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Working Paper 33341
<http://www.nber.org/papers/w33341>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2025

Research reported in this publication was supported by the Population Studies and Training Center at Brown University through the generosity of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (P2C HD041020). We thank seminar participants at Columbia University, the 2024 ASSA meeting, the NHH as well as and Katherine Rittenhouse and Jennifer Kaufman for extremely useful comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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Can Early Intervention Reduce Future Child Maltreatment?

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NBER Working Paper No. 33341

January 2025

JEL No. I18, I28, J12, J13, J14

ABSTRACT

Children with a disability are 3.5 times more likely to be maltreated. Federal Early Intervention (EI) serves 426,000 children 0-3 with a disability, 3.7% of the entire population under three. EI's objective is to support families in caring for their children's special needs. Compared to children evaluated but ineligible for EI, children receiving EI in the first year of life are 3.3 percentage points less likely to be maltreated later in life, a decline of 45%, with smaller effects for those receiving services later. Targeting at-risk children, intervening early, and engaging with families in a cooperative manner effectively reduces future maltreatment.

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I. Introduction

One in seven children are victims of abuse or neglect each year in the US, with 1,990 children dying from maltreatment in 2022 (USACF, 2024). Children with a disability are amongst the highest risk groups – they are three and a half times more likely to be maltreated than their non-disabled counterparts (Sullivan and Knutson, 2000; Jones et al., 2012; Putnam-Hornstein and Needell, 2011; Hill et al., 2011). Maltreatment in childhood is associated with significant negative short and long-term consequences, including worse physical and mental health, and lower employment and earnings later in life (Alink et al., 2012; Currie and Widom, 2010; Currie and Tekin, 2012; Gilbert et al., 2009; Jonson-Reid et al., 2012). Estimates of the lifetime costs of child maltreatment in the US exceed \$124 billion (Fang et al., 2012).

Evidence regarding the effectiveness of the two main policy responses to child maltreatment, Child Protective Services (CPS), an ex post response, and maltreatment prevention programs, is mixed. A large literature documents a negative correlation between foster care and child outcomes, but causal evidence is less clear.¹ Research exploiting random assignment of CPS caseworkers for identification of causal effects is mixed (Gross and Barron, 2022; Doyle, 2007). Maltreatment prevention programs target high risk mother (ie, teens, those with addiction) and generally show small to no effects on maltreatment (Piquart and Teubert, 2010; Euser et al., 2015), with some exceptions (van der Put, et al., 2018).

We study a federal program that targets children ages zero to 36 months who have a developmental disability or delay - the Early Intervention (EI) program. The objective of EI, established as Part C of the federal Individuals with Disabilities Education Act (IDEA), is not primarily to reduce maltreatment, but to promote child development by “enhancing the capacity of families to meet the special needs of their infants and toddlers.” This can include family training, counseling and home visits along with occupational, physical or speech therapy. By design, EI services are provided in the child’s natural environment whenever possible.

As of 2019, 427,234 children in the US aged 0-36 months were served by the EI program (3.7% of the entire age group), making EI the largest federal program serving infants and

¹ Correlational studies documenting a negative relationship between foster care and child outcomes include Barrat and Berliner, 2013; Berzin, 2010; Pears and Fisher, 2005; Pecora et al., 2006; Ryan and Testa, 2005; Scherr, 2007; Trout et al., 2008; Wulczyn, Smithgall and Chen, 2009; Zlotnick, Tam and Soman, 2012.

toddlers (USDOE, 2020). In comparison, the federal Early Head Start program serves less than half as many children, 188,000 in 2020. Despite the large size of the EI program, little is known about its impact on child outcomes outside of existing work documenting children's improvements along a set of developmental measures. That work is useful in establishing how children in EI progress developmentally, but includes no control or counterfactual comparison, nor does it examine impacts past kindergarten entry (see Hebbeler et al., 2007 for the national evaluation).

Besides the difference in primary objective, three additional factors distinguish EI from CPS and most existing maltreatment prevention programs: (1) the centrality of provider partnerships with parents, (2) targeting and (3) timing of services. The EI program is, by design, a program in which qualified providers work with parents to help them to meet their children's needs – a coaching model of engagement.² Parents are seen as partners and are encouraged and expected to play a central role in their child's care. This contrasts with many families' experience with CPS, which is often viewed as confrontational (Smith and Roane, 2023). Regarding targeting, EI targets children with a developmental disability or delay, not parents, and is not means tested. As for timing, EI is delivered very early, for some children as soon as birth. Early timing matters as infants are the group with the highest rate of maltreatment (22.2 per 1000 infants), with rates of victimization declining as children age (USACH, 2024).

