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Enhancing postpartum care access: associations between home visiting participation and postpartum visit attendance using a Quasi-Experimental study design

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Abstract

Background The Early Intervention Parenting Partnerships (EIPP) program is a multidisciplinary home visiting program that provides health screenings, education, counseling, and service coordination to expectant parents and families who experience pregnancy-related risk factors such as inadequate prenatal care or social risk factors including insufficient basic resources, depression, or violence in the home. This study examined whether EIPP was associated with receipt of postpartum visits in the first 90 days post-birth, overall and stratified by adequacy of prenatal care.

Methods EIPP participants ($n=611$) who enrolled prenatally from 2013 to 2017 were matched to a comparison group of families identified from birth certificates using coarsened exact matching. Study outcomes included receipt of postpartum visits before 21 days, 21 to 60 days, and 61 to 90 days post-birth based on healthcare claims codes using a definition of postpartum care based on Healthcare Effectiveness Data and Information Set (HEDIS) and an expanded definition that included additional codes used by providers to document postpartum care including visits related to contraception, feeding, and depression screening. Weighted regression models assessed differences in the odds of postpartum visit receipt (using HEDIS and expanded definitions) between the EIPP and comparison groups, with subsequent models examining adequacy of prenatal care as a moderator.

Results Using the expanded definition, EIPP participants had 51% greater odds of receiving postpartum care 21 to 60 days (aOR = 1.51, 95% CI [1.25, 1.83]) and 38% greater odds 61 to 90 days (aOR = 1.38, 95% CI [1.11, 1.71]) post-birth relative to the comparison group. The adjusted odds ratio of the association between EIPP and receipt of visits 21 to 60 days post-birth was greater among participants who received less than adequate (vs. adequate) prenatal care (aOR = 2.20, 95% CI [1.49, 3.25] less than adequate; aOR = 1.28, 95% CI [1.03, 1.59] adequate). Postpartum care receipt did not vary using the HEDIS definition.

Conclusions Home visiting programs such as EIPP that address barriers to healthcare access may increase uptake of postpartum visits. This support may be most important for people who struggle to connect to healthcare systems and are a critical part of a system that promotes health equity and positive birth outcomes.

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Enhancing postpartum care access

Associations between Home Visiting Participation and Postpartum Visit Attendance Using a Quasi-Experimental Study Design.

The U.S. maternal death rate has risen in recent years, from 20.1 deaths per 100,000 live births in 2019 to 32.9 deaths in 2021 [1]. In comparison, the rates for other high-income countries in Europe and North America are in the single digits [1]. According to the most recent findings of the Centers for Disease Control and Prevention (CDC) using data from Maternal Mortality Review Committees in 36 states [2], over half (53%) of pregnancy-related deaths occurred after the first week postpartum. Pregnancy-related mortality ratios are highest among non-Hispanic Native Hawaiian or Pacific Islander, non-Hispanic Black, and non-Hispanic American Indian or Alaska Native mothers, with a notable increase for non-Hispanic Native Hawaiian or Pacific Islander people in recent years [3, 4]. Thus, the initial months following childbirth provide a critical window for establishing a positive overall health trajectory and preventing serious health complications [5].

Postpartum visits: purpose, prevalence, and barriers

Postpartum care is important not only for pregnancy-induced conditions, such as hypertensive disorders of pregnancy and gestational diabetes, but also for chronic health conditions (e.g., diabetes, mental health conditions) and social concerns (e.g., nutritional concerns, housing instability) that exist before and after pregnancy. Postpartum care should include full assessment of birthing parents' physical, social, and psychological well-being, along with infant care, contraception, chronic disease management, and health maintenance [6–8]. Yet, many birthing people do not receive postpartum care. One systematic review of the prevalence of postpartum visits from 1995 to 2020 indicated that a substantial percentage of women, 27.9% on average across studies, did not attend a postpartum visit [9], and there is substantial variation in reported postpartum visit attendance across studies, ranging from 24.9% to 96.5% [9, 10].

Guidelines regarding timing of receipt of postpartum visits vary slightly. Released in 2018, the recommendations of the American College of Obstetricians and Gynecologists (ACOG) suggest contact with an obstetric care provider within 3 weeks of birth, followed by comprehensive, ongoing postpartum care within 12 weeks [6]. In 2023, the Healthcare Effectiveness Data and Information Set (HEDIS) postpartum care measure was updated to reflect attendance at a postpartum visit between 7 and 84 days after delivery [11]. During 2013 to 2017, the focal period of our study in Massachusetts, the ACOG recommendation was to provide one postpartum visit at about 6 weeks postpartum [6], with the HEDIS postpartum care measure focusing on postpartum care utilization between 21 and 56 days post-birth [12]. The MassHealth (Massachusetts Medicaid) postpartum insurance coverage at the time aligned with the HEDIS measure.

