

Does More Prenatal Care Improve Health Outcomes? Evidence from Paid Sick Leave Mandates *

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Abstract

The high rates of maternal and infant mortality in the U.S. have generated significant concern amongst policymakers, particularly as the U.S. rates are consistently higher than those in other OECD countries. Healthcare use during pregnancy can protect the mother and infant against health complications, but the inability to take time off work can be a barrier to seeking care. Using medical claims data from 2010 to 2019, I analyse the effects of U.S. state-level sick pay mandates on maternal healthcare utilisation in a commercially insured sample. I find that mothers increase their prenatal care use by 8% relative to the mean after the introduction of sick pay, and that emergency department use remains unchanged. I then evaluate the effectiveness of prenatal care on maternal and infant health outcomes. I find that more prenatal care has no statistically significant effect on severe maternal morbidity or stillbirth, but does reduce postnatal depression diagnoses by 7% relative to the mean. These results suggest that lack of paid time off is limiting mothers' routine healthcare use. More prenatal care may not prevent severe and rare outcomes, such as severe maternal morbidity, but reductions in postpartum depression could meaningfully reduce maternal mortality and improve maternal and infant well-being.

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1 Introduction

Ensuring a healthy pregnancy can protect mothers against health problems and the risk of mortality, and help give children the best possible start in life. I study one of the factors that can improve mothers' and infants' health outcomes at birth - prenatal care. Prenatal care allows doctors to identify potential issues in advance, prevent pregnancy complications to both the mother and child, and discuss lifestyle behaviours that can affect infant health (e.g. smoking during pregnancy). Mothers are advised to get early, and regular prenatal care ([Office on Women's Health, 2023](#)), which has been found to benefit infant and maternal health ([Yan, 2017](#); [Geiger et al., 2021](#)). Yet prenatal care utilisation is far from universal in the U.S. 25% of pregnant women did not receive early and adequate prenatal care in 2022, and this figure has increased since 2018 ([Healthy People, 2022](#)).

Despite the recommendations, in surveys, mothers cite lack of money and being unable to get time off work as reasons for not seeking routine care during pregnancy ([Kitsantas et al., 2012](#)). Quantitative evidence exploring these factors, however, is lacking. In this paper, I explore whether lack of paid time-off work is a barrier to obtaining healthcare in the context of expectant mothers. I ask whether sick pay mandates affect employees' healthcare seeking behaviours, such that they seek healthcare that they may have forgone otherwise.

I focus on this setting because of the state of maternal and infant health in the U.S., which has received attention from policymakers ([The White House, 2021](#); [Cohen, 2023](#); [Kaine, 2023](#)) and the medical profession ([D'Alton et al., 2013](#)). For both the infant and maternal mortality rates, the U.S. ranks below its OECD counterparts ([OECD.Stat, 2018](#))¹. Access to maternal health care, and particularly high quality care, has been cited as a factor that could reduce maternal mortality ([Wong and Kitsantas, 2020](#)). Infant and maternal mortality outcomes are closely tied so factors that drive increased maternal mortality

¹This is the case even when accounting for methodology changes in the National Vital Statistics System that affect the estimation of the maternal mortality rate ([Joseph et al., 2024](#)).

also contribute to elevated infant mortality. Authors have referenced maternal complications during pregnancy and at birth, and medical care during pregnancy and in the postpartum period as contributors to infant mortality (Warren et al., 2022).

There is much support for the position that prenatal care improves maternal and infant health outcomes. Yet there is a lack of consensus in the quantitative literature. Empirical researchers studying the effectiveness of prenatal care face the challenge that mothers who seek timely and more frequent care are more likely to be healthier and practice health behaviours that are protective of the infant. I provide new causal evidence on this matter, by evaluating the effect of more prenatal care visits on maternal and infant health outcomes. In doing so, I am able to explore how a labour market policy affects downstream health outcomes, which is valuable for understanding the true impact of the policy.

My analysis draws on a new and large medical claims dataset for researchers, Inovalon. These data allow me to look at healthcare use and health outcomes of a sample of over 800,000 births between 2010 and 2019. First, to study whether sick pay mandates affect maternal healthcare use, my analysis takes advantage of the staggered adoption of paid sick leave mandates on employers across U.S. states. I use a difference-in-differences approach to estimate the effects of these mandates on the number of prenatal care events, timely prenatal care use, and emergency department use. Second, to study the importance of prenatal care for maternal and infant health, I use a two-staged least squares strategy, instrumenting prenatal care with access to sick pay. This approach allows me to estimate the causal effect of prenatal care on outcomes such as severe maternal morbidity, stillbirth, preterm birth, and postnatal depression.

I find that the introduction of paid sick leave mandates leads to an increase in prenatal care use amongst commercially insured mothers, and no change in emergency department visits. This suggests that if a pregnant individual has a health scare during their pregnancy that requires rapid medical attention, they attend an emergency room. Yet their non-urgent healthcare

use increases when they have access to sick days. The rise in prenatal care use is driven by routine pregnancy supervision visits, and chiefly occurs in the first and second trimester. In the instrumental variables analysis, I find that more prenatal care has no significant effect on severe maternal morbidity or stillbirth, but does reduce postnatal depression diagnoses by 7% relative to the mean. Taken together, we can make the following conclusions based on these findings. First, that lack of paid time off work is a limiting factor for mothers seeking routine healthcare during pregnancy. Second, that receiving more prenatal care does not shift the probability of rare health shocks such as severe maternal morbidity. Nonetheless, reducing postnatal depression could both improve the well-being of these mothers and reduce the risk of postnatal death due to mental health conditions, with knock-on benefits for infants.

My paper contributes to two strands of research. First, the literature evaluating sick pay. Due to the wide availability of sick pay across the developed world, there is an extensive literature evaluating sick pay outside of the U.S. (e.g. [Ziebarth and Karlsson \(2014, 2010\)](#); [Johansson and Palme \(2005\)](#); [Henrekson and Persson \(2004\)](#); [Puhani and Sonderhof \(2010\)](#); [Halla et al. \(2017\)](#)). Yet the universal provision of sick pay in these countries means that the literature focuses on changes in the compensation level rather than the change from employers providing no paid sick leave days to full compensation for workers. In the U.S. setting, [Callison and Pesko \(2022\)](#) document a first stage; the introduction of PSL leads to an increase in sick leave coverage for employees, with women experiencing larger gains. Furthermore, there is take up of the benefit (e.g. [Ahn and Yelowitz \(2016\)](#); [Maclean et al. \(2020\)](#)). Employees use approximately 2 additional sick days per year after the introduction of the policy ([Maclean et al., 2020](#)). Other work focuses on presenteeism at work and labour productivity (e.g. [Cronin et al. \(2022\)](#)). There is a nascent literature evaluating health related effects in the U.S. For example, access to paid sick leave results in a reduction of influenza-like infection rates ([Pichler and Ziebarth \(2017\)](#); [Pichler et al. \(2021\)](#)), increases in cancer screening [Callison et al. \(2023\)](#), increases in contraception use ([Maclean et al., 2023](#)), and a reduction in emergency department (ED) visits for all causes ([Ma et al., 2022](#)).

The question of what happens to non-urgent care seeking and other forms of preventive care use remains understudied. [Chen et al. \(2020\)](#) look at health care utilisation, but suffer from pre-trends and have a small sample size. I use a large claims dataset, which allows for more precision in measuring health care use.

Second, I contribute to the literature on the effectiveness of prenatal care. From the papers that use robust causal inference methods, effects are mixed and modest - see [Corman et al. \(2019\)](#) for a review. Authors find some positive effects on smoking and breastfeeding behaviors which protect infants' health ([Yan, 2017](#)), and reduced mortality for commercially insured mothers at the age cutoff of 35 ([Geiger et al., 2021](#)). Others document null or imprecise effects ([Rosenzweig and Schultz, 1983, 1988](#); [Evans and Lien, 2005](#)). Timely initiation of prenatal care has been found to increase the child's birth weight ([Corman et al., 2019](#))², decrease smoking in the postpartum period, and increase the probability of attending well-child visits ([Reichman et al., 2010](#)). A related set of papers evaluate Medicaid expansions, which led to increases in prenatal care. The expansions are found to decrease infant mortality and low-birth weight ([Currie and Gruber \(1996a,b\)](#); [Gray \(2001\)](#); [Sonchak \(2015\)](#)). Overall, the literature lacks consensus and focuses on infant health. This paper provides new evidence on the effectiveness of prenatal care, and in particular, more findings on maternal health.

2 Background

2.1 Paid sick leave

Paid sick leave is a paid absence from work for use when an employee or their family member is sick, injured, or receiving medical attention. There is no federal provision for paid sick leave in the United States. Instead, there is a mosaic of paid sick leave entitlement across the country. Fourteen states (Ari-

²Birth weight is a standard measure of how healthy an infant is, as low birth weight babies are at greater risk of mortality and health problems in their first year of life and beyond ([Behrman and Rosenzweig, 2004](#)).

zona, California, Colorado, Connecticut, Maryland, Massachusetts, Michigan, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, and Washington State) plus Washington D.C. have paid sick leave laws. Additionally, some cities and counties have enacted their own mandates. 77% of private industry workers have access to paid sick leave ([U.S. Bureau of Labour Statistics, 2022](#)). There is, however, substantial variation in access to sick pay. Only 51% of part-time private industry workers have access to paid sick leave, and 53% of workers in leisure and hospitality. These statistics, however, do not only capture workers in states with sick pay mandates. Some organisations choose to offer employees sick pay regardless of whether their state has a mandate or not, but data on the prevalence of this practice is lacking. This means that mothers in states without mandates who in fact do have sick pay access will be treated as control mothers in my analysis. This may lead my estimates of the effect of state PSL mandates on prenatal care to be underestimates of the effect of *any* PSL mandate on prenatal care.

Paid sick leave mandates are similar across states, with some variation in features. Typically, all employees or employees at large businesses (with at least 50 employees) in the state are covered. Some states have a weekly hours requirement. Employees accrue sick leave hours based on number of hours worked, up to a cap of 40 hours in any year. Detailed information on existing paid sick leave laws are available in Appendix Section A.

During the time period I study, several cities and counties also enacted paid sick leave mandates. For example, San Francisco enacted its first mandate in 2007. In this paper, I study the effects of state-level paid sick leave mandates. Mothers in states that never introduce a mandate but contain cities that introduce a mandate will be in the control group in my analysis. Again, in this way, my estimates of the effect of state PSL mandates on prenatal care could be underestimates of the effect of *any* PSL mandate on prenatal care.

Employees do have access to other provisions to take time off work, if needed, but none of these are obvious substitutes for paid sick leave. All employees who have worked at least 1,250 hours over the previous year at a company with more than 50 employees are eligible for 12 weeks of unpaid

sick leave for specific medical situations affecting themselves or their family members under the Family and Medical Leave Act. This is distinct from paid sick leave in that the leave is not remunerated, and was introduced in 1993, far in advance of the time period that I study in this paper. Second, nine states and Washington D.C. offer paid family and medical leave policies, which are targeted at new parents, employees recovering from a long-term illness, and employees who need to care for a family member with a serious illness. These policies differ from paid sick leave in their provision for time off for long-term, serious illness rather than short-term sickness, injury, or medical treatment. No states simultaneously introduce paid sick leave and paid family and medical leave. Finally, many employees have access to paid time off, which is often used for a vacation or holiday, but may also be used for health related occurrences. Given that the average number of vacation days after one year is only 11 days ([U.S. Bureau of Labour Statistics, 2022](#)), employees are likely to try and save these days for vacation or urgent events that arise.

2.2 Prenatal care

Prenatal care involves visits to a health care provider, often an obstetrician-gynaecologist or a general practitioner, for preventative medical care during pregnancy. The goals of prenatal care are to promote the health of the mother and infant, identify and reduce the risk of pregnancy complications, and reduce the infant’s chance of complications. The visits often include physical exams, weight checks, blood tests, and ultrasounds ([NIH, 2024](#)). The American College of Obstetricians and Gynecologists (ACOG) advise that mothers attend 12 to 14 prenatal care visits throughout their pregnancy ([Michel and Fontenot, 2023](#)). The ACOG and Centers for Disease Control and Prevention (CDC) also recommend STI tests, laboratory panels, vaccinations and an ultrasound for mothers ([Gourevitch et al., 2022](#)).

