



Addressing maternal mental health to increase participation in home visiting

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ABSTRACT

Maternal depression poses a significant threat to the healthy development of young children and is associated with increased child behavior problems and poorer cognitive development. Home visiting programs provide critical support for children and families during early childhood, but further research is needed to examine how programs address maternal depression and whether referral to outside mental health services impacts parental participation in home visiting. This study aimed to examine rates of depression among mothers in the national Parent as Teachers (PAT) home-visiting program, whether various high needs characteristics were associated with elevated depressive symptoms, and whether depressive symptomology and initiation of outside mental health treatment were associated with attendance and retention in services, particularly after considering important family risk factors. Data from all participating affiliates was collected nationally. Measures included family demographics, high needs characteristics, rates of depression screening, initiation of maternal mental health services, and PAT program attendance and retention. Several high needs characteristics were strongly associated with maternal depressive symptoms, including intimate partner violence exposure, parental substance abuse, and parental disability. Results also showed that mothers who screened in either the probable Major Depressive Disorder or subclinical depression range on the Edinburgh Postnatal Depression Scale were enrolled for fewer months in PAT. However, depressed mothers who accessed outside mental health services stayed enrolled for more months than mothers who did not access services. Results demonstrate that mothers with higher depressive symptoms, including those in the subclinical range, have a harder time participating in home-visiting services, even though they may need the support the most. However, when PAT home-visitors address maternal mental health and mothers initiate treatment, mothers appear to be better equipped to participate in home visiting.

1. Introduction

Maternal depression is a serious public health concern, impacting more than 1 in 10 mothers in the United States (Ertel, Rich-Edwards, & Koenen, 2011). Maternal depression can have harmful impacts on both mothers and children affecting parent-child interactions, family dynamics, interfering with accessing basic needs such as housing and employment, and reducing the likelihood that affected families will receive necessary public benefits, such as the Supplemental Nutrition Assistance Program (SNAP) and Section 8 housing vouchers (Garg, Toy, Tripodis, Cook, & Cordella, 2016). Furthermore, prior research has demonstrated how maternal depression can negatively impact children's health and developmental trajectories at the epigenetic and neurocognitive levels (Szilagyi & Halfon, 2015). Children of mothers who experience even low-level depressive symptoms are less likely to receive important supports for cognitive development and school

readiness, and that those deficits persist into middle school (Connors-Burrow et al., 2014, 2016).

Home visitation services play an important role in the identification and amelioration of maternal depression for families and young children. By promoting maternal health and well-being, child development, informed parenting, and family self-sufficiency, home visiting is a valuable strategy to buffer against early childhood risk factors that influence lifelong health (Duffee, Mendelsohn, Kuo, Legano, & Earls, 2017; Szilagyi & Halfon, 2015). Most national program models of home visiting in the United States are targeted to mothers with "high-risk" characteristics (Duggan et al., 2018). These risks are also associated with maternal depression, which can ultimately negatively influence child development (Teeters et al., 2016). Results from the 2017 National Study of Home Visiting (Mother and Infant Home Visiting Program Evaluation) suggest that 40% of mothers exhibited depression or anxiety at enrollment, and screening for depression is required when

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programs receive Maternal, Infant, and Early Childhood Home Visiting (MIECHV) funding (Michalopoulos et al., 2015).

There are mixed findings regarding family participation in home visiting when maternal depression is present (McKelvey, Fitzgerald, Edge, & Whiteside-Mansell, 2018). Overall, poor parental participation in home visitation services is a challenge to the potential efficacy and impacts of the intervention (Guastafarro, Self-Brown, Shanley, Whitaker, & Lutzker, 2018). Families at highest risk are more likely to leave a program early, and younger, economically disadvantaged parents leave programs early or do not successfully complete programs (Boller et al., 2014). Given the variable rates of retention for families in home visitation and the documented high rate of attrition for high-risk families, more information is needed to understand the relationship between maternal depression and other family risk factors and how those factors impact program involvement.

2. Background

2.1. Home visitation

Home visiting refers to an evidence-based strategy in which a professional or paraprofessional renders a family support service in a community or private home setting. Early childhood home visiting programs generally focus on providing parents with support to enhance their parent-child relationships. With these enhanced skills, parents can create environments that positively affect their child's social and emotional development and prepare them for a productive life (Duffee et al., 2017). This two-generational strategy simultaneously addresses parental and family social and economic challenges (Finello, Terteryan, & Riewerts, 2016). High-quality home visiting services have been demonstrated to improve family relationships, advance school readiness, reduce child maltreatment, improve maternal-infant health outcomes, and increase family economic self-sufficiency (Duffee et al., 2017).

Services commonly included in home visitation include assisting families in identifying informal support networks, providing referrals to community resources as necessary, providing information on prenatal health, newborn care and child development, determining if families have a medical home, assessment of the mothers' well-being, and guiding caregivers through child developmental curricula (Finello & Center, 2016). As previously noted, due to theoretical orientation or responses to funding limitations, home visitation programs are generally targeted towards families with particular risk factors including low socio-economic status, young parents, parents previously engaged in the child welfare system, and parents with multiple births close together (Duggan et al., 2018). These risk factors are associated with poorer developmental outcomes in children and they are also associated with higher prevalence of maternal depression (Teeters et al., 2016).