Many studies have examined predictors of and barriers to postpartum visit attendance to understand variability in receipt of postpartum care. For example, although there are mixed findings on the association between race, ethnicity, and receipt of postpartum care, the data generally suggest that Black and Hispanic mothers are less likely than White mothers to receive postpartum visits [9, 10, 13, 14]. Differences in health outcomes (health disparities) are likely the result of structural racism that shape the distribution of resources and power in society, which then manifests in people's health and behaviors [15]. Socioeconomic status is associated with receipt of postpartum care, with studies reporting lower rates of postpartum care utilization among people with less than high school education [16] and among people receiving public health insurance [10, 17]. Receipt of prenatal care is also a significant predictor of postpartum visit attendance [10, 18], suggesting that individuals who are more likely to access important healthcare prior to birth continue to do so afterwards. Other studies have more explicitly examined barriers to receipt and reported challenges related to access including service location, hours of care, and transportation; quality of care; provider discrimination based on patient race, ethnicity, language, or health insurance type; the presence of significant life stressors including mental health challenges, homelessness, domestic violence, or substance use disorder; patient factors such as health literacy, prior experiences, and child care availability; and lack of continuity of care from pregnancy to postpartum period [10, 19–22].

Home visiting and postpartum visits

Programs and interventions offered during pregnancy and the postpartum period, such as home visiting, that coordinate and promote care continuity and address other barriers to accessing and utilizing postpartum care may support greater visit attendance [22, 23]. Although home visiting is a common service modality for providing services in the U.S., especially among families with heightened social, economic, and health-related challenges [24], home visiting impacts on postpartum visit attendance are not well-documented. A single study referenced on the Home Visiting Evidence of Effectiveness

(HomVEE) database [25] reported favorable impacts of home visiting provide through Michigan's Maternal Infant Health Program (MIHP) on mothers' receipt of on-time postpartum care 21 to 56 days post-birth [26]. More recent studies examining the association of MIHP home visiting on postpartum care reported similar findings, adding to the body of evidence on associations between home visiting receipt and maternal healthcare [27–29]. Thus, despite the recognition of the importance of postpartum care and the opportunity for home visiting programs to support greater utilization, there is little research on home visiting and receipt of postpartum visits in the U.S.

Early Intervention Parenting Partnerships (EIPP) program

Since 2003, the Early Intervention Parenting Partnerships (EIPP) program has engaged and supported families who experience challenges related to their health and well-being during pregnancy, childbirth, and until the child's first birthday in Massachusetts. EIPP is embedded in four communities in Massachusetts facing higher than average levels of poverty, unemployment, residential instability, violent crime, and adverse perinatal outcomes [30]. Primary program eligibility criteria include any of the following: pregnancy- and birth-related risk factors such as inadequate prenatal care, previous poor birth outcomes, or high-risk pregnancy, as well as social and environmental factors including inadequate basic resources, young parent age, low parent educational attainment, depression, and substance abuse or violence in the home [31]. The prevalence of these factors is driven by socioeconomic barriers and structural racism [32, 33]. These factors are frequently associated with lower likelihood of postpartum care visit attendance [10]. One of the aims of EIPP is to remove barriers to accessing healthcare, including postpartum care, associated with these factors.

EIPP provides individualized support to pregnant and postpartum families to ensure optimal parental health, perinatal outcomes, and child growth and development through the first year of life. Families receive services from a multidisciplinary home visiting team comprised of a community health worker, licensed mental health clinician or social worker, and maternal and child health nurse. During home visits, the team: [1] conducts bimonthly health assessments and screens to document families' social, emotional, and physical health strengths and needs; [2] provides education, brief interventions, and support on healthy behaviors, healthy parenting, safety, and child development; [3] facilitates referrals and connections to community services; and [4] engages families in healthcare systems including assessing families' access to a medical home, maintenance of health insurance, and receipt of postpartum visit(s). EIPP aims to help families navigate healthcare systems and access programs and resources, provide tangible and instrumental support such as helping families complete applications or providing transportation, and serve as emotional support—addressing some of the barriers to postpartum visit attendance described earlier. Notably, EIPP may support birthing people who did not experience adequate prenatal care to connect to healthcare systems postnatally.

The present study

The present study examined whether EIPP's multidisciplinary approach that provides services to families and connects them to community resources and healthcare systems was associated with receipt of postpartum visits. Specifically, the present study compared receipt of postpartum visits in the first 90 days post-birth between birthing parents who enrolled prenatally in EIPP relative to a matched comparison group. Our study used two measures of postpartum visits: routine visits and a more expansive measure that included visits related to common conditions and needs during the postpartum period including gynecological care, contraception, feeding and breastfeeding, and depression screening. The study also examined whether receipt of adequate or inadequate prenatal care moderated the association between EIPP enrollment and postpartum visit attendance using both definitions.

Methods

The present study used a quasi-experimental design focusing on families (birthing parent–child dyads) who enrolled prenatally in one of the four operational EIPP programs between 2013 and 2017. The evaluation used secondary data sources including: [1] EIPP program data, including enrollment and discharge forms, screenings and assessments, and referrals collected by staff; [2] Pregnancy to Early Life Longitudinal Data System (PELL), including birth and hospital utilization records; and [3] Massachusetts All-Payer Claims Database (APCD), including healthcare claims related to postpartum care. Healthcare claims were available from 2014 to 2018; thus, we focused on EIPP families who enrolled prenatally starting in 2013 and whose child(ren) were born after January 1, 2014.

