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Family Leave After Childbirth and the Mental Health of New Mothers

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Abstract

Background: Recent studies indicate that short maternity leave, and, more generally, full-time maternal employment during the first year of life, detract from children's health, cognitive development, and behavioral outcomes. Much less is known, however, about how early parental employment affects the mental and physical health of the mothers themselves.

Aims of the Study: The purpose of this paper is to examine the association between short family leave length (less than 12 weeks of total leave after childbirth, less than 8 weeks of paid leave) and mental and physical health outcomes among new mothers.

Methods: Data come from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), a nationally representative sample of 14,000 children born in 2001 and followed until kindergarten entry. We focus on a sample of ECLS-B mothers from the first wave of the survey who had worked during pregnancy and who had returned to work by the time of the first follow-up interview, which was conducted about 9 months after childbirth. When examining the effects of paternal leave, we further restrict this sample to mothers who were married at the time of the first follow-up interview. The maternal health outcomes of interest are measures of depression and overall health status. We use standard OLS and ordered probit models, as well as two-stage least squares and two-stage residual inclusion methods which address the potential endogeneity of family leave with respect to maternal health.

Results: Our findings from the OLS and ordered probit models indicate that, for mothers who worked prior to childbirth and who return to work in the first year, having less than 12 weeks of maternal leave and having less than 8 weeks of paid maternal leave are both associated with increases in depressive symptoms, and having less than 8 weeks of paid leave is associated with a reduction in overall health status. Findings from models that address the potential endogeneity of maternal leave generally support these results, and suggest that longer leave may improve the health of new mothers.

Discussion: Our findings suggest that longer leave after childbirth may benefit families. However, one potential drawback of using cross-sectional variation in state policies and community characteristics for identification is that these measures may be correlated with other unmeasured factors that directly influence family leave and maternal health.

Implications for Health Care Provision and Use: The mother's mental and physical health can be an important route through which infants are affected by parents' employment decisions. Our findings suggest that post-partum health services that target mothers' mental and physical health, and its effects on infants, may be useful.

Implications for Health Policies: Our findings suggest that policies that support longer family leave may benefit maternal mental health.

Implications for Further Research: Future research should examine how workplace and public policies related to maternal employment can be used to improve families' health outcomes.

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Introduction

In contrast to most industrialized countries, where paid maternity leave can extend to more than a year,[1] in the United States, almost a third of new mothers who worked during pregnancy return to work within three months of childbirth.[2] Although the Family and Medical Leave Act (FMLA) of 1993 guarantees 12 weeks of leave for eligible parents (both mothers and fathers), only about 46% of the private sector workforce is entitled to FMLA benefits, and the mandated leave is unpaid.[3,4] As a result, many families, particularly low-income families, cannot take advantage of this policy. Moreover, changes in the Earned Income Tax Credit (EITC) and other tax policies, and the passage of welfare reform legislation in 1996, explicitly encourage low-income mothers of infants to enter the workforce.[5]

Given that public policies in the U.S. do not support long periods of family leave after childbirth, particularly for low-income families, it is critical to understand how length of family leave during the first year after childbirth affects the mental health and overall wellbeing of new mothers. If employment detracts from the quality and quantity of time parents spend caring for their families and for themselves, returning to work during the first year, particularly after a short leave, may have detrimental effects on the health and wellbeing of both mothers and children. Alternatively, if employment brings psychic benefits to the parent and additional income to the family, mothers and children may

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benefit through increases in material resources and higher quality of time spent together.

Recent studies indicate that short maternity leave, and, more generally, full-time maternal employment during the first year of life, detract from children's health, cognitive development, and behavioral outcomes.[6-19] Much less is known, however, about how early parental employment affects the mental and overall health of the mothers themselves. Particularly for infants, maternal wellbeing and child wellbeing are inextricably linked.[20] The mother's mental and overall health can be an important route, perhaps the most important route aside from child care arrangements, through which infants are affected by parents' employment decisions.

The purpose of this paper is to examine the association between family leave length (leave taking by mothers and fathers after childbirth) and mental and overall health among new mothers. Data come from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), a nationally representative sample of 14,000 children born in 2001 and followed until kindergarten entry. We focus on a sample of ECLS-B mothers from the first wave of the survey who had worked during pregnancy and who had returned to work by the time of the first follow-up interview, which was conducted about 9 months after childbirth. When examining the effects of paternal leave, we further restrict this sample to mothers who were married at the time of the first follow-up interview. The maternal health outcomes of interest are measures of depression and overall health status. We use standard OLS and ordered probit models, as well as two-stage least squares and two-stage residual inclusion approaches which address the potential endogeneity of family leave with respect to maternal health.

Our findings from the OLS and ordered probit models indicate that, for mothers who worked prior to childbirth and who return to work in the first year, taking less than 12 weeks of maternal leave and taking less than 8 weeks of paid maternal leave are both associated with increased depressive symptoms, and taking less than 8 weeks of paid leave is associated with worse overall health. Findings from models that address the potential endogeneity of maternal leave generally support these results, and suggest that longer leave may improve the mental health and overall wellbeing of new mothers.

Maternity Leave Length and Maternal and Child Outcomes

Early Maternal Employment, Maternity Leave Length, and Children's Outcomes

There are several distinct literatures on the effects of maternal employment during the first year on child outcomes. One literature, which assesses the effects of working in the first year versus working later or not working, includes two sub-sets – studies based on econometric models that address selection issues, and studies based on psychological models that focus more on process and measurement. Studies from both these literatures generally indicate that working full-time in the first 9 to 12 months of a child's life increases the frequency of child behavior problems as well as detracts from long-term cognitive outcomes, such as school readiness, verbal ability, and test scores.[6-19]

There also is a small, growing body of work that focuses specifically on the effects of differences in the length of maternity leave among mothers who return to work during the first year of life. In cross-country comparisons, longer paid maternity leave in Europe has been associated with reductions in infant and child mortality.[16,17] Maternity leave of 12 or fewer weeks, particularly if it involves full-time return to work, is associated with lower cognitive test scores, lower rates of well-child care and immunizations, and higher rates of externalizing behavior problems.[6,14] Several other studies suggest that shorter maternity leave length detracts from breastfeeding initiation and duration.[21-24] In a recent study based on Canadian data, increases in job-protected leave were associated with longer time breastfeeding, but the results for a variety of child health outcomes were inconclusive and suggestive of few child health benefits.[25]

In sum, prior research generally presents a negative picture of the effects of early maternal employment on children. Studies based on the NICHD Study of Early Child Care and other data, however, suggest that the overall effect of maternal employment and child care on children's outcomes depends critically on the quality of the care in both those environments – high quality child care and sensitive parenting attenuate the adverse effects of early maternal employment.[26,27] There also is evidence of important variation in effects by demographic sub-groups, with boys and children of white, more educated, and married mothers showing the most negative impact.[8,9,12,13,15] Finally, the intensity and type of maternal work appears to make a difference – longer maternal working hours are associated with worse outcomes in some cases,[8,9,12] and there is evidence that non-standard work schedules are associated with adverse effects for children.[28]

