ORIGINAL PAPER

Predictors of Service Utilization of Young Children and Families Enrolled in a Pediatric Primary Care Mental Health Promotion and Prevention Program

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Abstract

Understanding early childhood mental health service utilization in community-based clinical settings is important. Project Linking Actions for Unmet Needs in Children's Health (Project LAUNCH) provided mental health-related services for young children and families within pediatric medical homes. Using data from the Project LAUNCH evaluation (n = 106), we implemented negative binomial regression models to determine if baseline variables were associated with service utilization, defined as the number of encounters between the family and the team. Past-year homelessness emerged as a significant predictor of service utilization. Encounters for families with children who experienced homelessness within the last 12 months occurred at a rate 34.5% lower than those who had not experienced homelessness. Results highlight the importance of addressing homelessness as a barrier to mental health service utilization for families. Screening for recent housing insecurity and developing interventions that integrate housing support services into mental health programs may inform strategies to increase attendance for families with young children.

Keywords Service utilization · Early childhood mental health · Primary care · Homelessness · Social determinants of health

Early-onset socioemotional difficulties related to various health and behavior problems in childhood through adulthood decrease quality of life and lead to considerable public expenditures (Alfonso & DuPaul, 2020; Brauner & Stephens, 2006; Cree et al., 2018; Jones et al., 2015). Epidemiological studies estimate that 9–26% of children ages 0–8 years are affected by emotional and behavioral disturbances (Brauner & Stephens, 2006; Briggs et al., 2012; Brown et al., 2012; Cree et al., 2018; Egger & Angold, 2006). Many young children experience an unmet need for mental health services due to lack of referrals from primary care providers, lack of caregiver awareness to needs and resources, limited availability of services, and barriers to access (Brauner & Stephens, 2006; Godoy et al., 2019; Roll et al., 2013). Research on access to child mental health services has sought to understand barriers and attitudes that influence caregivers' decisions to engage in services. For example, parents from ethnic minorities and parents with low socioeconomic status often have more barriers to service use (Thurston & Phares, 2008). Even among children who have access to and use mental health services, rates of service use tend to drastically decrease over time (Farmer et al., 1999; Gopalan et al., 2010; Reid et al., 2019). Sufficient attendance at mental health appointments is critical to achieving clinically significant improvements in treatment outcomes for children (Boggs et al., 2005).

The pediatric primary care service sector is widely recognized as uniquely positioned to provide mental health services for children (Committee on Psychosocial Aspects of Child & Family Health & Task Force on Mental Health, 2009). Primary care is a critical access point to the health

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system. While only a small proportion of children visit a mental health provider, most interact with a primary care provider in a typical year (Godoy et al., 2019; Ko et al., 2008). Behavioral health integration into pediatric primary care is one viable and feasible solution to improve mental health services for children (Asarnow et al., 2017; Centers for Disease Control and Prevention, n.d.; Moore & Krehbiel, 2016; Tyler et al., 2017). However, effective implementation and uptake remain low. A recent meta-analytic review found that only 1.76% of school-aged children (5–18 years) accessed services through primary care (Duong et al., 2021). There is a need to better understand how to increase behavioral health in primary care. This is particularly important for young children who may not be school-aged yet. Pediatric primary care may be an especially valuable space for behavioral health services for these infants, toddlers, and young children because of their standard well-child care structure (Simpson et al., 2016). Understanding factors associated with mental health service utilization for young children (0–8 years) in primary care settings is necessary to improve existing models and expand services to a larger proportion of young children and families.

Prior mental health service utilization research has focused on a range of factors that influence access, engagement, and retention in care. Several engagement studies in child and adolescent mental health services have shown promise (Alegría et al., 2004; May et al., 2007; McKay et al., 1998; Nock & Ferriter, 2005). Research on predictors of service utilization for children tends to focus on older children and children with externalizing behavior problems (e.g., Luk et al., 2001) and has mainly been conducted in the form of randomized controlled trials and quasi-experimental studies (Boggs et al., 2005; Lyon et al., 2013; Mendenhall, 2012). Few studies on service utilization have occurred in non-research clinical service settings where there are shortages of manualized treatments, and treatment endpoints are seldom predetermined (Gonzalez et al., 2011). Not much is known about service utilization in programs with young children in primary care settings. Evidence that helps us better understand service utilization in these programmatic settings is essential to strengthening the design and implementation of widespread public mental health programs. Understanding caregiver and family-level predictors of service utilization for children are vital for children under eight years old, given that younger children's engagement is mostly or wholly dependent on their caregivers (Power et al., 2005; Schneiderman & Villagrana, 2010; Staudt, 2007). Studies have shown that identifying caregiver and family characteristics can improve our understanding of mental health service utilization for children and youth (Kerkorian et al., 2006; Kruzich et al., 2003; Power et al., 2005).

Previous studies have identified several child, caregiver, and family characteristics associated with attendance. Low socioeconomic status and ethnic minority status have frequently been associated with attrition and decreased attendance in children's mental health services (Carr et al., 2016; Fernandez & Eyberg, 2009; Gopalan et al., 2010, McKay & Bannon, 2004). Caregiver stress, being a single parent, and severity of children's challenges have also been associated with attendance in child mental health services (Fernandez & Eyberg, 2009; McKay & Bannon, 2004, Gopalan et al., 2010). There is a dearth of research examining the association between homelessness and attendance in children's mental health services for young children. However, a study of children and youth aged 12–21 found the experience of homelessness to be associated with attrition in outpatient mental health services (Baruch et al., 2009).