“Complicated pregnancies” arise when mothers have pre-existing chronic conditions such as obesity or hypertension, or conditions that develop during pregnancy that pose a risk to the mother and child, such as gestational diabetes. 196 women in every 1,000 experience pregnancy complications, and 16.9

in every 1,000 experience birth complications ([Blue Cross Blue Shield, 2022](#)). For complicated pregnancies, mothers will need more intensive prenatal care ([Backes et al., 2020](#)), as will mothers with psychosocial risk factors such as a limited support network or intimate partner violence ([Peahl and Howell, 2021](#)).

Starting care in the first trimester is particularly important for the mother and her infant as it allows for early identification of conditions that can cause complications, intervention if necessary, and education on healthy behaviours during pregnancy. Early prenatal care has been found to reduce low birth-weight of the infant ([Frank et al., 1991](#)).

3 Data and sample construction

3.1 Data

My data source is the Inovalon primary source medical claims database ³. These data have the advantage of being extensive in the number of patients and coverage across states. Inovalon sources its data from over 150 payers (e.g. insurers) or providers of healthcare and/or administrative services to adjudicate providers' healthcare claims. The database consists of medical (inpatient and outpatient) claims, prescription drug claims, member and enrolment information, and provider information.

I supplement the Inovalon data with the Area Health Resource Files for 2010 to 2019 to capture information on county-level socioeconomic, health, and healthcare access characteristics.

3.2 Sample construction

My sample is made up of commercially insured females aged 18 to 51 who gave birth between 2010 and 2019 inclusive, sometimes more than once, resulting in a sample of mother-births. Mothers must have continuous medical coverage

³Harvard University uses Inovalon Insights, LLC as one of its normative benchmarking databases for health care claims.

6 months prior to the estimated date of their last menstrual period. I define a delivery using the Kuklina method for identifying obstetric deliveries (Kuklina et al., 2008)⁴. I focus on commercially insured mothers as these individuals are the group most likely to be employed. For the most part, individuals with commercial insurance receive health insurance through their employer⁵.

I need to identify the mother’s state to assess whether a mother has been affected by a paid sick leave policy. I approximate the mother’s state by identifying the mother’s location in 2022. I then exclude mothers where the mother state location does not match the delivery provider state location in 2022. I use this approach, rather than the geographic location of the birth, as a limitation of the Inovalon data is the inability to see the geographic location of a medical event on the claim. I can only see the provider’s location and the mother’s location at a fixed point in time, in 2022.

Further, I exclude mothers whose estimated birth location is Washington D.C., where paid sick leave was introduced in 2008, before my first year of data. Mothers in Colorado, New Mexico and New York remain “untreated” in my sample, as these states enacted paid sick leave laws after 2019. I also exclude mothers for whom I cannot calculate age.

3.3 Descriptive statistics

Table 1 gives the descriptive statistics of my mother-birth sample. The mean and median age of mothers giving birth is 29. The median age of mothers in the U.S. is 30 (United States Census Bureau, 2022). As is often the case with claims data, the data is incomplete on ethnicity of the mother so I cannot comment on the representativeness of the sample with regard to race or ethnicity. The majority of mothers (78%) are on a PPO medical insurance plan.

⁴The Kuklina method involves using additional International Classification of Diseases (ICD) codes, beyond the maternal outcome of delivery code Z37.0, to identify obstetric deliveries. These additional codes include the “normal delivery” ICD code, diagnosis-related group delivery codes for caesarean and vaginal deliveries, and ICD procedure codes for delivery related procedures. Deliveries are excluded if they involve an abortion or abnormal pregnancy outcome, such as an ectopic pregnancy.

⁵Some individuals may receive commercial insurance through the employer of a family member, and some individuals may choose to purchase commercial insurance privately.

Table 1. Descriptive statistics for mother-birth sample

	Mean/%	Std. Dev.
Age at delivery	30.93	5.43
Black	0.03	0.17
White	0.13	0.34
Hispanic	0.03	0.16
Asian	0.01	0.09
Other race/ethnicity	0.06	0.23
Unknown race/ethnicity	0.75	0.43
Elixhauser	0.26	0.55
Any EPO	0.02	0.15
Any HMO	0.18	0.38
Any PPO	0.78	0.42
Any POS	0.05	0.22

Notes: N=810,547. This table shows summary statistics of the mother-birth sample. Sample defined as births between 2010 and 2020 to mothers aged 18-51 with continuous commercial medical insurance coverage 6 months prior to the last menstrual period. “Elixhauser” is the Elixhauser comorbidity index of the mother at birth. “Any EPO” is whether the patient had any Exclusive Provider Organization plan type during the period in which the birth occurred. “Any HMO” is whether the patient had any Health Maintenance Organization plan type. “Any PPO” is whether the patient had any Preferred Provider Organization plan type. “Any POS” is whether the patient had any Point of Service plan type.

3.4 Variables

To analyse the effect of PSL on prenatal care, my main outcome is the number of prenatal care events that a mother has. I define prenatal care events using ICD-10, Current Procedural Terminology (CPT), and Healthcare Common Procedure Codes (HCPC) used in [Gourevitch et al. \(2022\)](#) and [Sinaiko \(2023\)](#). Please see Appendix Section B for these codes. Identifying the full picture of a mother’s prenatal care can be difficult in healthcare claims data, as prenatal care is often included as part of the global fee for a delivery.⁶ Thus we may not see all of the prenatal care interactions that took place in the data if there is no billing for these individual prenatal care interactions. I use two approaches to check that I have a suitable measure of prenatal care events in this paper. First, I include ICD-10, CPT, and HCPC codes that denote services that occur

⁶A global delivery fee is a single fee that covers the charges for labour and delivery, routine prenatal care, and postpartum care provided by a single physician or physician group. It does not cover all visits and services during a pregnancy.

during prenatal care visits. Although we may be unable to see all prenatal visits in the data, prenatal services such as genetic testing and ultrasounds are more likely to be billed separately and not included in the global delivery fee. Second, I carve out office visits from both the prenatal services and prenatal visits outcomes. Specifically, I carve out Evaluation and Management (E&M) claims. These E&M claims are more likely to be included in the global delivery fee, rather than being billed separately and visible in the claims data. However, there is variation in their inclusion across insurers and plans which I cannot identify in these data. My primary definition of prenatal care includes prenatal services, and excludes E&M visits. For robustness, I show the results using alternative definitions. I then break down this aggregate measure and look at the different types of prenatal care and how they change with the introduction of paid sick leave. The disaggregated categories of prenatal care consist of: ultrasounds, pregnancy supervision visits, genetic tests, foetal tests, pregnancy tests, lab tests, and E&M visits. Pregnancy supervision visit refers to regular outpatient visits during the pregnancy, for supervision of the pregnancy, antenatal screening, and risk assessment. E&M claims refer to visits and services that involve evaluating and managing patient health. Further, given the importance of prenatal care initiation in the first trimester in increasing birth weight ([Frank et al., 1991](#)), I use two related outcomes in my analysis. First, an indicator for first prenatal care visit in the first trimester, and second, the delay in days from the first trimester before the first prenatal care visit.

To analyse the effect of prenatal care on maternal and infant health, my main outcomes are severe maternal morbidity, stillbirth, preterm birth, and postnatal depression. These conditions are identified using ICD-10 and CPT codes, which can be found in Appendix Section C. Severe maternal morbidity is an index of various negative outcomes during labour and delivery that have significant implications for the mother's health ([The American College of Obstetricians and Gynecologists \(2016\)](#)). For analysis, I construct a binary variable that takes the value one if the mother has a diagnosis of any of twenty one indicators defined by the Centers for Disease Control and Pre-

vention (CDC, 2023). To give some examples, these indicators include: acute myocardial infarction, cardiac arrest, eclampsia, and hysterectomy. Postnatal depression is an indicator variable equal to one if the mother has a diagnosis of depression or anxiety at some point between delivery and six weeks postpartum. The stillbirth and pre-term indicators equate to one if the mother has an associated billing code at delivery, or up to 6 weeks before or after pregnancy. Preterm birth puts the infant at increased risk of mortality and a host of health and development problems (Butler et al., 2007). A mother is defined as having an induction if they have an associated billing code at delivery or up to one week postpartum. I am unable to observe mortality in these data.

4 Empirical strategy

4.1 Paid sick leave and maternal care utilisation

An ideal experiment to evaluate the effects of paid sick leave on maternal care utilisation would randomly assign mothers paid sick leave access to one group of mothers. Without such a random experiment, I evaluate the effects of access to paid sick leave using a difference-in-differences (DiD) approach that exploits variation in the introduction of paid sick leave mandates across time and states.

4.1.1 Specification

The empirical model is given by:

$$PC_{ist} = \alpha + \beta \cdot D_{st} + \kappa \cdot X_{ist} + \gamma_t + \delta_s + \varepsilon_{ist} \quad (1)$$

where mother i gives birth in state s in year t . The time fixed effect is γ_t and δ_s is the state fixed effect. PC denotes a prenatal care outcome. For example, the number of prenatal care events, prenatal care initiation in the first trimester, or delay in prenatal care initiation. D_{st} equals 1 if there is a paid sick leave mandate in state s in year t . D_{st} is the DiD variable of interest.

The coefficient β captures the causal effect of mandated sick pay on my various y outcomes. I cluster standard errors at the state level. Controls X_{ist} are age, and, at the county level, percent with high-school degree, and a rural-urban indicator.

I also estimate event study models to estimate the treatment effects by year, as there may be effect heterogeneity over time. As employees have to accrue sick pay hours over time, we could see a delay in the effects of the policy. I use indicators for seven years prior to the sick pay mandate date (leads) and five years after (lags). The two-way fixed effects linear regression event study specification with reference year -1 is denoted as:

$$PC_{ist} = \alpha + \sum_{k=-7, k \neq 1}^5 \beta_k \cdot D_{sk} + \kappa \cdot X_{ist} + \gamma_t + \delta_s + \varepsilon_{ist} \quad (2)$$

4.1.2 Identification

The critical assumption required for DiD estimation is the parallel trends assumption: the treatment and control states have parallel trends in outcomes absent treatment. Seeing these counterfactual outcomes is not possible, but event study plots allow me to assess pre-treatment trends. If we see that the DiD coefficients in the pre-treatment time periods are not statistically different from zero, then we cannot reject the hypothesis that access to paid sick leave had no effect on prenatal care before the mandate was introduced.

There have been numerous advances in the staggered difference-in-differences literature in recent years that address concerns with the two-way fixed effects (TWFE) method. In particular, when using a DiD model to evaluate the staggered introduction of a policy, the DiD coefficient estimate is a weighted average, which may represent a biased average treatment effect if there is effect heterogeneity across states and time. To overcome this problem, I use the estimator put forth in [Callaway and Sant'Anna \(2021\)](#). I select this estimation procedure as it allows for heterogeneity in treatment effects when the average treatment effect varies across time periods and states. This may be the case if over time, workers are more likely to take paid sick leave days when avail-

able to them, due to changing attitudes or a more supportive environment. The authors’ approach involves estimating disaggregated state-time average treatment effects for each time period. We can then aggregate these effects into an event study plot showing the average effects across different lengths of exposure to a sick pay mandate.

Roth (2024) points out that we may observe a kink in event studies produced using Callaway and Sant’Anna (2021) as the pre-treatment coefficients are estimated differently to the post-treatment coefficients. Specifically, the pre-treatment coefficients are “short differences” that compare neighbouring time periods, and the post-treatment coefficients are “long differences” that compare the current time period with the period before treatment. If there is a simple linear time trend, say, then the event study estimated using Callaway and Sant’Anna (2021) can produce a jump in the coefficients from $t = 1$ onwards. Callaway and Sant’Anna (2021) provide an estimator option that plots “long differences” both before and after treatment, which I use for all event studies in this paper.

Throughout the paper I have truncated the event study plots and ATT estimates (dropping observations) to seven years before and five years after treatment, to ensure that the results are not simply for one state for that lead or lag.

4.2 Prenatal care and health outcomes

A naive OLS approach involving regressing maternal or infant outcomes directly on the number of prenatal care events would likely suffer from statistical endogeneity. One source of such endogeneity is reverse causality. Maternal health status may affect the number of prenatal care events if mothers who are at high risk of experiencing problems at birth also receive more prenatal care. A second source is omitted variables. Although I attempt to control for socioeconomic characteristics through county-level indicators such as rural or urban status and median household income, I cannot observe patient level characteristics such as income that could affect prenatal care and maternal health. An ideal experiment would involve randomly assigning mothers a spe-

cific number of prenatal care events. In absence of this, to overcome statistical endogeneity, I use a two-stage least squares (2SLS) strategy. I instrument the number of prenatal care events with the presence of a paid sick leave mandate in a state-year.