Maternal Employment After Childbirth and Maternal Health Outcomes

According to psychological theory, the first few months of infancy is a critical time period during which parents gradually familiarize themselves with their newborns, and learn to adapt to their needs. If these first few months are disrupted by a mother's return to work, theory predicts that this staged process will be interrupted prematurely, with adverse outcomes for mothers and infants. Even when mothers derive mental health benefits from employment.[29-31] psychologists cite ''role overload'' as a potential problem for full-time working parents in the first few months.[30] In the psychology and public health literatures, however, there is only mixed empirical support for these theories, with some studies showing negative effects of short maternity leave on mothers' health outcomes, and other studies indicating no effects.[30,32-34]

In the economics literature, almost all prior research has focused on the effects of early maternal employment on children's health and wellbeing. Only a few economics papers examine how early employment may affect mothers' own health. In a recent study based on Canadian data, Baker and Milligan evaluate a mandated increase in the number of weeks of maternity leave granted to new parents. They find that

increasing paid leave benefits from a maximum of 25 weeks to 50 weeks has no influence on maternal health. Here, health is measured by self reported health states, a depression scale, an indicator of post partum depression, and a count of post-partum physical problems. In this Canadian sample, the average pre-reform length of maternal leave was about 8 months.[35] It is difficult to generalize these results to the United States where the average length of leave is much shorter (an average of 9 weeks in our sample). In the US, most women who were working when their child was one year old had returned to work within three months of childbirth.[2]

In our study, two of our maternal outcomes are depression. We focus on depression as a maternal health outcome because of the high prevalence of this condition among new mothers, and because of its important effects on children's health and wellbeing. About 10-20 percent of mothers of infants develop depression within six months of delivery.[36] Depression rates among poor mothers are estimated to be more than twice as high as those among non-poor mothers.[37] Numerous studies show that clinical depression in mothers as well as self-reported depressive symptoms, anxiety, and psychological distress, are important risk factors for adverse emotional and cognitive outcomes in their children, particularly during the first few years of life.[38-40] Depressed mothers of infants are less interactive with and less responsive to their children,[41] and are less likely to seek appropriate health care for their children.[42] Compared to infants of healthy mothers, infants of depressed mothers are more negative and less playful,[43,44] have more behavior problems during childhood,[45-48] and they are more likely to eventually develop psychopathology during childhood and adulthood.[49,50]

To the best of our knowledge, in the economics literature the only paper that focuses on maternal employment and maternal mental health in the United States is Chatterji and Markowitz. These authors study the effect of length of maternity leave on maternal wellbeing, based on a sample of mothers who were employed prior to childbirth and who returned to work during the first year.[51] Data for this study come from the 1988 National Maternal and Infant Health Survey (NMIHS). Two measures of depression and a measure of outpatient health visits are used to represent maternal health. Ordinary least squares models provide baseline estimates, and instrumental variables models, with state-level maternity leave policies as identifying variables, account for the potential endogeneity of maternity leave length. The findings suggest that longer maternity leave is associated with a reduction in the number or frequency of maternal depressive symptoms. There is suggestive but inconclusive evidence that longer maternity leave also is associated with a lower probability of being a likely case of clinical depression, and a lower likelihood of having frequent outpatient visits during the first six months after childbirth.*

The present study builds on prior work on the effects of maternal employment on families' health and wellbeing in three ways. First, we focus on the mental and overall health of mothers, a topic that is rarely considered in economic research in this area, which typically focuses on understanding the effects of maternal employment on direct measures of children's health and development. We argue that maternal health cannot be neglected if we are to understand the full implications of family leave policy. Maternal mental health is one of the most critical determinants of child health and development, particularly for infants. Second, this study is more informative for current US policy decisions regarding family leave since it is based on recent data collected post-FMLA (in 2001) while the prior work on maternal health is based on data collected in the 1980's and early 1990's. Third, unlike prior studies, we are able to examine several aspects of family leave in this study – the length of maternal leave, the length of paid maternal leave, and the length of the father's leave.

Methods

Data Analytic Procedures: Modeling the Return-to-Work and Maternal Health Relationship

The estimating equations are:

$$H_i^* = \alpha + L_i\delta + X_i\beta + \mu_i \quad (1)$$

$$L_i^* = \theta + X_i\xi + Z\lambda + \nu_i \quad (2)$$

The dependent variable H_i^* is a measure of mother i's health. The main independent variable of interest is L_i^*, a measure of family leave length after childbirth. Our measures of family leave are three binary indicators of whether the mother's total leave was less than 12 weeks; whether the mother's paid leave was less than 8 weeks; and, among married mothers, whether the father did not take any leave. The vector X_i includes observed maternal factors that may affect maternal health, such as the mother's age, marital status, number of children, education, and observed child-specific factors that may influence maternal health, such as the child's health endowment. Specific details about the variables included are discussed below. The residual terms are represented by μ_i in Equation 1 and ν_i in Equation 2.

In the case of depression, H_i^* is captured by either a non-negative scale of depressive symptoms, or a binary indicator of severe depression. In the case of the binary indicator, we observe a value of 1 if H_i^* passes a certain threshold of symptoms, and a 0 otherwise. For both these dependent variables, we initially use a standard ordinary least squares (OLS) model to estimate equation 1. We use the natural log of the scale of depressive symptoms for estimation since the distribution is highly skewed. OLS estimation, however, can lead to biased and inconsistent estimates if a problem of reverse causality exists (for example, depression affects length of leave) or if unobserved, mother-specific factors exist that influence both maternal health and leave decisions

* In the public health literature, several studies have explored the impact of returning to work on the mother's health. Based on relatively small (~400-600 respondents) samples of mothers living in Minnesota and Wisconsin, there is evidence that employed postpartum women have higher rates of respiratory infections, breast symptoms, gynecologic problems and mental health problems compared to postpartum women who are not employed.[30,52-54]

(e.g. μ_i and ν_i in Equations 1 and 2 are correlated).

If reverse causality is an issue (postpartum health drives leave decisions), some mothers experiencing depressive symptoms and other health problems may return to work later, in an effort to overcome postpartum health problems. Reverse causality may not be an issue if mothers who are eligible for the FMLA benefits tend to return to work at the expiration of FMLA-mandated leave, despite health status, in order to retain health insurance and other benefits. Although the FMLA mandates that firms continue to provide health insurance during the guaranteed twelve weeks unpaid leave, it is important to note that only about 46% of the private sector workforce is entitled to FMLA benefits. If unobserved heterogeneity exists, there are plausible reasons to think mothers who return later may have unmeasured traits that are correlated with higher levels of health, such as strong family support, but one can also make an argument that mothers who return later may have unmeasured factors that may be associated with lower levels of health, such as family stress. Ettner also points out that the direction of the endogeneity bias is theoretically indeterminate in a model with more than one regressor, since there may be second order effects through other covariates that are correlated with maternity leave length.[55]

Given these potential issues, when considering depression as an outcome, we address the potential endogeneity of leave length using two-stage least squares (2SLS) models. That is, we estimate equation (3) below:

$$H_i^* = X_i\beta + \widehat{L}_i\delta + \mu_i \qquad (3)$$

in which $\widehat{L}$ is the predicted value from equation 2, in which leave length (L_i) is regressed on observable individual characteristics (X) and instrumental variables (Z). Following Baum[6] and Chatterji and Markowitz,[50] we use cross-sectional variation in local labor market conditions, cost of child care, and state policies related to maternity leave as identifying instrumental variables.[6,50] These variables are expected to be correlated with maternal employment decisions after childbirth, but not directly related to maternal health after accounting for a range of individual-level characteristics. We discuss the potential drawbacks of these identifying assumptions in the next section.

