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Training Community Therapists in AIM HI: Individual Family and Neighborhood Factors and Child/Caregiver Outcomes

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Abstract

Objective: Publicly-funded mental health services play an important role in caring for children with mental health needs, including children with autism spectrum disorder (ASD). This study assessed the associations between individual family- and neighborhood-level sociodemographic factors and baseline family functioning and long-term outcomes when community therapists were trained to deliver *An Individualized Mental Health Intervention for ASD* (AIM HI).

Method: Participants included 144 children with ASD (ages 5 to 13 years; 58.3% Latinx) and their caregivers whose therapists received *AIM HI* training within a cluster-randomized effectiveness-implementation trial in publicly-funded mental health settings. Sociodemographic strain (e.g., low income, less education, single parent status, minoritized status) was coded at the individual family and neighborhood level, and caregivers rated caregiver strain at baseline. Child interfering behaviors and caregiver sense of competence were assessed at baseline and 6-, 12- and 18-months after baseline.

Results: Higher caregiver strain was associated with higher intensity of child behaviors ($B= 5.17$, $p < .001$) and lower caregiver sense of competence ($B= -6.59$, $p < .001$) at baseline. Child and caregiver outcomes improved over time. Higher caregiver strain ($B= 1.50$, $p < .001$) and lower family sociodemographic strain ($B= -0.58$, $p < .01$) were associated with less improvements in child behavior. Lower caregiver strain ($B= -2.08$, $p < .001$) and lower neighborhood sociodemographic strain ($B= -0.51$, $p < .01$) were associated with greater improvements in caregiver sense of competence.

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The authors state that they have no conflicts of interest.

Conclusions: Findings corroborate the importance of considering both family and neighborhood context in the community delivery of child-focused EBIs.

Keywords

child mental health; community effectiveness trial; evidence-based intervention; social determinants; autism

Publicly-funded mental health services play an important role in caring for children with mental health needs and their families, with Medicaid serving as the largest payer of mental health care in the United States (Mark et al., 2005). Over the past two decades, there have been substantial efforts to improve the quality of the care provided in these settings through the implementation of evidence-based interventions (EBIs; Hoagwood et al., 2014). One challenge with EBI implementation is that individuals receiving treatment in the context of tightly controlled intervention efficacy trials often differ from clients served in routine, community services (Ringle et al., 2015). Specifically, children and families receiving routine services often have multiple presenting problems and may experience a range of stressors that can impact the treatment process and make engaging in services difficult (Southam-Gerow et al., 2008). Previous research has highlighted individual caregiver and therapist factors associated with service utilization and clinical outcomes in response to EBIs delivered in community mental health settings (Self-Brown et al., 2016), but little is known about the relative associations of individual family- and neighborhood-level stressors with child and caregiver outcomes in the context of community EBI implementation.

ASD and Publicly-Funded Mental Health Services

Children and families receiving care through publicly-funded mental health services are more likely to experience life stressors compared with populations served in other settings (Southam-Gerow et al., 2008). In particular, traumatic life events and other stressors have been found to occur more frequently in low socioeconomic and racial/ethnic minoritized groups (Merrick et al., 2018). These contextual factors are critical to consider when implementing an EBI in community settings, as they can impact the treatment process and make it difficult for families to engage in services (Last et al., 2020).

An additional factor integral to serving children with autism spectrum disorder (ASD) in publicly-funded mental health services is their diagnostic complexity. Though children with ASD are typically referred to mental health services due to challenging behaviors, they present with, on average, 2.8 non-ASD mental health disorders (Brookman-Frazee et al., 2018). This diagnostic complexity, in addition to the exposure to stressful life events experienced by many families receiving publicly-funded services, poses unique challenges for delivering EBIs in these service settings. In addition, families of children with ASD may experience unique stressors related to caring for a child with ASD (Barroso et al., 2018; Hayes & Watson, 2012) that potentially compound existing stressors and impact the manner in which families access and engage in mental health services. Understanding individual family and neighborhood factors associated with community treatment outcomes is of particular interest for this population.

The Modified Socio-Cultural Framework for Health Service Disparities Framework

The Socio-Cultural Framework for Health Service Disparities (SCF-HSD; Alegría et al., 2011) is an applicable framework for understanding the roles of multi-level factors when implementing and evaluating EBIs in community mental health services. The framework posits that health disparities are a result of complex interactions between disadvantages in health care and community systems that occur at multiple levels (i.e., macro-, meso-, and micro-level). Macro-level factors include societal, policy, or environmental factors; meso-level factors include the community and healthcare system; while micro-level factors include individual-level factors (i.e., family factors) and provider-client interactions (Alegría et al., 2011; Lopez, 2014). The SCF-HSD framework has been modified to characterize service disparities for Latinx children with ASD (Modified SCF-HSD; Lopez, 2014) with consideration of the interaction of family-level factors with health care systems, environmental context (i.e., neighborhoods), and the operation of community systems and social network sectors (see Lopez, 2014). The broader SCF-HSD framework highlights how social context can impact access to, quality of, and outcomes of health care, particularly for racial and ethnic minorities (Alegría et al., 2011). Though factors at all three levels are likely to play a role in health service disparities, the present study will specifically focus on micro level factors (i.e., family factors) and macro level factors (i.e., neighborhood factors) that may be most relevant for publicly-funded child mental health services (Joshi et al., 2010) and for families of children with ASD (Barroso et al., 2018).