4.2.1 Specification

The model is given by:

$$H_{ist} = \zeta + \mu \cdot PC_{ist} + \eta \cdot X_{ist} + \epsilon_{ist} \quad (3)$$

$$PC_{ist} = \alpha + \beta \cdot D_{ist} + \kappa \cdot X_{ist} + \gamma_t + \delta_s + \varepsilon_{ist} \quad (4)$$

H denotes an infant or maternal health outcome, and the other variables are as above. I supplement the 2SLS analysis with additional controls that are relevant for analysing maternal and infant health. Specifically, X_{ist} consists of age, the individual’s Elixhauser comorbidity index, and, at the county level, percent with high-school degree, a rural or urban indicator, median household income, infant mortality rate, OB-GYN per capita. Aside from this, the first stage, given by Equation 4, is the same as Equation 1.

4.2.2 Identification

For identification of β as the local average treatment effect of receiving prenatal care, the 2SLS approach relies on several assumptions. The key identifying assumptions are relevance and the exclusion restriction.

Relevance is satisfied if we have a strong first stage. In the Results Section 5, Table 2, I show evidence of this. For the 2SLS analysis, I use a simple TWFE approach for the first stage as estimation via TWFE does not violate the assumptions of IV. TWFE estimation of the first stage satisfies relevance, as shown in Appendix Table D5. I report both the Cragg-Donald F statistic (Cragg and Donald, 1993) and effective F-statistic of Olea and Pflueger (2013). Given that I only have one endogenous regressor, this statistic is the

F-statistic to test the hypothesis that the instrument does not enter the first stage regression (Stock and Yogo, 2005). The F statistic is 4.20, lower than what is considered a strong instrument. I am, however, operating in the just identified IV scenario. Angrist and Kolesár (2024) state that the median bias of the just identified IV is minimised and halved if the first stage t statistic, t_1 , (and thus the coefficient estimate) is greater than zero. This theoretical results relies on the assumption that the population first stage is positive, which is a relevant assumption in my setting. I posit that the availability of paid sick leave leads to an increase in prenatal care use. I find that the estimated first stage has a positive coefficient, the expected sign. In my case, $t_1 = 2.05$, and so I proceed with the IV analysis. Further, in the case of a single instrument and single endogenous regressor, Anderson-Rubin confidence intervals are efficient and of the correct size even in the case of weak instruments (Andrews et al., 2019). I report the p-value of the Anderson-Rubin test of $H_0 : \beta = \beta_0$, as well as the 95% confidence intervals, in Section 5.2 Table 4.

Exclusion is satisfied if paid sick leave impacts health outcomes only through prenatal care, and not through other channels. I cannot directly test this assumption, but I discuss exclusion in relation to my results in Section 5.2. Estimation of the first stage via TWFE does not violate exclusion. The sources of bias that arise from using TWFE, such as the presence of heterogenous treatment effects or delayed effects of a policy, are not correlated with the error term in the second stage equation.

In addition to these assumptions, my instrument must address conditional independence. In this setting, this requires that PSL mandates are uncorrelated with maternal and infant health outcomes, conditional on state-year fixed effects and controls. In this institutional context, that the conditional independence assumption holds is convincing. It seems reasonable to assume that the month the mandate is introduced in any state is random and uncorrelated with maternal and infant health outcomes at birth. If there are heterogenous treatment effects of prenatal care on maternal and infant health, we also require monotonicity to hold to interpret the instrumental variables estimates as LATE.

Monotonicity in this setting demands that PSL mandates must weakly increase prenatal care use for all mothers, or weakly decrease use for all. It seems implausible that the mandates will have opposing effects on mothers, and I expect them to weakly increase prenatal care use. In Appendix Table D4, I provide an assessment of the monotonicity assumption that tests whether the instrument, presence of a sick pay mandate, and the number of prenatal care events are positively correlated for any group of mothers. I break the sample down into groups of above and below median for various maternal characteristics and repeat the first stage analysis for the subsamples. This analysis shows that both mothers below and above the median age in the sample seek weakly more prenatal care after the introduction of mandates. The sample finding is replicated for mothers residing in above and below median counties in terms of the infant mortality rate, OB-GYNs per capita, and metro and non-metro status. In addition, in Appendix Figure E1, I plot the cumulative distribution functions (CDF) of the number of prenatal care events for treated and untreated, or not yet treated, mothers. The CDFs do not cross, which shows stochastic dominance; the number of prenatal care events for mothers that have access to PSL is stochastically larger than that for mothers who do not have access to PSL. Further, a Kolmogorov-Smirnov test confirms stochastic dominance. I test the null hypothesis that the number of prenatal care events for post-treatment mothers comes from the same distribution as the number of events for pre-treatment mothers, against the alternative hypothesis that the former stochastically dominates the second. The null hypothesis is rejected with $p < 0.001$. I then run a second Kolmogorov-Smirnov test where the null is the same, but the alternative hypothesis is that distribution of the number of prenatal care events for pre-treatment mothers lies above the same distribution for post-treatment mothers. The null hypothesis is not rejected with $p = 0$. These tests give additional reassurance that the monotonicity assumption is reasonable.

Finally, the Stable Unit Treatment Value Assumption must hold. The potential outcome for one unit must be unaffected by the assignment of treatment to the other units. In my setting, for example, this means that mothers

in Massachusetts having access to PSL does not affect New Hampshire mothers' use of prenatal care. Mothers in New Hampshire do not have access to PSL, unlike mothers in Massachusetts. This is reasonable to assume.

With the instrumental variables approach set out here, the local average treatment effect will be the causal effect among commercially insured mothers who sought more prenatal care after their state introduced PSL, weighted by the change in the number of visits.

5 Results

5.1 Effects of paid sick leave on healthcare utilisation during pregnancy

There is an increase in the number of prenatal care events following the introduction of a paid sick leave mandate, as shown in Figure 1. The aggregated effects across the post-treatment period are shown in Table 2. There is an increase in the number of prenatal care events by 1.5 events, an 8% increase relative to the mean of 17.5. 99% of mothers in my sample get some prenatal care.

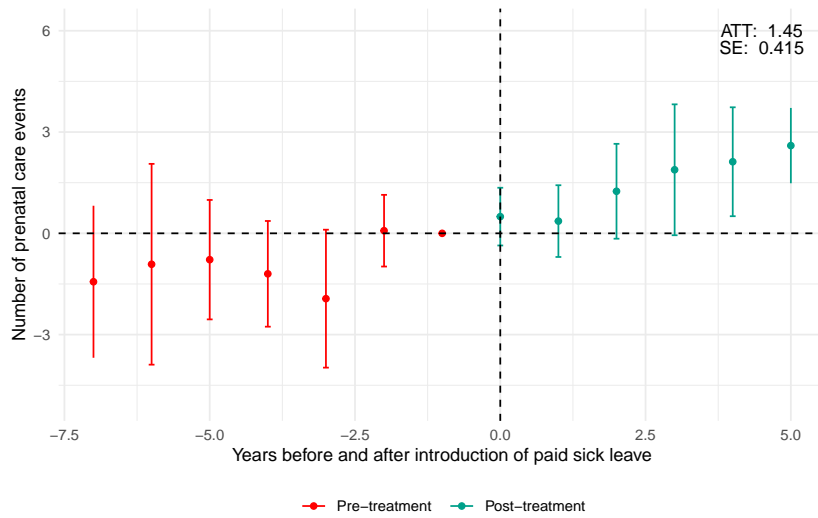
The increase in prenatal care events appears to be driven by prenatal supervision visits (see Figure 2 and Table 3). There is an increase by 1.1 visits, a 17% increase relative to the mean of 6.7. There is little to no change in ultrasounds, pregnancy tests, foetal tests, genetic tests, and other lab tests (see Appendix Figures E2, E3, E4, E5, E6, E7).

To put these figures in context, as mentioned above, the ACOG recommends 12 to 14 prenatal office visits for a term pregnancy (Michel and Fontenot, 2023). Pregnancy supervision visits are more comparable to the office visits specified in the the ACOG guidelines (recall that my main outcome includes not only visits to an OB-GYN, but pregnancy tests, ultrasounds, and the other forms of testing described in the data section).

We see that there is a delayed uptake of prenatal care following the introduction of the mandates, and that the effect increases over time. The delayed effect may be due to time for accrual of paid sick leave. Employees accrue

one hour of paid sick leave for every 30 to 52 hours, depending on the state of employment. Further, most states did not implement mandates in January of the relevant year. There may also be hesitancy to use paid sick leave until it has become normalised in a workplace, which could also explain the increased effect with time.

Figure 1. The effect of paid sick leave on prenatal care



Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Table 2. Effects of paid sick leave on prenatal care

<i>Dependent variable:</i>				
	Num. Prenatal Care	Any Prenatal Care	First Trimester Care	Prenatal Care Delay
PSL	1.450 ***	0.002	0.011	-1.266
Mandate	(0.415)	(0.002)	(0.012)	(1.420)
Mean	17.52	0.99	0.85	9.84

*p<0.05; **p<0.01; ***p<0.001

Notes: N = 809,519. This table shows the effects of paid sick leave access on prenatal care use. Treatment effects defined as the aggregate of the state-time average treatment effects estimated using Callaway and Sant'Anna (2021). "First trimester care" is whether the mother had any prenatal care during her first trimester. "Prenatal care delay" is the number of days until the first prenatal care event counted from the end of the first trimester. This variable equals zero if the mother had any prenatal care during her first trimester. See Appendix for codes used to define prenatal care events. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. Model includes state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

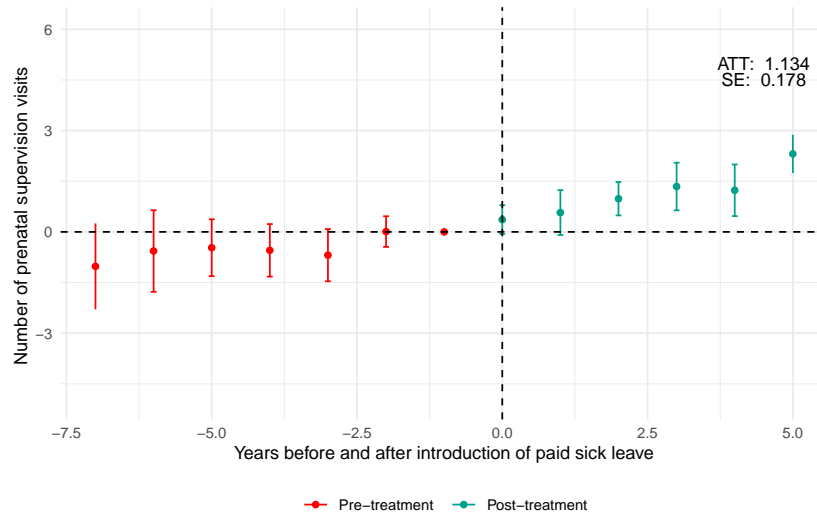
Table 3. Effects of paid sick leave on prenatal care, by type

<i>Dependent variable:</i>							
	Lab Tests	Preg. Tests	Foetal Tests	Gen. Tests	Supervision Visits	US	E&M
PSL	-0.238 *	0.023	0.209	0.157 **	1.134 ***	0.166	-0.375 *
Mandate	(0.108)	(0.081)	(0.123)	(0.051)	(0.178)	(0.118)	(0.161)
Mean	2.08	1.48	2.10	0.83	6.74	4.29	0.81

*p<0.05; **p<0.01; ***p<0.001

Notes: N = 809,519. This table shows the effects of paid sick leave access on different types of prenatal care use. Treatment effects defined as the aggregate of the state-time average treatment effects estimated using Callaway and Sant'Anna (2021). See Appendix for codes used to define each prenatal care type. "Gen. Tests" is genetic tests. "US" is ultrasounds. "E&M" is evaluation and management visits. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Figure 2. The effect of paid sick leave on prenatal supervision visits



Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of pregnancy supervision visits. See Appendix for codes used to define pregnancy supervision visits. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

We see no significant effects on prenatal care initiation and delay, as shown in Table 2 and the event studies in Appendix Figures E11 and E12. Although there are no significant effects, the signs of the effects are in the direction we would expect. A positive effect on first trimester care indicates a greater likelihood of starting prenatal care in the first trimester. A negative sign on prenatal care delay suggests a reduction in the delay to the first prenatal care visit. Note that a high proportion, 85%, of mother-births in our sample start prenatal care in their first trimester. These mothers may already be aware that they should visit their OB/GYN when they find out that they are pregnant.