Angrist[56] and Wooldridge[57] (pg. 622), argue that researchers can, and in many cases should, use two-stage least squares (2SLS) even when the endogenous and outcome variables are binary.[56,57] Thus, for both the continuous depression measure and the binary indicator of severe depression, we present 2SLS estimates in the paper with White corrected standard errors to adjust for heteroskedasticity. We also tested 2SLS models using a two-step GMM estimator, which is analogous to 2SLS but uses a weighting matrix that makes it efficient in the presence of heteroskedasticity (e.g. Greene, pg. 201-207; pg. 400-401).[58] Our 2SLS results are nearly identical to those of GMM (results not shown). For all models, we use the Durbin-Wu-Hausman test to test the endogeneity of maternal leave length with respect to maternal health. Our 2SLS approach depends critically on the validity and relevance of the identifying instruments. Consequently, we test the validity of the over-identifying restrictions using Hansen's J statistic, the minimized value of the GMM criterion. As suggested by Staiger & Stock, we use the F-statistic of the joint significance of the identifying instruments to gauge their relevance.[59]

The main advantage of using 2SLS to estimate the models of depressive symptoms is we can implement the standard Durbin-Wu-Hausman and overidentification tests to test for consistency of the OLS estimates and test whether our identifying exclusion restrictions are valid. However, an alternate approach would be to use a count data model for depressive symptoms. We discuss findings from such a model below.

In the case of the self-reported overall health outcome, what we observe for H_i^* in Equation 1 is an ordered, categorical variable. A mother reports whether her overall health is excellent, very good, good, fair, or poor. Initially, we use an ordered probit model as a baseline approach, ignoring the potential endogeneity problem. Next, we address the potential endogeneity of leave length using a two-stage residual inclusion approach.[60] In this two-step procedure, we run a first stage model of leave length (e.g., less than 12 weeks of leave) via a linear probability model including the variables described above as instruments (Equation 2). We predict the residuals from the first stage regression (Equation 2) and include the predicted residuals as an additional covariate in the second stage structural model (Equation 1), which is estimated using an ordered probit model. Standard errors are adjusted to be robust to heterokedasticity. We also take this same approach when estimating the count data model for the CES-D outcome. Results are discussed below.

The Early Childhood Longitudinal Study – Birth Cohort (ECLS-B)

The ECLS-B is a nationally representative sample of 14,000 children born in 2001 and followed until kindergarten entry. The sample includes over-samples of racial/ethnic minority children, twins, and low and very low birth weight infants. The data are collected from children, families (both mothers and fathers), teachers and schools, providing unusually rich information on children's development as well as maternal employment, work characteristics, and maternal health outcomes. The parent interviews are conducted with the child's primary caregiver, usually the mother. The interviews are computer-administrated at the child's home by a trained assessor, and are available in both English and Spanish. Note that because these analyses are based on a sample of mothers, we cannot address possible effects of federal, state, and employer leave policies on childbearing decisions. Instead, we examine effects of leave on maternal health among women who already have children.

Our main analytic sample is limited to approximately 3,350 adult ECLS-B respondents who: (i) were the biological or adoptive mother of the child; (ii) had worked either part-time or full-time during pregnancy; and (iii) had returned to work either part-time or full-time by the 9-month interview. The sample includes mothers who had returned to work at some

point before the 9-month interview, but were not currently working when the 9-month interview was conducted. In cases of twins, we randomly selected one twin for inclusion in the sample. Observations were dropped if an observation had missing information on any dependent or independent variables used in the study. Of mothers eligible for our sample, about 50 observations were dropped because of missing information on demographic characteristics, maternal education, infant health at birth or marital status, and another about 100 observations were dropped because of missing data on maternal family background, income, health insurance or welfare receipt. When examining effects of paternal leave, we limit the main analysis sample to approximately 2,200 mothers who were married at the time of the 9-month ECLS-B interview.

The FMLA only applies to parents who return to the same employer after childbirth.* From a policy perspective, therefore, it is interesting to test whether our results persist in a sample of mothers who return to the same employer after childbirth. Previous research by Klerman and Leibowitz suggests that most mothers who worked full-time during pregnancy continued to work for the same employer after childbirth.[61] Nevertheless, in sensitivity analyses, we re-estimated all models based on a sample that is restricted to about 2,500 mothers who appear to have returned to the same job after childbirth. Although we do not have information regarding whether or not the mother returned to the same employer, this sample excludes two groups of mothers who potentially may be returning to different jobs: (i) mothers who report not taking maternity leave because they quit their jobs during pregnancy (although they retuned to work after childbirth); and (ii) mothers who report a maternity leave length that is more than 6 weeks shorter than the child's age in weeks when the mother returned to work. Results based on this sample were qualitatively very similar to those shown in the paper and are not discussed here.

Dependent Variables

Center for Epidemiologic Studies Depression Scale

The ECLS-B survey includes a 12-item version of the Center for Epidemiologic Studies Depression Scale (CES-D) to measure depressive symptoms in the past week. The CES-D is one of the most widely used psychiatric scales and captures mood, somatic problems, problems in interactions with others, and issues with motor functioning, such as ''I felt lonely,'' ''my sleep was restless,'' and ''I could not get going.'' The respondent is asked to respond to each item according to a 4-point Likert scale, with higher values corresponding to higher frequency of the item in the past week. For example, for the item ''I felt lonely,'' mothers responded either ''less than 1 day'' (zero points), ''1-2 days'' (1 point), ''3-4 days'' (2 points), or ''5-7 days'' (3 points). The maximum possible score is 36 (12 items x maximum of 3 points per item). The U.S. Department of Education recommends using a cut-point of 15 or higher to define severe depression for this modified CES-D scale. The CES-D scale does not correspond to a DSM-IV diagnosis of major depression. It is used primarily as a screening tool for depression, not as a diagnostic tool.*[62,63]

We create two measures of depression from the CES-D scale, a continuous measure of symptoms and a dichotomous indicator of severe depression. Because the CES-D is skewed to the right in these data, we use the natural log of the total CES-D score as the continuous measure. In this variable and in others where log values are used, the zeros are replaced with a value of 0.5. The dichotomous measure is a dummy variable indicating whether or not the respondent's CES-D score is equal to or exceeds 15. This dummy variable is not equivalent to a psychiatric diagnosis of depression, but it does capture respondents who are experiencing many symptoms of depression, or several symptoms with high frequency, in the past week.[63]

Ideally, we would have liked to measure depression at the same point in time for all mothers in relation to when they returned to work. For example, if depression was measured for all the mothers when they been back at work for one month, we could isolate the effect of maternity leave length on maternal health, controlling for the child's age at the time of the interview and how long the mother has been back at work. Unfortunately, this approach is not possible since ECLS-B respondents completed the 9-month survey when their children were between 6 and 22 months old, regardless of when and whether they returned to work.

Although we control for the age of child at the interview date in all models, the length of maternity leave cannot be disentangled from how long the mother has been back at work. By construction, mothers who take longer leaves will have been back at work for shorter periods of time when the interview is conducted compared to mothers who took shorter leaves. For example, consider two employed mothers both interviewed when their children are 7 months old – one mother has taken a 3 month maternity leave, while the other has taken a 6 month maternity leave. If longer leave is associated with better health, the mother with the longer leave may be expected to be in better health, but this mother also has returned to work more recently than the mother who took the 3-month leave, and therefore may be adjusting to employment, which could negatively affect health. We select stringent thresholds for our depression indicator and for our poor health indicator so that for these two outcomes, this

* Workers must have worked for a minimum of 12 months for the same employer and a minimum of 1250 hours in the past 12 months. Also, the FMLA only applies to public sector workers and those private sector workers whose firms employ at least 50 employees.

