

## RESEARCH ARTICLE

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### Screening for Adverse Childhood Experiences (ACEs) before age 3: Evidence for the Family Map Inventory

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This study examined a web-based assessment of adverse childhood experiences (eFMI-ACE) of children birth to 3 years-of-age using the Family Map Inventory (FMI-ACE) conducted by early childhood education (ECE) program staff. The paper version of FMI-ACE (pFMI-ACE) is a validated tool to screen ACEs among children birth to 5 years-of-age enrolled in home visiting programs. In this study, parents of children (N=1,591) enrolled in Early Head Start (EHS) between August 2018 and July 2020 were interviewed using the electronically formatted Family Map Inventory (FMI). The EHS providers interviewed parents through the FMI online system as part of their program family assessments. Analyses mirrored the pFMI-ACE validation study to confirm the fidelity of electric assessment of the FMI-ACE (eFMI-ACE). Further analyses examined the change in the eFMI-ACE responses in programs that interviewed families twice during EHS program participation. The eFMI-ACE score, like the validation study, was negatively associated with parental warmth and had a similar distribution. After a minimum 90 days of EHS services (M = 186, SD = 60; range 91-448), eFMI-ACE scores were statistically significantly reduced. The family-friendly screen for risk of ACEs functions similarly in electronic and paper administration and for children birth to 3 years-of-age. It showed small but statistically significant reductions after EHS services.

*Keywords:* adverse childhood experiences (ACEs), early childhood education, screening

## INTRODUCTION

Engaging and supporting parents as key nurturers of children is a hallmark objective of Early Head Start (EHS) and other high quality childhood education programs (U.S. Department of Health and Human Services, 2018, 2022). In particular, two-generation programs like EHS are tasked with supporting children's optimal development directly, through educational programming, and indirectly, through collaboration with parents (or other caregivers). EHS programs are mandated to support parents in efforts to reduce child risks of poor development through partnership with parent in the use of educational services, supportive interventions, and referrals to community services. To be successful in this goal, educators require supportive training on developing partnerships with families and tools to systematically and accurately assess the environment while building a productive, goal directed relationship with the parent (U.S. Department of Health and Human Services, 2018, 2022).

Our growing understanding of the widespread negative impacts of adverse childhood experiences (ACEs) on children's development highlights the import of interventions that support the parenting environment (Centers for Disease Control and Prevention, 2019; Shonkoff et al., 2012). An array of studies has demonstrated that early experiences are consistently associated with adult emotional, social and health outcomes. These range from concurrent disruptions in development in early childhood to early adolescent behavior concerns to serious illness in adulthood such as cancer, diseases of the heart, lungs, and liver (American Academy of Pediatrics, 2014; Chanlongbutra, Singh, & Mueller, 2018; Gilgoff, Singh, Koita, Gentile, & Marques, 2020; Hunt, Slack, & Berger; Jimenez et al., 2017; McKelvey et al., 2015; McKelvey, Edge, Mesman, Whiteside-Mansell, & Bradley, 2018; McKelvey, Edge, Fitzgerald, Kraleti, & Whiteside-Mansell, 2017; McKelvey, Whiteside-Mansell, McKelvey, Saccente, & Selig, 2019).

Even though these studies underscore the need for screening and provisions for early intervention, there is a lack of consensus on the best method for concurrent screening during childhood. In particular in the context of building a collaborative partnership with parents, the choice of a screening tool is difficult. Specific indicators of ACEs vary but are generally reports of traumatic events experienced in childhood, including direct experiences of maltreatment, for example, physical, sexual, or emotional abuse/neglect. Indicators also includes parent/family characteristics associated with less optimal parenting such as incarceration of a family member, domestic violence, mental illness (Shonkoff et al., 2012). The 1998 seminal study of adults reporting retrospectively identified 10 key indicators of ACEs (Felitti et al., 1998). In this seminal work, the assessment of ACEs was a self-report assessment from adults reflecting on their childhood before age 18 (Stevens, 2012). Studies of the exposure to individual adverse experiences as well as the cumulative effect of the number of experiences (i.e. sum of indicators) has consistently indicated increased risk of poor outcomes as the number of adverse experienced increases (Anda et al., 2006; Brown et al., 2009). The tool used in the Felitti et al study (Kaiser-ACEs), is direct in the presentation of items used to assess abuse and neglect and has been excluded in some cases from research studies for that reason (Health Resources and Services Administration, 2015).