2.2. Maternal depression in home visitation

High rates of depression are consistently reported in home visiting programs, and are typically attributed to the cumulative risk factors present in the high-risk mothers who enroll in home visiting (Ammerman, Putnam, Bosse, Teeters, & Van Ginkel, 2010). While estimates vary, studies have found that 35.5%-57.2% of mothers enrolled in home visitation exceed the clinical cutoff for depression on program administered diagnostic tools (Ammerman et al., 2010; Easterbrooks, Kotake, Raskin, & Bumgarner, 2016). In addition, about one-third of depressed mothers in home visiting programs report previously attempting suicide (Ammerman et al., 2019). Maternal depression can severely limit the effectiveness of home visiting programs to improve outcomes (Teeters et al., 2016). Depressed mothers are difficult to engage in home visits, require more telephone contact with home visitors, and appear to be less motivated (Ammerman et al., 2010). Depressed mothers are also more likely to have child abuse and neglect reports

(Easterbrooks et al., 2016) and impaired parent-child interactions (Green, Tarte, Harrison, Nygren, & Sanders, 2014) in comparison to their nondepressed counterparts. Participation in home visitation has the potential to mitigate these risky outcomes.

Treatment is often indicated for depressed mothers in home-visiting, and programs differ in how they approach screening and referral for services. Some recommend conducting universal depression screening, which can be difficult to implement (Segre & Taylor, 2014). Researchers have piloted innovative "screen and refer" approaches that utilize universal screening to identify and link mothers to outside mental health services using motivational interviewing and case management (Dauber, Hogue, Henderson, Nugent, & Hernandez, 2019). Research shows that when mothers with depression in home visiting are referred to mental health treatment and begin services, depression severity decreases (Segre, O'Hara, Brock, & Taylor, 2012). Other home visiting pilot studies have provided mental health services directly to address the needs of caregivers with depression. For example, in the "Moving Beyond Depression" (MBD) program, therapists partner with home visitors to provide In-Home Cognitive Behavioral Therapy for up to 15 weeks. Results show that the MBD program significantly reduces depression relative to controls, and also increases social support (Ammerman, Putnam, Teeters, & Van Ginkel, 2014).

2.3. Participation and retention in home visitation

Attrition estimates in home visitation are very high and generally range from 20 to 67% (Damashek, Doughty, Ware, & Silovsky, 2011). Estimates from federally funded programs indicate that on average, families engage in home visitation for 8 months across home visitation models, and over half of participating families withdraw in less than a year of participation (Duggan et al., 2018). There are two theoretical frameworks that help explain the myriad of factors that may predict attrition in home visiting programs, Korfmacher et al.'s framework of parent involvement in home visiting programs (2008) and McCurdy & Daro's Integrated Theory of Parent Involvement in family support services (2001). These frameworks identify several important parental characteristics that may impact involvement, as well as characteristics of the home visitor, the program or agency, and the larger community. Parental characteristics include demographic characteristics, family context, psychological features, needs, motivation, and objective and subjective program experiences (Korfmacher et al., 2008; McCurdy & Daro, 2001). Characteristics of the home visitor include their background, match with clients, and supervision and training (Korfmacher et al., 2008). Previous studies show that poorer participation in home visiting is also associated with home-visitor levels factors like receiving home visits with less of a focus on child development and having more distractions during the visit (McKelvey et al., 2018; Roggman, Cook, Peterson, & Raikes, 2008).

In terms of parental characteristics, in their review article, Korfmacher et al. (2008) note that the literature is mixed in terms of how parental demographic characteristics impact involvement in home visiting, and that differences in involvement may be more related to life circumstances and parental characteristics, pointing to the importance of assessing a number of parent and family risk factors. For example, previous studies show that families who drop out of home visitation programs are more likely to have high needs characteristics like having more changes of residence and being headed by a single mother (Roggman et al., 2008). Korfmacher et al. (2008) also note that parental depressive symptoms may make it more difficult for parents to use emotional and instrumental support, and thus impede parents' involvement in home visiting. However, the impact of maternal depression on attendance and retention in home visitation is unclear. Several studies report no association between caregiver depression and retention in services (Booth, Munsell, & Doyle, 2014; Brand & Jungmann, 2014; Damashek et al., 2011; Navaie-Waliser et al., 2000; O'Brien et al., 2012) while others report a positive association between depressive

symptoms and retention, especially when the intervention focuses on parent-child interaction (Ammerman et al., 2010; McKelvey et al., 2018). In addition, it is unclear whether parental depressive symptoms explain unique variance in parental involvement in home visiting once other needs or risk factors are considered, and also whether severe or subclinical levels of depressive symptomatology impact involvement in home visiting.

