



College of Medicine

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Supporting Families with Home Visiting: Evaluation of the Arkansas Parents as Teachers Program

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Executive Summary

Background

Parents as Teachers (PAT) was developed as a universal parent support program. PAT is an evidence-based home visiting program that provides parenting education and support with the overall goal of preventing child maltreatment and promoting school readiness. The Parents as Teachers model includes one-on-one home visits, monthly group meetings, developmental screenings, and linkages and connections for families to needed resources.¹

Pregnant women and families of children birth to five who are at risk for parenting beliefs and/or practices that are associated with less optimal child outcomes are eligible for services. PAT services are voluntary and longitudinal; serving families for at least two years between pregnancy and kindergarten. Parent educators conduct the home visits using structured visit plans and guided planning tools. In Arkansas, PAT offers at least 24 hour-long home visits annually. Parent educators typically hold a bachelor's degrees in social work, psychology, or a related field. Each home visitor can serve up to 20 families.

Evaluation Goals

The goals of this evaluation are to assess whether PAT impacts birth outcomes, the health and health care use of children, and the health care use of mothers. This evaluation addresses the following research questions, based on the age of the child at enrollment:

1. For families enrolled in PAT in pregnancy, will children have better pregnancy and birth outcomes than a propensity matched sample of children who did not receive the PAT program? Pregnancy and birth outcomes include preterm birth, low birth weight, and maternal breastfeeding intention.
2. For all families enrolled in PAT, will children have better health and health care outcomes than a propensity matched sample of participants who did not receive the PAT program? Child health care use and health outcomes include hospitalizations, emergency department use, outpatient visits, immunizations, and infant mortality.
3. For all families enrolled in PAT, will mothers have better health outcomes than a propensity matched sample of participants who did not receive the PAT program? Maternal outcomes will include hospitalizations, emergency department use, and outpatient visits.

Design

This study is a quasi-experimental, intention-to-treat evaluation, which used administrative data to compare outcomes of infants receiving the PAT intervention to a propensity-score matched (PSM) control population of infants not receiving PAT with similar demographic, socio-economic, and medical characteristics. In a well-balanced match, where PAT and non-PAT are systematically similar across all characteristics, differences between PAT and non-PAT outcomes determine the effectiveness of the treatment.

Because PAT can enroll families of children at any age and the outcomes under investigation were measured over a period of time, it was essential to create a series of criteria for inclusion based on each analytic timeframe under investigation. The timeframes were

determined to maximize the likelihood that the measurement of the outcome occurred post-intervention. For pregnancy and birth outcomes, the sample was restricted to those who enrolled in pregnancy with the opportunity of at least 3 months of services. For child age-related outcomes, we required that children were enrolled in services within or before the first 3 months of the age period. An intention-to-treat approach was taken as PAT infants may have been enrolled in the intervention, but parents/guardians may have subsequently declined to receive services at any time after enrollment. This approach will produce conservative results.²

Vital statistics, health care coverage program enrollment, medical, and pharmacy claims records are continuously updated. There is a refresh of data for the University of Arkansas for Medical Sciences Arkansas Biosciences Institute (ABI) subscription once a year. For this study, we used administrative claims and vital statistics (birth and death certificate) records from January 1, 2014 to December 31, 2020. Mothers and children with dates of birth between January 1, 2014 and December 31, 2019 who were served by PAT were eligible for inclusion (N=1,229 mother and child dyads).

Results

Results from this study suggest that PAT did not impact birth outcomes. Babies whose mothers were served by PAT were heavier and trended towards being born a little later in gestation, but the averages were in the normal range for both groups. There were also not differences in maternal intention to breastfeed at the time of the child's birth nor were there differences in infant mortality between groups.

When we examine infant health care use, there were inconsistent group differences in use health care system across time, with more observed differences in children of older ages. Between their birth and first birthday, there were no overall differences in the average healthcare encounters of infants served in PAT and the non-PAT group. The one exception was in number of children seen in the ED for minor reasons, which was higher in the treatment group. We did document differences in ED encounters between the ages of 1 and 2 and 2 and 3, where infants in PAT had a higher overall number of visits to the emergency department (overall and for evaluation and management) in their second and third years of life than children in the control group. Existing studies of ED use in PAT report no effect.^{3,4} The vast majority of studies that have examined ED use in home visiting samples report null findings, but some studies have reported greater ED usage in the treatment group⁵⁻⁷ and others have reported lesser use in home visiting samples. It is unclear that use of the ED, particularly for less urgent care would be considered a negative outcome.

Between the ages of 2 and 3, children in PAT had more wellness visits than children in the non-PAT group. We also found that children in PAT had more total outpatient visits than children in the control group between the ages of 2 and 3. We also found more pharmacy claims for PAT children between ages 1 and 2 and ages 2 and 3. The number of well-child visits has been an outcome of interest in evaluations of PAT. Existing studies have not demonstrated impacts on wellness or outpatient visits^{3,4} and no existing studies have examined pharmacy use.

Infants in PAT were not significantly different in the number of outpatient visits in the first year of life in which immunizations were provided and there were no differences in the odds of

having had at least 4 immunization visits in the first year (our proxy for having completed the immunization series) than infants in the control group. There were also not significant differences in the number of visits with immunizations between the ages of 2 and 3. There was a trend towards significance in visits with immunizations when children between the ages of 1 and 2, which favored the PAT group. While not significant, this trend may be associated with increased well-child visits of the PAT group. No other studies of PAT have demonstrated impacts on immunizations,⁴ though data from other home visiting interventions have demonstrated favorable impacts.⁸

From birth to their child's first birthday, mothers who were served by PAT had greater inpatient stays than mothers in the matched-control group. PAT mothers also had a greater number of overall outpatient visits, specifically non-wellness visits. Mothers also had a greater number of visits in which discussion of substance-related disorders were discussed than the matched control group. We also demonstrated a greater number of medications claims for the PAT group. Differences between the healthcare of mothers as their children aged became fewer, and a new association between greater maternal use of the ED was documented. Between the ages of 1 and 2 and 2 and 3, mothers in PAT, compared to the control sample, used the ED to a greater extent for all reasons, and, between age 1 and 2, also had more use for evaluation and management of an existing condition. PAT in Arkansas screens mothers for depression and substance use on a recurring basis (e.g., within a month of enrollment, 8 weeks of delivery and every 6 months based on their child's age) with the intention of supporting the mother with referrals for additional services. This may have supported the increase in substance-use discussions with healthcare providers. This is the first study of PAT to examine maternal healthcare use. Our findings suggest that the screening and referral is supporting mothers in PAT to discuss their mental health needs within the health care system. It would appear that enrollment in PAT with younger children may support maternal medical help seeking.

Discussion

Our findings contribute novel information, being among the first to document the association between PAT home visiting and medical claims related to birth, child health, and child and maternal health care use. Our results indicate modest differences in the healthcare use of families are served by PAT, with greater use of the ED, overall and for minor reasons, and outpatient care for children as they aged. PAT also increased the mother's use of the health care system in a similar manner. Taken together, the data present that PAT as implemented in Arkansas provides children and their families some health care seeking benefits.

Evaluation of Parents as Teachers

Background

The benefits of home visiting programs to the health and development of at risk families and their infants and young children have been emphasized by several professional organizations, such as the American Academy of Pediatrics and the Academic Pediatric Association.⁹⁻¹¹ They emphasize that these programs are a mechanism to ensure that at-risk families have social support; linkage to health care and a variety of public and private needed services; and ongoing health, developmental, and safety education.

Parents as Teachers (PAT) was developed as a universal parent support program. PAT is an evidence-based home visiting program that provides parenting education and support with the overall goal of preventing child maltreatment and promoting school readiness. The Parents as Teachers model includes one-on-one home visits, monthly group meetings, developmental screenings, and linkages and connections for families to needed resources.¹ Parents as Teachers has been implemented in Arkansas since 1991. In 2012, Arkansas was awarded funds from the Health Resources and Services Administration's Maternal, Infant, and Early Childhood Home Visiting program to expand PAT services.

Pregnant women and families of children birth to five who are at risk for parenting beliefs and/or practices that are associated with less optimal child outcomes are eligible for services. PAT services are voluntary and longitudinal; serving families for at least two years between pregnancy and kindergarten. Parent educators conduct the home visits using structured visit plans and guided planning tools. In Arkansas, PAT offers at least 24 hour-long home visits annually. Parent educators typically hold a bachelor's degrees in social work, psychology, or a related field. Each home visitor can serve up to 20 families.

Referrals to PAT are solicited from partnering social services agencies and medical providers (e.g., educational settings; court and child welfare providers; Women, Infants and Children programs; and obstetrics and gynecology practices). There have been 14 local implementing agencies across the state with services being available in 30 of Arkansas's 75 counties. A central administrative team within the Arkansas Home Visiting Network provides model support and the national administrative team monitors implementation fidelity. PAT includes a foundational curriculum to support program implementation.¹²

Methods

Evaluation Design and Research Questions

This evaluation addresses the following research questions, based on the age of the child at enrollment:

1. For families enrolled in PAT in pregnancy, will children have better pregnancy and birth outcomes than a propensity matched sample of children who did not receive the PAT program? Pregnancy and birth outcomes will include:
 - a. preterm birth (PT; occurring earlier than 37 weeks gestational age),

- b. low birth weight (LBW; birth weight < 2500 grams), and
 - c. breastfeeding intention.
2. For all families enrolled in PAT, will children have better health and health care outcomes than a propensity matched sample of participants who did not receive the PAT program? Child health care use and health outcomes will include:
- a. hospitalizations,
 - b. emergency department visits and non-urgent emergency department visits,
 - c. wellness and non-wellness health care visits,
 - d. speech-language therapy visits,
 - e. clinical visits where immunizations are provided and immunization completion, and
 - f. infant mortality.
3. For all families enrolled in PAT, will mothers have better health outcomes than a propensity matched sample of participants who did not receive the PAT program? Outcomes will include:
- a. hospitalizations,
 - b. emergency department visits and non-urgent emergency department visits,
 - c. wellness and non-wellness health care visits, and
 - d. clinical visits with behavioral health supports.

This study is a quasi-experimental, intention-to-treat evaluation. The study used administrative data to compare outcomes of infants receiving the PAT intervention to a propensity-score matched (PSM) control population of infants not receiving PAT with similar demographic, socio-economic, and medical characteristics. In a well-balanced match, where PAT and non-PAT are systematically very similar across all characteristics, differences between PAT and non-PAT outcomes will determine the effectiveness of the PAT treatment.

Because PAT can enroll families of children at any age and the outcomes under investigation were measured over a period of time, it was essential to create a series of criteria for inclusion based on each analytic timeframe under investigation. The timeframes were determined to maximize the likelihood that the measurement of the outcome occurred post-intervention. For pregnancy and birth outcomes, the sample was restricted to those who enrolled in pregnancy with the opportunity of at least 3 months of services (calculated as enrolled at least 3 months before the child's expected date of birth as recorded on the birth certificate). For child age-related outcomes, we required that children were enrolled in services within or before the first 3 months of the age period. Therefore, to be eligible to be in the Year 1 outcomes sample, for which outcomes are measured from birth to the first birthday, a family would have to have enrolled prior to the child's age 3 months (i.e., prenatally or between birth and 3 months of age). To be eligible to be in the Year 2 outcomes sample, for which outcomes are measured from the first to second birthday, a family would have to have enrolled before the child's 15 months of age. An intention-to-treat approach was taken as PAT infants may have been enrolled in the intervention, but parents/guardians may have subsequently declined to

receive services at any time after enrollment. This approach will produce conservative analytic results.²

Data Sources

Vital statistics, health care coverage program enrollment, medical, and pharmacy claims records are continuously updated. There is a refresh of data for the University of Arkansas for Medical Sciences Arkansas Biosciences Institute (ABI) subscription once a year. For this study, we were able to use administrative claims and vital statistics (birth and death certificate) records from January 1, 2014 to December 31, 2020 using the sources described below.

Arkansas All-Payer Claims Database (APCD): In 2015, the Arkansas General Assembly established the Arkansas Healthcare Transparency Initiative (AHTI) to address the state's data needs to improve health and to support research. This initiative mandates entities throughout the state to submit medical, pharmacy, and dental claims from Arkansans. This led to the creation of the APCD, a large-scale database securely administered by the Arkansas Center for Health Improvement (ACHI) and governed by the Arkansas Insurance Department (AID). The APCD includes claims for all Arkansans starting in 2013, with claims data updated on an annual basis. ACHI and AID keep all records within the APCD confidential and manage and regulate data requests and subscriptions for researchers wishing to use the information.