In addition to timely prenatal care initiation, a higher cadence of prenatal care visits early on in the pregnancy increases the likelihood of identifying any pre-existing conditions or pregnancy complications. I break down number of prenatal care events by trimester and find that the increase in events occurs in the first and second trimester (see Appendix Figures E8, E9 and Table D1). There is no significant increase in prenatal care episodes in the third trimester as shown in Appendix Figure E10.

I do not find any significant changes in emergency department use, as shown in Table D2 and Appendix Figures E13 and E14. This suggests that mothers with and without access to paid sick leave seek urgent care if a problem arises that demands it.

Combined, these results suggest that the introduction of sick pay affects the use of prenatal care on the intensive margin. Sick pay allows this group of mothers to take paid time off to seek additional prenatal care. Prenatal care use is not significantly affected on the extensive margin; essentially all mothers in my sample have at least one prenatal care event. The increase in the number of prenatal care events is driven by pregnancy supervision visits: regular outpatient prenatal care visits. Paid sick leave access does not significantly affect the timeliness of prenatal care. Finally, no statistically significant effects on emergency department use support the hypothesis that mothers seek urgent care when it is needed, regardless of access to sick pay.

5.2 Effects of prenatal care on maternal and infant health

Table 4 shows both the OLS and IV estimates of the effect of more prenatal care on severe maternal morbidity, postnatal depression, stillbirth, and preterm birth. The IV analysis shows that more prenatal care leads to a significant reduction in the likelihood of a postnatal depression diagnosis, by 7% relative to the mean of 9%. The OLS estimate for postnatal depression is of an opposite sign, positive, and significant. This suggests that endogeneity is a problem with OLS. One potential explanation is that mothers who seek more prenatal care are doing so because they are experiencing mental health symptoms and so the probability of diagnosis is higher.

A surprising finding is that more prenatal care leads to more preterm births, based on the IV estimates. An increased probability of preterm birth is a “worse” outcome as it is associated with poor health later on for infants. In contrast, the negative OLS estimate suggests that more prenatal care is associated with fewer instances of preterm birth. Preterm birth can occur due to induced labour ([World Health Organisation, 2023](#)). In column 2 of Table 5, I look at induction, to see whether the increase in preterm births is matched by an increase in inductions. It is, although the Anderson-Rubin confidence interval does not allow us to rule out a null effect. One interpretation could be that more prenatal care visits allows for increased identification of problems where using induced labour is a preferred or necessary approach. Doctors may be inducing these births for the health of the mother and child, and the increased inductions could be linked to the increase in preterm births.

The IV estimates reveal no statistically significant effects on severe maternal morbidity or stillbirth. The confidence intervals do not allow us to rule out either positive or negative effects. In contrast, for these variables, the OLS estimates are significant. The imprecision of the IV estimates means that we cannot draw conclusions on whether the IV and OLS estimates differ. Table 5 also shows that I find no statistically significant effect on caesareans, including scheduled caesareans, in the IV analysis.

Table 4. Effects of prenatal care on maternal and infant health

	SMM		Depression		Stillbirth		Preterm	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Prenatal Care	0.04*** (0.00)	0.05 (0.15)	0.11*** (0.01)	-0.65* (0.28)	-0.01*** (0.00)	0.00 (0.05)	-0.02** (0.00)	0.46** (0.16)
Mean (%)	2.00	2.00	9.00	9.00	1.00	1.00	1.00	1.00
R ²	0.02	0.02	0.07	0.01	0.00	0.00	0.01	-0.08
AR p-val		0.72		0.01		0.85		0.02
AR CI		(-0.003, ∞)		(-∞, -0.003)		(-∞, 0.001)		(0.002, ∞)

* p < 0.05, ** p < 0.01, *** p < 0.001

Notes: N= 649,407. This table shows the estimated effects of the number of prenatal care events on maternal and infant health outcomes. Coefficient estimates multiplied by 100. “Prenatal care” is the number of prenatal care events. “SMM” is severe maternal morbidity. “Depression” is postnatal depression or anxiety. See Appendix for codes used to define prenatal care events and the health outcomes. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. “AR p-val” is the p-value of the Anderson-Rubin test. “AR CI” is the 95% Anderson-Rubin confidence interval. Standard errors, clustered at the state level, in parentheses.

Table 5. Effects of prenatal care on delivery procedures

	Induction		Caesarean		Scheduled Caesarean	
	OLS	IV	OLS	IV	OLS	IV
Prenatal Care	-0.06*** (0.01)	1.91* (0.79)	0.42*** (0.00)	-0.43 (0.34)	0.16*** (0.00)	-0.48 (0.42)
Mean (%)	4.00	4.00	26.00	26.00	8.00	8.00
R ²	0.03	-0.75	0.04	0.00	0.01	-0.03
AR p-val		0.06		0.16		0.34
AR CI		(-0.001, ∞)		(-∞, 0.003)		(-0.026, 0.032)

* p < 0.05, ** p < 0.01, *** p < 0.001

Notes: N= 649,407. This table shows the estimated effects of the number of prenatal care events on delivery procedures. Coefficient estimates multiplied by 100. “Prenatal care” is the number of prenatal care events. See Appendix for codes used to define prenatal care events and the procedures. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. “AR p-val” is the p-value of the Anderson-Rubin test. “AR CI” is the 95% Anderson-Rubin confidence interval. Standard errors, clustered at the state level, in parentheses.

I now consider the exclusion restriction in light of the findings, building on the discussion of identification in Section 4.2.2. The exclusion restriction requires that access to paid sick leave affects health outcomes only through the channel of prenatal care. My main findings are that more prenatal care reduces the probability of a postnatal depression diagnosis, and increases the likelihood of a preterm and induced birth. For the exclusion restriction to hold in this context, mothers taking more paid sick leave experience a reduction in postnatal depression through the increased prenatal care, and not through another channel. Similarly, they see an increase in preterm births and induction through the increased prenatal care, and not via another causal pathway. For preterm births and induction, there is no obvious such channel. For postnatal depression, the paid sick leave days themselves could affect health outcomes directly through a stress channel. Although this is plausible, the number of days taken off for sick leave is limited. I find an increase in prenatal care events of 1.45, and [Maclean et al. \(2020\)](#) find that employees use approximately two additional sick days per year. It seems unlikely that taking one to two days off during a pregnancy will have a substantial impact on maternal stress on its own. Note that whether we believe the exclusion restriction or not, either indirectly through prenatal care or directly, the paid sick leave policy appears to be having a positive effect on maternal postpartum depression.

6 Robustness

6.1 Paid sick leave and prenatal care

The result that paid sick leave mandates increase the number of prenatal care events is robust to alternative definitions of prenatal care, as shown in Appendix Table D3. The event studies of prenatal care including office visits and with the alternative [Gourevitch et al. \(2022\)](#) definition can be found in Figures E15 and E16. The first column in Appendix Table D3 shows the main prenatal care definition used in this paper. Columns two to four show alternative definitions of prenatal care. The alternative prenatal care definition includes fewer prenatal services (e.g. lab tests, foetal tests, ultrasounds) which

is why the mean number of events is lower. As shown in Table 3, paid sick leave access has small to no effects on these services.

For the main analysis, the control group consists of “never treated” mothers. These are units that never received treatment, i.e. mothers who delivered in states that never received paid sick leave mandates. As another test for robustness, I repeat the analysis with the control containing “not yet treated” mothers in addition to those that are “never treated”. The event study for the number of prenatal care events looks very similar and the aggregated treatment effect is also consistent, as shown in Appendix Figure E17.

6.2 Prenatal care and maternal and infant health

I repeat the instrumental variables analysis with an alternative instrument: years since the paid sick leave mandate was introduced in the mother’s state. This variable is zero for mother-births that occur prior to the introduction of a paid sick leave mandate, and for mothers that reside in states that do not have a paid sick leave mandate in the time period I study. The motivation behind using this instrument comes from the lagged uptick in prenatal care events after the introduction of a mandate, evident in Figure 1. The F statistic on the first stage of this instrument is also low, (see Appendix Table D6), but this remains a just-identified model as discussed in Section 4. The results of this robustness analysis can be found in Appendix Tables D8 and D9. The IV estimates are in the same direction as those presented in the main IV analysis in Table 4.

7 Discussion and conclusion

This paper examines whether sick pay access affects mothers’ use of healthcare during pregnancy, with a focus on prenatal care. This setting is important given the higher rates of maternal and infant mortality rates in the U.S. relative to OECD comparators (OECD.Stat, 2018), and as medical care use during pregnancy is cited as a contributing factor (Kamal et al., 2019; Wong and Kitsantas, 2020).

I find a significant increase in the number of prenatal care events following the introduction of a state level sick pay mandate. Overall, there is an 8% increase relative to the mean of 17.5 events in the post treatment period. This increase is predominantly driven by an increase in pregnancy supervision visits. I find a 17% increase in supervision visits relative to the mean of 6.74. Recall that there will be some mothers in states without mandates that have sick pay access through their employer or city. Thus the effect of any PSL mandate on prenatal care use may in fact be higher than the estimates presented here. I find no significant effects on prenatal care initiation, which may be the case if these mothers are aware of the medical recommendations to start prenatal care in the first trimester and prioritise attending a timely first visit. I find no statistically significant change in mothers' emergency department use, suggesting that mothers seek medical care when urgent health shocks arise.

I then ask whether the increase in prenatal care use translates to improved maternal and infant health outcomes. I find that more prenatal care reduces postnatal depression diagnoses by 7% relative to the mean. To put this figure into context, we can look to prior work evaluating other policies and mechanisms that have been found to impact mental health. [Baicker et al. \(2013\)](#) find that Medicaid coverage decreased the rate of depression by 30% amongst the Oregon Health Experiment enrollees in the first two years. [Lindahl \(2005\)](#) studies positive income shocks from lottery winnings in Sweden, and finds that a 10% increase in income leads to a reduction in poor mental health symptoms by 7 percentage points, a 13% reduction relative to the mean. [Schmidt et al. \(2023\)](#) find that an \$1,000 increase in a cash and food benefits decreases severe psychological distress by 8.4% of the mean. The estimated effects on severe maternal morbidity, stillbirth, and caesareans are too imprecise to rule out effects in either direction.

In this sample, receiving more prenatal care does not affect rare health events such as severe maternal morbidity. Yet this sample consists of commercially insured mothers, a group likely to be employed and in employment where they have had health insurance for a protracted period before and throughout

their pregnancy.

Given the evidence on substantial income inequalities in maternal and infant health in the U.S. ([Kennedy-Moulton et al., 2022](#)), research on these questions in the setting of low-income mothers is important. This is a limitation of my analysis. Low-income mothers are most likely underrepresented in this sample. Further, I am unable to look at heterogenous treatment effects by income in these data.

Nonetheless, if more prenatal care does reduce maternal stress and depression in commercially insured mothers, this could have a meaningful impact on postnatal mortality. Half of maternal deaths occur in the postnatal period ([Centers for Disease Control and Prevention, 2022](#)), and it is estimated that 11% of maternal deaths are related to mental health conditions ([Trost et al., 2021](#)). Furthermore, the impact of anxiety and depression on mothers is likely to extend past the postpartum period and have spillover effects on other aspects of their lives. For example, productivity in the workplace, upon return. As a result, the effects that I find may represent a lower bound of the potential direct and indirect effects.

Based on these findings, we can conclude that paid sick leave policies are a potential policy lever to address the maternal health crisis by helping protect mothers against depression and anxiety in the postpartum period. More research is needed on the effectiveness of prenatal care for low-income mothers in the U.S. setting if we are to better understand how to address high rates of maternal and infant deaths.

A Overview of Employer Sick Pay Mandates in the U.S.