2.4. The current study

The Council on Community Pediatrics, Council on Early Childhood, and the Committee on Child Abuse and Neglect all recommend that researchers give concerted effort towards improving the understanding of how to engage difficult-to-reach and high-risk communities and populations in evidence-based home visiting programs (Duffee et al., 2017). Understanding the prevalence of maternal depression among mothers enrolled in home visitation and its impact on attendance and retention is a crucial step in addressing this objective. Therefore, this study sought to examine maternal depressive symptoms and participation in Parents as Teachers (PAT), a widely disseminated home visitation model in the United States that serves over 188,000 families annually (Parents as Teachers, 2018). PAT has been shown to improve parenting skills, as well as children's behavioral and academic outcomes (Lahti, Evans, Goodman, Schmidt, & LeCroy, 2019). Prior studies of mothers experiencing depression while participating in PAT revealed that their average length of program participation was 13.8 months (range 0–18) with 24% of families ending PAT before 9 months and that there was an average of 61.8% of appointments with home visitors kept (Jonson-Reid et al., 2018). It is also important to examine the impact of family high needs characteristics, since this is hypothesized to be an important factor in participation (Korfmacher et al., 2008) and since PAT collects comprehensive data on family risk and uses this information to inform visit frequency. Furthermore, although research shows that receiving outside mental health services improves depression severity among mothers in home visiting (Segre et al., 2012), it is unclear how outside treatment impacts participation in the home visiting program itself. Therefore, the aims of the current study are: (1) to examine rates of depression among mothers in the national Parent as Teachers (PAT) home-visiting program to determine if they are commensurate with other national estimates; (2) explore whether various high needs characteristics are associated with maternal depression status, including subclinical and clinical levels of depression; (3) ascertain whether maternal depression status predicts PAT attendance and retention, particularly after including important family risk characteristics; and (4) examine whether initiation of outside mental health treatment is associated with PAT program attendance and retention among mothers with depression.

3. Methods

3.1. Program description

Parents as Teachers (PAT) began in 1984 in Missouri, and today is federally recognized as a national, evidence-based home visiting model that serves families through personal visits, primarily in the home (Lahti et al., 2019; Wagner & Clayton, 1999; Wagner et al., 2002). PAT provides families prenatal to kindergarten, particularly those considered at-risk, necessary resources and skills to raise children who are physically, socially, and emotionally healthy and ready to learn. Services include early and routine health and developmental screenings of the children, parent social support group connections, and referrals to community resources, as needed. Families with children ages prenatal to six years may voluntarily enroll in a local PAT program through a variety of organizations. It is recommended that families engage with PAT for at least two years (24 months), and that families with more high needs characteristics complete on average two home visits a

month over the course of PAT (Parents as Teachers, 2018).

In 1987, PAT created the Parents as Teachers National Center (PATNC) to oversee the expansion of PAT outside of Missouri. Today, the PATNC is the training and certification body for over 1,200 local PAT programs implementing the model in all 50 states and six other countries. The PATNC produces the research-based curricula used by the local programs to provide uniformity of services to families in all communities and monitors the quality of services. The PATNC is the training/certifying body for nearly 6000 model-certified parent educators worldwide.

3.2. Study design

Data was collected using a HIPAA-compliant data management system, "Penelope". The Penelope database is designed to store and connect data at three levels. Family-level data includes home visit information, family-centered assessment results, family goals, referrals to community resources, group connections tracking, and family high-needs characteristics. Parent/guardian-level data includes parental screenings (e.g., depression, intimate partner violence), parenting outcomes (e.g. parent-child interaction, parenting behaviors), parent/guardian health and substance use, and parent/guardian demographics. Finally, child-level data includes health and developmental screening results, the child health record, and milestones by age. PAT affiliates are able to select from a list of approved parental depression screening tools to administer with their families. The tools have various cut off points to determine depression—as does the literature—and the PAT model defers to the local affiliate to determine a cut off based on the tool they are using, recommendations from the tool, and guidance from the literature.

The PATNC has several guidelines in place to ensure the quality of the data in Penelope. For example, when PAT affiliates go through the Quality Endorsement and Improvement Process, they provide documentation of their quality assurance efforts as well as individual families' files for review. For Penelope users, the PATNC also creates reports that support local affiliates in checking for missing data. Data on depression screenings is a quality standard of PAT, and therefore affiliates are recommended to collect this data for parents/caregivers annually. Protection of human subjects review and certification for this study was completed by the University of Southern California Institutional Review Board (UP-16-00089).

3.3. Participants

A variety of depression screening tools are used across PAT affiliates, and this study focused on the subset of mothers who were screened using the Edinburgh Postnatal Depression Scale (EPDS), since this subset represented 60% of the total sample of mothers that were screened for depression within PAT. Therefore, this national, population-based cohort of 9,067 PAT mothers is extracted from program affiliates who used Penelope for twelve months or more as of June 25, 2019 ($n = 225$ affiliates in 31 states) and also had a documented EPDS depression screening. In addition, mothers were only included if it was the first time they were screened for depression, and if it was the first time they were enrolled in PAT. On average, mothers in the sample were 30.3 years of age ($SD = 6.6$), and the majority identified as White. Descriptive statistics are presented in Table 1.