Vital Statistics Records: The Arkansas Department of Health (ADH) Vital Statistics provides individual and address-level birth event data found on an Arkansas birth certificate about the child, mother (if available) and father (if available) from 1989 to 2020. Arkansas revised birth certificates in 2014, which were used in the current evaluation. ADH Vital Statistics also provide individual- and address-level death event data found on an Arkansas death certificate. Birth and death certificate records data are included in the ABI subscription of APCD.

Data Linkage Description: Within the ABI APCD subscription, ACHI extracted data fields for our analyses. The APCD uses HASH IDs to differentiate individuals and to protect any personally identifiable information within the data. The HASH ID is an anonymous, unique 44-character identifier that incorporates a person's last name and date of birth. The HASH ID is further combined with gender to improve data linkage accuracy. Individuals are linked by HASH ID across different data sources.

Measures

Measures used in the PSM and study outcomes are drawn from the data sources described above. Insurance claims codes used in the definition of measures are provided in Appendix D.

Propensity Matching: Matching characteristics and the data source used in the PSM are as follows.

1) Family Demographic Matching Variables

The following list of variables was used for matching for all outcomes explored (Birth Outcomes, Child and Maternal Health and Health Care Outcomes):

Demographics and Socioeconomic Status:

- child gender (birth certificate)
- mother race/ethnicity; age category at birth; education; Women, Infants, and Children (WIC) benefits receipt; insurance type; marital status at birth; father date of birth record availability; and smoking status during pregnancy (birth certificate)
- family rural-urban commuting area code (RUCA; birth certificate)

2) Health and Health Care Matching Variables

For Child Health and Health Care Use Outcomes, match indicators included the demographic and socioeconomic indicators listed in Family Demographics Matching Variables and the following child health indicators:

- child weight and gestational age at birth and the 5-Minute APGAR (Appearance, Pulse, Grimace, Activity, and Respiration) score
- child length of stay in the hospital after birth (APCD)
- delivery method (birth certificate).

For Maternal Health Care Use Outcomes, match indicators included the demographic and socioeconomic indicators listed in Family Demographics Matching Variables and the following maternal health indicators:

- mother length of stay in the hospital after delivery (APCD)
- delivery method (birth certificate)

Outcomes: Birth outcomes, child health and health care outcomes, early intervention services outcomes, and their sources are as follows:

1) Birth Outcomes (All Outcomes from Birth Certificate Data)

- preterm birth (PT; occurring earlier than 37 weeks gestational age)
- low birth weight (LBW; birth weight < 2500 grams)
- breastfeeding intention

2) Child Health and Health Care Services

- hospitalizations (APCD)
- emergency department visits: total and visits for evaluation and management (APCD)
- outpatient visits: total and specific visit categories as follows: (APCD)
 - wellness
 - non-wellness
 - early intervention services for speech-language pathology (SLP) therapies¹³
- filled pharmacy prescriptions (APCD)
- immunization outcomes (APCD)

- total number of immunization visits per year
- complete immunization coverage defined as a minimum of 4 immunization encounters in the first year of life. (Guidelines recommend a minimum of 5 encounters—not including influenza vaccination—to complete the immunization series, with the last round of immunizations administered between 12 and 18 months of age.¹⁴)
- infant mortality defined as death within the first year of life¹ (Death Certificate)

3) Maternal Health Care and Early Intervention Services (all from APCD):

- hospitalizations
- emergency department visits: total and visits for evaluation and management
- outpatient visits: total and specific visit categories:
 - wellness
 - non-wellness
 - visits for mood disorders
 - visits for substance-related disorders
- filled pharmacy prescriptions

Approach to Analysis

At the first analytic stage, a one-to-one PAT and non-PAT infant matching strategy was implemented using a combination of exact category and greedy nearest neighbor propensity scores matching. The variables included in the PSM are provided in the measures section. Both child groups had to be identical in child gender and maternal race/ethnicity to be matched for birth outcomes. In addition to gender and race, preterm birth status was also required to be identical to be matched for child health and health care utilization outcomes. For maternal health care use outcomes, both mother groups had to be identical in race/ethnicity. Additionally, using SAS (SAS Institute, Cary, NC) proc psmatch,^{16,17} both child and mother groups were matched by propensity score. The probability of each group being assigned to the PAT treatment was equal or nearly equal based on all remaining covariates included in the logistic regression model. The greedy nearest neighbor matching algorithm attempts sequential matches between PAT and non-PAT infants where the within-pair propensity score difference is the smallest. A potential bias due to those outside the exact match blocks and residual confounding is addressed in the next step.

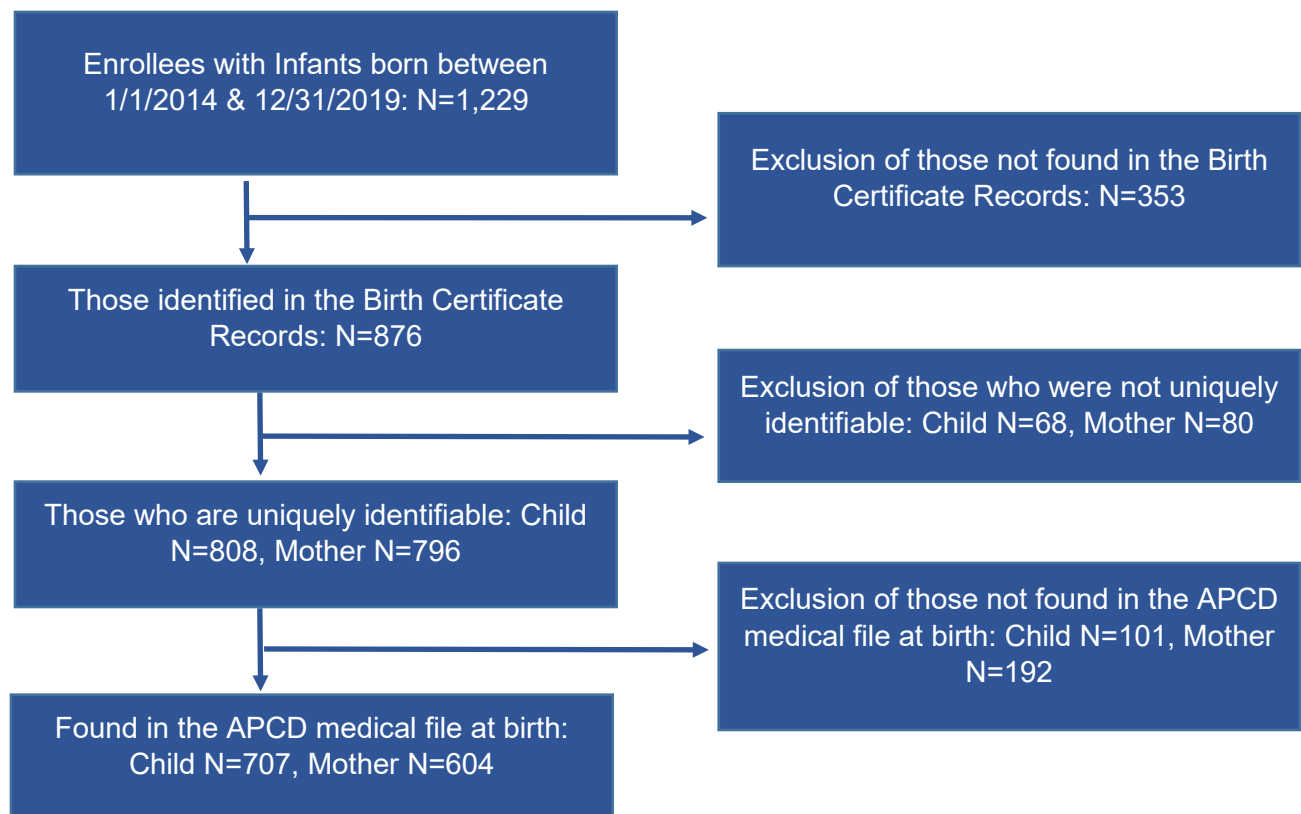
At the second analytic stage, we used a bias correction approach by fitting generalized linear integrated mixed models for each health care utilization outcome. An indicator of each PAT and non-PAT one-to-one matched dyad was included in the mixed models as a random variable. Count distribution outcome models were fitted by specifying a negative binomial distribution (chosen over a Poisson distribution due to significant over-dispersion parameter estimates) with a log-link function. A binomial distribution with a logit-link function was used for the binary outcomes. Differences in PAT and non-PAT utilization were determined using incident rate ratios (IRR, for Poisson count), adjusted odds ratios (aOR, for binary outcomes), and p-values.

Sample Size and Sampling Plan

The primary population targeted in this evaluation is high-risk pregnant women and children from birth to 3 years old. APCD and birth certificate records from 2014 to 2020 were used to exclude families and to identify the study population. Mothers and children with dates of birth between January 1, 2014 and December 31, 2019 who were served by PAT were eligible for inclusion (N=1,229 mother and child dyads). Mothers and children who did not meet each of the following criteria were excluded (see Figure 1):

- not found in the birth certificate file (N=353)
- not uniquely identifiable by HASH ID (Child N=68, Mother N=80)
- not found in the APCD eligibility file (Child N=101, Mother N=192)

Figure 1: Flow Diagram Depicting the Development of the Analyzable Child Population



We examined whether there were service or demographic differences between children who were served by PAT and identified within the data with those who were served by PAT (N=707), but who were not found in the birth certificate records, not uniquely identifiable, and not in the APCD (N=520; See Appendix A). There were not significant differences in whether the family enrolled during pregnancy or the length of enrollment in services. There were also not significant differences demonstrated for child gender or maternal educational attainment. There

was a demonstrated difference in maternal race/ethnicity where families with mothers identifying as Hispanic were more likely to be excluded from analysis. Unfortunately, this is somewhat expected as Arkansas has one of the highest rates of uninsured Latino children in the nation.¹⁸ There was a larger proportion of families that were not married and who were employed at the child's birth that were identified in the administrative data for analysis. There was a greater loss of mothers from the APCD linkage than children, which is to be expected as income eligibility for Medicaid is lowered during pregnancy, and coverage ends at 60 days postpartum.¹⁹

Two analytic samples for the birth outcomes were created. A match was made for all of the 105 expectant mothers who enrolled in PAT at least 3 months before the child's birth; keeping the full sample retained for the analysis of birth weight and child gestational age at birth (see Table B-1). Based on data availability, the candidates for match were further restricted when examining the breastfeeding intention outcome (N=101). All individuals retained in the restricted universe were matched (see Table B-2).

Three analytic samples for the health outcome and utilization analyses were created to correspond to child observation windows: from hospital discharge through age 1 year (Year 1), ages 1-2 years (Year 2), and ages 2-3 years (Year 3). Each of the analytic samples includes all participants who satisfied the inclusion/exclusion criteria as in Figure 1, had claims data for at least one observation window, and for whom an adequate propensity match could be made. We did not limit our sample based on the duration of the program. Out of 264, 369, and 391 child candidates, a match was made for 263, 369, and 390 PAT child participants in Year 1, Year 2, and Year 3 observation windows, respectively. The pre- and post-propensity score matching characteristics for child health care and birth outcomes are provided in Tables B-3, B-4, and B-5.

For the analysis examining infant mortality, we used all participants who satisfied the inclusion and exclusion criteria, as in Figure 1, as a candidate for propensity score match. Out of 290 candidates, a match was made for 283 PAT participants. The pre- and post-propensity score matching characteristics for the infants included in the mortality analysis is in Table B-6.

Like was completed for child health outcomes, for maternal health care use outcomes, three analytic samples were created to correspond to hospital discharge through their child's age 1 year (Year 1), ages 1-2 years (Year 2), and ages 2-3 years (Year 3) observation windows. Out of 129, 204, and 184 PAT mother participants in Year 1, Year 2, and Year 3 observation windows, respectively, all candidates were matched. The pre- and post-propensity score matching characteristics for maternal health care outcomes are provided in Tables B-7, B-8, and B-9.