The selection of a screening tool should depend on the expected use of the information (Bethell et al., 2017). Most are reworded versions of the Kaiser-ACE tool (Burke, Hellman, Scott, Weems, & Carrion, 2011) or leave out the potential offensive constructs of neglect or abuse (Bethell,

Newacheck, Hawes, & Halfon, 2014). The California Department of Health Care Services (DHCS) has adopted a screening tool for the pediatric setting. The goal of the pediatric screen is so that ‘providers can better determine the likelihood a patient is at increased health risk due to a toxic stress response’ (“Trauma Informed Care,” 2021). The DHCS uses PEARLS, the Pediatric ACEs and Related Life-events Screener (State of California Department of Health Care Services, 2022; Thakur et al., 2020; “Trauma Informed Care,” 2021). The PEARLS, like many ACE screening tools, is based on the Kaiser-ACEs tool reworded for the young child as the target of the screen. It has shown to be useful in the pediatric and research context (Bethell et al., 2017). However, when the intent is to provide support or intervention on specific parenting or home environmental risk for adverse experiences and is reported by parents in face-to-face interviews with educators in child education programs, screeners like the PEARLS and Kaiser-ACE may be inconsistent with the goals of supportive collaboration. An important challenge is that the parent will most often be the key informant and is likely reluctant to admit the existence of illegal or stigmatized behavior, such as child maltreatment, and drug use or abuse (McKelvey, Selig, & Whiteside-Mansell, 2017). Further, affirmative responses to questions about these exposures may require child welfare reporting. Finally, the direct questions used for adults may disrupt rapport building with the child’s caregiver, making the link to resources or intervention difficult.

The FMI system takes a different approach. The FMI-ACEs are proxies for the constructs identified (Kaiser-ACE) in adult retrospective reporting (Anda et al., 2006; McKelvey, Conners Edge, et al., 2017; McKelvey et al., 2016) but appropriate for preschool children. For example, the FMI asks if the parent spansks with objects, rather than asking about confirmed physical abuse. The FMI is family-friendly and was developed in collaboration with EHS parents, educators and administrators to strengthen parent-provider relationships (Whiteside-Mansell, et al., 2013; Whiteside-Mansell, et al., 2007). The FMI implementation includes training in the use of the tool to enhance the parent-educator partnership. ACEs assessed using the Family Map Inventory (FMI-ACE) have been shown to be associated with concurrent parenting attitudes and behavior (McKelvey, Whiteside-Mansell, Conners-Burrow, Swindle, & Fitzgerald, 2016) and early physical and behavioral health indicators (McKelvey, Conners Edge, Fitzgerald, Kraleti, & Whiteside-Mansell, 2017). Like the Kaiser-ACE, these validation studies indicate that reduction in the number of FMI-ACEs is associated with less developmental concerns for children. However, previous validation studies were conducted based on data from home visitor interviews with families and used a paper and pencil version of the tool.

Since the examination by McKelvey and colleagues (McKelvey, Conners Edge, et al., 2017; McKelvey et al., 2016), the FMI transitioned from a paper to an online educator-parent interview portal (eFMI). Like other electronic systems, eFMI allows for easy access to information for educators, detailed reports of the interview that guide the EHS staff toward productive intervention efforts, document progress toward family goals, and make administrative supervision easier. On the other hand, similar to the concern for disruption of communication between medical provider and patient with the introduction of the use of electronic medical records (EMR), there is a concern that the transition to an electronic system will disrupt the parent-educator partnership (Alcocer Alkureishi et al., 2016).