* About 50% of mothers experience increases in emotional reactivity for up to several weeks following the birth of a child.[36] This period of ''postpartum blues'' is transient and should be distinguished from postpartum depression, a mental disorder that affects nearly 10 to 20% of mothers in the US within six months of delivery.[35] Postpartum depression is defined as major depression that has its onset during the postpartum period, which lasts for up to 6 months after delivery.[62] The CES-D cannot be used to diagnose depression but it captures some symptoms associated with this condition. Since all ECLS-B respondents were interviewed after 6 months (most after 9 months) this postpartum time period is well outside the period during which postpartum blues is prevalent, but some mothers may be experiencing postpartum depression.

issue is unlikely to affect our findings. Short-term adjustments to employment are unlikely to induce severe depression and large reductions in overall health. This issue remains a limitation of the analysis, however, when we examine the continuous measure of depressive symptoms.

Self-Reported Health

All ECLS-B respondents are asked to report whether their health in general is excellent [1], very good [2], good [3], fair [4], or poor [5]. We use this scale as a dependent variable, combining the fair and poor categories since only a few mothers in the main sample reported being in poor health. Since the question does not specify physical or emotional health, these variables may capture both physical and mental illness. The ECLS-B does not include any measures of post-partum physical health conditions.

Independent Variables

Family Leave After Childbirth

The main independent variables of interest in this study are measures of maternal and paternal leave after childbirth. For maternal leave, we consider two dichotomous measures in alternative specifications: (i) whether the total length of maternity leave was fewer than 12 weeks; and (ii) whether the total length of paid leave was fewer than 8 weeks. The 12-week and 8-week thresholds represent the 75th percentiles of the distributions of total leave and paid leave, respectively. The 12-week threshold also has policy significance since it corresponds to the length of unpaid leave mandated by the FMLA.

These measures are created based on the question: ''did you take any maternity leave, either paid or unpaid, from your job while you were pregnant or right after your child was born?'' This question includes a probe that specifies that maternity leave is taken from a job to which one expects to return, at least at the time of the leave. Respondents who report taking any maternity leave are then asked ''in total, how many weeks of maternity leave, paid or unpaid, did you take?'' Respondents who took maternity leave were then asked the total number of weeks of paid maternity leave they took. This question specifies that paid leave includes pay received through maternity benefits, sick time, vacation time and other kinds of paid leave.

Respondents who report that they did not take any maternity leave are asked why and provided with the following possible reasons: (i) not employed during pregnancy; (ii) employed but quit before delivery; (iii) leave not provided/self-employed; (iv) could not afford to take it; and (v) other reason. In addition, all ECLS-B respondents, regardless of whether they took maternity leave, were asked if they had worked since the child was born and the age of the child when they returned to work. Our main analytic sample excludes mothers who were not employed during pregnancy. In sensitivity analyses, we estimate all models on a sample that excludes mothers who quit before delivery as well as mothers who report maternity leaves more than 6 weeks longer than the reported age of the child when they returned to work. Results are very similar to those presented below.

Individual and Family Factors Affecting Maternal Health

In addition to maternal employment, maternal depressive symptoms and self-reported health are likely to be influenced by numerous other personal and family-level factors. Previous research suggests that important predictors of postpartum depression include poor prenatal mental and physical health, low social support, concerns about child care arrangements, young maternal age, socioeconomic stresses, insurance status, poor infant health and low income.[52-54,64-68] Some of these factors, however, are possibly endogenous to the return-to-work decision.

We estimate all models with a set of presumably exogenous characteristics that are likely to be associated with maternal health outcomes. This set includes: (i) mother's age in years; (ii) mother's education (dummy indicators with less than high school graduate as the baseline, high school graduate, some college completed, and four-year college degree or more); (iii) race/ethnicity (dummy indicators with white as the baseline, African-American, Hispanic, and other); (iv) age of child at time of interview; (v) the number of siblings; (vi) a dummy variable indicating whether or not the mother is married; (vii) an indicator of whether the child has a twin; (viii) dummy indicators for urban residence and region; (ix) whether or not the mother has ever received welfare since the child's birth; (x) indicators for low and very low birth-weight; and (xi) an indicator of whether the child was born prematurely. In addition to these variables, to further reduce unobserved heterogeneity, we include several variables related to the mother's childhood and family background: (xii) whether the mother ever repeated a grade in school; (xiii) whether the mother lived with her biological mother from birth until age 16; (xiv) whether the mother lived with her biological father from birth until age 16; and (xv) the number of years of education that the mother's mother completed.*

Identifying Instrumental Variables

The identifying variables for the models which include ''less than 12 weeks of leave'' are: (i) the state-level average annual cost of center-based child care for a 12-month-old in 2000, from Schulman,†[69] and (ii) the average commuting

* The models we present in the paper do not include indicators for occupation, income, and health insurance because these variables may be endogenous to the return to work/health decision. However, we also estimated all models with occupation indicators, income, and health insurance status, and found the results were very similar to those presented in the paper.

† There were several large states with missing data on child care costs, including Massachusetts, New Jersey, New York and Pennsylvania. For these states, we included the mean national cost of child care. Because of this issue, we re-estimated the models with alternative proxies for child care costs that were available for most respondents in the sample, such as the median rent in the county. These instruments performed fairly well empirically and the models led to findings that were qualitatively very similar to those presented in the paper. The ECLS-B does not include information on firm size, but we experimented with county-level indicators of firm size as instruments. These instruments performed poorly empirically, however, so we did not include them in the final models presented in the paper.

time in the county in 2000, which comes from the Area Resource File.[69] Mothers may return to work later if they face longer commuting times, or if infant child care is relatively expensive in their location.* The average cost is about $6,000 per year and ranges from $3,692 to $9,509 in our sample. In models that include the less than 8 weeks of paid leave variable, we use the identifying variable of whether or not the state had a paid leave policy. About 23 percent of the sample lives in a state with a paid leave policy.

The potential drawback of using cross-sectional variation in state policies and community characteristics for identification is that these measures may be correlated with other unmeasured factors that directly influence family leave and maternal health. For example, it is possible that high commuting times are concentrated in higher-income, urbanized areas. If this is the case, the commuting time variable may also be capturing unmeasured high SES in these counties, which plausibly could be associated with better mental health and longer maternal leave at the individual level. However, this does not appear to be the case. Average commuting times in our sample range from 29 to 42 minutes, with a mean of 31 minutes. There is considerable diversity in counties with high commuting times. There are 106 counties from 30 states with commuting times greater than 29 minutes (the 75th percentile of the distribution). Counties with high commuting times include both urban and rural areas. For example, the two counties with the highest commuting times are the county of Matanuska-Susitna, Alaska and Queens, New York. Other non-metro counties with high commuting times (>35 minutes) include Paulding county, Georgia, Amite county, Mississippi, and Sussex county, New Jersey.