We performed a calculation to determine the power to correctly reject null hypotheses, given sample sizes and minimum effect of differences between PAT (treatment/intervention) and non-PAT populations (control) to conclude success of the intervention. Our ability to perform the a priori power analyses was limited by the lack of existing studies; thus, outcomes to test the power based on the availability of a priori results. Among birth outcomes, we chose to determine power on preterm, low birth weight, and breastfeeding intention at birth, and first year wellness visits. We used the adjusted odds ratio reported in the existing literature for the Healthy Families American home visiting model²⁰⁻²² to obtain the expected adjusted odds ratio as there were no

studies with expected outcomes for PAT. We used SAS proc power to perform the calculation. The power to detect the effect described above with the probability of a Type I error was set at $\alpha=0.05$, given the samples of 105 (preterm and low birth weight) and 96 (breastfeeding) in each matched group were 0.09 (preterm), 0.09 (low birth weight), and 0.93 (breastfeeding). Similarly, for a more prevalent health care use outcome, the power to detect an adjusted odds ratio of 1.7 in the proportion of children with any wellness visits in the first year of life in the sample of 263 children per matched group was 0.25. Given the low estimated power in correctly rejecting null hypotheses for the binary outcomes, we tested the differences in birth weight and gestational weeks as numerical variables in our sensitivity analysis and modeled the average number of wellness visits as a primary outcome among child health care utilization outcomes.

Results

Evaluation Question 1 – Birth Outcomes

Preterm Birth and Birth Weight: We compared the rate of preterm birth (defined as birth before 37 weeks) between PAT enrollees with matched control. As shown in Table C-1, infants in the treatment group had similar odds of being born preterm or low birth weight (LBW; defined as <2500 grams) than infants in the control group. When examining the continuous variables, infants whose mothers were enrolled in PAT prenatally were heavier ($M_T=3300$ g; $M_C=3137$ g; $P=.05$) and there was a trend towards infants being born later ($M_T=38.6$ weeks; $M_C=31.8$ weeks; $P=.07$) at birth than infants in the control group.

Maternal Intention to Breastfeed: We compared the rate of self-reported intention to breastfeed for mothers who were enrolled in PAT during their pregnancies to the matched control. As shown in Table C-1, there were no statistically significant differences observed between groups.

Evaluation Question 2 – Child Health Care Utilization and Health Outcomes

Health Care Utilization: Health care utilization from the day after the child's birth hospital discharge to the first birthday (Year 1) is shown in Table C-2. There were no differences in infant healthcare between infants in the treatment and control groups on any measures with one exception; infants in PAT were more likely to have been seen in the ED for non-urgent evaluation and management than infants in the control group (IRR=1.45 [95% CI=1.03-2.06], $P=.04$).

The utilization and health outcomes for from the first to second birthday are shown in Table C-3. In Year 2, children in PAT had significantly greater use of the ED when examining the total number of visits (IRR=1.34 [95% CI=1.12-1.59], $P=.001$) and non-urgent visits for evaluation and management (IRR=1.27 [95% CI=1.04-1.56], $P=.02$). Children in PAT had significantly more wellness visits than the matched control group (IRR=1.12 [95% CI=1.00-1.25], $P=.05$). Children in PAT had a significantly higher number of paid pharmacy claims than control infants (IRR=1.24 [95% CI=1.05-1.46], $P=.01$).

The utilization and health outcomes for Year 3 are shown in Table C-4. From ages 2 to 3, children in PAT continued to have significantly greater use of the ED when examining the total number of visits (IRR=1.40 [95% CI=1.13-1.72], $P=.002$) and non-urgent visits for evaluation

and management (IRR=1.42 [95% CI=1.12-1.80], $P=.004$). Children in PAT had significantly more overall outpatient visits than the matched control group (IRR=1.29 [95% CI=1.06-1.57], $P=.01$). Children in PAT had a trend towards a higher number of paid pharmacy claims than control children (IRR=1.16 [95% CI=0.98-1.37], $P=.09$).

Immunizations and Immunization Completion: The APCD does not contain records of which vaccines were administered to children during a visit in which immunizations were provided. We used the count of immunization visits seen in medical claims (including wellness visits with immunization codes) as a proxy for completion of immunization series in the first year of life. Findings are shown in Appendix C. In their first and third years of life (see Tables C-2 and C-4), there were no differences in the number of immunizations between the PAT and control groups. There was a trend towards a significant difference between groups in the number of visits in which immunizations occurred in Year 2 (IRR=1.08 [95% CI=0.99-1.19], $P=.06$) (see Table C-3).

Infant Mortality: We compared the mortality rate of PAT enrollees with matched control. The adjusted odds ratio was computed using the PAT recipients as the referent group. As shown in Table 1, we did not observe difference in the likelihood of the infant death in the treatment and control group.

Table 1. Infant Mortality Differences

Infant Mortality	Treatment (N=283)	Control (N=283)	P Value ^a
Death by the first birthday (n, %)	0 (0.00)	2 (0.01)	0.16

^aP-value was calculated using chi-square.

Evaluation Question 3 – Maternal Health Care Utilization Outcomes

Health Care Utilization: Maternal health care utilization outcomes from the day after the birthing hospital discharge to their child’s first birthday (Year 1) are shown in Table C-5. Mothers served by PAT had significantly more use of certain types of health care than the non-PAT matched control group. Mothers in PAT had more average hospitalizations (IRR=3.14 [95% CI=1.31-7.53], $P=.01$) than mothers in the control group. Mothers in PAT had a trend towards a higher number of ED visits, both minor (IRR=1.43 [95% CI=0.96-2.13], $P=.08$) and total (IRR=1.33 [95% CI=0.95-1.85], $P=.1$), than the comparison group. Mothers in PAT also had significantly greater use of outpatient visits (IRR=1.62 [95% CI=1.25-2.09], $P<.001$). While there were not significant differences for prevention or wellness, there was for non-wellness outpatient visits (IRR=1.66 [95% CI=1.28-2.14], $P<.001$). Mothers in PAT had a greater number of health care visits in which support for substance-related disorders (IRR=2.76 [95% CI=1.04-7.25], $P=.04$) were discussed. Finally, there was a significant higher number of paid pharmacy claims for mothers in PAT than the control group (IRR=1.28 [95% CI=1.01-1.63], $P=.05$).

The maternal utilization outcomes for Year 2 are shown in Table C-6. Between the child’s first and second birthday, mothers in PAT had significantly greater use of the ED when examining the total number of visits (IRR=1.34 [95% CI=1.03-1.73], $P=.03$), but also more non-urgent visits for evaluation and management (IRR=1.57 [95% CI=1.14-2.17], $P=.006$). There

were no other differences. The utilization outcomes for mothers in Year 3 (child's second to third birthday) are shown in Table C-7. Between the child's age 2 to 3, mothers in PAT had significantly greater use of the ED when examining the total number of visits (IRR=1.42 [95% CI=1.06-1.92], $P=.02$). Mothers in PAT had a trend towards a higher number of visits where mood disorder was discussed than control group (IRR=1.79 [95% CI=0.9-3.56], $P=.1$). Mothers in PAT also had significantly greater use of outpatient visits (IRR=1.62 [95% CI=1.25-2.09], $P<.001$). There were no other differences observed.

Discussion

The results of the PAT intervention expands the current literature by investigating the effects of the program on birth outcomes and health and health care utilization for children and their mothers over three years. Evidence of effectiveness for PAT has been demonstrated for children's school readiness, family economic self-sufficiency, and positive parenting practices. In the overall literature of the PAT intervention, few studies that have investigated child and maternal health outcomes,^{3,4,23,24} none of which demonstrated impacts in health domains.¹

Results from this study did not produce evidence that PAT impacted the odds of being born preterm and born low birth weight. The sample for birth outcome was small and may not have been sufficiently powered to detect the differences. Babies whose mothers were served by PAT were heavier and trended towards being born a little later in gestation, but the averages for both of these outcomes are in the normal range for both groups. There were also not differences in maternal intention to breastfeed between PAT and non-PAT mothers. There were also not demonstrated differences in infant mortality within the first year of life between groups.

When we examined children's health care use, there were inconsistent group differences in use health care system across time. There were more observed differences in children of older ages. Between their birth and first birthday, the sample was smallest and least powered to detect differences. Possibly due to this limitation, there were no overall differences in the healthcare encounters of infants served in PAT and the non-PAT group before the first birthday. The one exception was in number of children seen in the ED for minor reasons, which was higher in the treatment group. Findings did suggest differences in ED encounters in Year 1 and Year 2. Children in PAT had a higher overall number of visits to the ED (overall and for non-urgent evaluation and management) in their second and third years of life than children in the control group. Existing studies of ED use in PAT report no effect.^{3,4} The vast majority of studies that have examined ED use in home visiting samples report null findings, but some studies have reported greater ED usage in the treatment group⁵⁻⁷ and others have reported lesser use in home visiting samples. It is unclear that use of the ED, particularly for less urgent care should be considered a negative outcome.

In Year 2, children in PAT have more wellness and total outpatient visits than children in the non-PAT group. We also found more pharmacy claims for PAT children In Years 2 and 3. The number of well-child visits has been an outcome of interest in evaluations of PAT. Existing studies have not demonstrated impacts on wellness or outpatient visits^{3,4} and no existing studies have examined pharmacy use.

Infants in PAT were not significantly different in the number of outpatient visits in the first year of life in which immunizations were provided and there were no differences in the odds of having had at least 4 immunization visits in the first year (our proxy for having completed the immunization series) than infants in the control group. There were also not significant differences in the number of visits with immunizations in Year 3. There was a trend towards significance in visits with immunizations when children between the ages of 1 and 2, which favored the PAT group. While not significant, this trend may be associated with increased well-child visits of the PAT group. No other studies of PAT have demonstrated impacts on immunizations,⁴ though data from other home visiting interventions have demonstrated favorable impacts.⁸

This is the first study of PAT to examine maternal healthcare use. From birth to their child's first birthday, mothers who were served by PAT had greater inpatient stays than mothers in the matched-control group. PAT mothers also had a greater number of overall outpatient visits, and specifically non-wellness visits. Mothers also had a greater number of visits in which discussion of substance-related disorders were discussed than the matched control group. We also demonstrated a greater number of medications claims for the PAT group. Differences between the groups as children aged became fewer, and a new association between greater maternal use of the ED was documented. In Year 2 and Year 3, mothers in PAT, compared to the control sample, used the ED to a greater extent for all reasons, and, in Year 3, also had more use for evaluation and management of an existing condition. PAT in Arkansas screens mothers for depression and substance use on a recurring basis (e.g., within a month of enrollment, 8 weeks of delivery and every 6 months based on their child's age) with the intention of supporting the mother with referrals for additional services. This may have supported the increase in substance-use discussions with healthcare providers.

Our findings contribute novel information, being among the first to document the association between PAT home visiting and medical claims related to birth, child health, and child and maternal health care use. Our results indicate modest differences in the healthcare use of families are served by PAT, with greater use of the ED, overall and for minor reasons, and outpatient care as children age. PAT also increased the mother's use of the health care system in a similar manner. Taken together, the data present that PAT as implemented in Arkansas provides children and their families some health care seeking benefits.