Region	Law Effective	Content
Washington D.C.	Nov 13, 2008	“Qualified employees”; 1 hour of paid sick leave for every 43 hours, 90 days accrual period; up to 3 to 9 days depending on employer size; own sickness or family; no health care or restaurant employees; extension to 20,000 temporary and tipped employees (retrosp. in Sep 2014)
Connecticut	Jan 1, 2012	Full-time service sector employees at employers with > 49 employees (20% of workforce); 1 hour for every 40 hours; up to 5 days; own sickness or family member, 680 hours accrual period (4 months)
California	July 1, 2015	All employees; 1 hour of paid sick leave for every 30 hours; minimum 24 hours; own sickness or family member; 90 days accrual period
Massachusetts	July 1, 2015	All employees at employers with > 10 employees; 1 hour for every 40 hours; up to 40 hours; own sickness or family member; 90 days accrual period
Oregon	Jan 1, 2016	All employees at employers with > 9 employees; 1 hour every 30 hours; 90 days accrual period; up to 40 hours; own sickness or family member
Vermont	Jan 1, 2017	Employees w/ 18 hours/week & >20 weeks/year at employers with > 5 employees; 1 hour every 52 hours; up to 24 hours in 2017, 40 hours thereafter; own sickness or family member; underage employees and employers in the first year exempt; some state employees & per diem employees in health care or long-term care facility exempt
Arizona	July 1, 2017	All employees; 1 hour for every 30 hours; up to 40 hours at employers with > 14 employees, up to 24 hours <15 employees; own sickness or family member; employers can impose a 90-day accrual period for new employees
Washington	Jan 1, 2018	All employees except those who are exempt from the minimum wage law; 1 hour for every 40 hours; no cap but no more than 40 hours carry over; own sickness or family member; 90-day accrual for new employees
Maryland	Feb 11, 2018	Employees w/ 12 hours/week at employers with > 14 employees (<15 employees 40 hours unpaid); 1 hour for every 30 hours; employers can cap at 64 hours accrual and 40 hours carry over; own sickness or family member, also for parental leave; certain groups exempt (e.g., temp. agency employees)
Rhode Island	July 1, 2018	All employees; 1 hour for every 35 hours; 24 hours in firms > 17 (2018, 2019); 40 hours in firms > 17 (2020+); own sickness or family member; 90-day accrual period
New Jersey	Oct 28, 2018	All employees; 1 hour for every 30 hours up to 40 hours/year; per diem health care employees exempt own sickness or family member; 120-day accrual for new employees; preempts city laws
Michigan	Mar 28, 2019	Employees w/ 25 hours/week employed for 25 weeks at employers with > 49 employees; 1 hour for every 35 hours; government employees, certain railway and air carrier employees exempt; own sickness or family member; 90-day accrual for new employees

Source: [Maclean et al. \(2020\)](#)

B Billing codes used to define prenatal care

Outcome	Codes
Prenatal visit procedures	HCPCS: H1000, H1001, H1002, H1003, H1004, H1005; CPT: 0500F, 0502F, 59425, 59426, 0501F, 0503F, 59420; ICD-10-CM: Z36*, Z34*, O09*, Z037; ICD-9-CM: V28, V220, V221, V23, V89.
Evaluation and management visits	CPT: 99211, 99212, 99213, 99214, 99215, 99201, 99202, 99203, 99204, 99205, 99241, 99242, 99243, 99244, 99245, 99401, 99402, 99403, 99404, 99384, 99385, 99386, 99394, 99395, 99396, 3725F, 3351F, 3352F, 3353F, 3354F, 96150, 96151, 96152, 96156, 96158, 96127, 1220F, 3008F, 3074F, 3075F, 3077F, 3078F, 3079F, 3080F, 2000F, 2001F, 99500; HCPCS: G0442, G0443, G0444, G0445, G0446, G0447, G8431, G8432, G8433, G8510, G8511, G9717, H0004, G8419, G8420, G8421, G8422, G8938, G8752, G8753, G8754, G8755.
Foetal testing	CPT: 59025, 76818, 76819, 76820, 76821.
Genetic testing	CPT: 81200, 81205, 81209, 81220, 81242, 81250, 81251, 81255, 81257, 81260, 81290, 81329, 81330, 81361, 81412, 81443, 81508, 81509, 81510, 81511, 81512, 0124U, 0125U, 0126U, 82105, 82106, 82677, 84163, 86336, 81420, 81422, 81507, 0009M, 0168U, 81228, 81229; HCPCS: S3835, S3847, S3848, S3849, S3850, S3851, S3870.
Obstetrical laboratory tests	CPT: 80055, 80081, 80050, 86762, 86765, 86901, 86906, 3290F, 3291F, 3293F, 87806, 87534, 87535, 87536, 87537, 87538, 87539, 87390, 87391, 87389, 3292F, 3490F, 3491F, 3492F, 3494F, 3496F, 3497F, 3498F, 3500F, 3502F, 3503F, 86689, 86701, 86702, 86703, 86592, 86593, 3512F, 0065U, 87285, 86781, 86780, 0064U, 80074, 86704, 86705, 86706, 87340, 87341, 87516, 87517, 87110, 87270, 87320, 87810, 86631, 86632, 87490, 87491, 87492, 87590, 87591, 87592, 87850; HCPCS: G9228, G0432, G0433, G0435, S3645, G0475, G8869, G9912, G9820; ICD-10-CM: Z114; ICD-9-CM: V7389.
Pregnancy tests	CPT: 81025, 84163, 84703, 84702, 84704, 0167U; ICD-10-CM: Z3200, Z3201; ICD-9-CM: V7240, V7242.
Ultrasounds	CPT: 76805, 76810, 76811, 76812, 76815, 76816, 76817, 76801, 76802, 76813, 76814.

Sources: [Gourevitch et al. \(2022\)](#), [Sinaiko \(2023\)](#)

C Billing codes used for the maternal health outcomes

Outcome	Codes
Severe maternal morbidity	ICD-9-CMP: 996*, 990*, 6839, 6849, 6859, 6869, 6879, 689, 683, 684, 685, 686, 687, 311, 9670, 9671, 9672; ICD-9-CMD: 410*, 441*, 5845, 5846, 5847, 5848, 5849, 6693*, 5185*, 51881, 51882, 51884, 7991, 6731*, 42741, 42742, 4275, 2866, 2869, 6413*, 6663*, 6426*, 9971, 0463, 34839, 36234, 430*, 431*, 432*, 433*, 434*, 435*, 436*, 437*, 6715*, 6740*, 99702, 4280, 4281, 42820, 42821, 42823, 42830, 42831, 42833, 42840, 42841, 42843, 4289, 5184, 6680*, 6681*, 6682*, 9954, 99586, 038*, 449, 78552, 99591, 99592, 99802, 6702*, 6691*, 78550, 78551, 78559, 9950, 9980, 99800, 99801, 99809, 28242, 28262, 28264, 28269, 28952, 4150, 4151*, 6730*, 6732*, 6733*, 6738*; ICD-10-CMP: 5A12012, 5A2204Z, 30230H0, 30230K0, 30230L0, 30230M0, 30230N0, 30230P0, 30230R0, 30230T0, 30230H1, 30230K1, 30230L1, 30230M1, 30230N1, 30230P1, 30230R1, 30230T1, 30233H0, 30233K0, 30233L0, 30233M0, 30233N0, 30233P0, 30233R0, 30233T0, 30233H1, 30233K1, 30233L1, 30233M1, 30233N1, 30233P1, 30233R1, 30233T1, 30240H0, 30240K0, 30240L0, 30240M0, 30240N0, 30240P0, 30240R0, 30240T0, 30240H1, 30240K1, 30240L1, 30240M1, 30240N1, 30240P1, 30240R1, 30240T1, 30243H0, 30243K0, 30243L0, 30243M0, 30243N0, 30243P0, 30243R0, 30243T0, 30243H1, 30243K1, 30243L1, 30243M1, 30243N1, 30243P1, 30243R1, 30243T1, 0UT90ZL, 0UT90ZZ, 0UT97ZL, 0UT97ZZ, 0B110F4, 0B113F4, 0B114F4, 5A1935Z, 5A1945Z, 5A1955Z; ICD-10-CMD: I21*, I22*, I71*, I79*, N17*, O904, J80, J951, J952, J953, J9582*, J960*, J962*, J969*, R0603, R092, O88112, O88113, O88119, O8812, O8813, I46*, I490*, D65, D688, D689, O45002, O45003, O45009, O45012, O45013, O45019, O45022, O45023, O45029, O45092, O45093, O45099, O46002, O46003, O46009, O46012, O46013, O46019, O46022, O46023, O46029, O46092, O46093, O46099, O670, O723, O15*, I97120, I97121, I97130, I97131, I97710, I97711, A812, G45*, G46*, G9349, H340*, I60*, I61*, I62*, I6300, I6301*, I631*, I632*, I633*, I634*, I635*, I636, I638*, I639, I65*, I66*, I67*, I68*, O2250, O2252, O2253, I97810, I97811, I97820, I97821, O873, I501, I5020, I5021, I5023, I5030, I5031, I5033, I5040, I5041, I5043, I50810, I50811, I50813, I50814, I5082, I5083, I5084, I5089, I509, J810, O29112, O29113, O29119, O29122, O29123, O29129, O29192, O29193, O29199, O29212, O29213, O29219, O29292, O29293, O29299, O740, O741, O742, O743, O890*, O891, O892, T882XXA, T883XXA, A327, A40*, A41*, I76, O85, O8604, R6520, R6521, T8112XA, T8144XA, O751, R57*, T782XXA, T8110XA, T8111XA, T8119XA, T886XXA, D5700, D5701, D5702, D57211, D57212, D57219, D57411, D57412, D57419, D57811, D57812, D57819, I26*, O88012, O88013, O88019, O8802, O8803, O88212, O88213, O88219, O8822, O8823, O88312, O88313, O88319, O8832, O8833, O88812, O88813, O88819, O8882, O8883, T800XXA
Postnatal depression	ICD-9-CMD: 64840, 64841, 64842, 64843, 64844, 29621, 29622, 29623, 29624, 29625, 29626, 29630, 29631, 29632, 29633, 29634, 29635, 29636, 29682, 311, 2962, 29384, 30000, 30001, 30002, 30009, 30010, 308*; ICD-10-CMD: F53*, O906, F99, O9934*, F32*, F33*, F41*, F43*
Stillbirth	ICD-9-CMD: V271, V273, V274, V276, V277, 6564; ICD-10-CM: Z371, Z373, Z374, Z376, Z377, P95, O364
Pre-term	ICD-9-CMD: 64421, 7650, 7651, 76521, 76522, 76523, 76524, 76525, 76526, 76527, 76528; ICD-10-CMD: O601, P072, P073, O603
Induction	ICD-9-CMP: 734, 731, 7301; ICD-10-CMP: 3E033VJ, 3E0P7GC, 0U7C7ZZ, 0U7C7DZ
Caesarean	ICD-9-CMP: 6697*, 741, 742, 744, 7499; ICD-10-CMP: O82, O7582; CPT: 59510, 59514, 59515, 59525, 59611, 59620, 59622, 1968, 1969
Scheduled Caesarean	ICD-9-CMP: 6697*; ICD-10-CMP: 6697*

Sources: Geiger et al. (2021), Danilack et al. (2016), Sherman and Ali (2018), CDC (2023)

D Appendix Tables

Appendix Table D1. Effects of paid sick leave on prenatal care, by trimester

<i>Dependent variable:</i>			
	Num. Prenatal Care, 1st Tri.	Num. Prenatal Care, 2nd Tri.	Num. Prenatal Care, 3rd Tri.
PSL	0.563 ***	0.652 ***	0.236
Mandate	(0.082)	(0.115)	(0.267)
Mean	4.43	4.92	8.17

*p<0.05; **p<0.01; ***p<0.001

Notes: N = 809,519. This table shows the effects of paid sick leave access on prenatal care, by trimester. Treatment effects defined as the aggregate of the state-time average treatment effects estimated using [Callaway and Sant'Anna \(2021\)](#). See Appendix for codes used to define prenatal care events. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Appendix Table D2. Effects of paid sick leave on emergency department use

<i>Dependent variable:</i>		
	Any ED Visit	Num. ED Visits
PSL	0.010	0.025
Mandate	(0.032)	(0.074)
Mean	0.31	0.56

*p<0.05; **p<0.01; ***p<0.001

Notes: N = 809,519. This table shows the effects of paid sick leave access on emergency department use. Treatment effects defined as the aggregate of the state-time average treatment effects estimated using [Callaway and Sant'Anna \(2021\)](#). See Appendix for codes used to define emergency department visits. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Appendix Table D3. Effects of paid sick leave on alternative definitions of number of prenatal care events

<i>Dependent variable:</i>				
	(1)	(2)	(3)	(4)
	Num. Prenatal Care	(1) w/ E&M	Alternative Def. of (1)	(3) w/ E&M
PSL	1.450 ***	1.075 **	1.044 ***	0.666 *
Mandate	(0.415)	(0.371)	(0.309)	(0.276)
Mean	17.52	18.33	14.02	14.84

*p<0.05; **p<0.01; ***p<0.001

Notes: N = 809,519. Treatment effects defined as the aggregate of the state-time average treatment effects estimated using Callaway and Sant'Anna (2021). The outcome in column (1) is the main prenatal care definition. The outcome in column (2) includes evaluation and management (E&M) visits. The outcome in column (3) is the alternative definition of prenatal care, and that in column (4) includes E&M visits. See Appendix for codes used to define prenatal care events. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Appendix Table D4. Assessing monotonicity

<i>Dependent variable:</i>								
Number of prenatal care events								
	Age+	Age-	Mort.+	Mort.-	Metro	Non-Metro	OB+	OB-
PSL	1.43*	0.68	1.98***	0.74	1.25*	1.43*	0.76	1.67**
Mandate	(0.69)	(0.44)	(0.34)	(0.68)	(0.61)	(0.66)	(0.56)	(0.62)
N	376,949	272,458	329,242	320,165	645,955	3,452	380,212	269,195

* p < 0.05, ** p < 0.01, *** p < 0.001.