In general, given the rich set of covariates included in the models, it seems unlikely that our identifying variables would be associated directly with individual mothers' leave-taking and health outcomes. Nevertheless, we acknowledge that we cannot make an airtight case for our identifying assumptions on conceptual grounds. Thus, there remains the possibility that the identifying assumptions are not tenable, and this remains a limitation of the analysis.

In most cases, we merged county-level characteristics to child records by the county of residence listed on the child's birth certificate, and state-level characteristics are merged according to the mother's state of residence at the 9-month interview. However, in cases where the county of residence was missing on the birth certificate, or if the state on the birth certificate was not consistent with the state of residence at the 9-month interview, we used state-level averages of county-level variables according to the state reported at the 9-month interview.

* Long distance between the employer and the child care site may lead to problems such as long length of the child's day in child care or continuation of breastfeeding, and these issues may discourage mothers from taking short leaves.

Results

Table 1 displays means and standard deviations for the main sample used in the paper, as well as means by leave status (less than 12 weeks, or 12+ weeks). In terms of mental health, the average CES-D score is 4.86, and 5 percent of the respondents had a CES-D score of at least 15, which is considered to be a severe rate of depressive symptoms that may be indicative of clinical depression. This rate of depression is somewhat lower than the estimated 12-month prevalence rate for major depression for women in the US, which is estimated to be about 11 percent.[70] The sample appears to be in fairly good physical health overall, with only 6 percent of the sample reporting that their overall self-reported health is poor or fair. The difference in health outcomes based on length of leave are statistically significant and indicate that women who take shorter leaves have worse health outcomes on average. Compared to mothers who take 12 or more weeks of leave, mothers who take less than 12 weeks have higher rates of some observable characteristics that may predispose them to worse health outcomes, such as being unmarried and without a college education. However, mothers who take short leaves also are less likely than mothers who take longer leaves to have premature and low birth weight infants, which may predispose them to better health outcomes.

In the sample, 64 percent of mothers took maternity leave of less than 12 weeks, and 72 percent took fewer than 8 weeks of maternity leave. On average, these employed mothers take 9.43 weeks of maternity leave, and just under 5 weeks of this leave was paid (results not shown). Mothers are an average of about 29 years old, with a 10 month old child at the time of the interview. The sample is 17 percent African-American, 12 percent Hispanic, and 20 percent are in the other race category. The full sample includes fairly large proportions of low birth-weight infants (12 percent) and very low birth-weight infants (9 percent) because the ECLS-B over-sampled these groups. Eighty four percent of respondents live in an urban area and 5 percent received welfare.

Table 2 shows regression results for the full sample, which includes all mothers who worked in the year prior to childbirth. These models focus on the effect of taking less than 12 weeks of maternity leave (both prior to and after childbirth) and the effect of taking less than 8 paid weeks of leave on maternal mental health. This table shows findings for the two different mental health outcomes – depressive symptoms as measured by the log of the CES-D score and an indicator for severe depression. For each outcome, we show OLS followed by 2SLS results.

The OLS results indicate that having less than 12 weeks of leave is associated with a 15 percent increase in the CES-D score (for example, increasing the mean score from 4.86 to 5.59). The magnitude of this effect is fairly small, but this is perhaps not surprising, given that we are measuring maternal health outcomes about 9 months after childbirth. Many mothers who had been experiencing health problems early on may have started to recover by this point, and re-adjust to employment. For severe depression, however, the effects are

Table 1. Means and Standard Deviations

	Full sample N = 3350	Took 12+ weeks leave	Took <12 weeks leave
CES-D Depression Score	4.86	4.20	5.24***
	(5.04)	(4.43)	(5.32)
Mother is severely depressed (CES-D score is 15+)	0.05	0.04	0.06***
Mother's rating of her overall health	1.99	1.90	2.04***
(1 = excellent, 2 = very good, 3 = good, 4 = fair or poor)	(0.91)	(0.88)	(0.93)
Mother reports she is in excellent health	0.36	0.40	0.34***
Mother reports she is in very good health	0.35	0.34	0.35
Mother reports she is in good health	0.23	0.22	0.25*
Mother reports she is in fair or poor health	0.06	0.04	0.06***
Mother took fewer than 12 weeks of maternity leave	0.64	0.00	1.00
Mother took fewer than 8 weeks of paid maternity leave	0.72	0.50	0.85***
Child's age in months at time of interview	10.47	10.45	10.49
	(1.80)	(1.74)	(1.84)
Mother's age	29.4	30.8	28.5***
	(6.0)	(5.6)	(6.1)
Mother is married	0.71	0.78	0.66***
Number of siblings	0.94	0.96	0.93
	(1.04)	(1.02)	(1.05)
Child is a twin	0.09	0.15	0.05***
Mother is African-American	0.17	0.16	0.17
Mother is Latino	0.12	0.12	0.12
Mother is other race	0.20	0.17	0.21***
South	0.35	0.32	0.37***
West	0.22	0.23	0.22
Midwest	0.27	0.27	0.28
Mother has high school diploma	0.26	0.20	0.29***
Mother has vocational/technical training	0.02	0.02	0.03
Mother has completed some college	0.29	0.30	0.29
Mother has completed college degree	0.15	0.18	0.13***
Infant was premature (less than 37 weeks)	0.23	0.28	0.20***
Low birth weight	0.12	0.14	0.11***
Very low birth weight	0.09	0.10	0.08*
Urban	0.84	0.87	0.82***
Received welfare since child was born	0.05	0.03	0.07***
Mother lived with biological mother until age 16	0.87	0.89	0.86**
Mother lived with biological father until age 16	0.64	0.68	0.61***
Mother repeated a grade	0.11	0.09	0.12***
Number of years of education of grandmother	13.30	13.59	13.13***
Average commuting time in county	25.06	25.71	24.69***
	(4.71)	(4.70)	(4.69)
Average yearly cost of center-based child care for an infant in state (in thousands of dollars)	6.1 (1.3)	6.2 (1.3)	6.0*** (1.3)

Notes: Note that all samples sizes in tables are rounded to the nearest 50 per ECLS-B confidentiality rules. **Table 1** shows means for full sample and means by leave status (less than 12 weeks vs. 12+ weeks). Standard deviations are in parentheses for continuous variables.
*** indicates difference between mothers who took less than 12 weeks and mothers who took 12+ weeks is statistically significant at .01 level;
** indicates difference is statistically significant at .05 level;
* indicates difference is statistically significant at .10 level.

much more pronounced. The OLS models show that having less than 12 weeks of leave increases the probability of being classified as severely depressed by 2 percentage points (from a mean of 5 percent to 7 percent). We also estimated the CES-D model using a Poisson count model. In these models, less than 12 weeks of leave had a statistically significant, positive association with depressive symptoms, but less than 8 weeks of leave was not a statistically significant predictor of depressive symptoms.