3.4. Measures

Maternal depressive symptoms. Maternal depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), which is appropriate for use with pregnant, postnatal, and non-postnatal women (Cox, Chapman, Murray, & Jones, 1996; Cox et al., 1987). The EPDS includes 10 items on a four-point scale that captures incidence and severity of depressive symptoms

Table 1
Descriptive Statistics (n = 9071).

	M (SD) or n (%)
<i>Maternal Demographic Characteristics</i>	
Maternal Race/Ethnicity	
American Indian/Alaska Native	254 (2.8)
Asian	119 (1.3)
Black or African American	1884 (20.8)
White	5344 (58.9)
Mixed Race	375 (4.3)
Native Hawaiian or other Pacific Islander	33 (0.4)
Maternal Age	30.3 (6.6)
<i>Maternal Depressive Symptoms (EPDS)</i>	
Probable Major Depressive Disorder (≥ 13)	1178 (13.0)
Subclinical depressive symptoms (10–12)	928 (10.2)
Non-clinical symptoms (< 10)	6965 (76.8)
<i>Depression Screening, Referral and Initiation of Services</i>	
Positive screening on EPDS per home visitor	1089 (12.0)
Discussed outside mental health services	1247 (13.7)
Initiated outside mental health services	368 (4.1)
<i>PAT Attendance/Retention</i>	
Months enrolled in PAT	17.0 (15.7)
Total number of home visits	21.4 (18.6)
Total home visits in first 90 days	4.1 (3.0)

over a one-week period, with possible scores ranging from 0 to 30. For the purposes of this analysis, maternal depressive symptoms were categorized using two cut-offs; a cut-off of 13 or higher was used to indicate whether the mother met probable criteria for Major Depressive Disorder, and a score in the range of 10 to 12 indicated that the mother demonstrated subclinical levels of depressive symptoms. The EPDS demonstrated good internal consistency in this sample ($\alpha = 0.88$). Descriptive statistics are presented in [Table 1](#).

Family demographics and high needs characteristics. Information about family demographics and high needs characteristics were assessed using the PAT *Family Information Record*, which is filled out for every family during the first 90 days of enrollment with PAT and updated as relevant or at least annually thereafter. Family demographics include information like race/ethnicity, parental age, and family experiences and stressors. For example, PAT systematically gathers information about whether 16 high needs characteristics are present for each family, including: (1) child with disability or health condition, (2) young parent or caregiver (pregnant or parenting under the age of 21), (3) parental disability or health condition, (4) parental mental health condition, (5) low income status (family is eligible for free and reduced lunches, public housing, child care subsidy, WIC, food stamps/SNAP, TANF, Head Start/Early Head Start, and/or Medicaid), (6) low education status (parent did not attain high school diploma or equivalency), (7) recent immigrant or refugee family within the past 5 years, (8) parental substance use disorder at any point during the child's lifetime or current substance abuse, (9) foster care or other temporary caregiver, (10) reported or substantiated abuse or neglect of child or sibling, (11) housing instability including homelessness, couch-surfing, or living in shelters or hotels, (12) history of parental incarceration during the child's lifetime, (13) very low birthweight/preterm birth, (14) death in the immediate family at any point during the child's lifetime, (15) intimate partner violence at any point during the child's lifetime, and (16) planning for military deployment or experiencing deployment within the past two years. Descriptive statistics of maternal demographics and family risk factors are presented in [Tables 1 and 2](#).

PAT attendance/retention. Attendance and retention in PAT services were also assessed using the PAT *Family Information Record* and the *Family Service Record and Exit Summary*, which include information like the date of the family's enrollment in PAT, the number of months the family was enrolled in the program, the total number of home visits, the number of visits in the first 90 days, and the family's exit date from the program. Positive attendance and retention in PAT was defined as a

higher number of months enrolled in PAT. Descriptive statistics are presented in [Table 1](#).

Depression screening, referral, and initiation of services. Information indicating whether mothers were screened for depression using the EPDS, whether they discussed a referral for outside mental health services with their home visitor, and then whether or not the mother initiated outside mental health services was drawn from the PAT *Personal Visit Record* completed by the home visitor after each visit, as well as the *Resource Connections Record*. The majority of mothers who were referred for outside mental health services had a positive depression screen, and mothers that initiated outside services had discussed accessing outside services with their home-visitor. Descriptive statistics are presented in [Table 1](#).