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Appendix A. Sample Included in and Excluded from Propensity Score Match

Categorical variables	Category	In Sample (N= 707)	Excluded (N=520)	P
		N (%)	N (%)	
<i>Program Characteristics</i>				
Prenatal	No	525 (74.3)	406 (78.1)	0.122
	Yes	182 (25.7)	114 (21.9)	
Enrolled at Least 3 Months	No	60 (8.5)	49 (9.4)	0.569
	Yes	647 (91.5)	471 (90.6)	
Enrolled at Least 6 Months	No	127 (18.0)	93 (17.9)	0.972
	Yes	580 (82.0)	427 (82.1)	
Enrolled at Least 12 Months	No	275 (38.9)	195 (37.5)	0.619
	Yes	432 (61.1)	325 (62.5)	
<i>Demographics</i>				
Child Gender	Male	357 (50.5)	260 (50.0)	0.864
	Female	350 (49.5)	260 (50.0)	
Maternal Education at Enrollment	College or Beyond	206 (30.9)	188 (37.8)	<0.001
	High School	429 (64.3)	258 (51.8)	
	Less than 9th Grade	32 (4.8)	52 (10.4)	
Maternal Education Status at Enrollment	Not a Student	375 (85.6)	326 (89.8)	0.074
	Student	63 (14.4)	37 (10.2)	
Maternal Race at Enrollment	Black	219 (31.2)	169 (32.8)	<0.001
	Hispanic	95 (13.5)	118 (22.9)	
	Other	33 (4.7)	70 (13.6)	
	White	355 (50.6)	158 (30.7)	
Maternal Marital Status at Enrollment	Married	216 (32.4)	205 (41.2)	0.002
	Not Married	451 (67.6)	293 (58.8)	
Maternal Employment Status at Enrollment	Employed	251 (37.5)	146 (29.2)	0.003
	Not employed	418 (62.5)	354 (70.8)	

Appendix B. Characteristics of Samples Pre- and Post-Propensity Score Matching

Table B-1. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Infant Birth Outcomes

Variables	Category	Unmatched (N=202,250)			PS Matched (N=210)				
		Treatment (N=105) N (%)	Control (N=202,250) N (%)	P	Treatment (N=105) N (%)	Control (N=105) N (%)	SD	VR	P
Child Gender	Male	57 (54.3)	103,431 (51.1)	0.519	57 (54.3)	57 (54.3)	0	1	1.00
	Female	48 (45.7)	98,819 (48.9)		48 (45.7)	48 (45.7)			
Mother Race	White	65 (61.9)	134,659 (66.6)	0.119	65 (61.9)	65 (61.9)	0	-	1.00
	Black	26 (24.8)	34,432 (17.0)		26 (24.8)	26 (24.8)			
	Hispanic	NR	21,742 (10.8)		NR	NR			
	Others	NR	11,417 (5.6)		NR	NR			
Mother Education at Birth	<High School	35 (33.3)	29,725 (14.7)	<0.001	35 (33.3)	32 (30.5)	0.07	-	0.976
	HS/Some College	57 (54.3)	113,019 (55.9)		57 (54.3)	60 (57.1)			
	College Degree	12 (11.4)	58,112 (28.7)		12 (11.4)	12 (11.4)			
	Unknown	NR	1,394 (0.7)		NR	NR			
Mother Age at Birth	Less than 20	47 (44.8)	17,319 (8.6)	<0.001	47 (44.8)	49 (46.7)	0.04	-	0.962
	20 to 35	57 (54.3)	163,613 (80.9)		57 (54.3)	55 (52.4)			
	35-40	NR	17,659 (8.7)		NR	NR			
	40 and above	-	3,659 (1.8)		-	-			
Mother Insurance at Birth	Medicaid	59 (56.2)	91,312 (45.1)	0.022	59 (56.2)	59 (56.2)	0	-	0.970
	Private	36 (34.3)	96,427 (47.7)		36 (34.3)	35 (33.3)			
	Other	NR	14,511 (7.2)		NR	11 (10.5)			
Mother WIC Receipt at Birth	Yes	86 (81.9)	95,902 (47.4)	<0.001	86 (81.9)	84 (80.0)	0.02	-	0.725
	No	19 (18.1)	103,048 (51.0)		19 (18.1)	21 (20.0)			
	Unknown	-	3,300 (1.6)		-	-			
Mother Smoking During Pregnancy	Yes	22 (21.0)	35,364 (17.5)	0.367	22 (21.0)	20 (19.0)	0.05	-	0.730
	No	83 (79.0)	164,545 (81.4)		83 (79.0)	85 (81.0)			
	Unknown	-	2,341 (1.2)		-	-			
Mother Married at Birth	Yes	33 (31.4)	113,392 (56.1)	<0.001	33 (31.4)	35 (33.3)	0.05	0.97	0.768
	No	72 (68.6)	88,858 (43.9)		72 (68.6)	70 (66.7)			
RUCA	Urban	50 (47.6)	119,440 (59.1)	<0.001	50 (47.6)	55 (52.4)	0.11	-	0.909
	Large rural	44 (41.9)	41,281 (20.4)		44 (41.9)	41 (39.0)			
	Small rural	NR	29,687 (14.7)		NR	NR			
	Isolated	NR	11,842 (5.9)		NR	NR			
Father Birth Date	Yes	71 (67.6)	160,840 (79.5)	0.003	71 (67.6)	71 (67.6)	0	1	1.000
	No	34 (32.4)	41,410 (20.5)		34 (32.4)	34 (32.4)			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-2. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Breastfeeding Intention

		Unmatched (N=193,087)			PS Matched (N=202)				
		Treatment (N=101)	Control (N=192,986)		Treatment (N=101)	Control (N=101)			
Variables	Category	N (%)	N (%)	P	N (%)	N (%)	SD	VR	P
Mother Race	White	62 (61.4)	129,408 (67.1)	0.094	62 (61.4)	62 (61.4)	0	-	1.000
	Black	25 (24.8)	31,781 (16.5)		25 (24.8)	25 (24.8)			
	Hispanic	NR	20,884 (10.8)		NR	NR			
	Others	NR	10,913 (5.7)		NR	NR			
Mother Education at Birth	<High School	33 (32.7)	28,170 (14.6)	<0.001	33 (32.7)	32 (31.7)	0.09	-	0.939
	HS/Some College	56 (55.4)	107,786 (55.9)		56 (55.4)	57 (56.4)			
	College Degree	11 (10.9)	55,898 (29.0)		11 (10.9)	NR			
	Unknown	NR	1,132 (0.6)		NR	NR			
Mother Age at Birth	Less than 20	44 (43.6)	16,460 (8.5)	<0.001	44 (43.6)	43 (42.6)	0.02	-	0.990
	20 to 35	56 (55.4)	156,216 (80.9)		56 (55.4)	57 (56.4)			
	35-40	NR	16,829 (8.7)		NR	NR			
	40 and above	-	3,481 (1.8)		-	-			
Mother Insurance at Birth	Medicaid	56 (55.4)	87,454 (45.3)	0.025	56 (55.4)	57 (56.4)	0.05	-	0.944
	Private	35 (34.7)	92,363 (47.9)		35 (34.7)	33 (32.7)			
	Other	NR	13,169 (6.8)		NR	11 (10.9)			
Mother WIC Receipt at Birth	Yes	84 (83.2)	91,684 (47.5)	<0.001	84 (83.2)	84 (83.2)	0.02	-	1.000
	No	17 (16.8)	98,799 (51.2)		17 (16.8)	17 (16.8)			
	Unknown	-	2,503 (1.3)		-	-			
Mother Smoking During Pregnancy	Yes	22 (21.8)	33,981 (17.6)	0.357	22 (21.8)	21 (20.8)	0.05	-	0.864
	No	79 (78.2)	157,225 (81.5)		79 (78.2)	80 (79.2)			
	Unknown	-	1,780 (0.9)		-	-			
Mother Married at Birth	Yes	31 (30.7)	108,883 (56.4)	<0.001	31 (30.7)	32 (31.7)	0.05	0.98	0.879
	No	70 (69.3)	84,103 (43.6)	<0.001	70 (69.3)	69 (68.3)			
RUCA	Urban	46 (45.5)	112,893 (58.5)	<0.001	46 (45.5)	48 (47.5)	0.07	-	0.970
	Large rural	44 (43.6)	40,076 (20.8)		44 (43.6)	44 (43.6)			
	Small rural	NR	28,527 (14.8)		NR	NR			
	Isolated	NR	11,490 (6.0)		NR	NR			
Father Birth Date	Yes	67 (66.3)	154,146 (79.9)	<0.001	67 (66.3)	67 (66.3)	0	1	1.000
	No	34 (33.7)	38,840 (20.1)		34 (33.7)	34 (33.7)			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-3. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Infant Health Care Outcomes from Birth to First Birthday (Year 1)

Variables	Unit / Category	Unmatched (N=121,127)			PS Matched (N=526)				
		Treatment (N=264)	Control (N=120,863)	P*	Treatment (N=263)	Control (N=263)	SD	VR	P
		Mean (SE) / N (%)	Mean (SE) / N (%)		Mean (SE) / N (%)	Mean (SE) / N (%)			
APGAR: 5 Mins	Score	8.4 (1.2)	8.4 (1.2)	0.399	8.4 (1.2)	8.5 (1.0)	-0.07	1.32	0.373
Gestational Weeks	Weeks	38.4 (2.0)	38.3 (2.0)	0.748	38.4 (2.0)	38.4 (1.7)	-0.02	1.32	0.781
Child Hospital Stay at Birth	Days	23.9 (6.0)	26.0 (5.6)	<0.001	23.9 (6.0)	24.1 (5.8)	0.01	0.96	0.735
Birth Weight	Grams	3,204.3 (574.3)	3,225.5 (575.4)	0.549	3,202.5 (574.6)	3,235.2 (555.3)	-0.06	1.07	0.508
Mother Age	Years	4.0 (5.1)	4.1 (11.9)	0.811	4.0 (5.1)	3.9 (5.2)	-0.03	1.07	0.886
Child Gender	Male	131 (49.6)	61,932 (51.2)	0.599	130 (49.4)	130 (49.4)	0	1	1.000
	Female	133 (50.4)	58,931 (48.8)		133 (50.6)	133 (50.6)			
Mother Race	White	136 (51.5)	77,845 (64.4)	<0.001	136 (51.7)	137 (52.1)	0.08		0.809
	Black	94 (35.6)	26,955 (22.3)		94 (35.7)	87 (33.1)			
	Hispanic	24 (9.1)	10,712 (8.9)		23 (8.7)	29 (11.0)			
	Others	NR	5,351 (4.4)		NR	NR			
Mother Education at Birth	<High School	70 (26.5)	19,434 (16.1)	<0.001	70 (26.6)	76 (28.9)	0.05		0.895
	HS/Some College	160 (60.6)	77,023 (63.7)		159 (60.5)	152 (57.8)			
	College Degree	32 (12.1)	23,698 (19.6)		32 (12.2)	32 (12.2)			
	Unknown	NR	708 (0.6)		NR	NR			
Mother Insurance at Birth	Medicaid	170 (64.4)	68,949 (57.0)	0.026	170 (64.6)	170 (64.6)	0		1.000
	Private	76 (28.8)	44,496 (36.8)		75 (28.5)	75 (28.5)			
	Other	18 (6.8)	7,418 (6.1)		18 (6.8)	18 (6.8)			
RUCA	Urban	133 (50.4)	66,985 (55.4)	<0.001	133 (50.6)	130 (49.4)	0.02		0.986
	Large Rural	110 (41.7)	27,228 (22.5)		109 (41.4)	111 (42.2)			
	Small Rural	NR	18,364 (15.2)		NR	NR			
	Isolated	16 (6.1)	8,286 (6.9)		16 (6.1)	16 (6.1)			
Mother Smoking During Pregnancy	Yes	75 (28.4)	26,269 (21.7)	0.029	74 (28.1)	86 (32.7)	0.13		0.348
	No	187 (70.8)	93,213 (77.1)		187 (71.1)	173 (65.8)			
	Unknown	NR	1,381 (1.1)		NR	NR			