We also show the corresponding 2SLS results for each

Table 2. Effects of Maternal Leave Length on Maternal Depression

	Log CES-D score				Severely Depressed (1/0)			
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
< 12 weeks leave	0.15	0.79			0.02	0.15		
	(3.66)	(1.94)			(2.39)	(1.86)		
< 8 weeks paid leave			0.09	–0.25			0.02	0.13
			(2.00)	(–0.42)			(2.01)	(1.04)
South	–0.05	–0.09	–0.04	–0.02	–0.01	–0.02	–0.01	–0.02
	(–0.84)	(–1.43)	(–0.79)	(–0.23)	(–1.23)	(–1.68)	(–1.23)	(–1.45)
West	–0.06	–0.07	–0.06	–0.05	–0.02	–0.03	–0.02	–0.03
	(–0.98)	(–1.01)	(–0.99)	(–0.84)	(–1.91)	(–1.92)	(–1.93)	(–2.02)
Midwest	–0.07	–0.10	–0.07	–0.04	–0.02	–0.02	–0.02	–0.03
	(–1.17)	(–1.58)	(–1.18)	(–0.44)	(–1.43)	(–1.80)	(–1.47)	(–1.62)
Child's age	–0.01	–0.01	–0.01	–0.01	0.003	0.003	0.003	0.003
	(–1.03)	(–0.96)	(–1.03)	(–1.03)	(1.08)	(1.10)	(1.08)	(1.07)
Mother's age	–0.01	–0.001	–0.01	–0.01	0.001	0.002	0.001	0.003
	(–2.13)	(–0.16)	(–2.17)	(–1.37)	(0.77)	(1.81)	(0.82)	(1.21)
Married	–0.28	–0.24	–0.29	–0.31	–0.04	–0.04	–0.04	–0.04
	(–5.56)	(–4.20)	(–5.62)	(–4.85)	(–3.77)	(–2.70)	(–3.80)	(–2.52)
Number of siblings	0.03	0.01	0.03	0.04	0.01	0.01	0.01	0.01
	(1.33)	(0.28)	(1.38)	(1.33)	(2.73)	(1.62)	(2.69)	(1.18)
Child is a twin	0.08	0.24	0.06	–0.001	0.01	0.04	0.01	0.03
	(1.03)	(1.85)	(0.76)	(–0.01)	(0.56)	(1.62)	(0.45)	(0.96)
African-American	0.09	0.13	0.08	0.06	0.005	0.01	0.004	0.01
	(1.44)	(1.89)	(1.36)	(0.86)	(0.33)	(0.87)	(0.32)	(0.72)
Latino	–0.14	–0.13	–0.15	–0.15	0.01	0.01	0.01	0.01
	(–2.14)	(–1.80)	(–2.20)	(–2.19)	(0.60)	(0.82)	(0.57)	(0.56)
Other race	0.05	0.01	0.06	0.06	–0.003	–0.01	–0.002	–0.002
	(0.95)	(0.21)	(1.12)	(1.11)	(–0.29)	(–0.95)	(–0.19)	(–0.19)
High school graduate	0.11	0.08	0.12	0.12	0.01	0.001	0.01	0.01
	(2.03)	(1.42)	(2.14)	(2.16)	(0.59)	(0.10)	(0.65)	(0.58)
Vocational training	0.10	0.06	0.09	0.14	0.02	0.01	0.02	0.003
	(0.79)	(0.50)	(0.75)	(0.92)	(0.68)	(0.44)	(0.64)	(0.09)
Some college	0.15	0.15	0.16	0.14	0.01	0.01	0.01	0.01
	(3.01)	(2.83)	(3.10)	(2.52)	(0.88)	(0.77)	(0.96)	(1.21)
College graduate	–0.06	–0.07	–0.06	–0.08	–0.003	–0.004	–0.001	0.01
	(–1.00)	(–1.08)	(–0.89)	(–1.05)	(–0.24)	(–0.38)	(–0.13)	(0.42)
Premature	0.09	0.15	0.08	0.07	–0.01	0.004	–0.01	–0.01
	(1.43)	(1.93)	(1.27)	(1.07)	(–0.59)	(0.29)	(–0.67)	(–0.40)
Low birth weight	–0.04	–0.05	–0.03	–0.04	–0.0003	–0.003	0.001	0.004
	(–0.55)	(–0.73)	(–0.46)	(–0.59)	(–0.02)	(–0.24)	(0.04)	(0.26)
Very low birth weight	–0.02	–0.07	–0.01	–0.02	0.01	0.002	0.01	0.01
	(–0.26)	(–0.67)	(–0.15)	(–0.19)	(0.53)	(0.07)	(0.60)	(0.65)
Urban	–0.02	0.01	–0.03	–0.03	–0.01	–0.001	–0.01	–0.01
	(–0.40)	(0.19)	(–0.55)	(–0.51)	(–0.66)	(–0.07)	(–0.74)	(–0.78)
Welfare	0.27	0.22	0.28	0.31	0.10	0.09	0.10	0.09
	(2.88)	(2.12)	(2.93)	(2.92)	(3.29)	(2.82)	(3.31)	(2.89)
Lived with mother until 16	–0.05	–0.06	–0.05	–0.05	0.002	–0.0001	0.002	0.0003
	(–0.89)	(–1.01)	(–0.88)	(–0.78)	(0.16)	(–0.01)	(0.16)	(0.02)
Lived with father until 16	–0.11	–0.10	–0.11	–0.12	–0.01	–0.005	–0.01	–0.01
	(–2.58)	(–2.18)	(–2.62)	(–2.67)	(–0.81)	(–0.49)	(–0.82)	(–0.67)
Repeated a grade	0.13	0.12	0.13	0.14	0.003	0.001	0.002	–0.001
	(2.18)	(1.95)	(2.16)	(2.26)	(0.17)	(0.04)	(0.15)	(–0.05)
Grandmother's education	0.002	0.004	0.002	0.001	0.002	0.002	0.002	0.002
	(0.40)	(0.78)	(0.33)	(0.22)	(1.53)	(1.83)	(1.49)	(1.60)

➔

(continued)

Table 2. Effects of Maternal Leave Length on Maternal Depression

	Log CES-D score				Severely Depressed (1/0)			
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
R2	0.07		0.06		0.04		0.03	
F test on identifying instruments		17.14		18.68		17.14		18.68
(p-value)		(0.00)		(0.00)		(0.00)		(0.00)
Over identification test statistic		0.184		N/A		0.09		N/A
(p-value)		(0.668)				(0.77)		
Wu-Hausman test statistic		2.50		0.332		2.71		0.833
(p-value)		(0.886)		(0.435)		(0.900)		(0.639)

Notes: The sample size is 3,350. The dependent variables are the log of the CES-D score and a dichotomous indicator of whether the CES-D score was 15 or higher (severely depressed). The table shows OLS coefficients and 2SLS coefficients with T-statistics below. T-statistics are based on robust standard errors. The identifying instruments for the < 12 weeks leave models are: average commuting time in county and average center-based child care costs in state. The identifying instrument for the < 8 weeks paid leave models is whether the state has a paid leave policy.

OLS specification (the first stage regressions are shown in **Appendix**, **Table A1**). Note that in all models the joint *F* statistic on the instruments is reasonably high, ranging from 17 to 18. The partial R-squared on the identifying instruments is 0.01. Where applicable, the over-identification statistics are not statistically significant, indicating the instruments are uncorrelated with the error term and are properly excluded from the second stage equation. The Durbin-Wu-Hausman test fails to reject the null hypothesis that the OLS results are consistent. However, this failure to reject consistency of the OLS estimates may result from the large size of the 2SLS estimates' standard errors. We also applied the two stage residual inclusion approach when estimating the CES-D model using a Poisson model. These findings showed no statistically significant effects of maternal leave on depressive symptoms; the estimated coefficients on the predicted residuals were not statistically significant in these models either (results not shown).