We estimate the impact of EI on future maltreatment, defined as any allegation of maltreatment substantiated by CPS and occurring after 36 months of age, when children age out of EI. We focus on maltreatment after EI eligibility has ended as any effect on maltreatment during EI eligibility may simply reflect increased contact/monitoring. Using data on all EI referrals in Rhode Island 2010-2019 linked with CPS data through 2023, we follow the oldest children through age twelve in our data. Given the heightened risk of maltreatment among infants more generally, we focus on early receipt of EI services (before 12 months). The challenge to estimation is that EI receipt is not random, but correlated with other factors that may independently affect child maltreatment. Using a rich administrative dataset that links information on child EI receipt with characteristics of the parent and child at birth, we document that the mothers of children enrolled in EI are more likely to be single, have completed less

² Qualified providers include those working in the health or education fields.

schooling, are younger, and rely more heavily on Medicaid, a proxy for low income. The national evaluation of EI documented similar patterns (Hebbeler et al., 2007). Not surprisingly, children enrolled in EI are also more likely to be born very low birth weight and admitted to the NICU. Previous work has established these characteristics as significant risk factors for child maltreatment (CDC, 2024; Austin et al., 2020). We corroborate this with our data: Children in EI have a higher predicted risk of maltreatment based on family and child characteristics observed prior to EI referral. This will bias any estimates of the impact of EI on future maltreatment towards finding no effect.

Given the richness of our data, we can control for many of the underlying characteristics of the families and children. To address the possibility that the families of children in EI may differ in ways that we do not measure in our data and that may also affect future maltreatment, we use children referred to EI for evaluation but determined ineligible for EI services as a comparison group. The identifying assumption is that controlling for all observable characteristics of the family and child prior to EI referral, the eligible and ineligible are equivalent on unobservable characteristics. Indeed, in our data the ineligible population is more similar to the eligible population in terms of family and child background characteristics than is the general population, though the ineligible are still slightly more advantaged, potentially biasing any effect towards zero. This approach to identification has been used in other settings to estimate the impact of disability insurance and cash transfers, for example (Bound, 1989, 1991; Aizer et al., 2016). Finally, we combine this with a propensity score inverse probability weighting scheme to increase balance on observables across the eligible and ineligible.

We find that receipt of EI services at any point in the first three years of life has a marginally significant and negative effect on the probability of future maltreatment, reducing it by 1 percentage point, 14% relative to a mean of 7.3% for this population.

We then explore whether the timing of receipt of EI services matters and specifically whether EI in the first year of life is more protective. Given that children referred to EI early are at the highest risk of future maltreatment in our data, we implement three estimation strategies to address this. First, as above, we limit the sample to all children who were referred to EI in the first year of life and compare future maltreatment outcomes of the eligible and ineligible. The

protective effect of EI on future maltreatment doubles in size to 1.9 percentage point, 23% of the mean of 8.2% for the early referrals.

In a second strategy, we compare the difference in future maltreatment for early vs. late referrals among the eligible to the same difference for the ineligible in what approximates a difference in differences (DiD) estimation. The intuition behind this approach is that the difference in outcomes for those referred early versus late among the ineligible reflects only the greater underlying risk of future maltreatment among the early referrals. By subtracting this difference for the ineligible from the difference for the eligible, we generate an estimate of the impact of early EI receipt on future maltreatment, net of selection into early referral.

We find that early receipt of EI significantly reduces any instance of substantiated maltreatment after 36 months by 3.3 percentage points. Given rates of substantiated maltreatment of 7.3 percent for this population, this represents a 45 percent decline. The result is driven by reductions in neglect, not abuse. EI receipt in infancy also reduces future foster care placement by 2 percentage points, an effect that is three times larger than the effect for children who receive EI services at any point in the first three years of life.

This strategy in which we compare the eligible to the ineligible may still be biased. In our final and most conservative specification, we use as a counterfactual those who were referred early to EI, found to be ineligible, referred a second time, and found eligible. Not surprisingly, this control group is even more similar to treated children on observables, but receive EI later in life and for fewer months. With this control group, the estimated effects of early EI increase in magnitude, as do the standard errors though they remain precise at conventional levels, consistent with our previous estimates based on a comparison with the ineligible likely representing a lower bound.

These findings relate to multiple strands of research on the determinants of child maltreatment, the importance of early investments (Almond et al., 2018; Cunha et al., 2010; Heckman et al., 2010), and the role of public programs in promoting child well-being (Bailey et al., forthcoming; Bailey et al., 2022). With respect to the causes of child maltreatment, there is strong evidence that income transfers are protective, particularly with respect to neglect (Berger et al., 2017; Cancian et al. 2013; Rittenhouse, 2023), but beyond that there is little definitive evidence regarding effective programming. One notable exception is the Nurse Family

Partnership (NFP) which provides low income, first time young mothers with a visiting nurse soon after birth. NFP shares many similarities with the EI program. It is delivered early and is designed to support new mothers and their babies, providing advice and education on health, development and care more generally. One of the most important and robust findings is that NFP significantly reduces child maltreatment (Olds et al., 1995). This suggests that a less punitive, more cooperative approach early in a child's life can be effective in reducing child maltreatment. Two significant differences between EI and NFP are targeting (NFP targets at risk mothers) and program completion and satisfaction. Only 22% of mothers "attend consistently" in the NFP (Holland et al., 2018). In contrast, the EI program is characterized by higher satisfaction and completion (Hebbeler et al., 2007).