3.5. Analytic strategy

All statistical analyses were conducted in SPSS 25.0. First, we examined how many mothers in PAT were screened for depression with any type of screening measure, and whether there were differences between mothers who were screened for depression and mothers who were not screened using independent sample t-tests and Chi-square (χ^2) tests of independence. Second, descriptive statistics were computed to determine how many mothers in PAT were screened for depression using the EPDS, and whether this subsample differed from participants screened with other depression screening tools, again by conducting independent sample t-tests and χ^2 tests of independence. We also examined the average length of time from enrollment in PAT to the date of the first EPDS depression screening. Third, we calculated the number of positive EPDS screenings reported by home-visitors, as well as the number of mothers who met criteria for probable Major Depressive Disorder (MDD) and subclinical depressive symptoms on the EPDS once the continuous EPDS data was re-analyzed using established cut-offs from prior literature. Fourth, χ^2 tests of independence and analyses of variance were conducted to explore whether meeting criteria for sub-clinical depression or probable MDD criteria on the EPDS was associated with several high-risk family characteristics. Sixth, multiple regression was used to examine which family risk factors were most strongly associated with maternal depressive symptoms.

Subsequently, linear mixed models were estimated to ascertain whether mothers with nonclinical or no symptoms, subclinical depressive symptoms, or probable MDD showed differences in PAT program attendance and retention, after including maternal demographic characteristics. A separate sub-model was also developed to assess the marginal contribution of family risk factors. A mixed model was employed to account for possible differences in home visitor screening behavior and attendance and retention between PAT program sites. Lastly, linear mixed models were estimated to examine whether initiation of outside parental mental health services was associated with maternal participation in PAT, again after including demographic characteristics, family risk factors, and accounting for clustering by PAT site. These models were estimated in the subsample of mothers that scored in either the subclinical or probable MDD range on the EPDS, allowing a direct comparison between depressed mothers who initiated outside mental health services and depressed mothers who did not initiate mental health services.

4. Results

Descriptive results indicated that 16.9% of mothers in PAT were screened for depression, and that mothers who were screened for depression were more likely to be non-White, have lower levels of family income and parental education, and be slightly younger in age ($p < .001$) than mothers who were not screened for depression. Results also showed that approximately 60% of mothers screened for depression in PAT were screened using the EPDS. Participants screened with the EPDS were more likely to be White, have lower family income and

Table 2
Associations between maternal depression status and family risk factors (n = 9067).

	Non-clinical symptoms (<10 on EPDS) n (%)	Subclinical depressive symptoms (10–12 on EPDS) n (%)	Probable Major Depressive Disorder (≥ 13 on EPDS) n (%)	Sig. (p)
Low parental education	1726 (24.8)	245 (26.4)	336 (28.5)	.019
Low family income	5281 (75.9)	751 (80.9)	995 (84.5)	$<.001$
Young parent/caregiver	1017 (14.6)	162 (17.5%)	227 (19.3)	$<.001$
Child disability or health condition	751 (10.8)	127 (13.7)	176 (14.9)	$<.001$
Intimate partner violence exposure	326 (4.7)	95 (10.2)	184 (15.6)	$<.001$
History of parental mental illness	875 (12.6)	294 (31.7)	476 (40.4)	$<.001$
Parental substance abuse	691 (9.9)	155 (16.7)	217 (18.4)	$<.001$
Parental disability/health condition	582 (8.4)	112 (12.1)	197 (16.7)	$<.001$
Recent immigrant	600 (8.6)	48 (5.2)	64 (5.4)	$<.001$
Foster care/temporary caregiver	162 (2.3)	28 (3.0)	44 (3.7)	.013
Housing instability	567 (8.1)	115 (12.4)	174 (14.8)	$<.001$
Parental incarceration	343 (4.9)	61 (6.6)	98 (8.3)	$<.001$
Low birth weight/preterm	196 (2.8)	26 (2.8)	34 (2.9)	.990
History of child abuse/neglect	452 (6.5)	90 (9.7)	148 (12.6)	$<.001$
Military deployment	126 (1.8)	23 (2.5)	17 (1.4)	.205
Death in immediate family	235 (3.4)	39 (4.2)	67 (5.7)	.001
	M (SD)	M (SD)	M (SD)	
Total # of risk factors	2.0 (1.5)	2.6 (1.7)	2.9 (1.9)	$<.001$

Note: p-values are based on chi-square tests and analyses of variance (ANOVA).

parental education levels, and be slightly younger ($p < .001$) than mothers screened with other depression measures. Of the subsample screened with the EPDS, on average mothers were enrolled in PAT for 42.6 days before receiving a depression screening. Overall, 12.0% of mothers met criteria for a positive EPDS depression screening, according to the PAT home visitor's report (see Table 1). When mothers' continuous EPDS scores were re-analyzed, 13.0% of mothers screened using the EPDS met screening criteria for probable MDD using the established cut-off of 13, and 10.2% met screening criteria for subclinical depression using the established range of 10 to 12 (see Table 1).

Subsequently, bivariate analyses were used to examine the associations between maternal depression status and family high needs characteristics. Chi-square tests showed significant associations between maternal depression status and low parental education, low family income, young parent/caregiver, child disability or health condition, parental disability, history of parental mental illness, parental substance abuse, temporary caregiver, housing instability, parental incarceration, intimate partner violence exposure, recent immigrant, child abuse or neglect history, and death in the immediate family (see Table 2). In addition, the total number of parental risk factors differed by depression status. Furthermore, when examining family risk factors together as predictors of maternal depressive symptoms on the EPDS, the strongest predictors of higher depressive symptoms were parental intimate partner violence exposure ($\beta = 0.13, p < .001$), parental disability or health condition ($\beta = 0.08, p < .001$), and parental substance abuse ($\beta = 0.07, p < .001$), see Table 3. Only one risk factor was negatively associated with maternal depressive symptoms, which was recent immigrant status ($\beta = -0.03, p < .001$).