For the indicator of less than 12 weeks leave in the log CES-D model, the 2SLS coefficient is positive and increases in size relative to the OLS coefficient. One possible reason the 2SLS estimate is larger than the OLS estimate is mothers who take longer leaves have unmeasured attributes that also are correlated with poor mental health, such as low social support, post-partum complications, or preexisting psychiatric problems. Another interpretation is that there is heterogeneity in the effects of maternal leave length on maternal health. The 2SLS estimates capture the effects of maternal leave on health among mothers *whose leave decisions are affected by the instruments*. It is possible that, at the margin, mothers who are able to take longer leaves because of (for example) more favorable state environments actually benefit more from leave than the average mother. This explanation makes sense if we expect that mothers who need a favorable environment to take more leave also have fewer material and social support resources and thus are more prone to poor mental and physical health. In the case of the severely depressed outcome measure, the estimated 2SLS coefficient on less than 12 weeks of leave is only statistically significant at the ten percent level in a two-tailed test. For the indicator of less than 8 weeks paid leave, the 2SLS coefficients vary in sign but are always statistically insignificant.

Tables 3 shows findings from models that estimate the effects of taking less than 12 weeks of maternity leave and taking less than 8 weeks of paid maternity leave on overall maternal health. This table shows standard ordered probit estimates (column 1) and ordered probit estimates which include the predicted first stage residuals as a covariate (two-stage residual inclusion method, column 2). In Panel A of **Table 3**, we see that short leave generally is associated with worse overall health – all of the estimated coefficients on maternal leave are statistically significant at the 5% level, with the exception of the estimate on ''less than 12 weeks of leave'' in the standard ordered probit model. In Panel B of **Table 3**, we show marginal effects. In the case of taking less than 12 weeks of leave, the marginal effects from the ordered probit model (**Table 3**, Panel B, Column 1) are only marginally statistically significant in the standard ordered probit model, but they increase in magnitude and all become statistically significant when the two stage residual inclusion method is applied (**Table 3**, Panel B, Column 2). The estimated coefficient on the predicted residuals is statistically significant in this model.

In the standard ordered probit models, taking less than 8 weeks of paid leave is associated with a reduction of 4 percentage points in the likelihood of being in excellent health, and an increase of 1 percentage point in the likelihood of being in fair or poor health. These effects are statistically significant at the 0.01 level. In the paid leave models estimated using the two stage residual inclusion method, the findings support the standard ordered probit model results, suggesting that less than 8 weeks of paid maternal leave is associated with statistically significant, detrimental effects on mothers' overall health. The estimated coefficient on the predicted residuals is statistically significant in this model.

To determine whether our findings on the effects of short maternal leaves persist across alternate samples, we re-

Table 3. Effects of Maternal Leave Length on Maternal Overall Health

	Mother's self-rating of overall health (1 = excellent, 2 = very good, 3 = good, 4 = fair or poor)	
	(1) Ordered Probit Model	(2) Ordered Probit Model - TSRI method
PANEL A		
< 12 weeks leave	0.07	1.08
	(1.60)	(2.78)
< 8 weeks paid leave	0.10	1.04
	(2.31)	(2.27)
PANEL B	Marginal Effects	
< 12 weeks leave		
Health is excellent	–0.02	–0.40
	(–1.60)	(–2.94)
Health is very good	0.002	0.08
	(1.44)	(2.12)
Health is good	0.016	0.24
	(1.61)	(3.40)
Health is fair or poor	0.01	0.09
	(1.62)	(2.89)
< 8 weeks paid leave		
Health is excellent	–0.04	–0.52
	(–2.29)	(–2.63)
Health is very good	0.004	0.15
	(1.88)	(1.86)
Health is good	0.02	0.27
	(2.32)	(3.31)
Health is fair or poor	0.01	0.09
	(2.37)	(2.72)

Notes: Panel A shows estimated coefficient and T-statistic on maternal leave measure from an ordered probit model. Column 1 shows results from a standard ordered probit model, while column 2 shows results from a two-stage residual inclusion ordered probit model. T-statistics are based on robust standard errors. Models include the full set of variables shown in **Table 2**. Panel B shows marginal effects computed at sample means and T-statistics. Marginal effects indicate the change in the probability of being in the health category associated with a change in leave status from 0 to 1.

estimated the log CES-D and severely depressed models on samples limited to mothers who returned to work full-time, mothers who returned to work part-time, married mothers, unmarried mothers, mothers with one child, mothers with more than one child, mothers of different race/ethnicities (white, African-American, Latino), and mothers with and without a 4 year college degree. These results are presented in **Table 4**, and, in the discussion here, we focus only on results from the OLS models that include the indicator for less than 12 weeks leave although the 2SLS models are shown in the table.

We find that the effects of taking less than 12 weeks of leave hold for mothers who are employed full-time, but the effects disappear for part-time workers. Similarly, the effects of shorter leave length are much stronger for married women than unmarried women. The number of children does not appear to matter much as leave lengths affect depressive symptoms for mothers of only children as well as mothers with more than one child. Leave length affects maternal depressive symptoms for both white and African-American mothers, but not for Latino mothers. Finally, we find that less than 12 weeks of leave is associated with a statistically significant increase in depressive symptoms for mothers without a college education, but the effect is only marginally statistically significant for college-educated mothers.

The length of paternal leave may be a contributing factor in determining maternal health. outcomes. Conceptually, paternal leave may be endogenous, for many of the same reasons that motivated us to test for endogeneity of maternal leave. However, some problems are: (i) we lack good instruments for paternal leave; and (ii) we have only limited information on fathers, since the ECLS-B focuses on mothers and children; and (iii) the variation in the number of weeks of paternal leave is limited, given that 75% of fathers in the ECLS-B take 2 weeks of leave or less. Thus, the examination of paternal leave in the paper is exploratory.

In **Table 5**, we restrict the sample to married women in order to evaluate the marginal effects of paternity leave, holding maternity leave constant. Paternity leave is typically short in our sample – less than 2 weeks, although 87 percent of fathers take some level of leave. We measure paternity leave as a dichotomous indicator for whether or not the father

Table 4. Effect of Maternal Leave Length on Depressive Symptoms in Alternative Samples

Coefficient on <12 weeks of leave length:	Sample size	Log CES-D score		Severely Depressed	
		OLS	2SLS	OLS	2SLS
A. Returned to work full-time	1950	0.22	0.87	0.02	0.21
		(4.04)	(1.90)	(2.28)	(2.34)
Returned to work part-time	1400	0.04	0.56	0.01	0.03
		(0.67)	(0.71)	(0.92)	(0.14)
B. Married	2800	0.17	0.75	0.03	0.10
		(3.96)	(1.95)	(4.08)	(1.41)
Unmarried	600	–0.02	0.07	–0.03	0.66
		(–0.18)	(0.03)	(–0.95)	(0.72)
C. Child does not have siblings	1400	0.18	0.75	0.01	0.02
		(2.77)	(1.14)	(1.16)	(1.36)
Child has one or more siblings	2000	0.13	0.85	0.02	0.10
		(2.43)	(1.60)	(2.24)	(1.51)
D. White	2250	0.13	0.75	0.02	0.10
		(2.57)	(1.94)	(1.97)	(1.51)
African-American	600	0.22	0.65	0.01	0.06
		(2.13)	(0.79)	(0.45)	(0.29)
Latino	400	0.02	1.83	0.02	0.17
		(0.14)	(0.66)	(0.85)	(0.34)
E. Has 4 year college degree	650	0.16	1.05	0.016	0.005
		(1.81)	(1.46)	(1.16)	(0.04)
Does not have 4 year college degree	2700	0.14	0.74	0.020	0.23
		(3.09)	(1.45)	(2.10)	(2.07)

Notes: The table shows OLS coefficients and 2SLS coefficients on less than 12 weeks of leave. T-statistics are based on robust standard errors. All models include the full set of variables shown in **Table 2**, and the 2SLS models utilize the identifying variables in **Table 2**.