The advantage of addressing potential ACEs as early as possible is obvious in the protection to children. Further, addressing exposure to ACEs is in line with EHS goals. For example, EHS

programs have goals related to supporting parents with depressive symptoms to receive treatment. In addition, while treatment is sought, EHS programs support parents during depressive episodes to protect children from the inconsistent parenting typically seen during depression. With these services focused on environmental conditions, children should see a reduction in the number of exposures.

We had two goals in this study. First, we aimed to validate the FMI-ACE captured through the electric system (eFMI-ACE) in the EHS context. To achieve this goal, we analyzed the association between eFMI-ACE and parental warmth, mirroring the validation study of the original paper version FMI-ACE (pFMI-ACE) used in home visiting programs (McKelvey, Connors Edge, et al., 2017; McKelvey et al., 2016). Preliminary support for the validity for the electronic version has been conducted in older preschool children. In a study of families with children 3 to 5 years of age, the number of ACEs recorded through eFMI-ACE showed a distribution similar to those recorded through Kaiser-ACE (Whiteside-Mansell et al., 2019).

Our second goal was to produce evidence that EHS programs are using the FMI effectively as an intervention tool. The FMI is designed so that educators using the FMI electronic system correctly will focus on support to families related to the constructs including in the FMI-ACE and reduce the number of exposures for children. We examined the change in the number of ACEs reported by families whose children are enrolled in EHS programs recorded through eFMI-ACE. We hypothesize that on average, EHS enrolled children whose educators use eFMI-ACE experienced a reduction in the number of ACEs.

## METHODS

This study examined data extracted from the web-based eFMI assessment system for nine agencies funded to provide EHS services. Baseline records were included from agencies in seven states ( $N = 1,591$ ): AR ( $n = 365$ ), AZ ( $n = 549$ ), DE ( $n = 221$ ), KY ( $n = 34$ ), MD ( $n = 35$ ), NJ ( $n = 112$ ), and TX ( $n = 275$ ); each contributing one interview per child between August 2018 and July 2020. For longitudinal analyses, a subset of three programs ( $N = 301$ , AR, AZ, and DE) contributed a second interview. Interviews were conducted by EHS providers. The study was approved by the University of Arkansas for Medical Science Human Subjects office.

A description of the participants is shown in Table 1. Children ranged in age from birth to 34 months ( $M = 16.3$ ,  $SD = 8.4$  months), 48% were male, and 65% were non-Hispanic White. Most caregivers had at least a GED (72%). The days between interviews were restricted to assure that at least 3 months had passed (Range 91-448 days,  $M = 186$  days,  $SD = 60$  days).

Table 1

## Description and Comparison of Participants by Analysis

Characteristics	All Baseline N = 1,591	FMI-ACE and Warmth scores <sup>a</sup> N = 740	Paired Interview <sup>b</sup> N = 301	
			Interview 1	Interview 2
Child Demographics				
Male	47.6%	47.9%	47.5%	
Child Age in Month Mean (SD) <sup>a,b</sup>	21.41 (10.51)	19.88 (10.39)	16.40 (8.34)	22.12 (8.35)
Race <sup>a,b</sup>				
White	48.59%	47.97%	44.85%	
American Indian	1.26%	1.08%	1.99%	
Asian	0.75%	0.41%	0.33%	
Black	26.59%	23.51%	26.91%	
Native Hawaiian/Pacific	0.38%	0.27%	0.33%	
Other/Multiple	12.32%	15.67%	16.61%	
Hispanic <sup>a,b</sup>	49.10%	45.00%	55.15%	
Caregiver Demographics				
Biological Mother <sup>b</sup>	92.14%	92.84%	94.68%	
Caregiver age in years Mean (SD)	30.33 (7.78)	29.07 (6.30)	29.19 (6.26)	30.12 (6.10)
Education Status <sup>b</sup>				
No High School Degree	17.54%	18.78%	27.58%	24.59%
GED	5.15%	6.22%	3.99%	4.98%
High School Degree	33.75%	31.35%	28.24%	28.57%
Votech, License	10.94%	11.89%	10.96%	12.29%
Some College	21.25%	20.68%	18.94%	16.61%
College Degree	9.93%	9.87%	9.64%	10.96%
Employment <sup>a,b</sup>				
Unemployed	36.20%	43.92%	46.84%	40.53%
Part-Time (<30 hrs)	21.81%	20.17%	18.27%	20.92%
Full-Time (>30 hrs)	39.93%	34.47%	33.55%	37.21%
Home Characteristics				
Number of Children Mean (SD) <sup>a</sup>	1.69 (1.39)	1.74 (1.39)	1.74 (1.43)	1.72 (1.38)
Number of Adults Mean (SD) <sup>a</sup>	1.04 (0.98)	1.10 (1.03)	0.96 (0.87)	0.88 (0.84)
Partner in the Home <sup>a,b</sup>	27.20%	53.92%	54.49%	52.49%