		Unmatched (N=121,127)			PS Matched (N=526)				
		Treatment (N=264)	Control (N=120,863)		Treatment (N=263)	Control (N=263)			
Variables	Unit / Category	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
Mother Married at Birth	Yes	80 (30.3)	54,228 (44.9)	<0.001	80 (30.4)	84 (31.9)	0.11	0.97	0.707
	No	184 (69.7)	66,635 (55.1)		183 (69.6)	179 (68.1)			
Had Father Birth Date	Yes	163 (61.7)	89,235 (73.8)	<0.001	163 (62.0)	172 (65.4)	0.07	1.04	0.414
	No	101 (38.3)	31,628 (26.2)		100 (38.0)	91 (34.6)			
Mother WIC Receipt at Birth	Yes	213 (80.7)	71,671 (59.3)	<0.001	212 (80.6)	209 (79.5)	0.08	-	0.600
	No	48 (18.2)	47,267 (39.1)		48 (18.3)	48 (18.3)			
	Unknown	NR	1,925 (1.6)		NR	NR			
Gestational Age: Preterm	Normal	240 (90.9)	108,191 (89.5)	0.696	239 (90.9)	239 (90.9)	0	1	1.000
	Preterm	24 (9.1)	12,563 (10.4)		24 (9.1)	24 (9.1)			
	Missing	-	109 (0.1)		-	-			
Mother Age Category	Less Than 20	73 (27.7)	13,093 (10.8)	<0.001	72 (27.4)	76 (28.9)	0.05	-	0.985
	20 To 35	178 (67.4)	97,632 (80.8)		178 (67.7)	174 (66.2)			
	35-40	11 (4.2)	8,472 (7.0)		11 (4.2)	11 (4.2)			
	40 And Above	NR	1,666 (1.4)		NR	NR			
Delivery Method	Vaginal	164 (62.1)	76,574 (63.4)	0.970	163 (62.0)	171 (65.0)	0.06	-	0.910
	C-Section	91 (34.5)	39,822 (32.9)		91 (34.6)	84 (31.9)			
	Vacuum	NR	777 (0.6)		NR	NR			
	Forceps	NR	3,689 (3.1)		NR	NR			
	Missing	-	NR		-	-			
Birth Weight Category	Normal	240 (90.9)	110,428 (91.4)	0.985	239 (90.9)	241 (91.6)	0.14	-	0.714
	Low	20 (7.6)	8,859 (7.3)		20 (7.6)	20 (7.6)			
	Very Low	NR	1,564 (1.3)		NR	NR			
	Missing	-	12 (0.0)		-	-			
Child Hospital Length at Birth	< 5 Days	236 (89.4)	107,826 (89.2)	0.996	235 (89.4)	235 (89.4)	0.15	-	0.794
	5-< 10 Days	14 (5.3)	6,425 (5.3)		14 (5.3)	15 (5.7)			
	10 -< 21 Days	NR	3,825 (3.2)		NR	NR			
	21 -< 47 Days	NR	2,196 (1.8)		NR	NR			
	47 =< 94 Days	NR	515 (0.4)		NR	NR			
	> 94 Days	-	76 (0.1)		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-4. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Infant Health Care Outcomes from Age 1 to 2 (Year 2)

Variables	Unit / Category	Unmatched (N=84,237)			PS Matched (N=738)				
		Treatment (N=369)	Control (N=83,868)	P*	Treatment (N=369)	Control (N=369)	SD	VR	P
		Mean (SE)	Mean (SE)		Mean (SE)	Mean (StdErr)			
APGAR: 5 Mins	Score	8.5 (1.1)	8.4 (1.2)	0.264	8.5 (1.1)	8.6 (0.8)	-0.09	1.66	0.158
Gestational Weeks	Weeks	38.5 (1.8)	38.3 (2.0)	0.237	38.5 (1.8)	38.4 (1.9)	0.06	0.99	0.438
Child Hospital Stay at Birth	Days	4.1 (11.0)	4.2 (13.6)	0.909	4.1 (11.0)	3.8 (4.9)	0.03	5	0.579
Birth Weight	Grams	3,209.1 (508.1)	3,226.3 (580.6)	0.571	3,209.1 (508.1)	3,219.0 (545.3)	-0.02	0.87	0.799
Mother Age	Years	24.2 (5.9)	26.1 (5.6)	<0.001	24.2 (5.9)	24.7 (5.8)	-0.09	1.07	0.225
Child Gender	Male	178 (48.2)	43,141 (51.4)	0.220	178 (48.2)	178 (48.2)	0	1	1.000
	Female	191 (51.8)	40,727 (48.6)		191 (51.8)	191 (51.8)			
Mother Race	White	196 (53.1)	54,186 (64.6)	<0.001	196 (53.1)	203 (55.0)	0.1	-	0.631
	Black	116 (31.4)	19,055 (22.7)		116 (31.4)	103 (27.9)			
	Hispanic	44 (11.9)	7,528 (9.0)		44 (11.9)	52 (14.1)			
	Others	13 (3.5)	3,099 (3.7)		13 (3.5)	11 (3.0)			
Mother Education at Birth	<High School	92 (24.9)	13,428 (16.0)	<0.001	92 (24.9)	92 (24.9)	0	-	1.000
	HS/Some College	239 (64.8)	53,263 (63.5)		239 (64.8)	239 (64.8)			
	College Degree	35 (9.5)	16,717 (19.9)		35 (9.5)	35 (9.5)			
	Unknown	NR	460 (0.5)		NR	NR			
Mother Insurance at Birth	Medicaid	234 (63.4)	46,884 (55.9)	0.012	234 (63.4)	246 (66.7)	0.09	-	0.651
	Private	112 (30.4)	31,564 (37.6)		112 (30.4)	102 (27.6)			
	Other	23 (6.2)	5,420 (6.5)		23 (6.2)	21 (5.7)			
RUCA	Urban	192 (52.0)	46,014 (54.9)	<0.001	192 (52.0)	167 (45.3)	0.14	-	0.230
	Large Rural	132 (35.8)	18,987 (22.6)		132 (35.8)	142 (38.5)			
	Small Rural	16 (4.3)	13,025 (15.5)		16 (4.3)	20 (5.4)			
	Isolated	29 (7.9)	5,842 (7.0)		29 (7.9)	40 (10.8)			
Mother Smoking During Pregnancy	Yes	90 (24.4)	17,801 (21.2)	0.325	90 (24.4)	92 (24.9)	0.09	-	0.798
	No	275 (74.5)	65,010 (77.5)		275 (74.5)	271 (73.4)			
	Unknown	NR	1,057 (1.3)		NR	NR			
Mother Married at Birth	Yes	125 (33.9)	37,991 (45.3)	<0.001	125 (33.9)	117 (31.7)	0.02	1.03	0.530
	No	244 (66.1)	45,877 (54.7)		244 (66.1)	252 (68.3)			
Had Father Birth Date	Yes	241 (65.3)	62,244 (74.2)	<0.001	241 (65.3)	253 (68.6)	0.07	1.05	0.348
	No	128 (34.7)	21,624 (25.8)		128 (34.7)	116 (31.4)			

		Unmatched (N=84,237)			PS Matched (N=738)				
		Treatment (N=369)	Control (N=83,868)		Treatment (N=369)	Control (N=369)			
Variables	Unit / Category	Mean (SE)	Mean (SE)	P*	Mean (SE)	Mean (StdErr)	SD	VR	P
Mother WIC Receipt at Birth	Yes	298 (80.8)	51,165 (61.0)	<0.001	298 (80.8)	313 (84.8)	0.11	-	0.342
	No	67 (18.2)	31,307 (37.3)		67 (18.2)	53 (14.4)			
	Unknown	NR	1,396 (1.7)		NR	NR			
Gestational Age: Preterm	Normal	334 (90.5)	75,010 (89.4)	0.685	334 (90.5)	324 (87.8)	0.09	0.8	0.236
	Preterm	35 (9.5)	8,773 (10.5)		35 (9.5)	45 (12.2)			
	Missing	-	85 (0.1)		-	-			
Mother Age Category	Less Than 20	85 (23.0)	8,914 (10.6)	<0.001	85 (23.0)	77 (20.9)	0.09	-	0.748
	20 To 35	261 (70.7)	67,801 (80.8)		261 (70.7)	263 (71.3)			
	35-40	19 (5.1)	5,971 (7.1)		19 (5.1)	25 (6.8)			
	40 And Above	NR	1,182 (1.4)		NR	NR			
Delivery Method	Vaginal	240 (65.0)	53,153 (63.4)	0.839	240 (65.0)	232 (62.9)	0.06	-	0.599
	C-Section	119 (32.2)	27,673 (33.0)		119 (32.2)	130 (35.2)			
	Vacuum	NR	560 (0.7)		NR	NR			
	Forceps	NR	2,481 (3.0)		NR	0			
	Missing	-	NR		-	-			
Birth Weight Category	Normal	344 (93.2)	76,562 (91.3)	0.442	344 (93.2)	344 (93.2)	0	-	1.000
	Low	23 (6.2)	6,128 (7.3)		23 (6.2)	23 (6.2)			
	Very Low	NR	1,171 (1.4)		NR	NR			
	Missing	-	7 (0.0)		-	-			
Child Hospital Length at Birth	< 5 Days	335 (90.8)	74,745 (89.1)	0.458	335 (90.8)	332 (90.0)	0.08	-	0.692
	5-< 10 Days	19 (5.1)	4,447 (5.3)		19 (5.1)	20 (5.4)			
	10 -< 21 Days	NR	2,647 (3.2)		NR	NR			
	21 -< 47 Days	NR	1,560 (1.9)		NR	NR			
	47 =< 94 Days	NR	402 (0.5)		NR	NR			
	> 94 Days	-	67 (0.1)		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-5. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Infant Health Care Outcomes from Age 2 to 3 (Year 3)

Variables	Unit / Category	Unmatched (N=67,225)			PS Matched (N=780)				
		Treatment (N=391) Mean (SE) / N (%)	Control (N=66,834) Mean (SE) / N (%)	P*	Treatment (N=390) Mean (SE) / N (%)	Control (N=390) Mean (SE) / N (%)	SD	VR	P
APGAR: 5 Mins	Score	8.4 (1.1)	8.4 (1.2)	0.134	8.4 (1.1)	8.5 (1.1)	-0.02	1.16	0.744
Gestational Weeks	Weeks	38.4 (2.0)	38.4 (2.0)	0.632	38.4 (2.0)	38.4 (2.0)	0.02	1.06	0.733
Child Hospital Stay at Birth	Days	4.1 (5.9)	4.3 (14.7)	0.809	4.1 (5.9)	4.4 (7.5)	-0.03	0.61	0.549
Birth Weight	Grams	3,201.8 (532.4)	3,226.6 (580.9)	0.399	3,202.9 (532.7)	3,227.3 (587.0)	-0.04	0.82	0.543
Mother Age	Years	24.4 (5.9)	26.0 (5.6)	<0.001	24.4 (5.9)	24.5 (5.5)	-0.01	1.15	0.846
Child Gender	Male	193 (49.4)	34,488 (51.6)	0.376	192 (49.2)	192 (49.2)	0	1	1.000
	Female	198 (50.6)	32,346 (48.4)		198 (50.8)	198 (50.8)			
Mother Race	White	211 (54.0)	43,439 (65.0)	<0.001	211 (54.1)	211 (54.1)	0	-	1.000
	Black	125 (32.0)	15,471 (23.1)		124 (31.8)	124 (31.8)			
	Hispanic	49 (12.5)	5,820 (8.7)		49 (12.6)	49 (12.6)			
	Others	NR	2,104 (3.1)		NR	NR			
Mother Education at Birth	<High School	98 (25.1)	10,920 (16.3)	<0.001	98 (25.1)	90 (23.1)	0.05	-	0.930
	HS/Some College	251 (64.2)	42,483 (63.6)		250 (64.1)	257 (65.9)			
	College Degree	39 (10.0)	13,091 (19.6)		39 (10.0)	40 (10.3)			
	Unknown	NR	340 (0.5)		NR	NR			
Mother Insurance at Birth	Medicaid	250 (63.9)	37,143 (55.6)	0.002	249 (63.8)	230 (59.0)	0.1	-	0.364
	Private	112 (28.6)	24,924 (37.3)		112 (28.7)	129 (33.1)			
	Other	29 (7.4)	4,767 (7.1)		29 (7.4)	31 (7.9)			
RUCA	Urban	207 (52.9)	36,353 (54.4)	<0.001	206 (52.8)	208 (53.3)	0.04	-	0.974
	Large Rural	132 (33.8)	15,259 (22.8)		132 (33.8)	127 (32.6)			
	Small Rural	15 (3.8)	10,526 (15.7)		15 (3.8)	15 (3.8)			
	Isolated	37 (9.5)	4,696 (7.0)		37 (9.5)	40 (10.3)			
Mother Smoking During Pregnancy	Yes	99 (25.3)	14,351 (21.5)	0.115	99 (25.4)	107 (27.4)	0.05	-	0.809
	No	289 (73.9)	51,543 (77.1)		288 (73.8)	280 (71.8)			
	Unknown	NR	940 (1.4)		NR	NR			
Mother Married at Birth	Yes	136 (34.8)	30,236 (45.2)	<0.001	136 (34.9)	152 (39.0)	0.05	0.95	0.235
	No	255 (65.2)	36,598 (54.8)		254 (65.1)	238 (61.0)			