Program Description

Project Linking Actions for Unmet Needs in Children's Health (Project LAUNCH) in Massachusetts, USA, implemented a model for integrating mental health into pediatric primary care for young children (0–8 years) at risk of socioemotional and behavioral difficulties and their families (Boston Public Health Commission, 2011). The public program, funded by the Substance Abuse and Mental Health Services Administration (SAMHSA), was most recently implemented in three pediatric practices in three cities in Massachusetts, serving residents in predominantly low-income Latinx communities. The LAUNCH/MYCHILD model utilizes a team of a family partner and a mental health clinician that provides mental health promotion and prevention services and coordinated care for children and their families within pediatric medical homes. A family partner is a peer-professional with the lived experience of raising a child with social, emotional, or behavioral difficulties, who also shares cultural and linguistic backgrounds with participants and is a member of the community being served (Molnar et al., 2018; Nayak et al., 2021). They are experience-based peer experts commonly employed as part of the Children's Behavioral Health Initiative (CBHI) in Massachusetts. CBHI has developed systems of care for Medicaid-eligible youth with behavioral, mental, and emotional challenges. In the LAUNCH/MYCHILD model, the family partner and clinician work as equal partners to deliver a range of family-centered promotion and prevention services, including treatment, referrals, and linkages to essential resources for families of children at risk of socio-emotional and behavioral difficulties (Boston Public Health Commission, 2011).

Participation in LAUNCH/MYCHILD services was associated with positive improvements for both children and caregivers in an evaluation study of an earlier

iteration of this model implemented in Boston, MA (Molnar et al., 2018). Specifically, children who scored above clinically significant cutoffs for behavioral distress significantly improved over time, with symptoms falling into the normal range at 12-month follow-up. Similarly, caregiver depressive and stress symptoms significantly declined over time (Molnar et al., 2018). A more recent qualitative evaluation of this model with 38 participants found that family partners were vital in helping families navigate systems. The family partner approach could be one way to reduce disparities in mental health services for young children, particularly those from marginalized communities (Nayak et al., 2021). The LAUNCH/MYCHILD model has received the designation of an evidence-based best practice by the Association of Maternal and Child Health Programs (AMCHP) and was awarded Best Practice out of all 2020 submissions at the AMCHP 2021 Annual Conference (AMCHP, 2021).

The purpose of this analysis is to examine baseline factors that predict utilization in primary care mental health services for young children using a sample of families who participated in Project LAUNCH. To our knowledge, this is one of the first studies examining service utilization using prospectively collected data from young children (0–8 years) and families from a diverse cohort as part of an integrated primary care-based mental health promotion and prevention program.

Materials and Methods

Participants and Sampling

Data for this study come from families served by Project LAUNCH teams, based on referrals from pediatric primary care providers at the three sites in different Massachusetts cities from 2016 to 2019. Families were invited to participate in an evaluation study of Project LAUNCH. Participants did not have to participate in the evaluation study in order to receive services. Three hundred and forty families were enrolled in Project LAUNCH, and 106 families participated in the evaluation study, representing 119 children aged 0–8 years old at baseline. Caregivers provided informed consent for themselves and their child/children's participation in the evaluation study. The evaluation team only had access to data from families who consented to the evaluation. This study was approved by the Northeastern University Institutional Review Board, the Massachusetts Department of Public Health Institutional Review Board, and each participating primary care site's ethical oversight committee.

Measures

Demographic Characteristics

Caregiver participants reported a number of demographic variables at baseline about themselves and their children, including age, gender, and race/ethnicity (White, Black or African American, Hispanic or Latino, Asian, American Indian or Alaskan Native, Native Hawaiian, Other Pacific Islander, or Multiracial).

Social and Financial Characteristics

Caregivers were also asked a variety of questions regarding their social and financial situation. Specifically, caregivers were asked if they were currently employed or in school, if they had completed high school or its equivalent, if they were a single parent household, if the mother was/is a teenage mother (19 years or younger at the time of the child's birth), if the family participated in public assistance programs, if anyone in the household or family had a mental illness, if anyone in the household or family had a substance use problem, if a child in the household had been a victim of violence or trauma, if there was a known open case or investigation of abuse or neglect, if a child in the household had experienced homelessness in the last 12 months, if a child in the household had been removed from child care or preschool or expelled from elementary school, if a biological parent of the child was incarcerated, and if a household member was currently deployed on active duty in the military.

Caregiver Mental Health

We used two validated tools to measure caregiver mental health: The Patient Health Questionnaire-9 (PHQ-9) and the Parenting Stress Index-Short Form (4th Edition) (PSI-4-SF). The PHQ-9 is an adult depression scale with nine items. It has high validity as a screening tool and has been used with diverse sets of primary care patients (Huang et al., 2006). It has strong internal consistency ($\alpha = 0.86–0.92$) and test–retest reliability (0.83–0.84). The item scores range from 0 (not at all) to 3 (nearly every day) and are summed to obtain scores from 0 to 27, with ≥ 10 representing clinically significant depressive symptoms.

The PSI-4-SF uses 36 items from the Parenting Stress Index, a tool used to measure parenting-related stress (Abidin, 1995). It has three subscales (parental distress, parent–child dysfunction interaction, and difficult child) as well as a total stress composite scale. Raw scores are standardized into t-scores with accompanying percentile scores. Scores at the 85th percentile and higher for the total stress composite score indicate clinically significant stress levels

(Reitman et al., 2002). The PSI-4-SF total stress scale has excellent internal consistency ($\alpha = 0.91$, 0.92, 0.90) and good test–retest reliability (ICC $= 0.77$, 0.78, 0.77) (Barroso et al., 2016; Díaz et al., 2011; Haskett et al., 2006; Whiteside-Mansell et al., 2007).

Child Mental Health

We used the Ages & Stages Social and Emotional questionnaire (ASQ: SE-2) and the Devereux Students Strengths Assessment (DESSA) to examine baseline measures of child wellness. The ASQ: SE-2 is a parent-reported highly valid and reliable screening tool used to assess social, emotional, and behavioral concerns of children up to 72 months (6 years of age) (Squires et al., 2002). It has 19–30 items depending on the age of the child and has demonstrated good internal consistency ($\alpha = 0.82$) and test–retest reliability (0.94) (Squires et al., 2001). Scores are categorized as above or below the clinical cutoff based on age-specific guidelines. Scoring above age-specific clinical cutoff scores indicates follow-up and monitoring needs (Squires et al., 2002).