Notes: This table shows the first-stage two-way fixed effects estimates for each sub-sample of patients. See Appendix for codes used to define prenatal care events. "Age+" denotes above median age at delivery. "Age-" denotes below median age at delivery. "Mort.+" denotes above median infant mortality rate in the mother's birth county. "Mort.-" denotes below median infant mortality rate in the mother's birth county. "Metro" denotes mothers residing in metropolitan counties. "Non-Metro" denotes mothers residing in non-metropolitan counties. "OB+" denotes above median OB-GYN per capita in the mother's birth county. "OB-" denotes below median OB-GYN per capita in the mother's birth county. "Post treatment" defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Appendix Table D5. First stage

	Prenatal Care
PSL	1.25*
Mandate	(0.61)
Mean	17.5
F-stat	4.20
Effective F-stat	4.20
N	649,407

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table shows the first stage two-way fixed effects estimates. See Appendix for codes used to define prenatal care events. “Post treatment” defined as last menstrual period occurring after the sick pay mandate was introduced in their state. Controls include age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. The model includes state and year fixed effects. “Effective F-stat’ is that of [Olea and Pflueger \(2013\)](#). Standard errors, clustered at the state level, in parentheses.

Appendix Table D6. First stage (alternative instrument)

	Prenatal Care
Years since mandate	0.35 (0.21)
Mean	17.52
F-stat	2.73
Effective F-stat	2.73
N	649,407

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table shows the first stage two-way fixed effects estimates using the alternative instrument. See Appendix for codes used to define prenatal care events. “Years since mandate” defined as the number of years prior to the last menstrual period that the sick pay mandate has been in place in the mother’s state. Controls include age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. The model includes state and year fixed effects. “Effective F-stat’ is that of [Olea and Pflueger \(2013\)](#). Standard errors, clustered at the state level, in parentheses.

Appendix Table D7. Reduced form

	SMM	Postnatal Depression	Stillbirth	Preterm	Induction
PSL	-0.03	1.05*	-0.12	-0.48	-0.77
Mandate	(0.20)	(0.47)	(0.08)	(0.58)	(1.32)
Mean (%)	2.08	9.25	0.78	1.33	4.13

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Notes: $N = 649,407$. This table shows reduced form effects estimated using OLS. Coefficients multiplied by 100. “SMM” is severe maternal morbidity. See Appendix for codes used to define the health outcomes. “Post treatment” defined as last menstrual period occurring after the sick pay mandate was introduced in their state. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. Standard errors, clustered at the state level, in parentheses.

Appendix Table D8. Effects of prenatal care on maternal and infant health (alternative instrument)

	SMM		Depression		Stillbirth		Preterm	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Prenatal Care	0.04*** (0.00)	0.02 (0.13)	0.11*** (0.01)	-1.14+ (0.58)	-0.01*** (0.00)	0.05 (0.06)	-0.02** (0.00)	0.59+ (0.32)
Mean (%)	2.00	2.00	9.00	9.00	1.00	1.00	1.00	1.00
R ²	0.02	0.02	0.07	-0.10	0.00	-0.00	0.01	-0.17
AR p-val		0.88		0.01		0.49		0.00
AR CI		$(-\infty, \infty)$		$(-\infty, \infty)$		$(-\infty, \infty)$		$(-\infty, \infty)$

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: $N = 649,407$. This table shows the estimated effects of the number of prenatal care events on maternal and infant health outcomes using the alternative instrument of years since paid sick leave mandate. Coefficient estimates multiplied by 100. “Prenatal care” is the number of prenatal care events. “SMM” is severe maternal morbidity. “Depression” is postnatal depression or anxiety. See Appendix for codes used to define prenatal care events and the health outcomes. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. “AR p-val” is the p-value of the Anderson-Rubin test. “AR CI” is the 95% Anderson-Rubin confidence interval. Standard errors, clustered at the state level, in parentheses.

Appendix Table D9. Effects of prenatal care on delivery procedures (alternative instrument)

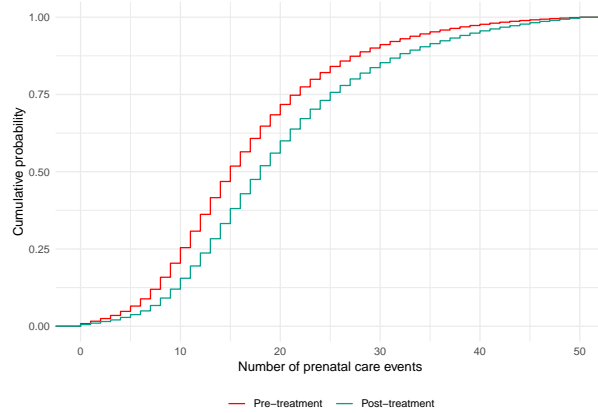
	Induction		Caesarean		Scheduled Caesarean	
	OLS	IV	OLS	IV	OLS	IV
Prenatal Care	-0.06*** (0.01)	2.51+ (1.45)	0.42*** (0.00)	-0.59 (0.71)	0.16*** (0.00)	-1.23+ (0.67)
Mean (%)	4.00	4.00	26.00	26.00	8.00	8.00
R ²	0.03	-1.42	0.04	-0.01	0.01	-0.22
AR p-val		0.02		0.44		0.09
AR CI		(-0.001, ∞)		(-∞, ∞)		(-∞, ∞)

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: N= 649,407. This table shows the estimated effects of the number of prenatal care events on delivery procedures using the alternative instrument of years since paid sick leave mandate. Coefficient estimates multiplied by 100. “Prenatal care” is the number of prenatal care events. See Appendix for codes used to define prenatal care events and procedures. All models include the following controls: age at delivery, percent of county with a high school degree, a rural-urban measure of the county, median household income in the county, the infant mortality rate in the county, the number of OB-GYNs per capita in the county, and the Elixhauser comorbidity index at birth. All models include state and year fixed effects. “AR p-val” is the p-value of the Anderson-Rubin test. “AR CI” is the 95% Anderson-Rubin confidence interval. Standard errors, clustered at the state level, in parentheses.

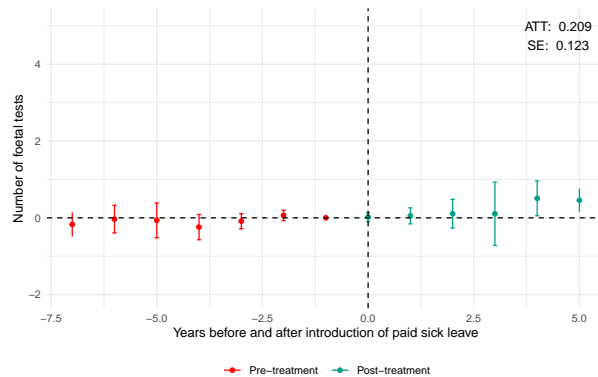
E Appendix Figures

Appendix Figure E1. Cumulative distribution of the number of prenatal care events, by treatment status



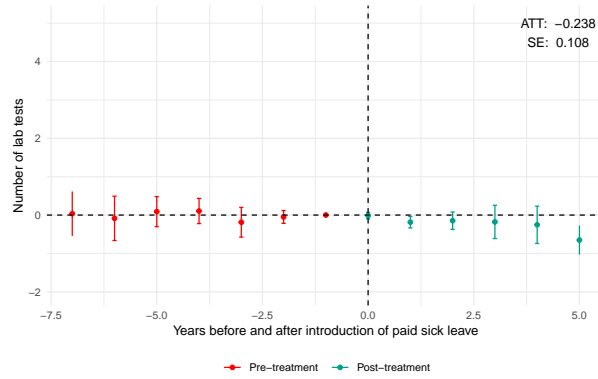
Notes: $N = 810,547$. “Pre-treatment” is the CDF for mother-births that occur before the state has introduced a PSL mandate, or for mother-births that occur in states that are never treated. “Post-treatment” is the CDF for mother-births that occur after their state has introduced a PSL mandate. The x-axis is the number of prenatal care events. The y-axis is the cumulative probability. See Appendix for codes used to define prenatal care events.

Appendix Figure E2. The effect of paid sick leave on the number of foetal tests



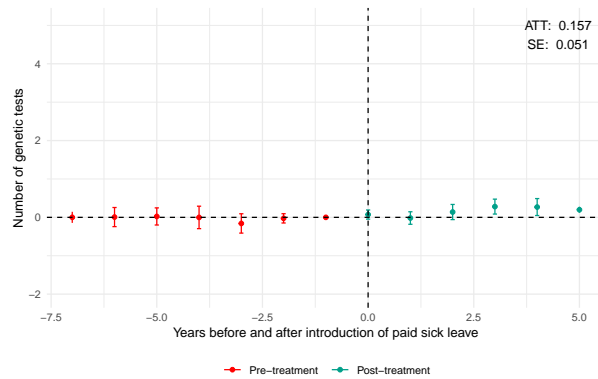
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant’Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of foetal tests. See Appendix for codes used to define foetal tests. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E3. The effect of paid sick leave on the number of lab tests



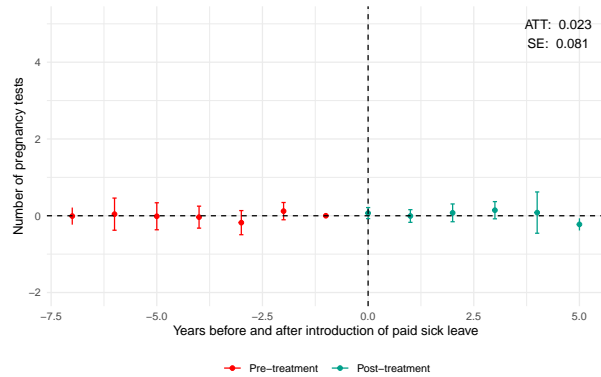
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of lab tests. See Appendix for codes used to define lab tests. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E4. The effect of paid sick leave on the number of genetic tests



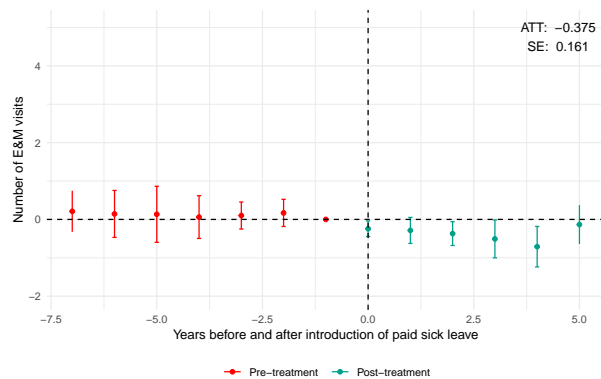
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of genetic tests. See Appendix for codes used to define genetic tests. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E5. The effect of paid sick leave on the number of pregnancy tests



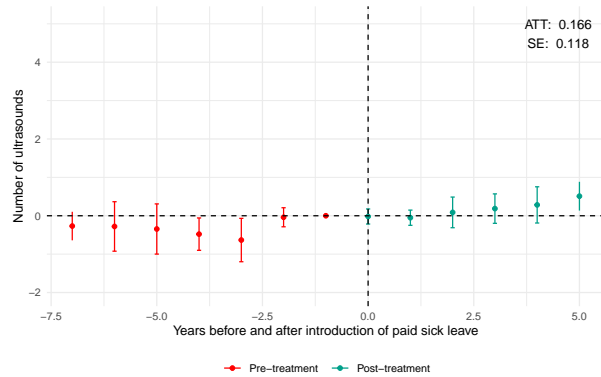
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of pregnancy tests. See Appendix for codes used to define pregnancy tests. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E6. The effect of paid sick leave on the number of E&M visits