		Unmatched (N=67,225)			PS Matched (N=780)				
		Treatment (N=391)	Control (N=66,834)		Treatment (N=390)	Control (N=390)			
Variables	Unit / Category	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
Had Father Birth Date	Yes	255 (65.2)	49,298 (73.8)	<0.001	254 (65.1)	267 (68.5)	0.07	1.05	0.323
	No	136 (34.8)	17,536 (26.2)		136 (34.9)	123 (31.5)			
Mother WIC Receipt at Birth	Yes	315 (80.6)	41,460 (62.0)	<0.001	314 (80.5)	320 (82.1)	0.08	-	0.330
	No	68 (17.4)	24,177 (36.2)		68 (17.4)	57 (14.6)			
	Unknown	NR	1,197 (1.8)		NR	13 (3.3)			
Gestational Age: Preterm	Normal	350 (89.5)	59,889 (89.6)	0.701	350 (89.7)	348 (89.2)	0.02	0.96	0.815
	Preterm	40 (10.2)	6,870 (10.3)		40 (10.3)	42 (10.8)			
	Missing	NR	75 (0.1)		-	-			
Mother Age Category	Less Than 20	87 (22.3)	7,394 (11.1)	<0.001	87 (22.3)	79 (20.3)	0.05	-	0.748
	20 To 35	280 (71.6)	53,948 (80.7)		279 (71.5)	288 (73.8)			
	35-40	20 (5.1)	4,598 (6.9)		20 (5.1)	21 (5.4)			
	40 And Above	NR	894 (1.3)		NR	NR			
Delivery Method	Vaginal	250 (63.9)	42,577 (63.7)	0.978	249 (63.8)	240 (61.5)	0.15	-	0.661
	C-Section	129 (33.0)	21,784 (32.6)		129 (33.1)	134 (34.4)			
	Vacuum	NR	427 (0.6)		NR	NR			
	Forceps	NR	2,045 (3.1)		NR	15 (3.8)			
	Missing	-	NR		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-6. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Infant Mortality

Variables	Unit / Category	Unmatched (N=132,302)			PS Matched (N=566)				
		Treatment (N=290)	Control (N=132,012)	P*	Treatment (N=283)	Control (N=283)	SD	VR	P
		Mean (SE) / N (%)	Mean (SE) / N (%)		Mean (SE) / N (%)	Mean (SE) / N (%)			
APGAR: 5 Mins	Score	8.4 (1.2)	8.4 (1.1)	0.753	8.4 (1.2)	8.3 (1.2)	0.07	0.89	0.437
Gestational Weeks	Weeks	38.4 (2.0)	38.4 (2.0)	0.913	38.4 (1.9)	38.4 (1.9)	0.03	1.00	0.707
Child Hospital Stay at Birth	Days	23.9 (6.1)	26.1 (5.6)	<0.001	24.0 (6.1)	23.7 (5.5)	0.01	1.02	0.582
Birth Weight	Grams	3,206.6 (566.8)	3,230.3 (573.2)	0.484	3,223.0 (553.5)	3,196.2 (545.4)	0.05	1.03	0.562
Mother Age	Years	4.0 (5.0)	4.1 (12.0)	0.845	3.7 (4.2)	3.6 (4.2)	0.05	1.23	0.786
Child Gender	Male	146 (50.3)	67,587 (51.2)	0.772	142 (50.2)	142 (50.2)	0	1.00	1.000
	Female	144 (49.7)	64,425 (48.8)		141 (49.8)	141 (49.8)			
Mother Race	White	154 (53.1)	86,234 (65.3)	<0.001	151 (53.4)	151 (53.4)	0		1.000
	Black	98 (33.8)	28,355 (21.5)		96 (33.9)	96 (33.9)			
	Hispanic	27 (9.3)	11,362 (8.6)		25 (8.8)	25 (8.8)			
	Others	11 (3.8)	6,061 (4.6)		11 (3.9)	11 (3.9)			
Mother Education at Birth	<High School	75 (25.9)	20,803 (15.8)	<0.001	73 (25.8)	73 (25.8)	0		1.000
	HS/Some College	177 (61.0)	82,334 (62.4)		173 (61.1)	173 (61.1)			
	College Degree	36 (12.4)	28,096 (21.3)		35 (12.4)	35 (12.4)			
	Unknown	NR	779 (0.6)		NR	NR			
Mother Insurance at Birth	Medicaid	187 (64.5)	73,198 (55.4)	0.004	185 (65.4)	185 (65.4)	0		1.000
	Private	84 (29.0)	50,687 (38.4)		81 (28.6)	81 (28.6)			
	Other	19 (6.6)	8,127 (6.2)		17 (6.0)	17 (6.0)			
RUCA	Urban	143 (49.3)	73,730 (55.9)	<0.001	141 (49.8)	138 (48.8)	0.08		0.883
	Large Rural	123 (42.4)	29,579 (22.4)		118 (41.7)	122 (43.1)			
	Small Rural	NR	19,799 (15.0)		NR	NR			
	Isolated	18 (6.2)	8,904 (6.7)		18 (6.4)	15 (5.3)			
Mother Smoking During Pregnancy	Yes	79 (27.2)	28,084 (21.3)	0.046	77 (27.2)	78 (27.6)	0.09		0.593
	No	208 (71.7)	102,430 (77.6)		203 (71.7)	199 (70.3)			
	Unknown	NR	1,498 (1.1)		NR	NR			
Mother Married at Birth	Yes	87 (30.0)	61,527 (46.6)	<0.001	86 (30.4)	85 (30.0)	0.03	0.01	0.927
	No	203 (70.0)	70,485 (53.4)		197 (69.6)	198 (70.0)			

		Unmatched (N=132,302)			PS Matched (N=566)				
		Treatment (N=290)	Control (N=132,012)		Treatment (N=283)	Control (N=283)			
Variables	Unit / Category	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
Had Father Birth Date	Yes	183 (63.1)	98,436 (74.6)	<0.001	179 (63.3)	183 (64.7)	0.03	1.02	0.726
	No	107 (36.9)	33,576 (25.4)		104 (36.7)	100 (35.3)			
Mother WIC Receipt at Birth	Yes	231 (79.7)	75,698 (57.3)	<0.001	226 (79.9)	231 (81.6)	0.15		0.565
	No	56 (19.3)	54,189 (41.0)		54 (19.1)	51 (18.0)			
	Unknown	NR	2,125 (1.6)		NR	NR			
Gestational Age: Preterm	Normal	263 (90.7)	118,344 (89.6)	0.759	262 (92.6)	262 (92.6)	0	1.00	1.000
	Preterm	27 (9.3)	13,550 (10.3)		21 (7.4)	21 (7.4)			
	Missing	-	118 (0.1)		-	-			
Mother Age Category	Less Than 20	79 (27.2)	13,897 (10.5)	<0.001	76 (26.9)	76 (26.9)	0		1.000
	20 To 35	196 (67.6)	106,786 (80.9)		192 (67.8)	192 (67.8)			
	35-40	13 (4.5)	9,489 (7.2)		13 (4.6)	13 (4.6)			
	40 And Above	NR	1,840 (1.4)		NR	NR			
Delivery Method	Vaginal	182 (62.8)	83,840 (63.5)	0.959	177 (62.5)	180 (63.6)	0.14		0.509
	C-Section	99 (34.1)	43,341 (32.8)		97 (34.3)	99 (35.0)			
	Vacuum	NR	843 (0.6)		NR	NR			
	Forceps	NR	3,987 (3.0)		NR	NR			
	Missing	-	NR		-	-			
Birth Weight Category	Normal	264 (91.0)	120,778 (91.5)	0.989	262 (92.6)	256 (90.5)	0.12		0.663
	Low	22 (7.6)	9,572 (7.3)		17 (6.0)	22 (7.8)			
	Very Low	NR	1,649 (1.2)		NR	NR			
	Missing	-	13 (0.0)		-	-			
Child Hospital Length at Birth	< 5 Days	257 (88.6)	117,871 (89.3)	0.915	256 (90.5)	256 (90.5)	0		1.000
	5-< 10 Days	16 (5.5)	7,017 (5.3)		13 (4.6)	13 (4.6)			
	10 -< 21 Days	12 (4.1)	4,124 (3.1)		NR	NR			
	21 -< 47 Days	NR	2,365 (1.8)		NR	NR			
	47 =< 94 Days	NR	552 (0.4)		NR	NR			
	> 94 Days	-	83 (0.1)		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-7. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Maternal Health Care Outcomes From Birth to Child’s First Birthday (Year 1)

Variables	Unit / Category	Unmatched (N=62,727)			PS Matched (N=258)				
		Treatment (N=129) Mean (SE) / N (%)	Control (N=62,598) Mean (SE) / N (%)	P*	Treatment (N=129) Mean (SE) / N (%)	Control (N=129) Mean (SE) / N (%)	SD	VR	P
Mother Hospital Stay at Birth	Days	2.7 (0.7)	2.9 (5.2)	0.759	2.7 (0.7)	2.7 (0.6)	-0.01	1.5	0.925
Mother Race	White	75 (58.1)	41,636 (66.5)	0.001	75 (58.1)	75 (58.1)	0	-	1.000
	Black	49 (38.0)	15,494 (24.8)		49 (38.0)	49 (38.0)			
	Hispanic	NR	3,386 (5.4)		NR	NR			
	Others	NR	2,082 (3.3)		NR	NR			
Mother Education at Birth	<High School	38 (29.5)	9,510 (15.2)	<0.001	38 (29.5)	39 (30.2)	0.09	-	0.848
	HS/Some College	74 (57.4)	37,651 (60.1)		74 (57.4)	76 (58.9)			
	College Degree	17 (13.2)	15,081 (24.1)		17 (13.2)	14 (10.9)			
	Unknown	-	356 (0.6)		-	-			
Mother Insurance at Birth	Medicaid	80 (62.0)	34,202 (54.6)	0.093	80 (62.0)	84 (65.1)	0.09	-	0.819
	Private	40 (31.0)	25,139 (40.2)		40 (31.0)	38 (29.5)			
	Other	NR	3,257 (5.2)		NR	NR			
RUCA	Urban	62 (48.1)	34,809 (55.6)	<0.001	62 (48.1)	69 (53.5)	0.11	-	0.833
	Large Rural	53 (41.1)	14,014 (22.4)		53 (41.1)	46 (35.7)			
	Small Rural	NR	9,614 (15.4)		NR	NR			
	Isolated	12 (9.3)	4,161 (6.6)		12 (9.3)	12 (9.3)			
Mother Smoking During Pregnancy	Yes	44 (34.1)	14,043 (22.4)	0.006	44 (34.1)	47 (36.4)	0.1	-	0.767
	No	84 (65.1)	47,830 (76.4)		84 (65.1)	80 (62.0)			
	Unknown	NR	725 (1.2)		NR	NR			
Mother Married at Birth	Yes	35 (27.1)	26,289 (42.0)	<0.001	35 (27.1)	32 (24.8)	0.06	1.06	0.670
	No	94 (72.9)	36,309 (58.0)		94 (72.9)	97 (75.2)			
Had Father Birth Date	Yes	71 (55.0)	44,522 (71.1)	<0.001	71 (55.0)	67 (51.9)	0.06	0.99	0.618
	No	58 (45.0)	18,076 (28.9)		58 (45.0)	62 (48.1)			
Mother Age Category	Less Than 20	32 (24.8)	6,751 (10.8)	<0.001	32 (24.8)	37 (28.7)	0.13	-	0.618
	20 To 35	90 (69.8)	50,491 (80.7)		90 (69.8)	88 (68.2)			
	35-40	NR	4,538 (7.2)		NR	NR			
	40 And Above	NR	818 (1.3)		NR	0			
Mother WIC Receipt at Birth	Yes	102 (79.1)	34,390 (54.9)	<0.001	102 (79.1)	99 (76.7)	0.05	-	0.901
	No	26 (20.2)	27,245 (43.5)		26 (20.2)	29 (22.5)			
	Unknown	NR	963 (1.5)		NR	NR			

		Unmatched (N=62,727)			PS Matched (N=258)				
		Treatment (N=129)	Control (N=62,598)		Treatment (N=129)	Control (N=129)			
Variables	Unit / Category	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
Mother Hospital Length at Birth	< 5 Days	128 (99.2)	61,002 (97.5)	0.889	128 (99.2)	129 (100.0)	-0.12	-	0.316
	5-< 10 Days	NR	1,316 (2.1)		NR	-			
	10 -< 21 Days	-	110 (0.2)		-	-			
	21 -< 47 Days	-	79 (0.1)		-	-			
	47 =< 94 Days	-	54 (0.1)		-	-			
	> 94 Days	-	37 (0.1)		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-8. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Maternal Health Care Outcomes from Child’s Age 1 to 2 (Year 2)