Since the ASQ: SE-2 can only be used with children up to 72 months of age, we used the DESSA to measure social and emotional development for children in the sample who were 6–8 years of age. The DESSA is a highly valid and reliable 72-item, norm-referenced behavior rating scale for social-emotional competencies (Lebuffe et al., 2009). It has very high internal consistency ($\alpha = 0.98$) and high test–retest reliability (0.90) for the social-emotional composite score (Lebuffe et al., 2018). It is strengths-based, and therefore lower scores indicate higher levels of concern. Standardized t-scores of 40 or below (16th percentile or below) indicate the likelihood of socio-emotional problems.

Service Utilization

Service utilization was defined as the total number of encounters with the Project LAUNCH team. An encounter for this analysis was defined as an in-person visit or a phone conversation between the team and a family. Number of sessions attended has previously been used an outcome measure in studies examining predictors of service utilization in youth and child mental health services (Brookman-Frazee et al., 2008; Haine-Schlagel et al., 2019; Mendenhall, 2012; Miller et al., 2008). Email or text message correspondences were not considered encounters for this analysis. Team members documented each encounter they had in a data collection database, using a process similar to medical record documentation used by health providers. A family had to have at least one in-person or phone encounter to be included in the analysis. Encounters had a mean length of 48.8 min ($SD = 22.5$ min). Encounters covered a range of topics, including caregiver parenting skills, psychoeducation for the caregiver, behavior management of the child, social skills for the child, school readiness preparation, stress management of the caregiver, referrals to clinical and non-clinical services, accompanying the caregiver to school-based Individual Education Program meetings (IEP meetings), assisting with housing applications, and more.

Data Analysis

As potential predictors of service utilization, we modeled child and caregiver race/ethnicity and gender, caregiver's current employment/student status, if the mother was/is a teenage mother, if they were a single parent household, if anyone in the household or family had a mental illness, if anyone in the household or family had a substance use problem, if a child in the household had been a victim of violence or trauma, if there was a known open case or investigation of abuse or neglect, if a child in the household had experienced homelessness in the last 12 months, adult depression (PHQ-9), parental stress (PSI-4-SF), and measures of child socio-emotional wellness (ASQ: SE-2 and DESSA) as categorical variables. We categorized scores for adult depression (PHQ-9), parenting stress (PSI-4-SF), and measures of child socio-emotional wellness (ASQ: SE-2, DESSA) based on clinical cutoffs as determined by each measurement tool. The DESSA and ASQ:SE-2 have age-specific clinical cutoffs that indicate clinically meaningful symptoms and are used by providers to inform the development of treatment plans. We used these cutoffs for our analyses (LeBuffe et al., 2009; Squires et al., 2002).

We modeled caregiver and child age as continuous measures. Due to the children's young ages (0–8), we limited the use of child demographic characteristics in the multivariable model to child gender and age. These have been shown to affect service utilization in other samples (Kataoka et al., 2002). All other demographic characteristics were assessed at the caregiver/family level since caregivers are ultimately responsible for seeking care for young children (Staudt, 2007).

The proposed analysis was completed in three separate steps. The first univariate analysis looked at child, caregiver, and family-level characteristics predicting the number of encounters. This first step in the analysis did not use multiple imputation and instead had missing data as a separate category for each variable.

In order to obtain model estimates while retaining as much of the sample data as possible, multiple imputation was implemented through fully conditional specification for the second and third analyses (described below). For each analysis, 20 imputed datasets were created with a maximum of 20 iterations; we assessed convergence of the imputation process using trace plots (Buuren, 2018).

The second analysis sought to better understand the relationship between child socio-emotional and behavioral wellness scores (ASQ: SE-2 and DESSA) and service utilization, utilizing a univariate analysis with multiple imputation. Since not all children qualified for both the DESSA and ASQ: SE-2 (due to the age requirements of each), three separate regression models were constructed based on child qualification (ASQ: SE-2 only, DESSA only, and ASQ: SE-2 and DESSA combined). In each regression model, clinically meaningful cutoffs were used to determine if a relationship existed between child socio-emotional and behavioral wellness and service utilization.

The third analysis used an a priori selection of study variables to model the multivariable relationship between variables and service utilization encounters using multiple imputation to account for missing data. The use of multiple imputation through fully conditional specification imputes missing data on a variable-by-variable basis under the assumption the data are *missing at random* (Buuren & Groothuis-Oudshoorn, 2011). We address this assumption in a sensitivity analysis. We included variables that (a) were associated with attendance in previous research and (b) represented important clinical characteristics relevant to our participants (e.g., assessment scores). Based on our review of the literature, the following were selected as variables of interest for the multiple imputation analyses: caregiver race/ethnicity, if the caregiver was currently employed or in school, if the mother was/is a teenage mother, if they were a single parent household, if anyone in the household or family had a mental illness, if anyone in the household or family had a substance use problem, if a child in the household had been a victim of violence or trauma, if there was a known open case or investigation of abuse or neglect, if a child in the household had experienced homelessness in the last 12 months, and measures of adult depression and parental stress from the PHQ-9 and PSI-4-SF tools, respectively (Alegría et al., 2004; Carr et al., 2016; Schneiderman & Villagrana, 2010; Staudt, 2007).

Univariate modeling from the first analysis did not inform inclusion/exclusion of covariates in the final model of interest. The only a priori variables not included in the final analysis model were caregiver race and ethnicity. Since the amount of missing data in this variable was high, we did not include it in the final model. We did not impute this variable because race is a social construct and therefore cannot and should not be estimated from imputations. All a priori variables considered for the multivariable negative binomial regression model were imputed and resulting parameter estimates were pooled (Rubin, 1987). In instances where a measurement was compared to some clinical cutoff (as seen with PHQ-9, PSI-4-SF,

DESSA and ASQ: SE-2 measures), raw scores were first multiply imputed and later transformed post-imputation.

Sensitivity Analysis

An appropriate sensitivity analysis was carried out to test the robustness of imputations and plausibility of the assumed missingness mechanism. In all analyses, negative binomial regression models were implemented. All analyses were completed using the software package R, version 3.4.4 (R Core Team, 2020) and missing data were imputed using the statistical package MICE (Buuren & Groothuis-Oudshoorn, 2011).