Study design

To assess differences in receipt of postpartum visits attributable to EIPP, we derived a matched comparison group of birthing parents and children based on birth records of infants born in the EIPP program communities who did not enroll in EIPP during the study period. We used background and health characteristics (referred to as "covariates") from state birth records that are related to or likely to influence EIPP eligibility as the basis

for matching. See Table 1 for a complete list of matching covariates.

Linking the three data sources yielded a starting sample of n = 733 EIPP participants and n = 24,405 potential comparison group participants. Prior to matching, the following children were excluded from matching: [1] siblings of the identified EIPP child and [2] people who were missing three or more of the matching covariates, leaving a base matching sample of n = 611 EIPP participants and n = 23,859 potential comparison group participants.

We used coarsened exact matching (CEM) to match participants [34]. CEM groups participants with the same values (raw or coarsened) on each of the covariates into strata that include at least one EIPP and one comparison group participant. While the rate of missingness for the covariates used in the matching analyses was relatively small (< 1% missing across all covariates), CEM uses missing data in matching. CEM yields analytic weights to balance the distribution of program and comparison groups within each stratum for use in subsequent analyses. Given equal distribution of covariates across the two groups, outcomes can be compared between the EIPP and comparison groups.

Using CEM, 93.8% of the base EIPP sample was matched. The matching specification achieved near perfect covariate balance based on L1 statistics, a measure of imbalance whereby a statistic close to 0 indicates that the two sample distributions overlap [35, 36]. To confirm the adequacy of the matching, we re-ran the matching algorithm including finer age (i.e., 19 years and under, 20–24, 25–29, 30 or older) and educational attainment (i.e., less than high school graduate, high school graduate or equivalent, some college) categories. Findings did not change with the additional categories, so the original categories were maintained for parsimony.

While birth records included information on important pregnancy risk factors, such as the presence of diabetes and hypertension, studies have shown that these indicators lack sensitivity, especially for hypertension, and may be subject to underreporting [37–39]. Birth records did not include any matching covariates related to depression, substance abuse, violence in the home, each an EIPP eligibility criterion. We created proxies of birthing parent diabetes, hypertension, depression, substance use, and intimate partner violence using PELL hospital utilization records. To create these variables, we used ICD-9 or ICD-10 codes to identify any hospitalization for emergency or urgent care related to each for the year up to the child's birth. The prevalence of hospitalizations related to intimate partner violence was nearly 0 so this variable was dropped. We re-specified the CEM matching algorithm including these variables as covariates. While findings did not change when they were included, we lost sample size and, thus, opted to use the samples generated from the original CEM for the present study. These variables are instead included as control variables in analytic models.

Table 1 Birthing parent demographic characteristics of Early Intervention Parenting Partnerships (EIPP) program evaluation study sample (EIPP program participants from 2013 to 2017 and a matched comparison group)

Characteristic	Study Sample (n = 8,906)
EIPP program catchment area	16.8%
Program 1	16.8%
Program 2	48.2%
Program 3	18.3%
Program 4	
Birthing parent age at birth	2.4%
19 and under	22.9%
Age 20–24	74.7%
Age 25+	
Birthing parent race/ethnicity	42.8%
Hispanic	27.9%
White non-Hispanic	15.0%
Black non-Hispanic	14.3%
Another race non-Hispanic[a]	
Birthing parent born in U.S.	59.5%
Birthing parent completed high school or GED	74.0%
Birthing parent married	35.8%
Father named on birth certificate	80.1%
Covered by public health insurance at birth	95.3%
WIC receipt[b]	86.9%
Received adequate prenatal care[c]	72.0%
Birth by cesarean section	20.0%
Parity (two or more)	72.3%

Table reports weighted proportions. Due to exact matching, the sample characteristics are identical between EIPP participants and the matched comparison group

[a]This category included participants who identified as non-Hispanic Asian, non-Hispanic Pacific Islander, non-Hispanic Native American, and people who identified as any other non-Hispanic race

[b]Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

[c]Adequate or adequate plus vs. intermediate or inadequate using the Prenatal Care Utilization Index [42]

Sample

Figure 1 illustrates the samples used to generate the final EIPP (n = 573) and matched comparison (n = 8,333) groups.