Micro-Level Factors

Individual Family Sociodemographic Strain—Consistent with the SCF-HSD framework, family-level sociodemographic strain (e.g., low income, less education, single parent status; racial and ethnic minoritized status) is linked to service disparities for families receiving mental health care (Marrast et al., 2016). Historically disadvantaged populations, such as families with lower socioeconomic status and members of minoritized racial and ethnic groups are more likely to experience traumatic and stressful life events (Merrick et al., 2018). Furthermore, caregivers from disadvantaged socioeconomic backgrounds might face additional caregiver-related strain due to economic hardships (Parkes et al., 2015). Specific to ASD, caregivers from low socioeconomic backgrounds (compared to those from higher socioeconomic backgrounds), report lower quality of care and higher unmet service needs (Vohra et al., 2014) and more limited understanding of their child's ASD (Pickard & Ingersoll, 2016), which in turn could impact service engagement and treatment response.

Caregiver Strain—Caregiver strain refers to the demands, responsibilities, difficulties, and negative psychological consequences of caring for the needs of a child with mental, emotional, and behavioral needs (Brannan et al., 1997). Higher levels of caregiver strain are associated with the use of fewer positive parenting strategies and poorer child outcomes in typically developing children with emotional and behavioral needs (Crnic et al., 2005). Caregivers of children with ASD experience higher rates of caregiver strain compared to caregivers of typically developing children, children with other developmental disabilities, and children with other clinical disorders (Barroso et al., 2018; Hayes & Watson, 2012).

Caregivers of children with ASD often face unique psychosocial challenges, including possible feelings of loss or uncertainty following a child's diagnosis, daily management of their child's behaviors, and the challenges of navigating specialized services (Hayes & Watson, 2012). Caregiver strain is an important micro-level factor to consider in relation to service outcomes for caregiver-mediated child EBIs, as these interventions explicitly target the development of caregiver skills and require high levels of caregiver involvement. Although several studies have found parent training interventions to be associated with a reduction in caregiver strain for caregivers of children with and without ASD (e.g. Iadarola et al., 2018), fewer studies have examined the associations of baseline caregiver strain on treatment outcomes. Those that have suggest a negative association of high levels of caregiver strain on community treatment outcomes for caregiver-mediated EBIs for children with and without ASD (Accurso et al., 2015; Osborne et al., 2007; Stadnick et al., 2015).

Macro-Level Factors

Neighborhood Sociodemographic Strain—In understanding child and caregiver outcomes in community EBI implementation, it is important to consider the broader social context in which families reside. There is ample evidence linking neighborhood sociodemographic strain (e.g., low median income, less education, high proportion of single parent households) to higher rates of mental health problems, including depression, anxiety, and overall psychological distress in adults (Hill & Maimon, 2013). For children, neighborhood-level sociodemographic strain has been associated with children's mental health, over and above individual child and family level factors (Alegría et al., 2018). Further, cumulative neighborhood sociodemographic strain (as measured by an index including single parent status, limited education, poverty, social capital, non-English speaking, immigrant population, residential instability) has been associated with developmental vulnerability for children with ASD (Siddiqua et al., 2020). There has been little research examining how neighborhood factors may be associated with clinical presentations and outcomes in children's mental health services. One study of children presenting for treatment for internalizing disorders at two university clinics found that neighborhood disadvantage was associated with higher child internalizing symptoms at treatment entry (Beidas et al., 2012). In contrast, a study of children presenting for trauma treatment in community services did not find a significant association between neighborhood disadvantage and baseline trauma symptoms (Last et al., 2020). There is a need to further parse apart the associations between neighborhood factors, child and family functioning, and treatment outcomes over time.

An Individualized Mental Health Intervention for ASD (AIM HI)

An effectiveness trial testing the effects of training therapists in an intervention for ASD within the context of publicly-funded mental health services provides an opportunity to examine the associations of multi-level (individual family and neighborhood) factors and child and caregiver outcomes when EBIs are implemented in community services. *An Individualized Mental Health Intervention for ASD* (AIM HI; Brookman-Frazee & Drahota, 2010) is a caregiver and child skill-building intervention and therapist training model for children 5 to 13 years old with ASD receiving mental health services. In AIM HI, child and

caregiver skills are taught to address a broad range of behaviors which interfere with the child's functioning in specific environments (e.g., daily routines, social interactions). These behaviors include physical or verbal aggression, not responding to adult instructions or social interactions, self-injury, tantrums/meltdowns, and elopement. The AIM HI protocol is comprised of well-established behavioral intervention strategies, including identify patterns of the target behavior and actively teaching (through modeling, behavioral rehearsal, and in-home practice) positive alternative skills for children and complementary strategies for caregiver to structure the environment to reduce the likelihood of the behaviors, as well as promote the child's use of alternative skills (e.g. communication skills, emotion regulation, self-help skills; Brookman-Frazee et al., 2019).