Results

Sample Characteristics

Of the 106 families in this sample, there were 119 child/caregiver pairs with a mean of 7.61 ($SD = 8.62$) service utilization encounters. A distribution describing the number of encounters per child/caregiver pair for the cohort of sample participants can be seen in Fig. 1. Five hundred and sixty-seven of encounters (71.1%) occurred at the primary care sites, 94 encounters (11.8%) at the family's home, 97 encounters (12.2%) by phone, and 39 (4.9%) in other locations, including at the child's school, local parks, housing shelters, etc. The average age of children at baseline was 50.86 months ($SD = 24.85$) and the average age of caregivers was 31.57 years ($SD = 7.78$) (Table 1).

Ninety-eight (82.4%) caregivers and 33 (27.7%) children were female. For caregiver race/ethnicity, 81 (68.1%) identified as Hispanic, 11 (9.2%) as White and 9 (7.6%) as Black or African American. Given the small number of participants from racial and ethnic minority groups such as Asian, American Indian or Alaskan Native, Native Hawaiian, Other Pacific Islander, etc., these were combined into an Other category. Four (3.4%) caregivers were categorized as Other and 14 (11.8%) were missing data on race/ethnicity. For child race/ethnicity, caregivers identified 82 (68.9%) of the children as Hispanic, 15 (12.6%) as White, 9 (7.6%) as Black or African American, and 5 (4.2%) as Multiracial. Three (2.5%) children were categorized as Other and 5 (4.2%) were missing data on race/ethnicity.

Twenty-five (21.0%) caregivers indicated that the mother was/is a teenage mother, 65 (54.6%) reported being in a single parent household, 4 (3.4%) reported that someone in the household had a substance use problem, 37 (31.1%) reported that someone in the household had a mental illness, 23 (19.3%) reported a child in the household had been a victim of violence or trauma, and

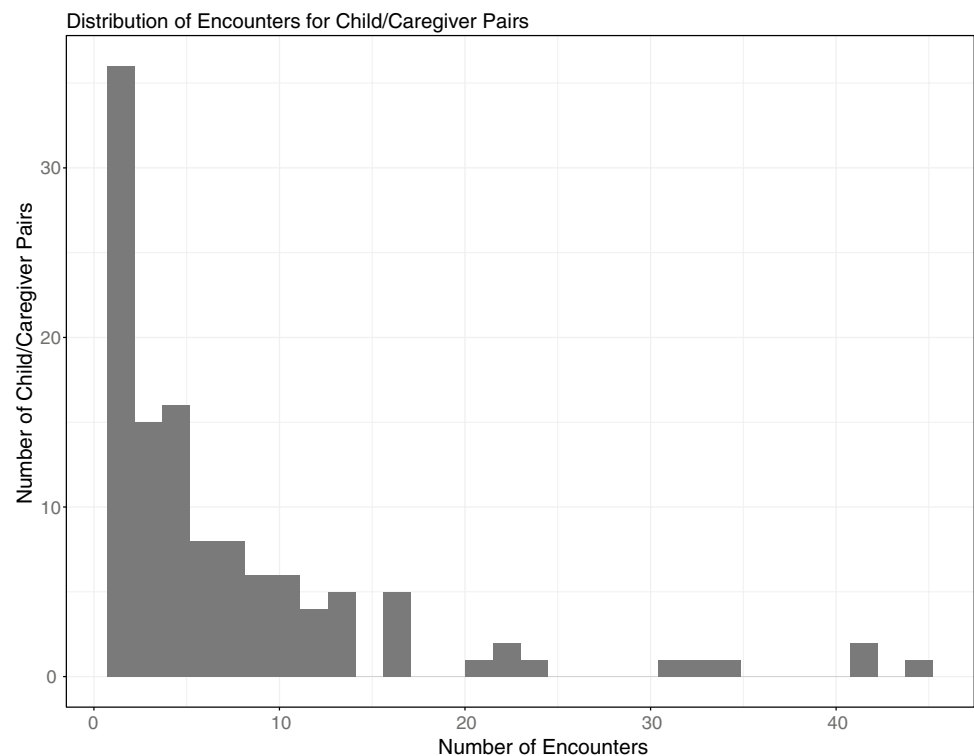**Fig. 1** Histogram of total number of encounters for child/caregiver pairs

(64.6%) had baseline scores in the clinically concerning range on the DESSA and ASQ: SE-2 assessments respectively (Table 2).

Univariate Results

For continuous and categorical variables, univariate analyses examined whether the covariate was associated with the outcome of interest (Table 3). Statistical significance was not found for caregiver age and child age. When examining caregiver and child race/ethnicity, those individuals identifying as Hispanic comprised the reference group as they represented the majority of the sample. Families with children identified as White by caregivers had encounters at a statistically significant rate of 2.01 times that of families with children identified as Hispanic in univariate analyses. There were no statistically significant differences between children identified as Black or African American and those identified as Hispanic. There were also no statistically significant differences between children identified as Other and those identified as Hispanic. Likewise, there were no statistically significant differences between children identified as Multiracial and those identified as Hispanic. However, upon switching the reference group from children identified as Hispanic to White, there were important differences between children identified as White and those who were racial and ethnic minorities. Families with children identified as Black or African American by caregivers had encounters at a

Table 1 Continuous descriptive measures of the caregiver/child cohort

	N (%)	Mean (SD)	Mean (SD) No. of encounters
Total encounters			
Present	119 (100)	7.61 (8.62)	–
Missing	0	–	–
Child Age (months)			
Present	118 (99.16)	50.86 (24.85)	7.67 (8.64)
Missing	1 (0.84)	–	1 (0.00)
Caregiver age (years)			
Present	99 (83.19)	31.57 (7.78)	7.49 (7.74)
Missing	20 (16.81)	–	8.2 (12.32)

35 (29.4%) caregivers reported being currently employed or in school. In 16 (13.5%) of the families, there was a known open case or investigation of abuse or neglect and 33 (27.7%) caregivers reported that a child in the household had experienced homelessness in the last 12 months.

