0.001	-0.005	0.004
	(0.013)	(0.002)	(0.003)	(0.004)	(0.013)
COHS	-0.004	0.001	0.007*	-0.003	0.025*
	(0.011)	(0.003)	(0.003)	(0.005)	(0.012)
Observations	218,751	221,707	210,994	221,772	221,758
Adjusted R^2	0.035	0.003	0.003	0.022	0.039
Mean TPC	0.69	0.05	0.09	0.03	0.05
Mean COHS	0.64	0.05	0.07	0.03	0.06

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

TABLE 8—DD PROGRAM EFFECTS BY RACE AND ETHNICITY
EXTREMELY DISADVANTAGED

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Black Mothers					
TPM	0.001	-0.006	0.003	-0.013+	0.002
	(0.021)	(0.012)	(0.012)	(0.006)	(0.016)
COHS	-0.118+	-0.028	-0.093+	-0.019	0.127**
	(0.059)	(0.033)	(0.050)	(0.018)	(0.019)
Observations	34,867	35,380	33,140	35,399	35,396
Adjusted R^2	0.032	0.006	0.001	0.035	0.089
Mean TPC	0.63	0.13	0.15	0.06	0.09
Mean COHS	0.54	0.11	0.16	0.04	0.15
Panel B – White Mothers					
TPM	-0.001	0.001	-0.001	-0.006	0.008
	(0.016)	(0.003)	(0.004)	(0.003)	(0.015)
COHS	0.011	-0.004	-0.004	-0.003	0.043**
	(0.014)	(0.003)	(0.004)	(0.005)	(0.012)
Observations	174,089	176,442	166,646	176,376	176,363
Adjusted R^2	0.031	0.003	0.003	0.021	0.113
Mean TPC	0.62	0.06	0.10	0.04	0.11
Mean COHS	0.58	0.06	0.08	0.03	0.10
Panel C – Hispanic Mothers					
TPM	0.008	-0.000	0.002	-0.004	0.019+
	(0.020)	(0.003)	(0.004)	(0.004)	(0.011)
COHS	0.017	-0.007	-0.007	-0.003	0.047**
	(0.021)	(0.005)	(0.004)	(0.005)	(0.014)
Observations	117,037	118,654	112,279	118,680	118,675
Adjusted R^2	0.032	0.002	0.002	0.024	0.048
Mean TPC	0.63	0.06	0.10	0.04	0.06
Mean COHS	0.55	0.06	0.09	0.03	0.08

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

TABLE 9—TRIPLE DIFFERENCE PROGRAM EFFECTS

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A – Extremely Disadvantaged					
TPM*Medicaid	-0.015	0.002	-0.004	-0.015**	-0.013
	(0.024)	(0.007)	(0.008)	(0.005)	(0.020)
Observations	250,456	253,913	239,338	253,863	253,838
Adjusted R^2	0.031	0.009	0.006	0.023	0.096
COHS*Medicaid	-0.011	-0.005	-0.011	-0.006	-0.012
	(0.027)	(0.008)	(0.011)	(0.006)	(0.020)
Observations	53,480	54,064	50,889	53,937	53,925
Adjusted R^2	0.050	0.003	0.001	0.019	0.114
Panel B – Moderately Disadvantaged					
TPM*Medicaid	0.017*	-0.002	-0.005+	-0.006+	-0.014
	(0.008)	(0.002)	(0.002)	(0.004)	(0.010)
Observations	1,767,489	1,780,319	1,711,393	1,780,336	1,780,044
Adjusted R^2	0.096	0.014	0.011	0.015	0.036
COHS*Medicaid	0.003	0.002	0.007**	0.012**	0.009
	(0.009)	(0.002)	(0.003)	(0.004)	(0.008)
Observations	610,931	615,783	591,568	615,326	615,171
Adjusted R^2	0.129	0.008	0.006	0.014	0.046

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index. Births to women who have private health insurance are used as the triple difference.

TABLE 10— DOUBLE DIFFERENCE PROGRAM EFFECTS, CONTROLLING FOR WELFARE EXPENDITURES

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A – Extremely Disadvantaged					
TPM	-0.001	0.001	0.001	-0.009**	-0.010
	(0.011)	(0.003)	(0.004)	(0.003)	(0.017)
COHS	-0.001	-0.007	-0.006	-0.006	0.049**
	(0.013)	(0.005)	(0.010)	(0.009)	(0.014)
Observations	216,157	219,137	206,595	219,075	219,057
Adjusted R^2	0.032	0.011	0.006	0.025	0.106
Panel B – Moderately Disadvantaged					
TPM	0.022*	0.001	-0.005	-0.010*	-0.019+
	(0.011)	(0.002)	(0.004)	(0.004)	(0.011)
COHS	-0.016	-0.000	0.004	0.006	0.022*
	(0.018)	(0.003)	(0.006)	(0.007)	(0.009)
Observations	576,323	582,980	554,466	582,901	582,832
Adjusted R^2	0.036	0.013	0.009	0.020	0.070