The results of the linear mixed models examining maternal depression status as a predictor of PAT attendance/retention are shown in Table 4, separated by sub-model. First, both subclinical maternal depressive symptoms ($B = -1.32, p < .05$) and probable MDD ($B = -1.74, p < .001$) were negatively associated with total months enrolled in PAT, even after controlling for maternal age and race/ethnicity (see Table 4, Sub-Model A). Second, after adding a number of family risk factors into the model, subclinical maternal depressive symptoms ($B = -1.28, p < .05$) and probable MDD ($B = -1.64, p < .001$) continued to predict fewer total months enrolled in PAT. On average, mothers with subclinical depressive symptoms or probable MDD were enrolled in PAT for fewer months (13.9 months and 13.5 months, respectively), compared to mothers with non-clinical or no depressive symptoms (15.2 months). In this model, parental

Table 3
Family risk factors as predictors of maternal depression symptoms (n = 9067).

Family Risk Factors	B	Sig. (p)
Low parental education	-0.01	.936
Low family income	0.04	$<.001$
Young parent/caregiver	0.04	$<.001$
Child disability/health condition	0.05	$<.001$
Intimate partner violence exposure	0.13	$<.011$
Parental substance abuse	0.07	$<.001$
Parental disability/health condition	0.08	$<.001$
Recent immigrant	-0.03	$<.001$
Foster care/temporary caregiver	-0.01	.702
Housing instability	0.04	$<.001$
Parental incarceration	0.01	.321
Low birth weight/preterm	-0.01	.436
History of child abuse/neglect	0.03	.020
Military deployment	-0.01	.624
Death in immediate family	0.02	.060

* $p < .05$, ** $p < .01$, † $p < .10$.

substance abuse ($B = -2.46, p < .001$), housing instability ($B = -1.60, p < .001$), and a history of child abuse or neglect ($B = -1.59, p < .05$) were also negatively associated with the total number of months enrolled in PAT (see Table 4, Sub-Model B).

Lastly, linear mixed models were estimated to examine whether initiating outside maternal mental health services was associated with improved participation in PAT among mothers with subclinical depression or probable MDD. First, initiation of outside mental health services was positively associated with total number of months enrolled in PAT ($B = 3.33, p < .001$), compared to not initiating outside services, see Table 5, Sub-Model A. Second, these patterns remained significant after including a number of family risk factors in the model (see Table 5, Sub-Model B). Results show that mothers with subclinical depression or probable MDD who initiated outside mental health services were enrolled for more months in PAT ($M = 15.4, SD = 2.5$) compared to those in either the subclinical or probable MDD groups who did not initiate outside services ($M = 11.9, SD = 2.4$). In this model, parental substance abuse ($B = -2.71, p < .001$) and housing instability ($B = -2.55, p < .05$) were also negatively associated with the total number of months enrolled in PAT (see Table 5, Sub-Model B).

Table 4
Maternal depression status as a predictor of total number of months enrolled in PAT (n = 9067).

Parameter	Sub-Model A	Sub-Model B
Maternal demographic characteristics		
Age	0.33 (0.03)**	0.36 (0.03)**
Race (White vs. non-White)	1.79 (0.44)**	1.79 (0.44)**
Maternal mental health		
Depression status (EPDS)		
Subclinical depression	-1.32 (0.54)*	-1.28 (0.54)*
Probable MDD	-1.74 (0.48)**	-1.64 (0.49)**
Nonclinical or no symptoms	-	-
Family risk factors		
Low parental education		0.69 (0.39) [†]
Low family income		0.94 (0.45)*
Young parent/caregiver		1.15 (0.54)*
Child disability/health condition		1.67 (0.51)**
Intimate partner violence exposure		0.38 (0.67)
Parental substance abuse		-2.46 (0.56)**
Parental disability/health condition		0.46 (0.54)
Recent immigrant		-0.89 (0.65)
Foster care/temporary caregiver		0.29 (1.03)
Housing instability		-1.60 (0.57)**
Parental incarceration		0.09 (0.72)
Low birth weight/preterm		-1.26 (0.96)
History of child abuse/neglect		-1.59 (0.67)*
Military deployment		-0.59 (1.17)
Death in immediate family		-1.33 (0.85)
Intercept	7.09 (1.06)**	5.44 (1.27)**
Number of sites	225	225
Intraclass Correlation	0.26	0.26

Note: Standard errors are in parentheses. Nonclinical symptoms or no symptoms were defined as < 10, subclinical depression was defined as 10–12, and probable MDD was defined as ≥ 13 on the EPDS. * $p < .05$, ** $p < .01$, [†] $p < .10$