Community stakeholders were involved in all aspects of AIM HI development and research. For example, AIM HI was developed in response to requests from community therapists, agency leaders, and caregivers for training in adapting psychotherapy for children with ASD (Brookman-Frazee et al., 2012). Leaders, therapists, and caregivers actively collaborated to integrate data on the training needs of therapists, clinical needs of children with ASD, and evidence-based strategies to address these needs to develop a protocol that "fit" within mental health services. Caregivers, therapists, and children contributed to the development of training materials and video exemplars in both English and Spanish. All Spanish materials were reviewed by multiple native speakers.

The targeted age range for AIM HI (5–13 years) covers the ages when many children present to community mental health clinics for services. The clinical intervention includes a package of caregiver-mediated and child-focused EBI strategies to develop individualized caregiver and child skills. Child skills may include emotion regulation, communication, and social interaction skills. The caregiver component of the protocol involves teaching caregivers to identify patterns in their child's environments that may elicit interfering behaviors and teaching them strategies to modify the environment and promote the child's use of skills. The length of AIM HI delivery is tailored to the individual client and can take up to 6 months to complete the protocol. AIM HI also includes a structured therapist training protocol (workshop, 11 structured didactic consultations, fidelity monitoring and performance feedback) designed to guide therapists through the delivery of AIM HI with a client (see Brookman-Frazee et al., 2019)

In a recent cluster randomized community effectiveness trial testing the effectiveness of AIM HI training in 29 publicly-funded outpatient and school-based mental health programs, children whose therapists received AIM HI training showed significantly greater improvements in behaviors over 18 months and increases in caregiver sense of competence after 6 months relative to usual care (Brookman-Frazee et al., 2019, 2021). Child characteristics (age, sex, race/ethnicity, IQ, and ASD symptoms) did not significantly moderate child outcome trajectories. Increases in caregiver sense of competence mediated the training effects on child outcomes over 18 months (Brookman-Frazee et al., 2021). Although there were positive effects of AIM HI training on child and caregiver outcomes, there was variability in these outcomes. Understanding micro- and macro-level factors associated with AIM HI family outcomes has the potential to provide direction for further intervention and training protocol refinements.

Current Study

The current study involved secondary data analyses of outcomes for the subset of families whose therapists received AIM HI training. The first aim is to examine the associations between individual family- and neighborhood-level factors (i.e., family and neighborhood sociodemographic strain, caregiver strain) and child interfering behaviors and caregiver sense of competence at the outset of therapist AIM HI training. It is hypothesized that greater sociodemographic strain and higher caregiver strain will be associated with more intensive child interfering behaviors and lower caregiver sense of competence at baseline. The second aim of the study is to examine the associations between these family- and neighborhood-level factors and child and caregiver outcome trajectories from baseline to 18-months. We hypothesize that greater family and neighborhood sociodemographic strain and higher caregiver strain will be associated with relatively less improvements in child and caregiver outcomes.

Methods

Procedure

The current study involves secondary data analyses from a subset of participants within a large-scale community effectiveness trial of AIM HI (*An Individualized Mental Health Intervention for ASD*). The community effectiveness trial was conducted in 29 publicly-funded outpatient and school-based mental health programs in Southern California between 2012 and 2015. Mental health programs were randomized to immediate AIM HI therapist training or a usual care/waitlist control condition; therapist and family “dyads” were then recruited and enrolled from randomized participating programs. Demographic data were collected from caregivers at the time of study enrollment. Outcome data were collected from caregivers at baseline and 6-, 12-, and 18-months post baseline using standardized measures. All study procedures were reviewed and approved by the University of California San Diego regulatory board. Study procedures were verbally reviewed by research staff prior to obtaining written consent from all therapist and caregiver participants. See Brookman-Frazee et al. (2019, 2021) for additional trial information and CONSORT. For the current study, data were extracted for the subset of family participants ($N = 144$) in the AIM HI training condition of the parent trial.

Participants

In the parent trial, mental health programs were enrolled and randomized. Therapists were recruited from enrolled programs, and children were recruited from the caseloads of participating therapists. Therapists were eligible if they (1) were a trainee or staff providing psychotherapy services in an enrolled program, (2) anticipated working in the program for at least the next 7 months, and (3) had at least one eligible child on their current caseload. Families were eligible for the trial if the: 1) child age was 5 to 13 years during study enrollment, 2) the child’s caregiver spoke English or Spanish as their primary language, 3) child had an existing ASD diagnosis on record, and/or the child exhibited clinically significant ASD symptoms on a standardized ASD measure collected by research team (the Autism Diagnostic Observation Schedule, second edition (ADOS-2), or the Social

Responsiveness Scale, second edition (SRS-2). In the parent trial, 20.3% of submitted sessions from therapists in the AIM HI training condition were partially or fully conducted in Spanish; 5% included the use of an interpreter. Spanish proficiency was not assessed.

A total of 150 families were enrolled in the AIM HI training condition of the trial (see Brookman-Frazee et al., 2019 for the CONSORT diagram). Of these participants, data on 144 were extracted for the current analyses. Six families were excluded from the current analyses due to missing data at baseline. In the current sample, the mean age of the child participants was 9.0 years ($SD = 2.5$) and 121 (84%) were male, and 58.3 % were Latinx/Hispanic. Caregivers were primarily female (91.7%), 51.4% were Latinx/Hispanic, and approximately 28% indicated that Spanish was their preferred language. See Table 1 for additional demographic information.