Note: 43 were missing sufficient information to compute baseline ACE score, 825 were missing ACE or parental warmth score at baseline

<sup>a</sup> Significant ( $p < 0.05$ )  $\chi^2$  or mean (t-test) difference in the values between those who are not missing ACE Scores and Parental Warmth at baseline and those who are missing either of them or both.

<sup>b</sup> Significant ( $p < 0.05$ )  $\chi^2$  or mean (t-test) difference in the values between those at baseline and those in the paired interview analysis.

## Measures

The Family Map Inventory (FMI) screen for risks in the home and parenting environment for children from prenatal to age 5 (Whiteside-Mansell, et al., 2013; Whiteside-Mansell et al., 2007). The FMI is a research-based system that includes a structured and semi-structured interview, coded observations, and individualized reports of family needs and strengths. Items used to assess ACEs (FMI-ACE) are described in detail elsewhere (McKelvey, Conners Edge, et al., 2017; McKelvey et al., 2016). Scores for items are yes (1) or no (0) indicating that the item was reported as an event in the family or child's life.

ACE sum scores (e.g. eFMI-ACE score, pFMI-ACE score, Kaiser-ACE score) were created as the number of ACEs identified through assessment of the specified method per participant. ACE sum scores range from 0 to 10.

Parental warmth was assessed based on items from the PICCOLO - Parenting Interactions with Children: Checklist of Observations Linked to Outcomes (Roggman, Cook, Innocenti, Norman, & Christiansen, 2009). Eight items from the PICCOLO are embedded in the FMI. The observational tool was designed to measure affectionate touching, smiling, praising, and positive regard (e.g., Touches child affectionately) on a 3-point scale (Did not happen (0) to Happen a lot (2)). The 8 items had good reliability with  $\alpha = .90$  and test-retest reliability was 80% (Whiteside-Mansell et al., 2007).

Parental warmth score is defined as the number of "at-risk" items (Range: 0-8). Additionally, a dichotomous variable indicating "emotional neglect risk" (yes/no), was defined as scoring "at-risk" on 5 of the 8 parental warmth items.

## Statistical Analyses

To confirm the similar functioning of eFMI-ACE to the pFMI-ACE, the distribution of the eFMI-ACE and pFMI-ACE scores were compared. Kaiser-ACE score was also included in the comparison as a point of reference. Furthermore, the association between the eFMI-ACE and parental warmth was assessed by testing the correlation between eFMI-ACE score and parental warmth score. Multivariate analyses controlled for child gender, child age, child race/ethnicity, and caregiver education.

To achieve our second goal and validate eFMI-ACE as an effective tool to be incorporated in an intervention to reduce the risk of ACEs, we examined the change in eFMI-ACE between the first and second interview. The sample for this analysis was limited to those whose second interview record was available. In accordance with our hypothesis, to evaluate the reduction in eFMI-ACE score over time, one-sided paired t-test was used ( $\alpha=0.05$ ).