Table 5
Initiation of outside mental health services among mothers with depression as a predictor of total number of months enrolled in PAT (n = 2107)

Parameter	Sub-Model A	Sub-Model B
Maternal demographic characteristics		
Age	0.31 (0.05)**	0.37 (0.07)**
Race (White vs. non-White)	2.75 (0.87)**	2.76 (0.87)**
Mental health services		
Initiated outside mental health services ^a	3.33 (1.11)**	3.49 (1.12)**
Did not initiate outside mental health services	-	-
Maternal risk factors		
Low parental education		0.10 (0.79)
Low family income		2.35 (1.04)*
Young parent/caregiver		1.91 (1.08) [†]
Child disability/health condition		2.35 (1.00)*
Intimate partner violence exposure		-0.13 (1.04)
Parental substance abuse		-2.71 (1.00)**
Parental disability/health condition		0.47 (1.00)
Recent immigrant		-1.89 (1.58)
Foster care/temporary caregiver		2.64 (1.92)
Housing instability		-2.55 (1.03)*
Parental incarceration		-0.13 (1.33)
Low birth weight/preterm		-0.44 (2.08)
History of child abuse/neglect		-0.80 (1.19)
Military deployment		-2.81 (2.45)
Death in immediate family		-1.29 (0.85)
Intercept	4.32 (1.81)*	0.98 (2.43)
Number of sites	69	69
Intraclass Correlation	0.17	0.17

Note: Standard errors are in parentheses. ^aMothers who initiated outside mental health services from the subclinical depression and probable MDD groups were compared to those who did not initiate outside services who also scored in the subclinical or probable MDD range. Nonclinical or no symptoms were defined as < 10, subclinical depression was defined as 10–12, and probable MDD was defined as ≥ 13 on the EPDS. * $p < .05$, ** $p < .01$, [†] $p < .10$

5. Discussion

This study examined maternal depression using the EPDS screener in the national Parents as Teachers home visiting program and explored whether maternal depressive symptoms were associated with attendance and retention in PAT and several family high needs characteristics. This study is also the first to assess whether engaging in outside mental health treatment promotes attendance and retention in home visiting among mothers with depression. This is a particularly important question since research shows that depressed mothers are difficult to engage in home visiting services and that depression negatively impacts home visitation outcomes (Ammerman et al., 2010; Teeters et al., 2016).

First, results showed that a relatively small percentage of mothers in PAT were screened for depression, and that depression screening was associated with lower family income and education, as well as maternal age. This suggests that home visitors may conduct screening when mothers present with more demographic risks. In addition, the EPDS was more likely to be used with White mothers than with non-White mothers, raising questions about what might be driving this difference. However, the EPDS was also used with families who had lower levels of education and income, as well as younger maternal age. This information helps contextualize study findings and points to the need for additional research examining home-visitor and program choices regarding when to screen for depression and which screening tools to use.

Second, results showed that approximately 12% of mothers who were screened by home-visitors using the EPDS were reported to meet criteria for depression. However, PAT affiliates often use different clinical cut-off points on the EPDS, and after re-analyzing scores using standardized cut-offs from prior literature, 13% of mothers met criteria for probable MDD and 10.2% were in the subclinical depression range. These rates of depression are lower than those published in prior studies, which estimate that 35–57% of mothers in home visitation score in the clinical range on standard depression screening measures (Ammerman et al., 2010; Easterbrooks et al., 2016), particularly when utilizing lower cut-off thresholds. This disparity in depression screening rates may reflect variation in depression screening measures and cut-off points, as well as differences in the populations studied. Two previous studies using the EPDS report that 22.1 to 27.5% of mothers in home visiting screened positive for depression using cutoffs of 12 and 13, respectively (Mersky & Janczewski, 2018; Sampson, Duron, Mauldin, Kao, & Davidson, 2017), although both of these studies conducted screening approximately three months after childbirth, and one focused specifically on mothers at-risk of perpetrating child maltreatment (Sampson et al., 2017). In contrast, the current study examines depression rates among all mothers of children from birth through early childhood who were screened in PAT using the EPDS. In addition, the current study draws on administrative data from several PAT programs, whereas some previous studies examined depression screening in the context of clinical trials or formal evaluations (Ammerman et al., 2010). Future research should focus on how home visiting programs identify and address maternal depression in everyday practice throughout the early childhood period.