Of all caregiver participants, 26 (21.9%) scored above the PSI-4-SF cutoff for having clinically significant parenting stress and 40 (33.6%) met the criteria for depression on the PHQ-9. Of those children who qualified and were given the assessment tools, 5 (11.6%) and 62

Table 2 Categorical descriptive measures of the caregiver/child cohort

	N (%)	Mean (SD) No. of encounters
Caregiver race/ethnicity		
Hispanic	81 (68.07)	7.53 (7.30)
White	11 (9.24)	6.55 (5.28)
Black or African American	9 (7.56)	4.22 (2.91)
Other	4 (3.36)	15.25 (18.39)
Missing	14 (11.76)	8.93 (14.61)
Child race/ethnicity		
Hispanic	82 (68.91)	6.82 (6.96)
White	15 (12.61)	13.73 (15.69)
Black or African American	9 (7.56)	4.11 (2.71)
Multiracial	5 (4.20)	8.20 (5.67)
Other	3 (2.52)	3 (2.65)
Missing	5 (4.20)	10.80 (9.47)
Caregiver gender		
Female	98 (82.35)	7.46 (7.82)
Male	5 (4.20)	7.80 (2.49)
Missing	16 (13.45)	8.50 (13.66)
Child gender		
Female	33 (27.73)	7.55 (9.04)
Male	85 (71.43)	7.72 (8.53)
Missing	1 (0.84)	1.00 (0.00)
Child developmental category		
Infant (0–1 years)	9 (7.56)	12.8 (14.7)°
Toddler (1–3 years)	22 (18.5)	6.91 (5.46)
Preschool (3–5 years)	44 (37.0)	7.07 (7.43)
Middle Childhood (6 + years)	43 (36.1)	7.6 (9.42)
Missing	1 (0.84)	1.0 (0.00)
Teenage mother		
Yes	25 (21.01)	8.00 (7.82)
No	79 (66.39)	7.37 (8.55)
Missing	15 (12.61)	8.27 (10.63)
Single parent household		
Yes	65 (54.62)	6.72 (7.94)
No	39 (32.77)	8.85 (8.93)
Missing	15 (12.61)	8.27 (10.63)
Substance use in household		
Yes	4 (3.36)	17.25 (10.56)
No	95 (79.83)	7.22 (8.21)
Missing	20 (16.81)	7.55 (9.47)
Mental illness in household		
Yes	37 (31.09)	6.59 (7.68)
No	60 (50.42)	8.10 (9.06)
Missing	22 (18.49)	8.00 (9.13)
Child victim of trauma		
Yes	23 (19.33)	6.74 (6.52)
No	76 (63.87)	7.89 (9.02)
Missing	20 (16.81)	7.55 (9.47)

Table 2 (continued)

	N (%)	Mean (SD) No. of encounters
Caregiver employed/school		
Yes	35 (29.41)	7.94 (8.84)
No	68 (57.14)	6.81 (7.08)
Missing	16 (13.45)	10.31 (13.13)
Open abuse or neglect case		
Yes	16 (13.45)	9.00 (11.25)
No	86 (72.27)	7.36 (7.81)
Missing	17 (14.29)	7.59 (10.14)
Recent homelessness		
Yes	33 (27.73)	5.33 (4.17)
No	70 (58.82)	8.60 (9.61)
Missing	16 (13.45)	8.00 (10.32)
Total parenting stress (PSI-4-SF)		
Yes	26 (21.85)	7.42 (8.29)
No	56 (47.06)	8.45 (8.23)
Missing	37 (31.09)	6.49 (9.49)
Depression (PHQ-9)		
Yes	40 (33.61)	6.15 (6.40)
No	46 (38.66)	8.91 (8.86)
Missing	33 (27.73)	7.58 (10.43)
Socio-emotional concerns (DESSA)		
Yes	5 (11.6)	2.80 (1.64)
No	9 (20.9)	5.00 (3.39)
Missing	29 (67.4)	9.24 (10.97)
Socio-emotional concerns (ASQ: SE-2)		
Yes	62 (64.6)	7.18 (6.84)
No	14 (14.6)	6.07 (7.9)
Missing	20 (20.8)	11.4 (12.95)

statistically significant rate of 0.30 times (70% lower) than those families with children identified as White. Similarly, families with children identified as "Other" had encounters at a statistically significant rate of 0.22 times (78% lower) than those families with children identified as White. These associations were not replicated with caregiver race/ethnicity as a predictor of encounters.

In univariate analyses examining whether family homelessness in the past 12 months was a statistically significant predictor of service utilization encounters, families with children who did not experience homelessness within the last 12 months had more encounters at a rate of 1.61 than those families who had experienced homelessness in the last 12 months. In other words, families with children who had experienced homelessness within the last 12 months had fewer encounters at a rate of 0.62 times (38% lower) than those families with children who had not experienced homelessness within the last 12 months (Table 3). No significant relationships

Table 3 Univariate negative binomial regression results for both continuous and categorical variables

	Outcome: number of encounters		
	Incidence rate ratio	Standard error	p-value
Child age	1.00	0.003	0.268
Caregiver age	1.00	0.011	0.997
Caregiver race/ethnicity			
(Intercept)	7.53	0.10	0.000
Hispanic	Ref	Ref	Ref
White	0.87	0.30	0.638
Black or African American	0.56	0.34	0.089
Other	2.03	0.45	0.118
Missing	1.19	0.26	0.517
Child race/ethnicity			
(Intercept)	6.82	0.10	0.000
Hispanic	Ref	Ref	Ref
White	2.01	0.24	0.004*
Black or African American	0.60	0.33	0.127
Multiracial	1.20	0.41	0.649
Other	0.44	0.58	0.159
Missing	1.58	0.40	0.249
Caregiver gender			
(Intercept)	7.46	0.09	0.000
Female	Ref	Ref	Ref
Male	1.05	0.43	0.917
Missing	1.14	0.25	0.603
Child gender			
(Intercept)	7.55	0.16	0.000
Female	Ref	Ref	Ref
Male	1.02	0.19	0.906
Missing	0.13	1.33	0.128
Teenage mother			
(Intercept)	8.00	0.19	0.000
Yes	Ref	Ref	Ref
No	0.92	0.21	0.701
Missing	1.03	0.30	0.914
Single parent household			
(Intercept)	6.72	0.12	0.000
Yes	Ref	Ref	Ref
No	1.32	0.19	0.144
Missing	1.23	0.27	0.437
Substance use in household			
(Intercept)	17.25	0.44	0.000
Yes	Ref	Ref	Ref
No	0.42	0.45	0.054
Missing	0.44	0.49	0.090
Mental Illness in household			
(Intercept)	6.59	0.16	0.000
Yes	Ref	Ref	Ref
No	1.23	0.20	0.295
Missing	1.21	0.25	0.444
Child victim of trauma			
(Intercept)	6.74	0.20	0.000