Adverse Event Monitoring

During the course of the project, there was continuous monitoring for cases of clinical deterioration and other adverse events. Three adverse events occurred according to the study's data safety and monitoring plan. Two cases of clinical deterioration (defined as worsening of symptoms by more than 1 standard deviation on the ECBI) occurred. Additionally, one case of disclosure of confidential information (study participation) occurred due to mandated child abuse reporting requirements. These cases were determined to be not related to study participation by the study's Data Safety and Monitoring Board. None of these events resulted in participant withdrawal from the study.

Measures

Outcome: Child Challenging Behaviors—The Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999) is a caregiver-report measure designed to assess common behaviors in children aged 2–16 years, as well as the extent to which caregivers perceive the behaviors as concerning. The ECBI includes 36 items (e.g. “Yells or screams”, “Interrupts”, “Is easily distracted”), rated on a dichotomous Problem scale and a 7-point Likert Intensity scale. Higher scores indicate more frequent (Intensity scale) or more concerning (Problem scale) behaviors. The ECBI demonstrates strong psychometric properties, including test-retest reliability ($r = .80$) and convergent and divergent validity (Eyberg & Pincus, 1999; Funderburk et al., 2003). The ECBI also demonstrates strong internal consistency in assessing youth with ASD (Jeter et al., 2017), including in the current sample ($\alpha = 0.92$ for the Intensity scale).

Outcome: Caregiver Sense of Competence—Caregiver sense of competence was assessed using caregiver self-report on the Parenting Sense of Competence scale (PSOC; Johnston & Mash, 1989) at baseline and 6, 12, and 18 months following baseline. The PSOC scale is a 17-item questionnaire using a Likert 6-point scale that measures parental competence and self-efficacy on the dimensions of Satisfaction and Efficacy. Example items include: “I honestly believe I have all the skills necessary to be a good parent to my child,” and “Being a parent is manageable, and any problems are easily solved.” The Satisfaction domain examines the parents' anxiety, motivation and frustration and the Efficacy domain measures parents' competence, capability levels, and problem-solving abilities; the items

on the scales are also combined for an overall total score. Higher scores indicate greater self-perceptions of caregiver competence. Research on the factor structure, reliability, and validity of the PSOC support its use (Karp et al., 2015), including in samples of children with ASD (Arellano et al., 2019). In the current sample, the PSOC Total score demonstrated adequate internal consistency with $\alpha = 0.61$ at baseline and α 's ranging from .60 to .65 at follow-up assessments.

Micro-Level Factor: Caregiver Strain—Caregiver strain was reported by caregivers at baseline using the Caregiver Strain Questionnaire (CGSQ; (Brannan et al., 1997a). The CGSQ is a 21-item scale that measures the impact of caring for a child with emotional and behavioral needs across six domains including economic burden, impact on family relations, disruption of family activities, psychological adjustment of family members, stigma/anger, and worry/guilt. The CGSQ consists of three subscales (Objective Strain, Subjective Internalizing Strain, Subjective Externalizing Strain) and a Global Score which represents the sum of all three subscales. Items are rated on a 5-point (1 = not at all, 5 = very much) scale; items within scales are averaged to calculate scale/subscale scores. Given the goal of the present study, the significant interrelations between subscales, and the high internal consistency and good convergent validity metrics of the Global scale in both the original validation sample (e.g., $\alpha = .93$; Brannan et al., 1997a) and samples of children with ASD ($\alpha = .94$; (Lindly et al., 2022), including the current sample ($\alpha = .93$), the Global scale was used for the present study (example items: “Interruption of personal time related to child’s emotional or behavioral problems.”; “How isolated did you feel as a result of your child’s emotional or behavioral problems?”). Intercorrelations between the three subscales and the Global Scale in the current sample ranged from $r = .72$ to $.95$.

Micro-Level Factor: Individual Family Sociodemographic Strain—Individual family sociodemographic strain was assessed as a composite score using a cumulative risk method (Brown & Ackerman, 2011). Information regarding caregiver education, marital status, income, and racial/ethnic minoritized status were obtained from demographic questionnaires completed at baseline. Each factor was given a score of zero (0) if absent and a score of one (1) if present: (a) caregiver did not complete high school, (b) caregiver is a single parent, (c) yearly household income of \leq \$35,000, and (d) caregiver self-reported as non-White race and/or Hispanic/Latinx ethnicity. These factors were summed to make a composite score that ranged from 0 to 4. See Table 1 for descriptive information.

Macro-Level Factor: Neighborhood Sociodemographic Strain—Neighborhood sociodemographic strain was calculated as a composite using a cumulative risk method (Brown & Ackerman, 2011). Family zip codes reported at baseline were matched to publicly-available census data to calculate the composite score. Data regarding neighborhood income, poverty and single parent status, and education level were drawn from the 2007–2011 five-year estimates of the U.S. Census American Community Survey (U.S. Census Bureau, 2011). Neighborhood population density was obtained from the 2010 U.S. Decennial Census of Population and Housing (U.S. Census Bureau, 2010). Each factor was given a score of zero (0) if absent and a score of one (1) if present: (a) neighborhood median income 1 standard deviation (S.D.) below the mean of neighborhoods represented in

the sample (i.e., < \$39,320); (b) proportion of population with a high school degree or more education 1 S.D. below the mean (i.e., < 75.7%), (c) proportion of single parent families in poverty 1 S.D. above the mean (> 35.8%), (d) population density 1 S.D. above the mean (i.e., > 16,042 people per square mile). These factors were summed to make a composite score that ranged from 0 to 4.