Measures

Postpartum visits

Postpartum visits measured using healthcare claims from APCD were operationalized in two ways based on consultation with an expert and other studies measuring similar outcomes [13, 16]. The first operational definition reflected the traditional definition of postpartum care using select codes from HEDIS including (HEDIS definition): [1] routine postpartum care [2], global/bundle

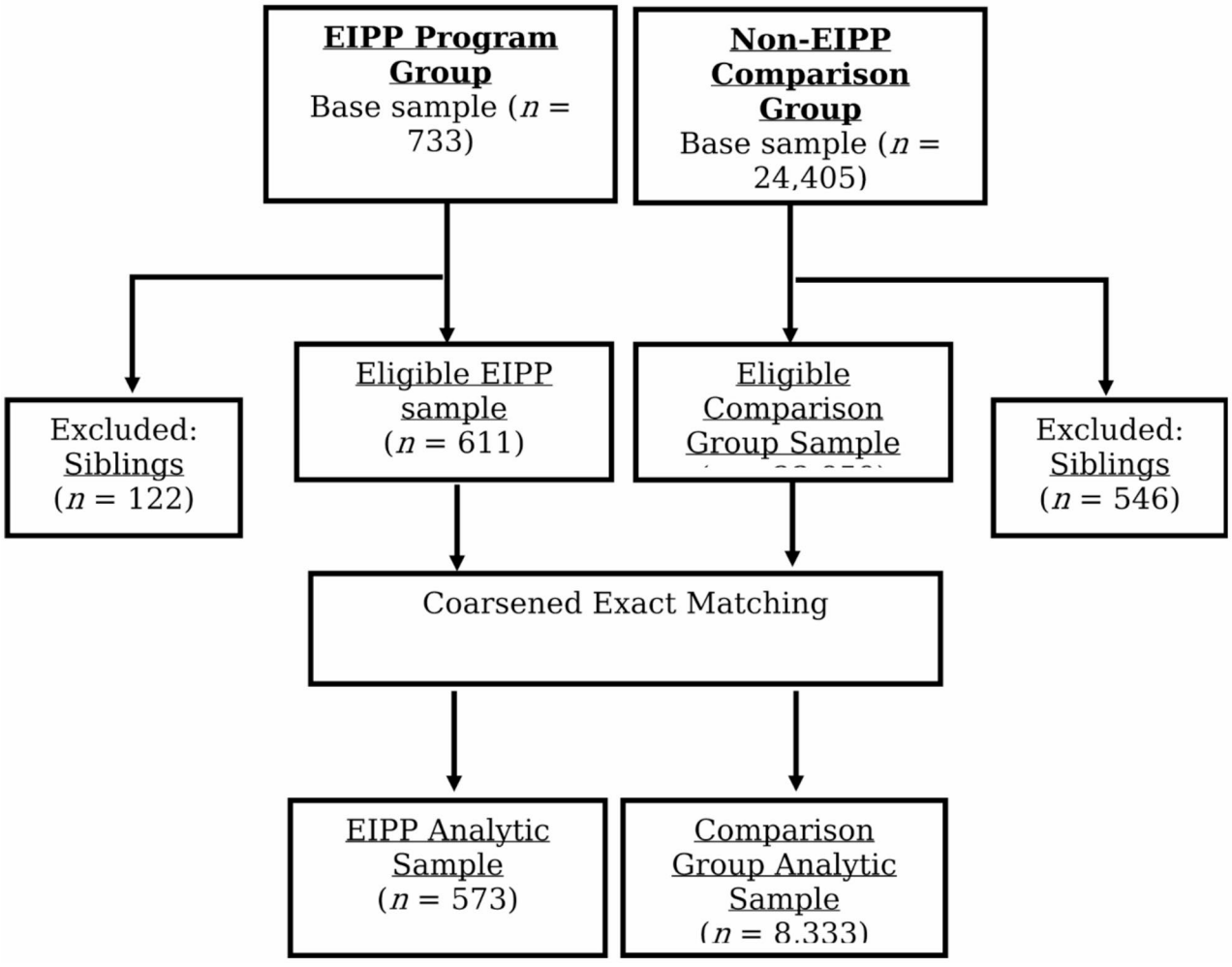

Fig. 1 Early Intervention Parenting Partnerships (EIPP) Program Quasi-Experimental Study Sample: Original, Excluded Sample, Eligible Sample, and Final Analytic Sample for EIPP Participants from 2013 to 2017 and a Matched Comparison Group

postpartum maternity care [3], gynecological exam [4], select contraceptive services, and [5] cervical cytology/pap smear [12, 40]. The second operational definition expanded the HEDIS definition to include additional codes relevant to pregnancy, birth, post-birth, and well-visit codes that are frequently used by providers to document postpartum care including (expanded definition): [1] HEDIS postpartum care (as above) [2], contraceptive management (e.g., encounter for initial prescription of injectable contraceptive) [3], codes included in pregnancy, birth, post-birth section of the International Classification of Disease (ICD-9, ICD-10) codebooks (e.g., infections of breast associated with pregnancy, post-birth, and lactation) [4], depression screening [5], surgical aftercare (e.g., cesarean wound check) [6], breastfeeding consultation, and [7] well-visit including routine gynecological exam. Using place of service and revenue code indicators, eligible postpartum visit claims occurred in office and clinic settings, outpatient hospitals, home-based settings, and other relevant facilities (e.g., prison).