Table 3 (continued)

	Outcome: number of encounters		
	Incidence rate ratio	Standard error	p-value
Yes	Ref	Ref	Ref
No	1.17	0.22	0.481
Missing	1.12	0.29	0.693
Caregiver employed/school			
(Intercept)	7.94	0.16	0.000
Yes	Ref	Ref	Ref
No	0.86	0.19	0.426
Missing	1.30	0.28	0.344
Open abuse or neglect case			
(Intercept)	9.00	0.23	0.000
Yes	Ref	Ref	Ref
No	0.82	0.25	0.426
Missing	0.84	0.32	0.599
Recent homelessness			
(Intercept)	8.60	0.11	0.000
Yes	Ref	Ref	Ref
No	1.61	0.20	0.016*
Missing	1.50	0.28	0.151
Total parenting stress (PSI-4-SF)			
(Intercept)	7.42	0.18	0.000
Yes	Ref	Ref	Ref
No	1.14	0.22	0.559
Missing	0.87	0.24	0.575
Depression (PHQ-9)			
(Intercept)	6.15	0.15	0.000
Yes	Ref	Ref	Ref
No	1.45	0.20	0.065
Missing	1.23	0.22	0.343
Socio-emotional concerns (DESSA)			
(Intercept)	5.00	0.32	0.000
Yes	Ref	Ref	Ref
No	0.56	0.57	0.305
Missing	1.85	0.36	0.091
Socio-emotional concerns (ASQ: SE-2)			
(Intercept)	7.18	0.11	0.000
Yes	Ref	Ref	Ref
No	0.85	0.27	0.535
Missing	1.59	0.23	0.041*

It should be noted, not all participants qualified for the ASQ: SE-2 and DESSA assessments; as such, only individuals based on their age were considered for inclusion in this table (ex: individuals marked as missing are only those individuals qualifying for the assessment). Statistical significance (at the .05 level) is designated with an asterisk (*)

were found between caregiver parenting stress or depression and service utilization encounters. When examining univariate relationships between child socio-emotional and behavioral development (using the ASQ: SE-2 and DESSA) and service utilization encounters, no statistically significant results were found in these univariate models, even after multiple imputation (Table 4). These latter models were created separately as the ASQ: SE-2 and DESSA apply to children up to 72 months of age and over 72 months of age, respectively; including these measurements in the final multivariable regression model would reduce the available sample size of the study.

Table 4 Results from the socio-emotional negative binomial regression models using multiple imputation

	Outcome: number of encounters		
	Incidence rate ratio	Standard error	p-value
Model 1:			
(Intercept)	7.497	0.199	0.000
Socio-emotional concerns (ASQ: SE-2)			
No	Ref	Ref	Ref
Yes	1.026	0.251	0.917
Model 2:			
(Intercept)	7.805	0.296	0.000
Socio-emotional concerns (ASQ: SE-2)			
No	Ref	Ref	Ref
Yes	1.018	0.261	0.946
Socio-emotional concerns (DESSA)			
No	Ref	Ref	Ref
Yes	0.927	0.344	0.829
Model 3:			
(Intercept)	7.904	0.195	0.005
Socio-emotional concerns (DESSA)			
No	Ref	Ref	Ref
Yes	0.935	0.334	0.808

Multivariable Results

Our negative binomial multivariable model indicates that having a child in the family experience recent homelessness is a statistically significant predictor of encounters in this sample (Incidence Rate Ratio = 0.655, $SE = 0.208$, $p = 0.045$); specifically, those families where a child had experienced homelessness in the last 12 months had encounters at a rate 0.655 times (34.5% lower) than that of those families where a child had not experienced homelessness in the last 12 months (Table 5).

Sensitivity Analysis

In order to test the stability of our multiply imputed datasets, the delta adjustment method was implemented (Rubin, 1987). This method aims to simulate imputations under a *missing not at random* scheme to test how regression coefficients change (or do not change) after successive imputations. If regression coefficients remain relatively unchanged, the assumptions of how data are missing in the original data are said to be reasonable. In particular, this sensitivity analysis tested whether changes to the imputed PSI-4-SF and classification of homelessness and presence of substance use values, would (independently) affect results obtained from the negative binomial regression analysis. This analysis

Table 5 Pooled results from the multivariable negative binomial regression model

	Incidence rate ratio	Standard error	p-value
(Intercept)	11.298	0.223	0.000
Teenage mother			
No	Ref	Ref	Ref
Yes	0.982	0.229	0.938
Single parent household			
	0.799	0.212	0.293
Substance use in the household			
No	Ref	Ref	Ref
Yes	1.908	0.357	0.076
Mental illness in the household			
No	Ref	Ref	Ref
Yes	0.935	0.215	0.754
Child victim of trauma			
No	Ref	Ref	Ref
Yes	0.753	0.265	0.288
Caregiver employed/school			
No	Ref	Ref	Ref
Yes	0.998	0.219	0.994
Open abuse of neglect case			
No	Ref	Ref	Ref
Yes	1.258	0.262	0.385
Recent homelessness			
No	Ref	Ref	Ref
Yes	0.655	0.208	0.045*
Total parenting stress (PSI-4-SF)			
No	Ref	Ref	Ref
Yes	0.790	0.237	0.325
Depression (PHQ-9)			
No	Ref	Ref	Ref
Yes	0.793	0.217	0.291

Statistical significance (at the .05 level) is designated with an asterisk (*)

was designed to examine if the estimate of the incidence rate ratio when comparing families with children who had experienced homelessness (compared to those who were not) changed (via statistical significance) when artificially manipulating caregiver's PSI-4-SF scores, and the log odds of our model imputing a child as experiencing recent homelessness and/or someone in the household as having a substance use problem.