Analytic Plan—Aim 1 of the current study examined whether family and neighborhood factors were associated with child behaviors and caregiver sense of competence at baseline. First, correlations amongst family and neighborhood factors were run. Then, two-level models accounting for the nested nature of data were run with therapist-family dyads (Level 1; $n = 144$) nested within programs (Level 2; $n = 21$). Two models were run, one for each dependent variable (i.e., baseline ECBI Intensity, baseline PSOC total score). Independent variables included in both models included baseline CGSQ score, family sociodemographic strain composite score, neighborhood sociodemographic strain composite score.

Aim 2 sought to examine these family and neighborhood factors in relation to long-term trajectories of child and caregiver outcomes. Two 3-level mixed multilevel models were run, with time (Level 1: $n = 576$) nested within therapist-family dyads (Level 2: $n = 144$), nested within programs (Level 3: $n = 21$). Caregiver strain, family sociodemographic strain, and neighborhood sociodemographic strain were assessed as predictors of the linear slope in caregiver sense of competence (PSOC; model 1) and child interfering behaviors (ECBI Intensity; model 2) across baseline, 6-month, 12-month and 18-month assessments. Caregiver and child outcome data were available for 144 families at baseline (100%), 127 caregiver (88%) and 129 children (90%) at 6-months post baseline, 121 caregivers (84%) and 122 children (85%) at 12-months post baseline, and 113 caregivers (78%) and 114 children (79%) 18-months post baseline. Little's MCAR test was non-significant for caregiver data [$\chi^2(4, N = 576) = 4.09, p = 0.39$] and child data [$\chi^2(4, N = 576) = 3.44, p = 0.49$], indicating that MCAR could be inferred. Maximum likelihood robust estimate procedure was used to account for missing data (Muthén & Muthén, 2017). Across all analyses, autism symptoms (SRS-2 Total) and primary clinical service setting (i.e., outpatient, school, multiple settings) were included as covariates given their known association with outcomes in AIM HI (see Brookman-Frazee et al., 2019).

Results

Aim 1: Associations Between Family and Neighborhood Factors and Baseline Child Symptoms and Caregiver Functioning

Pearson correlations revealed that caregiver strain on the CGSQ was significantly but weakly negatively associated with the family sociodemographic strain composite ($r = -.17, p < .05$). There was no significant association between CGSQ scores and neighborhood sociodemographic strain composite scores ($r = -.10, p = .23$). Family sociodemographic strain scores and neighborhood sociodemographic strain composite scores were significantly positively correlated ($r = .21, p < .05$).

Results for Aim 1 models examining the associations between individual family and neighborhood strain composites and baseline levels of child behaviors (ECBI) and caregiver

sense of competence are reported in Table 2. Higher baseline caregiver strain (CGSQ) was significantly associated with higher baseline ECBI scores ($B = 5.17, p < .001$) and lower baseline parent sense of competence ($B = -6.59, p < .001$). The family and neighborhood sociodemographic composites were not significantly associated with baseline ECBI or caregiver sense of competence (all $p > .10$).

Aim 2: Associations Between Family and Neighborhood Strain and Child and Caregiver Outcomes

Results for Aim 2 models are reported in Table 3. Higher baseline caregiver strain on the CGSQ was associated with significantly less improvement (i.e., less decline) on the ECBI ($B = 1.50, p < .001$). In contrast, higher family sociodemographic strain was associated with significantly greater ECBI improvements (i.e., greater decline; $B = -0.58, p < .01$). Lower baseline caregiver strain ($B = -2.04, p < .001$) and lower neighborhood sociodemographic strain scores ($B = -0.58, p < .01$) were associated with greater improvements in caregiver sense of competence.

Exploratory post-hoc analyses of the individual components of the sociodemographic strain composites were conducted to assess which demographic factors drove the associations with outcome trajectories. For child outcomes, caregiver non-White race and/or Hispanic ethnicity ($B = -1.80, p < .01$) was associated with relatively greater improvements in child ECBI scores. For caregiver outcomes, neighborhood-level household composition (i.e., neighborhoods with lower proportion of single parent households in poverty; $B = -2.24, p < .05$) as well as education level (i.e., neighborhoods with a higher proportion of high school graduates; $B = -2.25, p < .05$) were associated with relatively greater improvements in caregiver sense of competence. Other factors assessed within the family and neighborhood composites were not associated with child and caregiver outcomes trajectories, respectively.