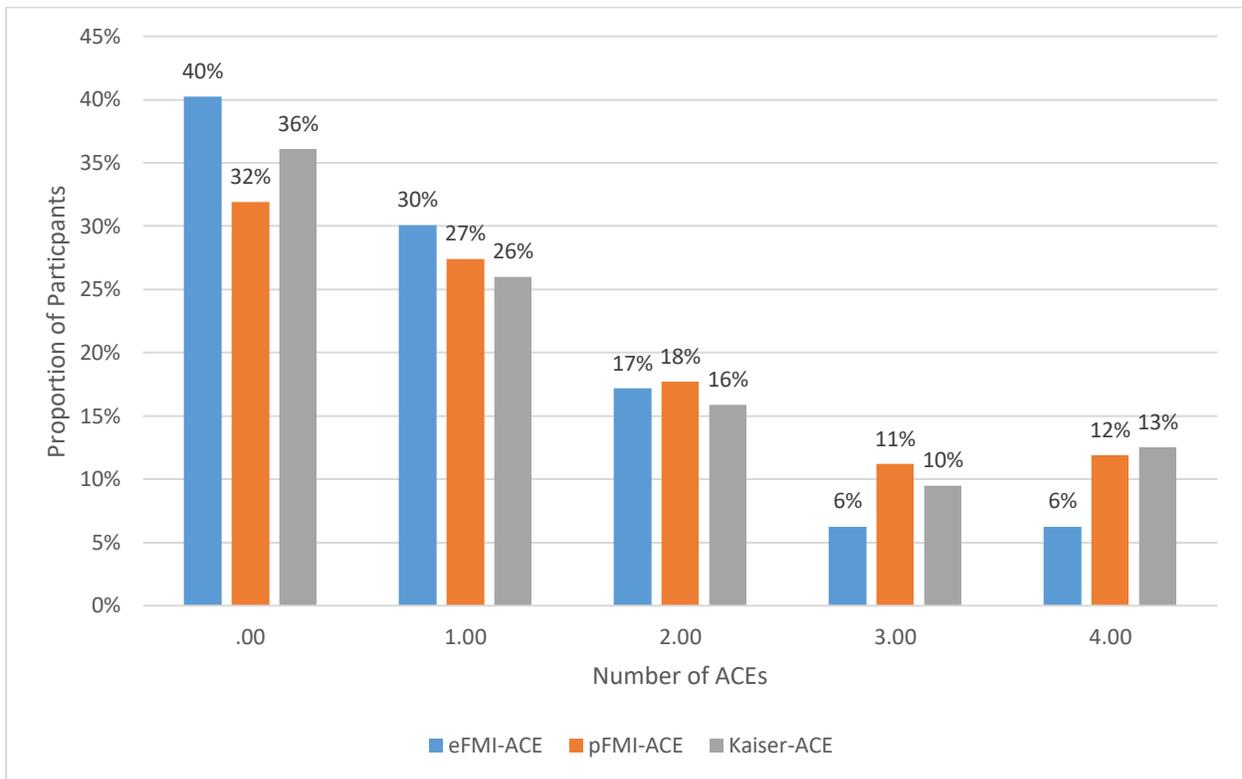
## RESULTS

As seen in Table 1, of 1,591 assessments, 1,548 had sufficient data to compute FMI-ACE scores. Parental warmth was observed in 46.5% of assessments (i.e., required child present). Compared to

the full sample, the analytic subset with parental warmth data (n = 740) and paired follow-up data (n = 301) was demographically different; therefore, multivariate analyses included appropriate controls. As seen in Figure 1, only 40% of children attending EHS (eFMI-ACE) experienced no potential adverse experiences. Children participating in home visiting programs who are on average one year older (33 months compared to 21 month) were slightly more likely to experience at least one ACE compared to the younger children attending EHS. Finally, only 36% of adults who participated in the direct retrospective assessment reported no adverse experience as children.

FIGURE 1

Comparison of Percent of Participants by Number of Family Map Inventory-ACE Scores by Study



*Abbreviation:* eFMI-ACE = Electric Family Map Inventory-ACE; pFMI-ACE = Paper Family Map Inventory-ACE; Kaiser-ACE= Kaiser-ACE.