The results from the sensitivity analysis when adjusting for PSI-4-SF, homelessness, and substance use can be seen in Table 6 and further confirm the robustness of the multiple imputation technique. The final negative binomial regression model estimates remain consistent even through artificial

Table 6 Sensitivity analysis results with the delta adjustment method

	− 60	− 40	− 20	0	20	40	60
(Intercept)	11.462	11.044	11.712	11.365	11.781	11.870	11.772
Teenage Mother	0.925	0.914	0.956	0.949	0.910	0.927	0.937
Single Parent Household	0.786	0.811	0.801	0.803	0.841	0.829	0.846
Substance Use in the Household	1.910	2.001*	1.696	1.943	2.136*	2.104	2.142
Mental Illness in the Household	0.925	0.948	0.906	0.934	0.880	0.930	0.930
Child Victim of Trauma	0.789	0.747	0.794	0.749	0.751	0.721	0.733
Caregiver Employed/School	0.972	0.989	0.918	0.962	0.987	0.960	0.954
Open Abuse of Neglect Case	1.200	1.260	1.255	1.299	1.263	1.324	1.317
Recent Homelessness	0.654*	0.647	0.653*	0.653*	0.659	0.656*	0.655
Total Parenting Stress (PSI-4-SF)	0.816	0.811	0.812	0.777	0.772	0.751	0.755
Depression (PHQ-9)	0.795	0.815	0.782	0.827	0.855	0.853	0.844
	− 6	− 4	− 2	0	2	4	6
(Intercept)	11.076	11.138	11.492	11.365	11.389	11.764	11.269
Teenage Mother	0.947	0.948	0.930	0.949	0.938	0.924	0.939
Single Parent Household	0.819	0.804	0.819	0.803	0.821	0.814	0.819
Substance Use in the Household	1.956	1.892	1.916	1.943	2.040*	2.070	2.049
Mental Illness in the Household	0.916	0.973	0.930	0.934	0.965	0.935	0.985
Child Victim of Trauma	0.749	0.757	0.748	0.749	0.772	0.749	0.745
Caregiver Employed/School	0.974	0.957	0.955	0.962	0.989	0.937	1.005
Open Abuse of Neglect Case	1.253	1.224	1.247	1.299	1.274	1.309	1.276
Recent Homelessness	0.684	0.684	0.657*	0.653*	0.621*	0.642*	0.640*
Total Parenting Stress (PSI-4-SF)	0.787	0.791	0.774	0.777	0.756	0.764	0.765
Depression (PHQ-9)	0.821	0.810	0.812	0.827	0.820	0.811	0.815
	− 6	− 4	− 2	0	2	4	6
(Intercept)	11.387	11.454	11.439	11.365	11.353	11.514	11.299
Teenage Mother	0.957	0.971	0.961	0.949	0.941	0.924	0.958
Single Parent Household	0.812	0.848	0.800	0.803	0.812	0.805	0.788
Substance Use in the Household	2.971*	3.095*	2.590*	1.943	1.819	1.596	1.618
Mental Illness in the Household	0.944	0.918	0.947	0.934	0.928	0.935	0.960
Child Victim of Trauma	0.761	0.801	0.761	0.749	0.714	0.716	0.709
Caregiver Employed/School	0.968	0.913	0.959	0.962	0.951	0.976	0.996
Open Abuse of Neglect Case	1.338	1.254	1.287	1.299	1.277	1.306	1.306
Recent Homelessness	0.652*	0.632*	0.653*	0.653*	0.666	0.657*	0.662*
Total Parenting Stress (PSI-4-SF)	0.744	0.750	0.742	0.777	0.791	0.788	0.798
Depression (PHQ-9)	0.815	0.808	0.816	0.827	0.829	0.820	0.821

Tables displaying the incidence rate ratios of each of the covariates reported from the final negative binomial regression model with the delta adjustment method for PSI-4-SF (top), homelessness (middle), and substance use (bottom). The top row represents by how much each imputation was augmented after each iteration. Statistical significance (at the .05 level) is designated with an asterisk (*)

adjustment (as homelessness remains a statistically significant predictor of service utilization encounters across adjustments).

Discussion

Prior research on integrating child mental health services into primary care has shown promise in improving access to care, identifying problems, and improving outcomes (Gadomski & Hoagwood, 2014; Hodgkinson et al., 2017; Molnar et al., 2018). However, retention in these services still remains a challenge. In this study we identified factors that predict service utilization among young children and their families participating in an integrated behavioral health pediatric primary care-based program. The experience of families in this sample who had a child who had experienced homelessness in the past year emerged as a significant predictor of 34.5% lower service utilization. Homelessness is an

important social determinant of health. Family homelessness places an immense material and psychosocial burden on caregivers. Caregivers in families who experience homelessness are at an increased risk of having high levels of caregiving stress, poor mental health outcomes, a disrupted social network to draw on for social support, violence victimization, and interrupted family routines and rituals (Bassuk & Beardslee, 2014; Gilroy et al., 2016; Mayberry et al., 2014; Park et al., 2015; Shinn et al., 1991; Sylvestre et al., 2018). Therefore, caregivers in families that have experienced recent homelessness might have difficulty remaining active participants in children's mental health services because of these competing demands on their time and mental energy (Torquati, 2002).

Research also suggests that homelessness and related housing insecurity can have deleterious effects on child mental health and child mental health treatment success (Marcal, 2017; Marçal et al., 2020). Experiencing homelessness in childhood is associated with a higher rate of experiencing adverse childhood experiences (Radcliff et al., 2019). These can put children at a higher risk of poor physical and mental health outcomes over the life course (Brown et al., 2010; Felitti et al., 1998; Kerker et al., 2015; Shonkoff et al., 2012). Moreover, the causes and consequences of housing insecurity may be mutually reinforcing. For example, on one hand homelessness could worsen child mental health. On the other hand, child emotional or behavioral difficulties may create a barrier to finding stable housing (Bassuk & Beardslee, 2014; Marçal et al., 2020). Consequently, targeting housing insecurity may be a critical intervention not only in the treatment of the child and the caregiver, but also in the maintenance of treatment results. Screening for recent housing insecurity in families of young children at the outset of treatment may inform targeted strategies for increased attendance. Moreover, integrating interventions to increase housing stability into treatment could positively impact engagement and retention.