Table 5. Effects of Maternal and Paternal Leave on Mother's Health – Married Sample

	Log CES-D score	Severely Depressed	In poor or fair health
Mother took < 12 weeks leave	0.16	0.03	0.004
	(3.20)	(3.47)	(0.49)
Father took no leave	0.11	0.01	0.01
	(1.59)	(1.05)	(0.60)
Mother took < 8 weeks paid leave	0.09	0.01	0.01
	(1.80)	(1.81)	(1.54)
Father took no leave	0.12	0.02	0.01
	(1.76)	(1.18)	(0.59)

Notes: The sample size is 2,200. The table shows OLS coefficients with T-statistics below. T-statistics are based on robust standard errors. All models include the full set of variables shown in **Table 2**. Models also include categories for father's education, age, and occupational prestige score. In the married sample, the means of the father's characteristics are: age = 33.2 (sd = 6.0), high school graduate = .22, vocational training = .05, some college = .24, college graduate = .20, occupational prestige score = 45.3 (sd = 10.8), no leave = 0.13.

took any leave. Given the previous results showing that we fail to reject the consistency of OLS models, only OLS results are shown for these models. These models include all the maternal and family characteristics previous discussed. We also add father's education, age, and occupational prestige score to these models.

Including paternity leave does not change the conclusions regarding the mother's own maternity leave that shorter lengths of maternity leave are associated with worse mental health outcomes. In the CES-D models, the absence of father's leave is associated with an 11-12 percent increase the CES-D score, although the coefficient is statistically

significant only at the 10 percent level in one of the models. The coefficients on the absence of paternity leave are also positive in the models for severely depressed and fair or poor health, but do not achieve statistical significance at conventional levels.

Conclusions

To understand the net impact of family leave policies, decision makers at the federal and state level need information on the benefits of parental leave for families. Previous economic research on maternal employment has focused on understanding how employment after childbirth impacts children's health and development. This study extends this literature by examining the effects of both maternal and paternal leave after childbirth on the health of mothers. Our baseline OLS and ordered probit results suggest that taking more than 12 weeks of maternity leave from work and taking more than 8 weeks of leave is associated with declines in depressive symptoms, a reduction in the likelihood of severe depression, and when paid leave is considered, an improvement in overall maternal health. When we use empirical methods to address the potential endogeneity of maternal leave, these results persist in the case of less than 12 weeks of leave and depressive symptoms, and in the case of less than 8 weeks of paid leave and overall health.

Our baseline OLS findings suggest that increasing the length of leave to over 12 weeks will reduce maternal depressive symptoms on the CES-D scale by 15 percent, and will reduce the probability of being classified as severely depressed by 2 percentage points. Increasing paid leave to over 8 weeks will reduce maternal depressive symptoms on the CES-D scale by 9 percent, will reduce the probability of being classified as severely depressed by 2 percentage points, and will increase the likelihood of being in excellent health by 3.5 percentage points. It is notable that the benefits of longer leave appear to persist well into the first year after childbirth. If we were able to measure health outcomes closer to the time of childbirth, we would expect these effects to be much larger.

The effects of short maternal leave on depressive symptoms are more robust in certain sub-groups. When examining effects of maternal leave on the CES-D, effects are most consistent across models among mothers who return to work full-time, mothers who are married, and non-Latino white mothers. When examining effects of maternal leave on the likelihood of severe depression, effects are most consistent among mothers who return to work full-time and mothers without college education. We also find suggestive evidence that paternal leave affects maternal mental health, but these effects are marginally statistically significant and we cannot address the potential endogeneity of paternal leave in these models.

One potential drawback of using cross-sectional variation in state policies and community characteristics for identification is that these measures may be correlated with other unmeasured factors that directly influence family leave and maternal health. This is the main limitation of this study. Other limitations include the lack of detailed information on fathers – for mothers who live with a spouse or partner, it is probably the interaction of maternal and paternal work characteristics that affect maternal mental health, and we can only address this issue in a limited fashion. In addition, the 2SLS findings can only be generalized to mothers whose leave decisions are influenced by the state and county characteristics we use as identifying instruments. However, this group is likely to be of interest from a policy perspective, since these mothers are influenced by policies that decision makers can control.

Currently, much remains unknown about the effects of early maternal employment on families, despite the large number of women in the U.S. who balance employment with the care of an infant. The findings from this paper suggest maternal and, possibly, paternal leave after childbirth matter for maternal health, as has been found for infant health and wellbeing in the case of maternal leave. This research provides some new insights into this under-studied area.

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Appendix

Table A1. First Stage Results

	< 12 weeks leave	< 8 weeks paid leave
South	0.04	0.01
	(1.51)	(0.38)
West	0.03	0.02
	(1.14)	(0.61)
Midwest	0.04	0.03
	(1.50)	(1.03)
Child's age	–0.002	–0.002
	(–0.37)	(–0.45)
Mother's age	–0.01	–0.02
	(–6.50)	(–10.61)
Married	–0.06	–0.06
	(–2.72)	(–3.65)
Number of siblings	0.03	0.040
	(3.29)	(5.04)
Child is a twin	–0.24	–0.17
	(–7.29)	(–5.35)
Black	–0.05	–0.06
	(–2.04)	(–2.58)
Latino	–0.005	0.01
	(–0.07)	(0.53)
Other race	0.07	0.01
	(3.17)	(0.48)
High school	0.04	0.01
	(1.62)	(0.31)
Vocational Tech.	0.04	0.13
	(0.85)	(3.41)
Some college	–0.001	–0.044
	(–0.07)	(–2.25)
College graduate or more	0.02	–0.06
	(0.64)	(–2.11)
Premature	–0.08	–0.024
	(–3.10)	(–0.960)
Low birth-weight	0.02	–0.032
	(0.76)	(–1.19)
Very low birth-weight	0.07	–0.015
	(1.73)	(–0.45)
Urban	–0.04	0.007
	(–1.94)	(0.34)
Welfare	0.09	0.09
	(2.78)	(4.00)

➔

(continued)

Table A1. First Stage Results

	< 12 weeks leave	< 8 weeks paid leave
Lived with mother until 16	0.01	0.015
	(0.59)	(0.69)
Lived with father until 16	–0.02	–0.010
	(–1.06)	(–0.62)
Repeated grade	0.01	0.03
	(0.49)	(1.33)
# yrs education of grandmother	–0.004	–0.002
	(–1.75)	(–0.91)
Average commuting time in county	–0.01	
	(–4.07)	
Average center-based child care cost in state	–0.03	
	(–3.58)	
State has paid leave policy		–0.11
		(–4.32)
F-statistic on identifying instruments	17.14	18.68
(p-value)	(0.00)	(0.00)
Partial R-squared on identifying instruments	0.01	0.01
R-squared	0.09	0.11