*Note:* The bar chart compares the distribution of eFMI-ACE score, pFMI-ACE score, and Kaiser-ACE score. Each bar represents the percent of study population for each study. eFMI-ACE assessed a sample of children 21 months of age on average (n = 1,548) and pFMI assessed a sample of children 33 months of age on average (n = 1,282). Kaiser-ACE retrospectively assessed adults.

A significant negative correlation  $r = -0.20$  ( $p < .001$ ) between eFMI-ACE and Parental Warmth was found. Similar to McKelvey et al, a mixed-effect logistic regression, predicting emotional neglect risk (yes/no), demonstrated that with each additional eFMI-ACE score, the probability of

having emotional neglect risk increased (McKelvey, Conners Edge, et al., 2017; McKelvey et al., 2016). For example, children in the highest eFMI-ACE score group (4+ ACEs) were had 16 times higher adjusted odds to experience emotional neglect (adjusted odds ratio [aOR]=16.55, 95% Confidence Interval [CI]=3.18, 86.13) than those with no eFMI-ACE exposure.

Second, to examine the change in eFMI-ACE scores over time, a paired one-sided t-test found a significant reduction of 0.11 (95% CI=0.002, >999) with  $t(300) = 1.68$  ( $p = 0.047$ ) between Time 1 ( $M = 1.12$ ,  $SD = 1.39$ ) and Time 2 ( $M = 1.00$ ,  $SD = 1.34$ ). This finding was also confirmed using non-normal test ( $Z = -1.713$ ,  $p = 0.04$ ) with a relatively small effect size for the one-tailed test,  $r = 0.10$ .

## DISCUSSION

For early childhood professionals, access to a family-friendly tool that supports the parent-educator partnership and provides an assessment of the child's current exposure to adverse events is ideal. Use of the FMI meets an array of program goals and ultimately supports two-generation services. The tool permits targeted individualization of services; providing opportunities to support the optimal parenting environment through education and resource referral and supportive services for children identified most at risk for poor developmental outcomes.

Based on the results of this study, the FMI in its electronic format used with parents/caregivers of children from birth to 3 years of age, functions similarly to the paper version. The rates of ACEs indicators were relatively consistent with what was demonstrated in earlier studies with slightly older age children using paper forms but with differences as expected. That is, the younger EHS children with less time to experiences adversity had fewer reported experiences than the preschoolers over 3 years. Similar associations with validation constructs were also demonstrated and the eFMI-ACE, like the pFMI-ACE, was associated with observed parenting behaviors.

We also found support for the change over time of the FMI-ACE score in the context of EHS programs. Previous work has demonstrated that children in families with the highest levels of FMI-ACEs were more likely to screen at risk for developmental delays, globally and specific to social-emotional development (McKelvey, Conners Edge, et al., 2017; McKelvey et al., 2016). While the change in ACEs across time in this sample was small, findings from a study of ACEs in another EHS sample indicate some evidence that reductions in ACEs experienced during infancy into toddlerhood does permit some developmental rebound, particularly in the cognitive and language domains (McKelvey, Selig, et al., 2017).

An important limitation in this study is the lack of a comparison group. Without a comparison group, one cannot determine whether the reduction of scores would have happened outside the context of the EHS program nor the use of the FMI. While the use of the FMI broadly supports programming which could lead to improvements of the family and parenting environment, this study is limited in that EHS program services data are unavailable. Program services data would permit an examination of resources and referrals provided to families. Further, FMI follow up data were not available for families that did not remain in the program.

This study suggests that the eFMI-ACE is an effective tool to identify and document early childcare program efforts to reduce children’s exposure to adverse events. Further, it appears that the web-based data system did not disrupt the interview. The use of the system by multiple early childhood education programs across the U.S. suggests the system is both acceptable and feasible to implement. For EHS programs, the use of the electronic system has several advantages over the paper version including easy access by the EHS team to plan services, by administrators to review family progress and to provide aggregate summaries for all families in the program. Each of these benefits could be instrumental in supporting the two-generation promise of the EHS program.

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