Discussion

The current study assessed the associations between individual family- and neighborhood-level factors and the initial clinical presentation and outcome trajectories of families receiving an EBI for ASD in publicly-funded mental health services. Prior studies have shown that therapist training in AIM HI is associated with overall improvements in child behavior and caregiver sense of competence relative to usual care (Brookman-Frazee et al., 2019, 2021). Examination of the descriptives of the primary outcome, child interfering behavior, revealed not only significant change in mean intensity from pre-treatment to follow-up, but also that the average child interfering behavior score fell from the borderline clinically significant range pre-treatment (T -score: $M = 63$) to within an average range at follow-up (T -score: $M = 59$). Changes in T -score ratings into the average range are often used to monitor treatment success and to determine when treatment can be terminated. However, the current study revealed that greater baseline caregiver strain was associated with lower child and caregiver functioning at baseline as well as relatively less improvements in child and caregiver outcomes over 18 months. Moreover, individual family sociodemographic strain was associated with greater improvements in child outcomes, while neighborhood sociodemographic strain was associated with less improvements in caregiver

outcomes. Thus, the present findings suggest that families differentially benefit from this community-delivered EBI depending on their levels of caregiver strain and family- and neighborhood-level sociodemographic strain at EBI onset.

Factors Associated with Baseline Child Symptoms and Caregiver Functioning

That caregiver strain was significantly associated with initial child and caregiver functioning is perhaps unsurprising, given the mounting literature that high levels of caregiver strain are linked to high levels of child interfering behaviors for both children with mental health concerns and those with ASD (Barroso et al., 2018), and that without formal intervention, these factors will transact to mutually increase across time (Rodriguez et al., 2019). Theories regarding the influence of child behaviors on caregiver strain and vice versa emphasize the role of caregiver appraisals of child behavior (Morgan et al., 2002), which in turn may influence a caregiver's perceptions of their own caregiving competence.

Two micro-level factors were included in the current study: 1) caregiver *subjective experiences* of strain specifically related to parenting a child with emotional or behavioral needs (i.e., caregiver strain), and 2) objective, broader family sociodemographic strain (e.g., low income, education level). For families receiving publicly-funded mental health services, findings of the current study suggest that caregiver *experiences* of strain may be more relevant to child and caregiver clinical functioning than objective, family sociodemographic strain. While sociodemographic strain such as limited education and poverty have long been understood as social determinants of mental health (Alegría et al., 2018), within the context of publicly-funded mental health services serving predominantly ethnic minority and low-resourced families, it may be that perceived strain related to caregiving is a more proximal determinant of child and family functioning. This finding coincides with recent literature supporting that subjective rather than objective caregiver strain is associated with concurrent child interfering behaviors (Bradshaw et al., 2021), and that caregivers' subjective experience of hardship explains significantly more variance in caregiver functioning relative to household income (Hurwich-Reiss et al., 2019).

Factors Associated with Child and Caregiver Outcome Trajectories

Importantly, caregiver strain on the CGSQ was also associated with long-term child and caregiver outcome trajectories in the context of therapist training in an ASD EBI. Thus, while therapist training in AIM HI is associated with positive improvements in child behaviors and caregiver functioning (Brookman-Frazee et al., 2019, 2021), higher levels of caregiver strain at baseline was associated with relatively less improvements in these outcomes. This finding is consistent with prior evidence demonstrating that high levels of caregiver strain at the outset of caregiver-focused interventions is associated with mitigated treatment outcomes for children with ASD (Osborne et al., 2007; Stadnick et al., 2015) and those without ASD (Accurso et al., 2015). In children's mental health services, caregiver emotional wellbeing has been shown to be a stronger predictor of treatment engagement than caregiver motivation (Haine-Schlagel et al., 2019). Future research is needed to assess whether the link between caregiver strain and family EBI outcomes is mediated by caregiver or family engagement. Findings suggest important future directions for refinements to the

AIM HI, including assessment of caregiver strain at EBI onset, and strategic adaptations to maximize gains for families with high levels of caregiver strain.

Contrary to hypotheses, greater family sociodemographic strain was associated with relatively *greater* improvements in child outcome trajectories. This finding is inconsistent with previous studies documenting health and health service disparities for low income and minoritized groups (Alegría et al., 2018). Posthoc analyses indicated that caregiver minoritized status drove these associations. Of note, minoritized status was only included in the family-level sociodemographic strain composite, as it was not available at the neighborhood level. Findings may be explained by the community-partnered approach to developing AIM HI, which was developed in collaboration with and for diverse families, therapists and leaders involved in publicly-funded child mental health services. Thus, the EBI materials and training protocol were specifically tailored to fit the service system, serving predominantly low income and ethnic/racial minority families. This included training materials in Spanish and English and explicit attention to teaching therapists to individualize skill-building processes based on family needs and preferences. These specifications may have leveraged family-level resilience factors in Hispanic/Latinx families (the largest racial/ethnic group in the current sample).

Finally, although neighborhood sociodemographic strain was not associated with caregiver sense of competence at baseline, it was associated with less improvement in caregiver sense of competence over time. This is an important finding, as previous research has examined associations between neighborhood factors and child functioning at the time of mental health treatment initiation (Beidas et al., 2012; Last et al., 2020) but has not explored the associations of neighborhood factors on outcome trajectories. These findings confirm the importance that broader neighborhood factors contribute to family functioning above and beyond individual caregiver factors. It is plausible that neighborhood level interventions may be potentially impactful for supporting individual families. Other research has found that macro-level factors such as neighborhoods can contribute to parent self-efficacy, which may be related to a sense of competence in caregiving (Rhoad-Drogalis et al., 2020).