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions are double difference models and include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

Appendix Tables

TABLE 1 —MEDICAID BIRTHS AND MANAGED CARE STATUS BY AID CODE CATEGORY, 1998

Aid Code Category	% of Births (managed care status)			
	COHS		TPM	
Families	60.6	(MC)	67.9	(MC)
Blind/Disabled	2.4	(MC)	2.3	(FFS/V)
Medicaid Indigent Child	4.9	(MC)	4.4	(MC/V)
Medicaid Indigent Adult	9.1	(MC)	7.9	(FFS)
Percent Poverty	19.1	(FFS)	14.7	(FFS)
Minor Consent	3.8	(FFS)	2.8	(FFS)
Other	0.6	(unknown)	0.1	(unknown)

Source: Numbers calculated by the author based on Rains (2002) table 20.5. Managed care status determine by authors from Rains (2002) appendix A and Aid Code Chart (CDHS, 2007)
Notes: Managed care status for aggregated age codes are in parenthesis. Managed care status codes are: MC – mandated into managed care, FFS – stay in FFS, V – may voluntarily switch from FFS to managed care. Births to undocumented women are excluded since they are not included in the analyses. The families program includes mainly those who are on welfare, recently on welfare, or whose financial resources would qualify them for welfare but they are not on welfare. The percent poverty group includes women whose incomes too high to receive welfare but are below 200 percent of the FPL.

TABLE 2—DD PROGRAM EFFECTS
CONTROLLING FOR COUNTY TIME TRENDS INTERACTED WITH MOTHER CHARACTERISTICS

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Extremely disadvantaged					
TPM	0.002	0.000	0.000	-0.006+	0.011
	(0.016)	(0.003)	(0.003)	(0.003)	(0.014)
COHS	0.003	-0.007*	-0.005	-0.004	0.042**
	(0.013)	(0.003)	(0.005)	(0.005)	(0.012)
Observations	216,157	219,137	206,595	219,075	219,057
Adjusted R^2	0.033	0.011	0.007	0.025	0.114
Panel B – Moderately disadvantaged					
TPM	0.023+	0.000	-0.001	-0.008*	-0.008
	(0.011)	(0.001)	(0.002)	(0.003)	(0.010)
COHS	0.001	0.001	0.005+	0.002	0.018+
	(0.011)	(0.002)	(0.003)	(0.004)	(0.010)
Observations	576,323	582,980	554,466	582,901	582,832
Adjusted R^2	0.037	0.014	0.009	0.020	0.074

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

TABLE 3—DOUBLE DIFFERENCE PROGRAM EFFECTS, AGE 18 AND OLDER

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Extremely disadvantaged					
TPM	0.003	-0.001	-0.000	-0.005	0.009
	(0.016)	(0.004)	(0.005)	(0.004)	(0.016)
COHS	0.008	0.004	-0.004	-0.005	0.046**
	(0.016)	(0.003)	(0.007)	(0.005)	(0.013)
Observations	149,880	152,088	143,156	152,042	152,027
Adjusted R^2	0.034	0.014	0.008	0.024	0.117
Mean TPM	0.64	0.08	0.11	0.04	0.11
Mean COHS	0.59	0.06	0.08	0.03	0.13
Panel B – Moderately disadvantaged					
TPM	0.027*	-0.002	-0.004+	-0.010**	-0.007
	(0.012)	(0.002)	(0.002)	(0.004)	(0.011)
COHS	0.001	0.001	0.005+	0.001	0.019+
	(0.012)	(0.002)	(0.003)	(0.004)	(0.011)
Mean TPM	0.70	0.07	0.10	0.04	0.09
Mean COHS	0.66	0.05	0.07	0.03	0.11
Observations	551,047	557,315	530,199	557,231	557,167
Adjusted R^2	0.036	0.014	0.009	0.020	0.070

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.

TABLE 4—DOUBLE DIFFERENCE (DD) PROGRAM EFFECTS
DROPPING SMALL AND LARGE COUNTIES AND THOSE PHASED-IN LATE

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Extremely disadvantaged					
TPM	0.005	0.001	-0.003	-0.004	0.011
	(0.022)	(0.004)	(0.004)	(0.003)	(0.023)
COHS	-0.014	-0.019+	-0.022	-0.019	0.055*
	(0.030)	(0.009)	(0.017)	(0.012)	(0.023)
Observations	127,909	129,992	121,631	129,902	129,893
Adjusted R^2	0.028	0.009	0.005	0.017	0.092
Mean TPM	0.61	0.08	0.11	0.03	0.11
Mean COHS	0.49	0.09	0.12	0.03	0.25
P-value TPM=COHS	0.63	0.07	0.28	0.22	0.19
Panel B – Moderately disadvantaged					
TPM	0.025+	-0.002	-0.003	-0.008+	-0.005
	(0.014)	(0.002)	(0.003)	(0.004)	(0.014)
COHS	-0.018+	-0.000	0.006**	0.019**	0.007
	(0.010)	(0.002)	(0.002)	(0.002)	(0.010)
Observations	357,103	361,649	342,360	361,498	361,465
Adjusted R^2	0.037	0.012	0.008	0.014	0.060
Mean TPC	0.69	0.07	0.10	0.03	0.11
Mean COHS	0.54	0.07	0.09	0.02	0.25
P-value TPM=COHS	0.00	0.45	0.00	0.00	0.15