The postpartum care measures using both the HEDIS and expanded definitions were examined at three time-points, aligning with current postpartum care guidance and guidance used at the time of the study [6, 11, 41]: [1] before 21 days post-birth (early postpartum care) [2], 21 to 60 days post-birth (as formerly recommended by ACOG and HEDIS, traditional postpartum care), and [3] 61 to 90 days post-birth (late postpartum care) for a total of six binary outcomes. The upper limit of 60 to 90 days was selected as MassHealth provides postpartum coverage for 60 days following birth, plus an additional extended period until the end of the month in which the 60-day period ends. Five study participants were missing postpartum care outcomes due to missing information on place of service.

Program status

We created a program status indicator variable to examine differences between the EIPP (= 1) and comparison

group (= 0) participants, the main independent variable of interest.

Control variables

The final EIPP and comparison groups were derived using exact matching. To enhance the precision of impact estimates, analytic models incorporated control variables that were not included in the matching: child preterm birth (= 1 if born before 37 weeks gestation, = 0 if born at 37 weeks or after; $n = 4$ study participants were missing data on preterm birth) and hospitalizations related to birthing parents' diabetes, hypertension, depression and substance use, respectively, as described previously (any hospitalizations = 1, no hospitalizations = 0). Preterm birth was not included as a matching variable since the program sample enrolled in EIPP prenatally and the likelihood of preterm birth could have been influenced by participation in the program. Analytic models also controlled for whether participants had any previous postpartum visits prior to each time point analyzed since discharge from birth hospital (any prior postpartum visits = 1, no prior postpartum visits = 0 using the HEDIS or expanded definition to align with the outcome) to account for unmeasured variables that may influence a general likelihood of use healthcare services.

Moderator

We examined whether the association between EIPP participation and receipt of postpartum visits was moderated by adequacy of prenatal care received. Adequacy of prenatal care was measured using the Adequacy of Prenatal Care Utilization (APNCU) index [42]. The index measures adequacy of prenatal care initiation and utilization using two elements obtained from birth records: [1] the month when prenatal care began, and [2] the percentage of recommended prenatal visits received based on ACOG prenatal care standards. The two elements are combined into a summary score that is used to create four categories: [1] inadequate, prenatal care starting after the 4th month of pregnancy and/or receiving less than 50% of recommended prenatal visits; [2] intermediate, prenatal care beginning in the first 4 months of pregnancy and receiving 50% to 79% of recommended visits; [3] adequate, prenatal care beginning in the first 4 months of pregnancy and receiving 80% to 109% of recommended visits; and [4] adequate plus, prenatal care beginning in the first 4 months of pregnancy and receiving 110% or more of recommended visits. The index defines "adequate" prenatal care as the adequate or adequate plus categories (= 1) and less than adequate care are the intermediate or inadequate categories (= 0).

Analytic strategy

First, we computed the percentage of EIPP and comparison group participants that attended a postpartum care visit from the time of birth to 90 days post-birth (overall, and before 21 days, 21 to 60 days, and 61 to 90 days); percentages were weighted using the CEM weights. Next, a series of weighted multivariable logistic regression models assessed associations between EIPP participation and receipt of postpartum care. The primary independent variable of interest was the program status indicator, which was entered into the models with the control variables. All models incorporated the CEM weights and robust standard errors. Models estimated the average treatment effect on the treated. Subsequent models included adequacy of prenatal care received as a moderator of the association between EIPP participation and receipt of postpartum care. An interaction term between the EIPP program status indicator variable and the moderator was computed and entered in the regression model for each outcome. Significant interaction terms were interpreted by examining the marginal association between EIPP participation and postpartum visits for people who received either adequate or less than adequate prenatal care for each of the six outcomes using either the HEDIS or expanded definition of postpartum care for each of the three time points (e.g., EIPP vs. comparison group differences in receipt of postpartum care 21 to 60 days post-birth for study participants who received less than adequate prenatal care) and by running separate logistic regression models for each subgroup. All analyses were conducted using Stata 17. The Massachusetts Department of Public Health Institutional Review Board and Data Access reviewed and approved the study.

Results

Characteristics of the matched sample

Table 1 displays the sample characteristics based on the matching covariates for the full analytic sample ($n = 8{,}906$; $n = 573$ EIPP; $n = 8{,}333$ comparison group). CEM matched the EIPP and comparison group participants exactly, so no covariate differences were observed between the two groups. The sample was racially and ethnically diverse with 42.8% of birthing parents identifying as Hispanic, 27.9% as non-Hispanic White, 15% as non-Hispanic Black, and the remaining 14.3% were grouped into another non-Hispanic race and ethnicity category which included non-Hispanic Asian, non-Hispanic Pacific Islander, non-Hispanic Native American, or another non-Hispanic race responses. Almost all (95.3%) of the sample received Medicaid at the time of birth.