Variables	Unit	Unmatched (N=52,271)			PS Matched (N=408)				
		Treatment (N=204)	Control (N=52,067)	P*	Treatment (N=204)	Control (N=204)	SD	VR	P
		Mean (SE) / N (%)	Mean (SE) / N (%)		Mean (SE) / N (%)	Mean (SE) / N (%)			
Mother Hospital Stay at Birth	Days	2.8 (0.7)	2.9 (5.4)	0.73	2.8 (0.7)	2.7 (0.6)	0.04	1.39	0.712
Mother Race	White	114 (55.9)	34,823 (66.9)	0.002	114 (55.9)	114 (55.9)	0	-	1.000
	Black	75 (36.8)	13,115 (25.2)		75 (36.8)	75 (36.8)			
	Hispanic	11 (5.4)	2,752 (5.3)		11 (5.4)	11 (5.4)			
	Others	NR	1,377 (2.6)		NR	NR			
Mother Education at Birth	<High School	57 (27.9)	7,875 (15.1)	<0.001	57 (27.9)	54 (26.5)	0.05	-	0.861
	HS/Some College	130 (63.7)	31,488 (60.5)		130 (63.7)	135 (66.2)			
	College Degree	17 (8.3)	12,414 (23.8)		17 (8.3)	15 (7.4)			
	Unknown	-	290 (0.6)		-	-			
Mother Insurance at Birth	Medicaid	134 (65.7)	28,534 (54.8)	0.002	134 (65.7)	138 (67.6)	0.05	-	0.915
	Private	56 (27.5)	20,529 (39.4)		56 (27.5)	53 (26.0)			
	Other	14 (6.9)	3,004 (5.8)		14 (6.9)	13 (6.4)			
RUCA	Urban	105 (51.5)	28,831 (55.4)	<0.001	105 (51.5)	106 (52.0)	0.03	-	0.986
	Large Rural	66 (32.4)	11,726 (22.5)		66 (32.4)	63 (30.9)			
	Small Rural	NR	7,990 (15.3)		NR	11 (5.4)			
	Isolated	23 (11.3)	3,520 (6.8)		23 (11.3)	24 (11.8)			
Mother Smoking During Pregnancy	Yes	61 (29.9)	11,520 (22.1)	0.020	61 (29.9)	63 (30.9)	0.15	-	0.820
	No	142 (69.6)	39,871 (76.6)		142 (69.6)	139 (68.1)			
	Unknown	NR	676 (1.3)		NR	NR			
Mother Married at Birth	Yes	56 (27.5)	22,266 (42.8)	<0.001	56 (27.5)	54 (26.5)	0.03	1.02	0.823
	No	148 (72.5)	29,801 (57.2)		148 (72.5)	150 (73.5)			
Had Father Birth Date	Yes	120 (58.8)	37,176 (71.4)	<0.001	120 (58.8)	121 (59.3)	-0.01	1	0.920
	No	84 (41.2)	14,891 (28.6)		84 (41.2)	83 (40.7)			
Mother Age Category	Less Than 20	51 (25.0)	5,617 (10.8)	<0.001	51 (25.0)	50 (24.5)	0	-	0.784
	20 To 35	144 (70.6)	42,098 (80.9)		144 (70.6)	145 (71.1)			
	35-40	NR	3,679 (7.1)		NR	NR			
	40 And Above	NR	673 (1.3)		NR	NR			
Mother WIC Receipt at Birth	Yes	169 (82.8)	29,615 (56.9)	<0.001	169 (82.8)	168 (82.4)	0.08		0.710
	No	33 (16.2)	21,588 (41.5)		33 (16.2)	32 (15.7)			
	Unknown	NR	864 (1.7)		NR	NR			

		Unmatched (N=52,271)			PS Matched (N=408)				
		Treatment (N=204)	Control (N=52,067)		Treatment (N=204)	Control (N=204)			
Variables	Unit	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
Mother Hospital Length at Birth	< 5 Days	201 (98.5)	50,776 (97.5)	0.939	201 (98.5)	204 (100.0)	-0.17	-	0.082
	5-< 10 Days	NR	1,053 (2.0)		NR	NR			
	10 -< 21 Days	-	96 (0.2)		-	-			
	21 -< 47 Days	-	69 (0.1)		-	-			
	47 =< 94 Days	-	43 (0.1)		-	-			
	> 94 Days	-	30 (0.1)		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Table B-9. Parents as Teachers Treatment and Control Group Characteristics, Pre- and Post-Propensity Score Matching — Maternal Health Care Outcomes from Child’s Age 2 to 3 (Year 3)

Variables	Unit	Unmatched (N=41,497)			PS Matched (N=368)				
		Treatment (N=184)	Control (N= 41,313)	P*	Treatment (N=184)	Control (N=184)	SD	VR	P
		Mean (SE) / N (%)	Mean (SE) / N (%)		Mean (SE) / N (%)	Mean (SE) / N (%)			
Mother Hospital Stay at Birth	Days	2.8 (0.9)	2.8 (3.4)	0.96	2.8 (0.9)	2.8 (0.7)	0.09	1.48	0.393
Mother Race	White	104 (56.5)	27,536 (66.7)	<0.001	104 (56.5)	104 (56.5)	0	-	1.000
	Black	72 (39.1)	10,734 (26.0)		72 (39.1)	72 (39.1)			
	Hispanic	NR	2,102 (5.1)		NR	NR			
	Others	NR	941 (2.3)		NR	NR			
Mother Education at Birth	<High School	46 (25.0)	6,178 (15.0)	<0.001	46 (25.0)	45 (24.5)	0.02	-	0.917
	HS/Some College	121 (65.8)	25,087 (60.7)		121 (65.8)	124 (67.4)			
	College Degree	17 (9.2)	9,856 (23.9)		17 (9.2)	15 (8.2)			
	Unknown	-	192 (0.5)		-	-			
Mother Insurance at Birth	Medicaid	127 (69.0)	22,061 (53.4)	<0.001	127 (69.0)	129 (70.1)	0.02	-	0.955
	Private	49 (26.6)	16,529 (40.0)		49 (26.6)	48 (26.1)			
	Other	NR	2,723 (6.6)		NR	NR			
RUCA	Urban	95 (51.6)	22,683 (54.9)	<0.001	95 (51.6)	93 (50.5)	0.09	-	0.940
	Large Rural	60 (32.6)	9,326 (22.6)		60 (32.6)	58 (31.5)			
	Small Rural	NR	6,489 (15.7)		NR	NR			
	Isolated	21 (11.4)	2,815 (6.8)		21 (11.4)	25 (13.6)			
Mother Smoking During Pregnancy	Yes	52 (28.3)	9,054 (21.9)	0.111	52 (28.3)	52 (28.3)	0.08	-	0.903
	No	129 (70.1)	31,646 (76.6)		129 (70.1)	130 (70.7)			
	Unknown	NR	613 (1.5)		NR	NR			
Mother Married Birth	Yes	55 (29.9)	17,976 (43.5)	<0.001	55 (29.9)	54 (29.3)	-0.01	1.01	0.909
	No	129 (70.1)	23,337 (56.5)		129 (70.1)	130 (70.7)			
Had Father Birth Date	Yes	109 (59.2)	29,496 (71.4)	<0.001	109 (59.2)	108 (58.7)	0.01	1	0.916
	No	75 (40.8)	11,817 (28.6)		75 (40.8)	76 (41.3)			
Mother Age Category	Less Than 20	45 (24.5)	4,584 (11.1)	<0.001	45 (24.5)	46 (25.0)	0.02	-	0.934
	20 To 35	135 (73.4)	33,324 (80.7)		135 (73.4)	133 (72.3)			
	35-40	NR	2,883 (7.0)		NR	NR			
	40 And Above	-	522 (1.3)		-	-			
Mother WIC Receipt at Birth	Yes	149 (81.0)	23,954 (58.0)	<0.001	149 (81.0)	150 (81.5)	0.03	-	0.990
	No	29 (15.8)	16,640 (40.3)		29 (15.8)	28 (15.2)			

		Unmatched (N=41,497)			PS Matched (N=368)				
		Treatment (N=184)	Control (N= 41,313)		Treatment (N=184)	Control (N=184)			
Variables	Unit	Mean (SE) / N (%)	Mean (SE) / N (%)	P*	Mean (SE) / N (%)	Mean (SE) / N (%)	SD	VR	P
	Unknown	NR	719 (1.7)		NR	NR			
Mother Hospital Length at Birth	< 5 Days	180 (97.8)	40,286 (97.5)	0.976	180 (97.8)	181 (98.4)	-0.03	-	0.703
	5-< 10 Days	NR	846 (2.0)		NR	NR			
	10 -< 21 Days	-	78 (0.2)		-	-			
	21 -< 47 Days	-	54 (0.1)		-	-			
	47 =< 94 Days	-	39 (0.1)		-	-			
	> 94 Days	-	NR		-	-			

Notes: P value based on chi-square for categorical variables. Abbreviations: NR=Not Reported due to small cell sizes; HS=High School; RUCA=rural-urban commuting area code; SE=standard error; PS=propensity score; Std Diff=standardized difference; VR=variance ratio

Appendix C. Health Care Utilization and Child Outcomes by Child Age

Table C-1. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Infant Birth Outcomes and Breastfeeding Intention

	Treatment (N=105)	Control (N=105)	EstDiff/aOR (95% CI) ^a	P Value
<i>Continuous Outcomes</i>				
Gestational Age (Mean, SE)	38.6 (0.16)	38.1 (0.24)	0.51 (-.05-1.08)	0.0733
Birth Weight (Mean, SE)	3300 (55.7)	3137 (59.6)	163 (3.1-324)	0.0458
<i>Binary Outcomes</i>				
Preterm Birth (n, %) ^b	8 (7.62)	13 (12.4)	0.58 (0.23-1.48)	0.2556
Low Birth Weight (n, %) ^c	6 (5.71)	13 (12.4)	0.43 (0.16-1.18)	0.1013
Maternal Intention to Breastfeed (n, %) ^d	73 (72.3)	64 (63.4)	1.52 (0.83-2.78)	0.1741
^a Estimated differences for continuous variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. ^b Preterm birth defined as before 37 weeks gestation. ^c Low Birth Weight defined as <2500 grams. ^d N=147. Abbreviations: IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-2. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Child Health Care Outcomes from Birth to First Birthday (Year 1)

	Treatment (N=263)	Control (N=263)	aOR/IRR (95% CI) ^a	P Value
<i>Immunizations</i>				
Immunization visits (mean, SE)	4.66 (0.11)	4.62 (0.13)	1.02 (0.94-1.11)	0.6115
≥ 4 immunization visits (n, %)	210 (79.8)	198 (75.3)	1.30 (0.86-1.96)	0.2109
<i>Health Care and Early Intervention Continuous Outcomes</i>				
Inpatient stays (mean, SE)	0.15 (0.03)	0.15 (0.03)	1.03 (0.64-1.65)	0.9166
ED visits (mean, SE)	1.60 (0.11)	1.48 (0.12)	1.07 (0.87-1.32)	0.5169
Non-urgent ED visits (mean, SE)	0.97 (0.08)	0.84 (0.08)	1.15 (0.90-1.47)	0.2527
Outpatient visits	12.0 (0.55)	11.2 (0.43)	1.07 (0.97-1.19)	0.1737
Wellness visits (mean, SE)	4.34 (0.10)	4.17 (0.11)	1.01 (0.32-3.12)	0.9926
Non-wellness/non-SLP visits (mean, SE)	9.08 (0.41)	8.52 (0.40)	1.07 (0.94-1.20)	0.301
Early intervention/SLP visits (mean, SE)	0.57 (0.32)	0.29 (0.10)	1.97 (0.76-5.10)	0.1597
Prescription medications (filled; mean, SE)	6.41 (0.44)	6.76 (0.50)	0.95 (0.79-1.14)	0.5682
<i>Health Care Utilization Binary Outcomes</i>				
At least one inpatient stays (n, %)	34 (12.9)	34 (12.9)	1.00 (0.60-1.67)	1.000
At least one ED visit (n, %)	173 (65.8)	157 (59.7)	1.31 (0.91-1.89)	0.1418
At least one non-urgent ED visit (n, %)	136 (51.7)	112 (42.6)	1.45 (1.03-2.06)	0.035
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; SLP = speech-language pathology; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-3. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Child Health Care Outcomes from Age 1 to 2 (Year 2)