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. The mean is for Medicaid beneficiaries before Medicaid managed care was introduced. PCI stands for Pregnancy Complication Index. We drop the following FFS counties: Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, and Trinity counties; COHS counties: Orange, Santa Cruz, Napa, and Monterey; TPM counties: Los Angeles.

TABLE 5—DOUBLE DIFFERENCE (DD) PROGRAM EFFECTS
DROPPING COUNTIES WITH <150,000 OR >1,000,000 PEOPLE AND THOSE PHASED-IN LATE

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A –Extremely disadvantaged					
TPM	0.055*	-0.003	-0.002	-0.006	0.004
	(0.023)	(0.005)	(0.004)	(0.004)	(0.036)
COHS	-0.022	-0.017+	-0.019	-0.020	0.048*
	(0.033)	(0.009)	(0.016)	(0.013)	(0.023)
Observations	65,107	66,323	61,855	66,349	66,347
Adjusted R^2	0.034	0.008	0.006	0.019	0.104
Mean TPM	0.63	0.08	0.11	0.03	0.11
Mean COHS	0.49	0.09	0.12	0.03	0.25
P-value TPM=COHS	0.09	0.21	0.33	0.29	0.33
Panel B – Moderately disadvantaged					
TPM	0.030	-0.000	-0.001	-0.008	-0.009
	(0.025)	(0.003)	(0.003)	(0.005)	(0.022)
COHS	-0.012	-0.004	0.006	0.005*	0.015
	(0.033)	(0.003)	(0.004)	(0.002)	(0.022)
Observations	186,279	188,942	178,580	189,028	189,020
Adjusted R^2	0.040	0.011	0.007	0.016	0.068
Mean TPC	0.70	0.07	0.09	0.03	0.11
Mean COHS	0.54	0.07	0.09	0.02	0.25
P-value TPM=COHS	0.16	0.37	0.08	0.01	0.32

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. The mean is for Medicaid beneficiaries before Medicaid managed care was introduced. PCI stands for Pregnancy Complication Index. In addition to the counties already dropped in Table 3 for reviewers we drop: Alameda, Riverside, San Bernardino, Santa Clara, Humboldt, Imperial, Kings Lake, Mendocino, Nevada, San Benito, Sutter, Tehama, Tuolumne, Yuba.

TABLE 6—DOUBLE DIFFERENCE PROGRAM EFFECTS OVER TIME

	First Trimester	LBW	Preterm Birth	Fetal Distress	PCI Index
Panel A – Extremely disadvantaged					
TPM	0.004	-0.000	-0.000	-0.007**	0.004
	(0.015)	(0.003)	(0.003)	(0.003)	(0.015)
TPM*Yr3+	0.005	-0.003	-0.003	0.005	0.005
	(0.009)	(0.003)	(0.004)	(0.004)	(0.009)
COHS	-0.009	-0.007*	-0.005	-0.002	0.049**
	(0.012)	(0.003)	(0.006)	(0.009)	(0.013)
COHS*Yr3+	0.023*	0.005+	0.002	-0.001	-0.012
	(0.010)	(0.003)	(0.005)	(0.009)	(0.015)
Observations	216,157	219,137	206,595	219,075	219,057
Adjusted R^2	0.032	0.011	0.006	0.025	0.106
Panel B – Moderately disadvantaged					
TPM	0.028*	-0.001	-0.004+	-0.011**	-0.009
	(0.011)	(0.001)	(0.002)	(0.002)	(0.010)
TPM*Yr3+	0.004	-0.003	-0.000	0.002	0.007
	(0.008)	(0.002)	(0.002)	(0.004)	(0.005)
COHS	-0.010	0.000	0.005*	0.006	0.019*
	(0.012)	(0.002)	(0.002)	(0.005)	(0.008)
COHS*Yr3+	0.029**	0.002	-0.002	-0.008	0.001
	(0.007)	(0.001)	(0.004)	(0.011)	(0.010)
Observations	576,323	582,980	554,466	582,901	582,832
Adjusted R^2	0.036	0.013	0.009	0.020	0.070

Notes: Standard errors are clustered at the county level. "**" ,"*", "+" indicate that the difference in the coefficient from zero is statistically significant at 1 percent, 5 percent, and 10 percent significance levels respectively. All regressions include year and zip code fixed effects, county specific linear time trends, and mother and child controls presented in Table 3. PCI stands for Pregnancy Complication Index.