More than 90% of participants received at least one postpartum care visit in the first 3 months following birth (see Table 2). Visits were most likely to occur in the first 3 weeks, with a decrease in prevalence over time. Using

Table 2 Receipt of postpartum care visit since discharge from birth hospital up to 90 days Post-Birth using Healthcare Effectiveness Data and Information Set (HEDIS) definition of postpartum care and an expanded definition of postpartum care) for Early Intervention Parenting Partnerships (EIPP) program group and a matched comparison group from 2013 to 2017

	0–90 Days Post-Birth		< 21 Days Post-Birth		21–60 Days Post-Birth		61–90 Days Post-Birth	
	EIPP Program Group	Comparison Group	EIPP Program Group	Comparison Gro up	EIPP Program Group	Comparison Group	EIPP Program Group	Comparison Group
HEDIS Definition	92.1%	92.6%	89.7%	89.0%	34.3%	36.9%	10.7%	10.1%
Expanded Definition	94.9%	94.1%	91.8%	89.7%	55.2%	46.0%	29.0%	22.9%

Table reports weighted percentages; $n = 8{,}901$ ($n = 5$ participants missing outcome data)

Table 3 Logistic regressions results for associations between Early Intervention Parenting Partnerships (EIPP) program participation and receipt of postpartum care visit since discharge from birth hospital up to 90 days Post-Birth using Healthcare Effectiveness Data and Information Set (HEDIS) definition of postpartum care and an expanded definition of postpartum care from 2013 to 2017

	< 21 Days Post-Birth		21–60 Days Post-Birth		61–90 Days Post-Birth	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
HEDIS Definition						
EIPP program participant	1.09	[0.79, 1.50]	0.92	[0.76, 1.12]	1.06	[0.77, 1.44]
Birthing parent diabetes[a]	0.40*	[0.17, 0.95]	0.74	[0.42, 1.28]	0.70	[0.34, 1.43]
Birthing parent hypertension[a]	2.33*	[1.11, 4.91]	0.85	[0.58, 1.26]	1.74	[0.92, 3.30]
Birthing parent depression[a]	1.16	[0.44, 3.07]	0.75	[0.40, 1.43]	0.54	[0.26, 1.10]
Birthing parent substance use[a]	1.06	[0.62, 1.81]	0.52***	[0.36, 0.74]	1.07	[0.61, 1.87]
Preterm birth[b]	0.53**	[0.34, 0.81]	1.07	[0.77, 1.49]	1.04	[0.63, 1.72]
Previous receipt of postpartum care	--	--	1.71**	[1.23, 2.37]	2.40*	[1.06, 5.47]
Expanded Definition						
EIPP program participant	1.31	[0.93, 1.86]	1.51***	[1.25, 1.83]	1.38**	[1.11, 1.71]
Birthing parent diabetes[a]	0.36*	[0.15, 0.85]	0.72	[0.43, 1.20]	0.79	[0.45, 1.40]
Birthing parent hypertension[a]	2.47*	[1.11, 5.52]	0.90	[0.61, 1.32]	1.62*	[1.04, 2.53]
Birthing parent depression[a]	1.08	[0.41, 2.87]	0.64	[0.35, 1.15]	0.69	[0.39, 1.20]
Birthing parent substance use[a]	1.03	[0.58, 1.80]	0.57***	[0.41, 0.79]	0.96	[0.64, 1.42]
Preterm birth[b]	0.56*	[0.36, 0.89]	1.15	[0.83, 1.59]	1.14	[0.78, 1.67]
Prior receipt of postpartum care	--	--	1.85***	[1.35, 2.53]	1.90*	[1.08, 3.33]

$n = 8{,}897$ ($n = 9$ participants missing outcome data or preterm birth)

aOR adjusted odds ratio, *CI* confidence interval

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

[a]Whether birthing parent hospitalized for diabetes, hypertension, depression, or substance use, respectively, for the year up to the child's birth

[b]Born before 37 weeks of gestation

the HEDIS definition, only about 10% of participants received postpartum care in the late postpartum period, increasing to 29% and 22.9% for the EIPP and comparison groups, respectively, using the expanded definition. The time points are not mutually exclusive, so participants could have had visits at multiple time points.

Associations between EIPP participation and receipt of postpartum visits

Table 3 presents the adjusted odds ratios (aOR) examining differences between the EIPP and comparison groups after adjusting for control variables. Using the HEDIS definition of postpartum care, the odds of receiving postpartum care at each of the timepoints: early, traditional, and late (i.e., before 21 days, 21 to 60 days, and 61 to 90 days post-birth) did not differ between the EIPP and comparison groups. Using the expanded definition, however, EIPP participants had 51% greater odds of receiving postpartum care between 21 and 60 days after birth and 38% greater odds between 61 and 90 days post-birth relative to the matched comparison group.

Regression adjusted percentages indicated that an average of 56.1% EIPP and 46.0% of comparison group participants received a postpartum care visit between 21 and 60 days post-birth, and 29.0% of EIPP and 22.9% of comparison group participants received a visit between 61 and 90 days post-birth using the expanded definition.