Our study did not find an association between caregiver depression and service utilization. Prior studies examining caregiver depression and use of community-based child mental health services have mixed findings, with some showing that caregiver depression is associated with lower service utilization, and some showing no association (Brookman-Frazee et al., 2008; Gopalan et al., 2015; Gordon et al., 2010; Podell & Kendall, 2011). Our findings of a null effect could have a few explanations. Although Project LAUNCH was family-centered, the focus remained on children. It is possible that caregiver mental health did not play as much of a role in this context because families were focused on their children's needs. Given our findings regarding the experience of homelessness, it is possible that families had more immediate basic needs that Project LAUNCH was able to serve. It is possible that the caregivers' mental health was a

secondary need in this context and therefore mental health symptomology including depression and stress may not have impacted their likelihood of continuing to seek services for their children.

In line with other studies, we found statistically significant differences in service utilization based on child race/ethnicity; children identified as White by their caregivers had a higher rate of encounters than children identified as Hispanic. This disparity also was seen between White and Black or African American children, and between White children and those who comprised the "Other" race/ethnicity category. Although this result was not replicated with caregiver race/ethnicity, this is likely due to a high proportion of missing data on race/ethnicity of the caregivers and should not be taken as evidence of no effect. Nearly 12% of caregivers were missing data on race/ethnicity compared to approximately 4% of children in this sample. Therefore, the univariate analyses for caregiver race/ethnicity might have been underpowered to detect an effect. There are several possibilities that could explain this difference between children of different races and ethnicities. Previous findings with standardized programs have found that that racial and ethnic minority groups are at an increased risk for attrition. Reasons for this have included structural racism, institutional distrust, distinct cultural beliefs about mental health, preferences for alternate interventions, experiences of interpersonal racism, and/or sociocultural norms around coping styles (Cauce et al., 2002). It is possible that some of these factors were also at play in Project LAUNCH. At the same time, it is worth noting that the LAUNCH/MYCHILD model does not include a prescribed number of sessions. Therefore, a lower rate of encounters might not necessarily represent a deficit. Families with children who are racial and ethnic minorities might have had stronger external supports and/or social networks, which resulted in having fewer needs and subsequently fewer encounters. In this case, a lower rate of encounters could represent a stronger community support system. The LAUNCH/MYCHILD model was designed with the intention of reducing racial and ethnic health disparities. Qualitative research from Project LAUNCH indicates that family partners in particular are able to engage families in ways that traditional medical personnel cannot by cultivating meaningful relationships with families and leveraging their personal experiences (Nayak et al., 2021). Further research is needed to better understand the mediators that fully explain the differences in rates of encounters seen between White children and children who are racial and ethnic minorities.

Strengths and Limitations

The strength of this study includes its focus on young children in primary care settings, the racial and ethnic

diversity of families, and prospective data collection which is not subject to recall bias. Nonetheless, findings must be interpreted with some caveats. There was a high level of missing data across certain variables. However, the sensitivity analyses demonstrate that our main multi-variable findings were consistent even when missingness was addressed. A small proportion of our encounters were by phone (10.7%). Therefore, we were not able to conduct analyses that distinguished between in-person vs. tele-phone encounters. Future studies with larger sample sizes should seek to explore this question. The measurement of gender in this study was limited to a binary and does not accurately capture the range of the gender spectrum. In our present work with this model (currently under-way), gender is being collected in a more accurate and comprehensive manner. Future research should ensure that questions related to gender are inclusive of all gen-der identities. Next, there is the possibility of selection bias since not all families who participated in Project LAUNCH consented to the evaluation study. Delays in securing ethical approval for the evaluation study from each of the study sites resulted in a number of families entering and leaving the program before the evaluation study commenced. Many of these families could not be contacted for inclusion in the evaluation study. It is also possible that families who consented to the study remained engaged in services longer and hence these results may not be representative of the entire cohort of participants in the program. Since the evaluation team did not have access to individual-level data from families who declined to participate, differences between partici-pating families and non-participating families cannot be empirically studied. However, demographic distributions between families in the evaluation (n = 106) and aggregate findings from all families in Project LAUNCH (n = 340) are comparable. Finally, there was also a lack of detail concerning the specifics of what transpired during each encounter with the team. Access and ongoing participa-tion in mental health promotion and prevention services are undoubtedly important for the families of children with socio-emotional difficulties; however, attendance for any mental health service alone does not necessarily produce positive outcomes. Research suggests that the key to positive service outcomes may be the quality of engagement in mental health services, which this study did not measure (Haine-Schlagel & Walsh, 2015; Gopalan et al., 2010; Weisz et al., 1995). Furthermore, there is a need for improvement in delivery of evidence-based strat-egies of high intensity child mental health care (Garland et al., 2010). Research has shown that usual care outpa-tient psychotherapy for children employs a wide variety of treatment strategies that are delivered at low average intensity (Garland et al., 2010).

Conclusions and Future Directions

This study adds to the literature on patterns of service use among demographically diverse children and families. Since the children in this age group are young (0–8 years) and are not responsible themselves for seeking mental health services, adult caregivers, the school system, the primary care system, and the community at large play important roles in ensuring that they are matched with appropriate services and that they remain in services. The primary finding that recent homelessness predicted a lower rate of encounters underscores the need to expand mental health promotion and preventive interventions beyond the clinic to address a family's social needs and the social determinants of health. While social needs and social determinants of health have sometimes been considered tangentially related to mental health services, our find-ings highlight that addressing these needs, particularly those around securing stable housing for families, must be included in primary service delivery. Future research should develop and test interventions where family sup-port services for housing insecurity are key components of mental health services for young children. Moreover, given the prominent role of insurance companies in mental health services in the US health system, developing pay-ment mechanisms that allow providers to bill for activities to promote housing security will increase the likelihood that these services become integrated into mental health care and improve socio-emotional and behavioral wellness for young children.

Declarations

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