Clinical Implications

Findings highlight the potential benefits of community-partnered EBI co-development, as well as the need to adapt models of evidence-based care to improve accessibility for families presenting to treatment with high levels of caregiver strain and neighborhood-level sociodemographic strain. For example, interventions aimed at reducing the stress or strain associated with caring for a child with disabilities or mental health needs have been developed and shown to be effective at improving child outcomes when delivered as standalone treatments (Neece et al., 2019) or when integrated with a parent training model (e.g. Kazdin & Whitley, 2003); though such practices have not yet been well studied in community contexts. Referrals to adjunct supports (e.g., caregiver support groups, individual mental health), as well as tailoring the delivery of EBIs to take into account the family's individual needs (e.g., slowing the pacing, refining focus to a fewer number of key caregiver skills) may also be warranted. Indeed, community therapists trained in AIM HI frequently reported adapting the EBI, in a manner consistent with the intervention

protocol, to accommodate caregiver needs and functioning (Dyson et al., 2018). Caregivers managing stressors in many domains may have less time and energy to fit in the additional demands associated with parent-mediated interventions (e.g., completing out of session practice). In turn, challenges with completing components such as at-home skill practice might contribute to a lower sense of caregiving competence. EBIs that support therapists in flexibly adapting to individual family needs are warranted to promote equitable treatment outcomes in community settings.

Limitations & Future Directions

The present study should be interpreted within the context of study limitations. First, coding of neighborhood sociodemographic strain was limited to zip code level data, though there may be important variability within zip codes. Study measures were also limited to caregiver report. While caregiver perceptions of strain and competence are meaningful and provide important information about clinical presentation and progress, future studies may build on this work through more objective and multi-method assessment. This study also used one caregiver report of strain. Future research would benefit from additional measures of this construct. Given the focus of the current EBI (building child and family skills to address specific interfering child behaviors) and the particularly high prevalence of caregiver strain in ASD, findings may not generalize to youth without ASD served in community mental health settings. While beyond the scope of the current study, future studies assessing levels of clinical improvement across varying degrees of caregiver strain will inform EBI and EBI training refinements. Future studies may also benefit from assessing how stress related to caregiving and the neighborhood context may affect treatment trajectories of other high-risk populations, such as older adolescents or those living in residential care. While a key strength of this study is the strong representation of ethnic minority (predominantly Latinx) and under-resourced families, it will be important to replicate these findings across racial/ethnic populations and geographic regions. It is also possible that selection bias resulting from therapists' self-selecting into the study to receive AIM HI training and requirements that they had a currently eligible child on their caseload at the time of enrollment could impact the generalizability of findings. Although the parent trial was powered to detect differences between usual care and AIM HI training groups on child outcomes, it is possible that null findings may reflect limited power for the current exploratory analyses of data from the AIM HI training group only. Future studies would benefit from examining similar caregiver and neighborhood-level factors on outcome trajectories with larger sample sizes. Finally, while the current study focused on family- and neighborhood-level strain, the community effectiveness literature will benefit from future research examining sources of resilience within the context of publicly-funded mental health services. In the domain of education, neighborhood-level (e.g., neighborhood safety, supportive neighbors) and family-level (e.g., non-smoking household) protective factors are linked to school engagement for children ages 6–17 years (Robles et al., 2019); similar factors may play a role in mental health service engagement and community-delivered EBI outcomes.

The present study represents an important extension of prior work demonstrating the effectiveness of training community therapists in AIM HI in child and caregiver outcome (Brookman-Fraze et al., 2019, 2021). The present study adds to the limited availability

of data regarding factors of community effectiveness of EBIs for families receiving publicly-funded mental health services. This study advances our understanding of how to improve care in diverse community service settings. Of note, the majority of caregivers and children in the study were Hispanic/Latinx and receiving publicly-funded mental health services. Findings highlight the importance of assessing caregiver strain in the context of community delivered and caregiver-mediated EBI, as well as providing therapists with supports to systematically adapt EBIs to maximize the benefit of services for families with high caregiver strain or neighborhood-level sociodemographic burden. Future research testing the mechanisms through which caregiver strain and neighborhood sociodemographic factors may be associated with outcomes will be important in informing these strategic adaptations to community implemented EBI for ASD.

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Data availability.

Deidentified participant data from the larger community effectiveness trial have been shared within [ClinicalTrials.gov](https://clinicaltrials.gov), a data repository for clinical trials, and are available to researchers whose proposed use of the data has been approved (available beginning 02-28-2019). Data and associated documentation will only be available to users under a data-sharing agreement.