Moderation of receipt of postpartum visits by adequacy of prenatal care

The interaction term between program participation and the adequacy of prenatal care was significant (using the 95% confidence intervals) for one of the six outcomes: receipt of postpartum visits 21 to 60 days post-birth using

Table 4 Logistic regressions results for associations between Early Intervention Parenting Partnerships (EIPP) program participation and receipt of postpartum care visit since discharge from birth hospital 21 to 60 days post-birth using the expanded definition of postpartum care, stratified by adequacy of prenatal care from 2013 to 2017

	Less than Adequate Prenatal Care[a]		Adequate Prenatal Care[a]	
	aOR	95% CI	aOR	95% CI
EIPP Program participant	2.20***	[1.49, 3.25]	1.28*	[1.03, 1.59]
Birthing parent diabetes[a]	0.57	[0.17, 1.85]	0.74	[0.42, 1.29]
Birthing parent hypertension[a]	0.69	[0.26, 1.79]	0.88	[0.60, 1.31]
Birthing parent depression[b]	0.67	[0.24, 1.88]	0.62	[0.31, 1.25]
Birthing parent substance use[b]	0.53	[0.26, 1.09]	0.55***	[0.38, 0.79]
Preterm birth[c]	1.12	[0.51, 2.46]	1.15	[0.81, 1.64]
Prior receipt of postpartum care	1.40	[0.71, 2.75]	2.00***	[1.44, 2.79]

n = 8,897 (*n* = 9 participants missing outcome data or preterm birth)

aOR adjusted odds ratio, *CI* confidence interval

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

[a]Adequate or adequate plus vs. intermediate or inadequate using the Prenatal Care Utilization Index [42]

[b]Whether birthing parent hospitalized for diabetes, hypertension, depression, or substance use, respectively, for the year up to the child's birth

[c]Born before 37 weeks of gestation

the expanded definition of postpartum care. Moderation analyses revealed that the association between EIPP participation and receipt of postpartum visits 21 to 60 days post-birth using the expanded definition of postpartum care was moderated by the adequacy of prenatal care received. The association was stronger among participants who received less than adequate prenatal care relative to participants who received adequate prenatal care (see Table 4). EIPP participants who received less than adequate prenatal care had more than twice the odds of receiving postpartum care between 21 and 60 days after birth than the comparison group. Among EIPP participants who received adequate prenatal care, the adjusted odds ratio was smaller at 1.28.

Discussion

We conducted a matched comparison study of a home visiting program serving a racially and ethnically diverse sample of pregnant and postpartum families that aimed to ensure optimal birth outcomes and parent and child health throughout the first year of life. Although the program and comparison groups were equally likely to use early postpartum care (within first 20 days post-birth), group differences emerged 21 to 90 days post-birth. Program participants had greater odds—51% greater odds 21 to 60 days postpartum and 38% greater odds 61 to 90 days postpartum—of receiving postpartum healthcare visits using an expanded definition of postpartum care compared to their comparison group counterparts. The association between program participation and postpartum visit attendance 21 to 60 days post-birth (using an expanded definition of postpartum care) was strongest for birthing parents who had received less than adequate prenatal care.

These findings are notable for two reasons. First, the CDC reported most pregnancy-related deaths occurred during the postpartum period [2]. Many conditions occur after the traditional 6 week visit and can affect subsequent pregnancies if not treated [43], and some vulnerabilities start prenatally, reinforcing the importance of postpartum care for individuals who did not experience adequate prenatal care [44]. Second, the comprehensive postpartum care visit beyond the initial childbirth period typically is more extensive, covering a greater range of health and wellbeing in addition to childbirth recovery (e.g., chronic disease management, psychological wellbeing, annual physical exam, contraceptive care), providing a greater opportunity for positive health and wellbeing [6, 8].

We suspect that several mechanisms (at both individual- and systems-levels) might explain the greater receipt of postpartum care visits using the expanded definition by participants in EIPP relative to the matched comparison group. EIPP nurses, community health workers, and mental health professionals conduct bimonthly health assessments and screens during home visits. These assessments may identify health concerns for follow-up at postpartum care visits. The program also helps participants to navigate healthcare systems, which can feel confusing or intimidating, by providing participants with health education and self-advocacy tools, key features of successful healthcare navigation [45, 46]. In addition, the program builds relational trust through the emotional and informational support provided during home visits and offers tangible support, such as transportation or help with documentation, which are common barriers to receipt of postpartum care [46]. Finally, EIPP home visitors support care coordination by offering referrals and helping to connect participants to needed resources and services [45].

Our findings suggest that incorporating a more expansive definition of postpartum care is critical to

understanding how home visiting programs, such as EIPP promote postpartum care, outside the routine postpartum visit (captured by the HEDIS definition). The expanded definition covered an array of medical visits related to gynecological care, contraception, feeding and breastfeeding, and depression screening, each important health-related topics that EIPP provides through education, brief intervention, and referrals. Further, EIPP helps participants identify potential complications they may be experiencing post-birth, which are also covered with the expanded definition. Evidence suggests that person-centered postpartum care requires a flexible, responsive, and multidisciplinary approach to address the various challenges an individual may experience [43]. Our expanded definition of postpartum care enabled us to capture better the array of support included within the umbrella of postpartum care—many aspects of which are well-aligned with core topics and activities covered within home visits.