	Treatment (N=369)	Control (N=369)	aOR/IRR (95% CI) ^a	P Value
<i>Immunizations</i>				
Immunization visits (mean, SE)	2.72 (0.08)	2.51 (0.08)	1.08 (0.99-1.19)	0.0763
<i>Health Care and Early Intervention Continuous Outcomes</i>				
Inpatient stays (mean, SE)	0.06 (0.02)	0.05 (0.02)	1.24 (0.45-3.37)	0.6795
ED visits (mean, SE)	1.44 (0.09)	1.08 (0.07)	1.34 (1.12-1.59)	0.001
Non-urgent ED visits (mean, SE)	0.87 (0.06)	0.69 (0.05)	1.27 (1.04-1.56)	0.0172
Outpatient visits	13.4 (1.14)	12.4 (1.25)	1.09 (0.93-1.28)	0.2941
Wellness visits (mean, SE)	1.81 (0.06)	1.63 (0.06)	1.12 (1.00-1.25)	0.0485
Non-wellness/non-SLP visits (mean, SE)	10.2 (0.88)	9.16 (0.96)	1.11 (0.94-1.31)	0.206
Early intervention/SLP visits (mean, SE)	3.25 (0.71)	3.09 (0.85)	1.05 (0.46-2.41)	0.9102
Prescription medications (filled; mean, SE)	7.20 (0.44)	5.82 (0.37)	1.24 (1.05-1.46)	0.0126
<i>Health Care Utilization Binary Outcomes</i>				
At least one inpatient stays (n, %)	12 (3.25)	11 (2.98)	1.09 (0.48-2.52)	0.8323
At least one ED visit (n, %)	237 (64.2)	207 (56.1)	1.41 (1.05-1.90)	0.0237
At least one non-urgent ED visit (n, %)	178 (48.2)	166 (45.0)	1.14 (0.85-1.53)	0.3738
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; SLP = speech-language pathology; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-4. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Child Health Care Outcomes from Age 2 to 3 (Year 3)

	Treatment (N=390)	Control (N=390)	aOR/IRR (95% CI) ^a	P Value
<i>Immunizations</i>				
Immunization visits (mean, SE)	1.13 (0.04)	1.11 (0.04)	1.02 (0.89-1.16)	0.8127
<i>Health Care and Early Intervention Continuous Outcomes</i>				
Inpatient stays (mean, SE)	0.03 (0.02)	0.01 (0.01)	3.25 (0.44-24.0)	0.2473
ED visits (mean, SE)	1.02 (0.07)	0.73 (0.06)	1.40 (1.13-1.72)	0.0017
Non-urgent ED visits (mean, SE)	0.60 (0.05)	0.42 (0.04)	1.42 (1.12-1.80)	0.0044
Outpatient visits	18.7 (1.90)	14.5 (1.61)	1.29 (1.06-1.57)	0.0123
Wellness visits (mean, SE)	0.77 (0.03)	0.71 (0.03)	1.08 (0.91-1.27)	0.3824
Non-wellness/non-SLP visits (mean, SE)	13.0 (1.39)	11.0 (1.28)	1.18 (0.97-1.43)	0.1037
Early intervention/SLP visits (mean, SE)	7.79 (1.40)	3.91 (0.99)	1.99 (0.93-4.28)	0.0765
Prescription medications (filled; mean, SE)	6.59 (0.39)	5.70 (0.42)	1.16 (0.98-1.37)	0.0883
<i>Health Care Utilization Binary Outcomes</i>				
At least one inpatient stays (n, %)	4 (1.03)	3 (0.77)	1.34 (0.30-5.98)	0.704
At least one ED visit (n, %)	203 (52.1)	159 (40.8)	1.59 (1.19-2.11)	0.0016
At least one non-urgent ED visit (n, %)	152 (39.0)	112 (28.7)	1.59 (1.18-2.15)	0.0026
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; SLP = speech-language pathology; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-5. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Maternal Health Care Outcomes from Birth to Child’s First Birthday (Year 1)

	Treatment (N=129)	Control (N=129)	aOR/IRR (95% CI)^a	P Value
<i>Health Care Outcomes: Continuous</i>				
Inpatient stays (mean, SE)	0.17 (0.04)	0.05 (0.02)	3.14 (1.31-7.53)	0.0104
ED visits (mean, SE)	1.83 (0.21)	1.38 (0.17)	1.33 (0.95-1.85)	0.0968
Non-urgent ED visits (mean, SE)	0.92 (0.13)	0.64 (0.09)	1.43 (0.96-2.13)	0.0759
Outpatient visits	10.5 (1.09)	6.49 (0.64)	1.62 (1.25-2.09)	<0.001
Wellness visits (mean, SE)	0.16 (0.04)	0.16 (0.04)	0.95 (0.49-1.86)	0.8861
Non-wellness visits (mean, SE)	10.1 (1.05)	6.11 (0.58)	1.66 (1.28-2.14)	<0.001
Mood disorder visits (mean, SE)	3.57 (0.86)	1.94 (0.84)	1.84 (0.70-4.87)	0.2155
Substance-related disorder visits (mean, SE)	4.52 (0.93)	1.64 (0.61)	2.75 (1.04-7.25)	0.0409
Prescription medications (filled; mean, SE)	13.3 (1.18)	10.4 (0.87)	1.28 (1.01-1.63)	0.0448
<i>Health Care Outcomes: Binary</i>				
At least one ED visit (n, %)	81 (62.8)	72 (55.8)	1.34 (0.81-2.20)	0.2556
At least one non-urgent ED visit (n, %)	59 (45.7)	49 (38.0)	1.38 (0.84-2.27)	0.2086
At least one mood disorder visit (n, %)	36 (27.9)	19 (14.7)	2.24 (1.20-4.18)	0.0114
At least one substance-related disorder visit (n, %)	37 (28.7)	18 (14.0)	2.48 (1.32-4.66)	0.0049
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-6. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Maternal Health Care Outcomes from Child’s Age 1 to 2 (Year 2)

	Treatment (N=204)	Control (N=204)	aOR/IRR (95% CI) ^a	P Value
<i>Health Care Outcomes: Continuous</i>				
Inpatient stays (mean, SE)	0.31 (0.05)	0.34 (0.05)	0.92 (0.63-1.35)	0.6613
ED visits (mean, SE)	1.79 (0.16)	1.34 (0.14)	1.34 (1.03-1.73)	0.027
Non-urgent ED visits (mean, SE)	0.88 (0.09)	0.56 (0.08)	1.57 (1.14-2.17)	0.0061
Outpatient visits	9.57 (0.69)	8.24 (0.63)	1.16 (0.96-1.41)	0.132
Wellness visits (mean, SE)	0.19 (0.03)	0.25 (0.04)	0.78 (0.49-1.23)	0.2866
Non-wellness visits (mean, SE)	9.38 (0.68)	7.99 (0.61)	1.17 (0.96-1.43)	0.11
Mood disorder visits (mean, SE)	4.42 (1.46)	3.00 (0.71)	1.47 (0.74-2.93)	0.2688
Substance-related disorder visits (mean, SE)	6.05 (1.26)	6.65 (1.92)	0.91 (0.44-1.89)	0.7984
Prescription medications (filled; mean, SE)	12.4 (1.01)	11.6 (1.00)	1.07 (0.84-1.36)	0.5941
<i>Health Care Outcomes: Binary</i>				
At least one ED visit (n, %)	128 (62.7)	118 (57.8)	1.24 (0.82-1.85)	0.3045
At least one non-urgent ED visit (n, %)	89 (43.6)	71 (34.8)	1.46 (0.98-2.19)	0.066
At least one mood disorder visit (n, %)	58 (28.4)	51 (25.0)	1.19 (0.77-1.85)	0.4342
At least one substance-related disorder visit (n, %)	51 (25.0)	60 (29.4)	0.80 (0.52-1.24)	0.3177
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Table C-7. Parents as Teachers Treatment and Control Group Health Care Utilization and Outcome Measures Differences — Maternal Health Care Outcomes From Child’s Age 2 to 3 (Year 3)

	Treatment (N=184)	Control (N=184)	aOR/IRR (95% CI) ^a	P Value
<i>Health Care Outcomes: Continuous</i>				
Inpatient stays (mean, SE)	0.30 (0.05)	0.36 (0.05)	0.85 (0.54-1.34)	0.4793
ED visits (mean, SE)	1.62 (0.15)	1.18 (0.14)	1.42 (1.06-1.92)	0.0208
Non-urgent ED visits (mean, SE)	0.72 (0.09)	0.53 (0.09)	1.38 (0.93-2.05)	0.1082
Outpatient visits	9.40 (0.73)	8.47 (0.65)	1.11 (0.90-1.36)	0.3177
Wellness visits (mean, SE)	0.21 (0.04)	0.23 (0.04)	0.91 (0.57-1.44)	0.6757
Non-wellness visits (mean, SE)	8.95 (0.68)	8.04 (0.63)	1.11 (0.91-1.36)	0.3017
Mood disorder visits (mean, SE)	4.20 (0.84)	2.35 (0.53)	1.79 (0.90-3.56)	0.0993
Substance-related disorder visits (mean, SE)	4.54 (0.94)	3.91 (1.13)	1.16 (0.55-2.44)	0.695
Prescription medications (filled; mean, SE)	13.0 (1.08)	11.0 (0.94)	1.18 (0.93-1.48)	0.1664
<i>Health Care Outcomes: Binary</i>				
At least one ED visit (n, %)	105 (57.1)	88 (47.8)	1.47 (0.96-2.23)	0.073
At least one non-urgent ED visit (n, %)	69 (37.5)	52 (28.3)	1.53 (0.98-2.39)	0.0589
At least one mood disorder visit (n, %)	52 (28.3)	49 (26.6)	1.09 (0.69-1.72)	0.7262
At least one substance-related disorder visit (n, %)	52 (28.3)	44 (23.9)	1.25 (0.78-2.00)	0.3433
^a Incidence rate ratio for counting variables and adjusted odds ratio for binary variables are calculated by generalized linear model with the matched ID as a random effect. Abbreviations: ED = emergency department; IRR=incidence rate ratio; aOR= adjusted odds ratio; SE=standard error; CI=confidence interval.				

Appendix D. Claims Codes Used in Variable Definitions

Variable	Codes
<i>Child Health Care and Early Intervention Utilization Outcomes</i>	
Hospitalizations ¹	UBREV: 100, 101, 110, 111-114, 116-124, 126-134, 136-144, 146-154, 156-160, 164, 167, 169-174, 179, 190-194, 199-204, 206-214, 219, 1000-1002
Emergency department visits ¹	CPT: 99281-99285 / UBREV: 450-452, 456, 459, 981 Non-urgent: CPT: 99281–99283
Wellness visits ²	CPT: 99381-99385, 99391-99395, 99432, 99461 / HCPCS: G0438, G0439 / ICD-9: V20.2, V20.31, V20.32, V70.0, V70.3, V70.5, V70.6, V70.8, V70.9 / ICD-10: Z00.00, Z00.01, Z00.110, Z00.111, Z00.121, Z00.129, Z00.5, Z00.8, Z02.0-Z02.6, Z02.71, Z02.79, Z02.81-Z02.83, Z02.89, Z02.9
Outpatient non-wellness visits ^{1,3}	POS: 3, 5, 7, 9, 11-20, 22, 33, 49, 50, 71, 72
Early intervention – speech-language pathology visits	CPT: 31579, 70371, 74230, 90901, 92507, 92508, 92511, 92520-92524, 92526, 92597, 92605-92618, 92626, 92627, 92630, 92633, 96105, 96110, 96112, 96125, 97032, 97110, 97112, 97129, 97130, 97530, 97533, 97535, 97537, 96113 / HCPCS: G0451, G0515
<i>Maternal Health Care Utilization Outcomes</i>	
Mood disorder visits ⁴	ICD-9 or ICD-10: CCS Category 657
Substance-related disorder visits	ICD-9 or ICD-10: CCS Category 661

Notes: 1=HEDIS 2020 definition; 2=HEDIS 2016 definition; 3=Excludes wellness and early intervention visit codes; 4=Clinical Classifications Software.^{25,26}

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