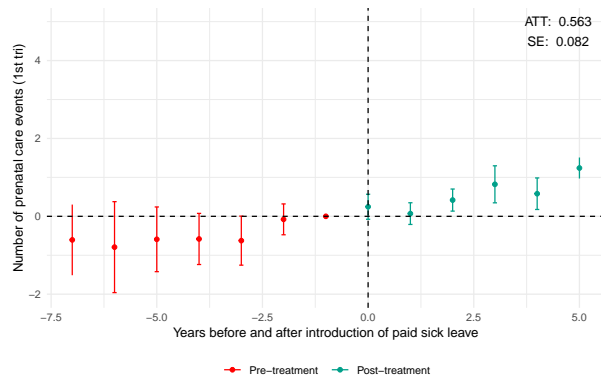
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of evaluation and management (E&M) visits. See Appendix for codes used to define E&M visits. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E7. The effect of paid sick leave on the number of ultrasounds



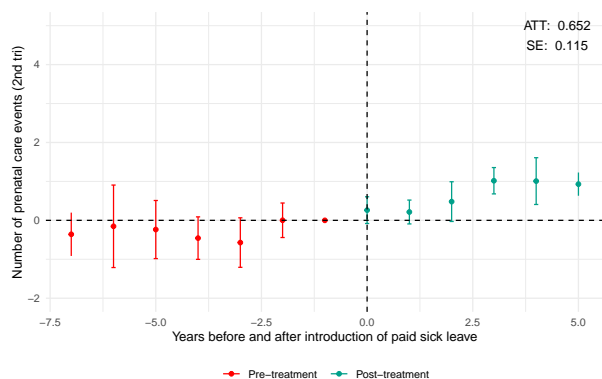
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of ultrasounds. See Appendix for codes used to define ultrasounds. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E8. The effect of paid sick leave on number of prenatal care episodes in the 1st trimester



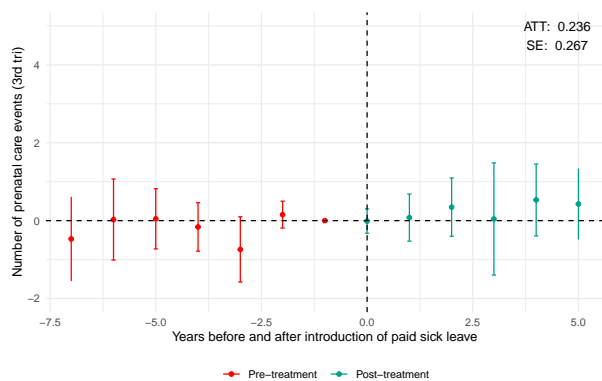
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events in the first trimester. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E9. The effect of paid sick leave on number of prenatal care episodes in the 2nd trimester



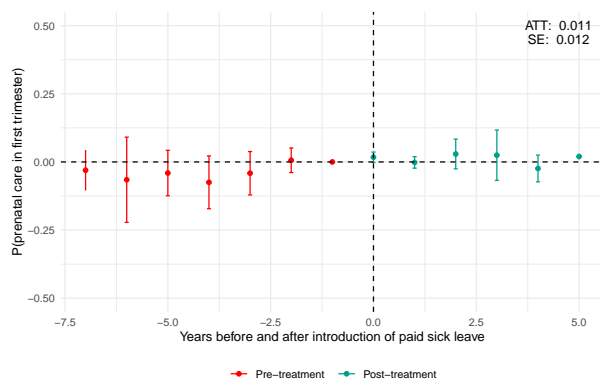
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events in the second trimester. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E10. The effect of paid sick leave on number of prenatal care episodes in the 3rd trimester



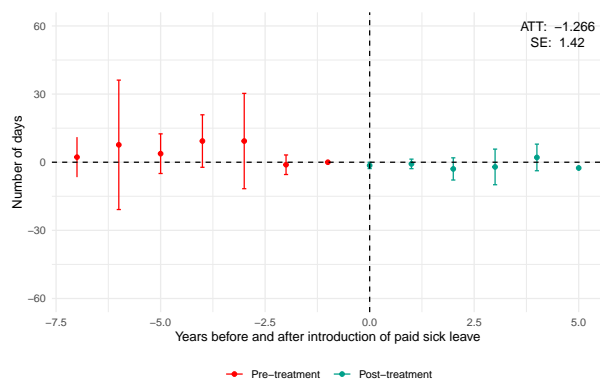
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events in the third trimester. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E11. The effect of paid sick leave on first trimester care



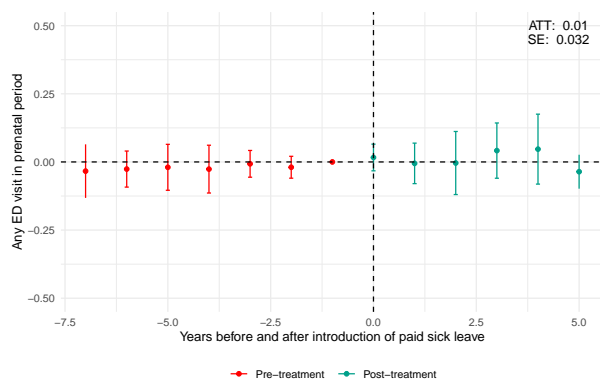
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the probability of first trimester care. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E12. The effect of paid sick leave on prenatal delay



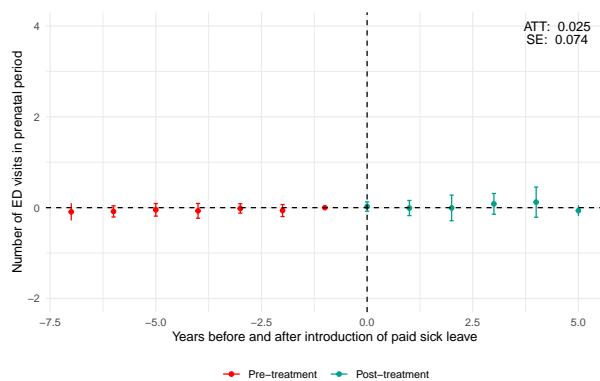
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of days following the end of the first trimester until the first prenatal care event. See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E13. The effect of paid sick leave on any emergency department visit



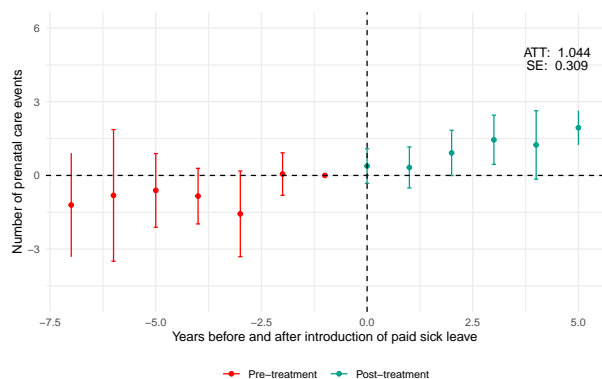
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the probability of an emergency department visit. See Appendix for codes used to define emergency department visits. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E14. The effect of paid sick leave on the number of emergency department visits



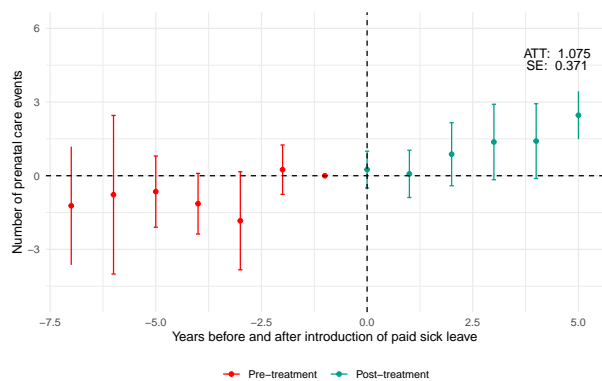
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of emergency department visits. See Appendix for codes used to define emergency department visits. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E15. The effect of paid sick leave on prenatal care (alternative definition)



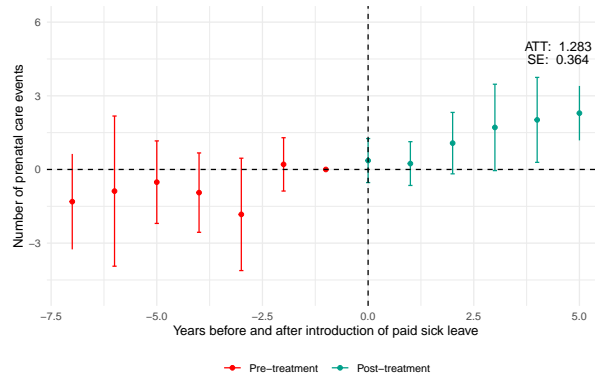
Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events (alternative definition). See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E16. The effect of paid sick leave on prenatal care (including office visits)



Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events (including office visits). See Appendix for codes used to define prenatal care events. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

Appendix Figure E17. The effect of paid sick leave on prenatal care (alternative control group)



Notes: $N = 809,519$. Equation 2 event study coefficients and 95% confidence intervals estimated using Callaway and Sant'Anna (2021). ATT defined as the aggregate of the state-time average treatment effects. The dotted vertical line is the year of treatment. The x-axis is relative time to the introduction of paid sick leave. The y-axis is the number of prenatal care events. See Appendix for codes used to define prenatal care events. This robustness analysis uses an alternative control group of not yet treated mothers in addition to mothers that are never treated. Controls for age at delivery, percent of county with a high school degree, and the rural-urban measure of the county. The model includes state and year fixed effects. Standard errors clustered at the state level.

References

- Ahn, Thomas and Aaron Yelowitz**, “Paid sick leave and absenteeism: The first evidence from the US,” *Available at SSRN 2740366*, 2016.
- Andrews, Isaiah, James H Stock, and Liyang Sun**, “Weak instruments in instrumental variables regression: Theory and practice,” *Annual Review of Economics*, 2019, 11 (1), 727–753.
- Angrist, Joshua and Michal Kolesár**, “One instrument to rule them all: The bias and coverage of just-ID IV,” *Journal of Econometrics*, 2024, 240 (2), 105398.
- Backes, Emily P, Susan C Scrimshaw, Engineering National Academies of Sciences, Medicine et al.**, “Epidemiology of Clinical Risks in Pregnancy and Childbirth,” in “Birth Settings in America: Outcomes, Quality, Access, and Choice,” National Academies Press (US), 2020.
- Baicker, Katherine, Sarah L Taubman, Heidi L Allen, Mira Bernstein, Jonathan H Gruber, Joseph P Newhouse, Eric C Schneider, Bill J Wright, Alan M Zaslavsky, and Amy N Finkelstein**, “The Oregon experiment—effects of Medicaid on clinical outcomes,” *New England Journal of Medicine*, 2013, 368 (18), 1713–1722.
- Behrman, Jere R and Mark R Rosenzweig**, “Returns to birthweight,” *Review of Economics and statistics*, 2004, 86 (2), 586–601.
- Blue Cross Blue Shield**, “Trends in Pregnancy and Childbirth Complications in the US,” <https://www.bcbs.com/the-health-of-america/reports/trends-in-pregnancy-and-childbirth-complications-in-the-us> 2022. Accessed: 2024-05-28.
- Butler, Adrienne Stith, Richard E Behrman et al.**, *Preterm birth: causes, consequences, and prevention*, National Academies Press, 2007.
- Callaway, Brantly and Pedro HC Sant’Anna**, “Difference-in-differences with multiple time periods,” *Journal of Econometrics*, 2021, 225 (2), 200–230.
- Callison, Kevin and Michael F Pesko**, “The effect of paid sick leave mandates on coverage, work absences, and presenteeism,” *Journal of Human Resources*, 2022, 57 (4), 1178–1208.
- , —, **Serena Phillips, and Julie A Sosa**, “Cancer screening after the adoption of paid-sick-leave mandates,” *New England Journal of Medicine*, 2023, 388 (9), 824–832.
- CDC**, “How Does CDC Identify Severe Maternal Morbidity?,” <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm> 2023. Accessed: 2024-05-28.