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Table 1

Characteristics of Participating Children and Families and their Neighborhoods (N = 144)

	<i>M (SD) or No. (%)</i>
Children	
Age in years <i>M(SD)</i>	9.0 (2.5)
Gender (n; % Male)	121 (84%)
Race/Ethnicity	
Hispanic/Latinx	84 (58.3%)
White, Non-Hispanic	40 (27.8%)
Asian American/Pacific Islander	8 (5.6%)
Multiracial	7 (4.9%)
African American	5 (3.5%)
ASD Severity (SRS-2 T-Score at Baseline)	79.0 (11.4)
Child Behavior Problems (ECBI Intensity T-Score at Baseline)	62.3 (10.3)
Caregiver/Family	
Age in years <i>M(SD)</i>	40.4 (8.6)
Gender (n; % Female)	132 (91.7%)
Race/Ethnicity	
Hispanic/Latinx	74 (51.4%)
White, Non-Hispanic	51 (35.4%)
Asian American/Pacific Islander	10 (6.9%)
African American	5 (3.5%)
Multiracial	3 (2.1%)
American Indian/Alaskan Native	1 (0.7%)
Caregiver Sense of Competence (PSOC Total Score at Baseline)	71.4 (10.6)
Caregiver Strain (CGSQ Total Score at Baseline)	2.7 (0.8)
Family Sociodemographic Strain Composite (Range: 0 to 4; <i>M, SD</i>)	1.8 (1.3)
Household Income (\leq \$35,000)	82 (56.9%)
Education Level (Did Not Complete High School)	30 (20.8%)
Single Parent Status	48 (33.3%)
Racial/Ethnic Minoritized Status	93 (64.6%)
Neighborhood	
Neighborhood Sociodemographic Strain (Range: 0–5; <i>M, SD</i>)	0.9 (1.5)
Population Density (>16,398 residents per sq. mile)	11 (7.6%)
Median Household Income (<\$39,569)	24 (16.7%)
Education Level (< 65.7% High School graduates)	27 (18.8%)
Single Parent household in Poverty (>35.4% of households)	21 (14.6%)

Note. Neighborhood factors contributing to the Neighborhood Sociodemographic Strain composite were calculated by assessing a cutoff one S.D. above or below the mean (depending on the direction that indicated greater risk) across all zip codes represented within the sample. SRS-2: Social Responsiveness Scale, 2nd Edition. ECBI: Eyberg Child Behavior Inventory. PSOC: Parent Sense of Competence scale. CGSQ: Caregiver Strain Questionnaire. Total scores on the PSOC range from 17 to 102, with higher scores indicating higher competence. Total scores for the CGSQ range from 1 to 5, with higher scores indicated higher strain.

Table 2

Associations between Caregiver and Neighborhood Factors and Baseline Child and Caregiver Functioning

	Child Interfering Behaviors (EBCI Intensity)			Caregiver Sense of Competence (PSOC)		
	<i>B</i>	<i>SE</i>	95% <i>CI</i>	<i>B</i>	<i>SE</i>	95% <i>CI</i>
Caregiver Strain ^a	5.17***	0.73	3.75, 6.60	-6.59***	1.28	-9.09, -4.48
Family Sociodemographic Strain	-0.51	0.55	-1.59, 0.56	-0.002	0.50	-0.98, 0.82
Neighborhood Sociodemographic Strain	-0.46	0.52	-1.48, 0.55	-0.33	0.56	-1.44, 0.60

Note. ECBI: Eyberg Child Behavior Inventory. Positive coefficients for the ECBI Intensity scale indicate associations with higher levels of baseline child behavior problems. PSOC: Parent Sense of Competence scale. Negative coefficients on the PSOC indicate associations with lower levels of baseline caregiver sense of competence. *B* = unstandardized coefficients. *SE* = standard error. *CI* = confidence interval. Covaries in the model include child ASD severity (Social Responsiveness Scales, 2nd Edition [SRS-2] Total Score) and service settings (clinic, school, multiple).

^a Caregiver strain assessed via the Caregiver Strain Questionnaire (CGSQ), Total Score.

+ p<.10,

* p<.05,

** p<.01,

*** p<.001

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Table 3

Caregiver and Neighborhood Factors as Predictors of Child and Caregiver Outcome Trajectories Over 18 months

	Change in Child Interfering Behaviors (ECBI Intensity) (Baseline to 18-month follow-up)			Change in Caregiver Sense of Competence (PSOC) (Baseline to 18-month follow-up)		
	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>B</i>	<i>SE</i>	<i>95% CI</i>
Caregiver Strain ^a	1.50 ^{***}	0.34	0.84, 2.17	-2.04 ^{***}	0.51	-3.04, -1.04
Family Sociodemographic Strain	-0.58 ^{**}	.22	-1.01, -0.14	0.14	0.26	-0.36, 0.64
Neighborhood Sociodemographic Strain	-0.14	0.29	-0.70, 0.42	-0.53 ^{**}	0.19	-0.90, -0.17

Note. ECBI: Eyberg Child Behavior Inventory. Positive coefficients for the ECBI analyses indicate relatively less improvement in this child outcome. PSOC: Parent Sense of Competence scale. Negative coefficients on the PSOC analyses indicate relatively less improvement in this caregiver outcome. *B* = unstandardized coefficients. *SE* = standard error. *CI* = confidence interval. Covaries in the model include child ASD severity (Social Responsiveness Scales, 2nd Edition [SRS-2] Total Score) and service settings (clinic, school, multiple).

^aCaregiver strain assessed via the Caregiver Strain Questionnaire (CGSQ), Total Score.

⁺ p<.10,

^{*} p<.05,

^{**} p<.01,

^{***} p<.001