Implications for reducing health inequities

EIPP serves a diverse population of pregnant and parenting people: 42.8% of program participants identified as Hispanic people, 15% identified as non-Hispanic Black people, and 14.3% identified as non-Hispanic Asian people, non-Hispanic Pacific Islander people, or non-Hispanic Native American people. EIPP specifically recruits families who experience challenges to their health and well-being due to socioeconomic barriers, inadequate healthcare access and quality, emotional and behavioral health challenges, violence in the home, and other stressors. These circumstances often are driven by structural and social determinants of health such as racism, inequities in access to housing, food security, education, and safety [33]. Due to its intentional eligibility criteria and recruitment, EIPP can play a role in reducing racial and ethnic inequities in maternal and infant mortality and increasing health and wellbeing.

The fact that the odds of receipt of postpartum visits between 21 and 60 days were stronger for birthing parents with less than adequate prenatal care that those with adequate prenatal care speaks further to the potential impact of home visiting programs like EIPP in promoting health equity. Common reasons for inadequate prenatal care include barriers to access, perceptions that care is disrespectful and judgmental, and overmedicalization of pregnancy care [47]. These experiences are most likely for people who identify as Black or Hispanic, are recent immigrants, are younger in age, and experience low income [10].

To this end, a 2022 Massachusetts report included recommendations to strengthen public health infrastructure and outcomes especially for populations historically and presently most impacted by social and structural inequities [48]. The report highlighted the importance of postpartum care including the use of community health workers and home visitors to increase uptake of postpartum visits by providing culturally appropriate health education, information, and outreach in community-based settings; acting as cultural mediators between individuals, communities, and health and human services; facilitating access to services; providing direct services, such as informal counseling, social support, care coordination, and health screenings; and advocating for individual and community needs. The program examined in the current study embraces many of these tenets and implements them in their practices.

Continuity of healthcare coverage is a critical facilitator of receipt of timely healthcare during the postpartum period [49, 50]. One study in Wisconsin found continuous Medicaid coverage was associated with a higher rate of receiving postpartum visits up to 60 days post-birth relative to people with pregnancy-only eligibility for Medicaid [51]. The American Rescue Plan Act of 2021 gave states the option to extend pregnancy eligibility for Medicaid from 60 days to 12 months post-birth; Massachusetts took up this option [52]. In the present study, nearly all parents received Medicaid at the time of delivery. This policy change, in combination with programs like EIPP may combine to help reduce racial and ethnic systemic inequities in birthing parents' health outcomes.

Limitations

Our study benefited from a large sample across four communities in Massachusetts and access to several administrative data sources. Despite these strengths, several factors warrant mention. First, our study relied entirely on secondary data sources. Notably, the matched comparison group was derived using birth records. While these records include many demographic variables, proxies of poverty and socioeconomic status, and pregnancy- and birth-related factors, the records do not collect data on important psychosocial characteristics such as parents' mental health and substance use. We aimed to minimize bias by including indicators for hospitalizations related to urgent and emergent depression and substance use as control variables in analytic models. It is possible, however, that the program and comparison samples were not entirely equivalent based on unmeasured characteristics, which could bias results. Potential bias also might have resulted from the fact that a person might have been asked to attend a postpartum visit earlier than expected due to high-risk condition follow-up, perhaps influencing who attended "early postpartum care" visits. Analytic models controlled for hospitalizations related to diabetes and hypertension to guard against this potential confound, to the extent possible.

Second, our study relied on retrospective data, predating the COVID-19 pandemic. In the ensuing years in Massachusetts, existing health inequities have widened [53]. Programs like EIPP have witnessed increased need for emergency assistance and provision of basic resources. They have also had to adapt to changes in healthcare access, with reported declines in postpartum visit attendance from 2019 to 2021 [54]. Further evaluation with more recent data could elucidate whether the reported findings are replicated.

Conclusion

Prenatal and postpartum home visiting programs can support birthing people's access to postpartum healthcare. Participation in EIPP, which includes combination of health assessments and screenings, education and brief interventions, emotional and instrumental support, and service coordination delivered by an interdisciplinary team was associated with increased postpartum visit attendance 3 weeks to 3 months following birth. Findings also provided evidence that the program may be particularly effective at connecting participants who experienced less than adequate prenatal care to postpartum care. Programs like EIPP can play a role in promoting health equity and positive outcomes for birthing people.

Authors' contributions

RCF and CK conceptualized the study design, performed data analysis, and wrote the manuscript. BB and CFS conceptualized the study design, provided secondary data, and edited the manuscript. MAE conceptualized the study design and wrote the manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available because they are limited datasets. Codebooks and statistical code are available upon request.

Declarations

Ethics approval and consent to participate

This study was approved by the Massachusetts Department of Public Health Institutional Review Board and Data Access (1340024) and was performed in accordance with the ethical standards from the 1964 Declaration of Helsinki and its later amendments and the Common Rule. The study used secondary data sources; the IRB determined that the study met the requirements to waive informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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