- Centers for Disease Control and Prevention**, “Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017–2019,” <https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/data-mmrc.html> 2022. Accessed: 2024-05-28.
- Chen, Jie, Chad D Meyerhoefer, and Lizhong Peng**, “The effects of paid sick leave on worker absenteeism and health care utilization,” *Health Economics*, 2020, *29* (9), 1062–1070.
- Cohen, Steve**, “Congressmen Cohen and Graves and Senator Van Hollen Introduce Newborn Screening Saves Lives Reauthorization Act,” <https://cohen.house.gov/media-center/press-releases/congressmen-cohen-and-graves-and-senator-van-hollen-introduce-newborn> May 2023. Accessed: 2024-05-28.
- Corman, Hope, Dhaval Dave, and Nancy E Reichman**, “The effects of prenatal care on birth outcomes: Reconciling a messy literature,” in “Oxford Research Encyclopedia of Economics and Finance” 2019.
- Cragg, John G and Stephen G Donald**, “Testing identifiability and specification in instrumental variable models,” *Econometric theory*, 1993, *9* (2), 222–240.
- Cronin, Christopher J, Matthew C Harris, and Nicolas R Ziebarth**, “The Anatomy of US Sick Leave Schemes: Evidence from Public School Teachers,” Technical Report, National Bureau of Economic Research 2022.
- Currie, Janet and Jonathan Gruber**, “Health insurance eligibility, utilization of medical care, and child health,” *The Quarterly Journal of Economics*, 1996, *111* (2), 431–466.
- and —, “Saving babies: The efficacy and cost of recent changes in the Medicaid eligibility of pregnant women,” *Journal of Political Economy*, 1996, *104* (6), 1263–1296.
- D’Alton, Mary E, Clarissa A Bonanno, Richard L Berkowitz, Haywood L Brown, Joshua A Copel, F Gary Cunningham, Thomas J Garite, Larry C Gilstrap III, William A Grobman, Gary DV Hankins et al.**, “Putting the “M” back in maternal–fetal medicine,” *American Journal of Obstetrics and Gynecology*, 2013, *208* (6), 442–448.
- Danilack, Valery A, Elizabeth W Triche, David D Dore, Janet H Muri, Maureen G Phipps, and David A Savitz**, “Comparing expectant management and spontaneous labor approaches in studying the effect of labor induction on cesarean delivery,” *Annals of Epidemiology*, 2016, *26* (6), 405–411.
- et al. Sinaiko, Anna**, “Out-of-pocket spending for pregnancy and childbirth,” 2023. Work in progress.
- Evans, William N and Diana S Lien**, “The benefits of prenatal care: evidence from the PAT bus strike,” *Journal of Econometrics*, 2005, *125* (1-2), 207–239.

- Frank, Richard G, Donna Strobino, David S Salkever, and Catherine A Jackson,** “Updated estimates of the impact of prenatal care on birthweight outcomes by race,” Technical Report, National Bureau of Economic Research 1991.
- Geiger, Caroline K, Mark A Clapp, and Jessica L Cohen,** “Association of prenatal care services, maternal morbidity, and perinatal mortality with the advanced maternal age cutoff of 35 years,” in “JAMA Health Forum,” Vol. 2 American Medical Association 2021, pp. e214044–e214044.
- Gourevitch, Rebecca A, Tanya Natwick, Christine E Chaisson, Amber Weiseth, and Neel T Shah,** “Variation in guideline-based prenatal care in a commercially insured population,” *American Journal of Obstetrics and Gynecology*, 2022, *226* (3), 413–e1.
- Gray, Bradley,** “Do Medicaid physician fees for prenatal services affect birth outcomes?,” *Journal of Health Economics*, 2001, *20* (4), 571–590.
- Halla, Martin, Susanne Pech, and Martina Zweimüller,** “The effect of statutory sick-pay on workers’ labor supply and subsequent health,” Technical Report, Working Papers in Economics and Statistics 2017.
- Healthy People,** “Increase the proportion of pregnant women who receive early and adequate prenatal care,” <https://tinyurl.com/ymvzpsfe> 2022. Accessed:2024-08-01.
- Henrekson, Magnus and Mats Persson,** “The effects on sick leave of changes in the sickness insurance system,” *Journal of Labor Economics*, 2004, *22* (1), 87–113.
- Johansson, Per and Mårten Palme,** “Moral hazard and sickness insurance,” *Journal of Public Economics*, 2005, *89* (9-10), 1879–1890.
- Joseph, KS, Sarka Lisonkova, Amélie Boutin, Giulia M Muraca, Neda Razaz, Sid John, Yasser Sabr, Wee-Shian Chan, Azar Mehrabadi, Justin S Brandt et al.,** “Maternal mortality in the United States: are the high and rising rates due to changes in obstetrical factors, maternal medical conditions, or maternal mortality surveillance?,” *American Journal of Obstetrics and Gynecology*, 2024, *230* (4), 440–e1.
- Kaine, Tim,** “Kaine and Murkowski Introduce Bill to Reduce Maternal and Infant Mortality, Address Racial Inequities in Maternal Health,” <https://tinyurl.com/46sk856z> May 2023. Accessed: 2024-05-28.
- Kamal, Rabah, Julie Hudman, and Daniel McDermott,** “What do we know about infant mortality in the U.S. and comparable countries?,” <https://www.healthsystemtracker.org/chart-collection/infant-mortality-u-s-compare-countries/#Share%20of%20total%20infant%20deaths%20by%20age%20of%20infant%20at%20death,%202017> 2019. Accessed: 2024-05-28”.
- Kennedy-Moulton, Kate, Sarah Miller, Petra Persson, Maya Rossin-Slater, Laura Wherry, and Gloria Aldana,** “Maternal and infant health inequality: new evidence from linked administrative data,” Technical Report, National Bureau of Economic Research 2022.

- Kitsantas, Panagiota, Kathleen F Gaffney, and Jehanzeb Cheema**, “Life stressors and barriers to timely prenatal care for women with high-risk pregnancies residing in rural and nonrural areas,” *Women’s Health Issues*, 2012, *22* (5), e455–e460.
- Kuklina, Elena V, Maura K Whiteman, Susan D Hillis, Denise J Jamieson, Susan F Meikle, Samuel F Posner, and Polly A Marchbanks**, “An enhanced method for identifying obstetric deliveries: implications for estimating maternal morbidity,” *Maternal and Child Health Journal*, 2008, *12*, 469–477.
- Lindahl, Mikael**, “Estimating the effect of income on health and mortality using lottery prizes as an exogenous source of variation in income,” *Journal of Human resources*, 2005, *40* (1), 144–168.
- Ma, Yanlei, Kenton J Johnston, Hao Yu, J Frank Wharam, and Hefei Wen**, “State Mandatory Paid Sick Leave Associated With A Decline In Emergency Department Use In The US, 2011–19: Study examines the association between state mandatory paid sick leave and emergency department use.,” *Health Affairs*, 2022, *41* (8), 1169–1175.
- Maclean, Johanna Catherine, Ioana Popovici, and Christopher J Ruhm**, “Does Paid Sick Leave Facilitate Reproductive Choice?,” Technical Report, National Bureau of Economic Research 2023.
- , **Stefan Pichler, and Nicolas R Ziebarth**, “Mandated sick pay: Coverage, utilization, and welfare effects,” Technical Report, National Bureau of Economic Research 2020.
- Michel, Alexandra and Holly Fontenot**, “Adequate prenatal care: an integrative review,” *Journal of Midwifery & Women’s Health*, 2023, *68* (2), 233–247.
- NIH**, “What is prenatal care and why is it important?,” <https://www.nichd.nih.gov/health/topics/pregnancy/conditioninfo/prenatal-care> 2024. Accessed:2024-05-28.
- OECD.Stat**, “Health Status: Maternal and Infant Mortality,” <https://stats.oecd.org/index.aspx?queryid=30116> 2018. Accessed: 2024-05-28.
- Office on Women’s Health**, “Prenatal care,” <https://www.womenshealth.gov/a-z-topics/prenatal-care> 2023. Accessed: 2024-05-28.
- Olea, José Luis Montiel and Carolin Pflueger**, “A robust test for weak instruments,” *Journal of Business & Economic Statistics*, 2013, *31* (3), 358–369.
- Peahl, Alex F and Joel D Howell**, “The evolution of prenatal care delivery guidelines in the United States,” *American Journal of Obstetrics and Gynecology*, 2021, *224* (4), 339–347.
- Pichler, Stefan and Nicolas R Ziebarth**, “The pros and cons of sick pay schemes: Testing for contagious presenteeism and noncontagious absenteeism behavior,” *Journal of Public Economics*, 2017, *156*, 14–33.
- , **Katherine Wen, and Nicolas Ziebarth**, “Positive health externalities of mandating paid sick leave,” *Journal of Policy Analysis and Management*, 2021, *40* (3), 715–743.

- Puhani, Patrick A and Katja Sonderhof**, “The effects of a sick pay reform on absence and on health-related outcomes,” *Journal of Health Economics*, 2010, 29 (2), 285–302.
- Reichman, Nancy E, Hope Corman, Kelly Noonan, and Ofira Schwartz-Soicher**, “Effects of prenatal care on maternal postpartum behaviors,” *Review of Economics of the Household*, 2010, 8, 171–197.
- Rosenzweig, Mark R and T Paul Schultz**, “Estimating a household production function: Heterogeneity, the demand for health inputs, and their effects on birth weight,” *Journal of Political Economy*, 1983, 91 (5), 723–746.
- and —, “The stability of household production technology: A replication,” *The Journal of Human Resources*, 1988, 23 (4), 535–549.
- Roth, Jonathan**, “Interpreting Event-Studies from Recent Difference-in-Differences Methods,” *arXiv preprint arXiv:2401.12309*, 2024.
- Schmidt, Lucie, Lara Shore-Sheppard, and Tara Watson**, “The Effect of Safety Net Generosity on Maternal Mental Health and Risky Health Behaviors,” *Journal of Policy Analysis and Management*, 2023, 42 (3), 706–736.
- Sherman, Laura J and Mir M Ali**, “Diagnosis of postpartum depression and timing and types of treatment received differ for women with private and Medicaid coverage,” *Women’s Health Issues*, 2018, 28 (6), 524–529.
- Sonchak, Lyudmyla**, “Medicaid reimbursement, prenatal care and infant health,” *Journal of Health Economics*, 2015, 44, 10–24.
- Stock, James and Motohiro Yogo**, *Testing for Weak Instruments in Linear IV Regression*, New York: Cambridge University Press,
- The American College of Obstetricians and Gynecologists**, “Severe Maternal Morbidity: Screening and Review,” 2016.
- The White House**, “Fact Sheet: Vice President Kamala Harris Announces Call to Action to Reduce Maternal Mortality and Morbidity,” <https://tinyurl.com/4y2e3sxy> December 2021. Accessed: 2024-05-28.
- Trost, Susanna L, Jennifer L Beauregard, Ashley N Smoots, Jean Y Ko, Sarah C Haight, Tiffany A Moore Simas, Nancy Byatt, Sabrina A Madni, and David Goodman**, “Preventing Pregnancy-Related Mental Health Deaths: Insights From 14 US Maternal Mortality Review Committees, 2008–17: Study examines maternal mortality and mental health.,” *Health Affairs*, 2021, 40 (10), 1551–1559.
- United States Census Bureau**, “Stable Fertility Rates 1990-2019 Mask Distinct Variations by Age,” <https://www.census.gov/library/stories/2022/04/fertility-rates-declined-for-younger-women-increased-for-older-women.html> 2022. Accessed: 2024-05-28.

- U.S. Bureau of Labour Statistics**, “National Compensation Survey: Employee Benefits in the United States, March 2022,” <https://tinyurl.com/rt4spu9m> 2022. Accessed: 2024-05-28.
- Warren, Michael D, Ashley H Hirai, and Vanessa Lee**, “Accelerating upstream together: achieving infant health equity in the United States by 2030,” *Pediatrics*, 2022, *149* (2), e2021052800.
- Wong, Ping Chet and Panagiota Kitsantas**, “A review of maternal mortality and quality of care in the USA,” *The Journal of Maternal-Fetal & Neonatal Medicine*, 2020, *33* (19), 3355–3367.
- World Health Organisation**, “Preterm Birth,” <https://www.who.int/news-room/fact-sheets/detail/preterm-birth> 2023. Accessed: 2024-06-20.
- Yan, Ji**, “The effects of prenatal care utilization on maternal health and health behaviors,” *Health Economics*, 2017, *26* (8), 1001–1018.
- Ziebarth, Nicolas R and Martin Karlsson**, “A natural experiment on sick pay cuts, sickness absence, and labor costs,” *Journal of Public Economics*, 2010, *94* (11-12), 1108–1122.
- **and** —, “The effects of expanding the generosity of the statutory sickness insurance system,” *Journal of Applied Econometrics*, 2014, *29* (2), 208–230.