Third, several family risk factors were associated with maternal depression status for mothers in both the subclinical and probable MDD groups. Parental intimate partner violence exposure, substance use, and disability status or health condition were most strongly associated with maternal depressive symptoms. Previous research on home visiting has documented the association between meeting criteria for depression and intimate partner violence (Stevens, Ammerman, Putnam, & Van Ginkel, 2002), but not with other risk factors like parental substance use or disability status. These new findings highlight the importance of understanding these particular sub-populations within home visiting, who may present with specific barriers to participation in home visiting, and who may also need additional support to access and benefit from mental health services if they are offered. Conversely, only one

family risk factor showed a negative association with maternal depressive symptoms, which was whether a parent immigrated within the past five years. This finding echoes a substantial literature showing that immigrants appear to be less at risk for mental health disorders (Salas-Wright, Kagotho, & Vaughn, 2014), which may reflect that immigrants are more mentally healthy overall or that standardized measures like the EPDS are not capturing depression symptom presentation accurately for this population. Overall, results demonstrate the importance of considering the constellation of parental risk factors that may either cause or exacerbate symptoms of maternal depression within home visiting programs. The groups most at-risk of presenting with depression (i.e., those with interpersonal violence exposure, substance abuse, or disability/health condition), may also have the most difficulty engaging in services, and therefore may need additional targeted interventions to address more primary needs (i.e., establishing physical and emotional safety, addressing barriers to accessing care) in order to benefit from depression treatment. Emerging work in the area of precision home visiting could help determine the active ingredients needed in home visitation interventions for these specific populations impacted by maternal depression (Supplee & Duggan, 2019).

Fourth, nondepressed mothers stayed enrolled in PAT longer than either the subclinical or probable MDD groups, who on average ended the PAT program 1.5 months sooner than their nondepressed counterparts. This finding represents a departure from several prior studies showing no association between caregiver depression and retention in services (Booth et al., 2014; Brand & Jungmann, 2014; Damashek et al., 2011; Navaie-Waliser et al., 2000; O'Brien et al., 2012). Importantly, this association remained significant even after accounting for several other family risk factors that could contribute to differences in enrollment duration. However, it is important to note that the current study examines attendance and retention as defined by length of time enrolled, whereas the majority of prior studies only examined attrition, or reason for leaving home visiting services. Although there may not be an association between depressive symptoms and the stated reason for leaving services, increased depressive symptoms appear to predict fewer number of months enrolled in services. In addition, these results show that mothers in the subclinical range show a similar attendance pattern as their more symptomatic counterparts, at least in terms of attendance and retention in PAT services, suggesting that home visiting programs may want to use lower clinical cut-offs in order to address the needs of mothers with a broader range of depressive symptoms. It is also important to note that mothers in the subclinical and probable MDD groups stayed enrolled for far fewer months than the recommended dosage of 24 months. While mothers in non-clinical group had better rates of retention, they too did not reach this recommended dosage.

Fifth, depressed mothers who were referred by a PAT home-visitor to parental mental health services, and who then initiated those services (per parent report), appeared to participate more successfully in PAT. This is the first study examining depression in home visiting services that has directly tested this question, and these findings suggest that referral to outside services may be a beneficial step in addressing maternal depression, at least for some mothers. Interestingly, a prior study found a negative association between retention and visit completion and having a parent/family or case management focus in home visiting services (McKelvey et al., 2018). Rather, McKelvey et al. found that parents showed higher engagement when sessions focused on child development and parent-child interactions (2018). It may be that addressing parental needs in home visits does not directly promote better attendance and retention among depressed mothers, but that the actual initiation of outside mental health services is the key.

While there are multiple strengths of the study, there are also limitations. First, mothers self-reported to the PAT home visitor whether they had initiated mental health services, which may mean there is some information bias in the reporting. Mothers may have been influenced by social desirability bias to tell their home visitors that they

were seeking treatment when in fact they did not. Second, it is impossible to ensure that the referral to outside mental health services only occurred after a positive depression screening. Third, it is possible that mothers who are more engaged in home visiting are also more likely to seek treatment simply because they are more likely to engage in services in general. Fourth, the finding that mothers who receive treatment remain in home visiting longer may be an artifact reflecting that the home visitor is able to steer the parent towards treatment over the course of time rather than the mental health treatment reinforcing home visitation participation. Fifth, there may also be variations in the methods each PAT affiliate utilized to collect and record data that could impact the reliability of reports. Despite these potential study limitations, the strengths of this study outweigh these concerns and include the utilization of a large data set from one of the largest home visitation programs in the United States, the utilization of validated measures for measuring maternal depression, and the utilization of a data management system that allows for standardized data collection across a large number of programs.

Future studies should gather additional information regarding the intensity or duration of outside mental health treatment and re-assess parental mental health symptoms over time. It would also be helpful to have additional data from the home visitor regarding completion of services and the quality of the family's engagement in services, as well as characteristics of the home visitor, program, and community that likely impact program involvement (per Korfmacher et al., 2008). Furthermore, a more complete picture would be attained by gathering qualitative interview data from mothers regarding their subjective experience of depression screening and initiation of services within home visiting programs.

In conclusion, this study shows that mothers with higher depressive symptoms, including those in the subclinical range, appear to have a harder time engaging in home-visiting services, even though they may need the support the most. However, when home-visitors address maternal mental health and mothers initiate treatment, mothers participate for a longer period of time in home visiting services.

CRediT authorship contribution statement

Abigail Palmer Molina: Conceptualization, Methodology, Software, Data curation, Formal analysis, Writing - original draft.
Dorian E. Traube: Writing - original draft, Writing - review & editing.
Allison Kemner: Investigation, Resources, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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