The rest of the paper is organized as follows: In section II we provide background information on child maltreatment, disability and the EI program, in section III we describe the data, in section IV we provide descriptive evidence regarding patterns and predictors of child maltreatment in our data, in section V we characterize children in the EI program, section VI presents our identification strategy and results, and section VII concludes.

II. Background on Child Maltreatment, Disability and the Early Intervention Program

A. Existing Evidence Regarding Risk Factors for Child Maltreatment

Nationally, three million children were investigated by CPS in 2022, of whom 559,000 were found to have substantiated cases of maltreatment, representing a victimization rate of 7.7 per 1,000 children. The CDC reports that children who are female, young, and those with special needs are at higher risk of maltreatment (CDC, 2024). Historically, however, the focus has been on identifying and targeting families based on parental (not child) risk factors: substance abuse and mental health issues, young age, single parenthood, low levels of education, material hardship, and low income (CDC, 2024; Austin et al., 2020; Conrad-Hiebner and Byram, 2020; Yang, 2015; Pelton, 2015; Marcal, 2018). While these factors do predict risk, according to the Institute of Medicine "relatively little progress has been made in understanding the causes of child abuse and neglect" (IOM, 2014.)

B. Background on Child Disability and Maltreatment

Researchers have identified multiple potential factors to explain why childhood disability more than triples the risk for maltreatment. These include 1) caregiver assumptions about disability, resulting in reduced expectations for growth which leads to failure to provide appropriate stimulation, 2) increased care demands of the child, 3) limited communication skills on the part of the child which can increase maltreatment and reduce child reporting (Legano et al., 2021; Hibbard and Desch, 2007). The EI program addresses all three factors, as described below.³

C. Background on the Early Intervention Program

The reauthorization of IDEA in 1986 mandated that in addition to providing services to children aged three and older, individual states provide services to families of children with a disability or developmental delay as early as birth. Referrals for an EI evaluation and eligibility determination can be initiated by any service provider or parent. CPS will also refer children who are “the subject of a substantiated case of abuse and neglect or have been directly affected by illegal substance abuse or withdrawal symptoms resulting from prenatal drug exposure” to either home visiting or to EI if a delay is suspected.

In Rhode Island, a child may be deemed eligible for EI in one of three ways: An established disability or condition (ie, specific chromosomal genetic disorders), a significant developmental delay that is 2 standard deviations below the mean in one area or delays that are 1.5 standard deviations below the mean in two or more areas of development. Areas of development evaluated include cognitive, fine and gross motor (including hearing and vision), communicative, social/emotional and adaptive.⁴

Once eligible, an Individual Family Service Plan (IFSP) is developed in collaboration with the family which details the needs of the child, goals of the program and services to be provided. The purpose of EI is to “enhance the capacity of families to meet the special needs of their infant or toddler and enhance the developmental functioning of infants and toddlers with

³ In theory, EI affects child communication as speech therapy is an important component of the program. However, this would not be relevant for our focus, the youngest children (infants).

⁴ Other states can have different eligibility criteria (see ECTA, 2021)

special needs.”⁵ EI services must be provided in the child’s natural environment, typically the home or child care setting. Eligibility for EI ceases at 36 months of age at which point a child may be deemed eligible for IDEA Part B 619 Preschool Special Education services. We do not have information on IDEA services provided after 36 months.

A national evaluation of EI was conducted in 2007 (Hebbeler et al., 2007). The study authors were tasked with answering the following: What children are served? What services do they receive? What are the costs? What outcomes do the children and family experience? The study findings were based on a sample of 3,338 children who entered EI in 1997-1998. Information was gathered via family interviews, review of service records, provider surveys and kindergarten teacher surveys. Notable findings include the fact that low income children were overrepresented among EI recipients as were the children of mothers without a college degree and those living in single parent homes. Families expressed satisfaction with the EI program and the services their children received. The authors note that “because the study was limited to EI entrants, no data were obtained on the children who should have been in EI but were not” (page 2-6, Hebbeler, 2007). The lack of a comparison group limits the ability to draw conclusions regarding the impact of EI on future outcomes of the child.

III. Description of Data

Our dataset consists of all children referred to EI for an evaluation in the state of Rhode Island between 2010 and 2019 and a random 20% sample of children with no EI involvement drawn from the same birth cohorts. The data includes information on EI referral and eligibility determination (date, source of referral, and outcome), and IFSP service receipt. These data are linked with information on the children and their parents from natality records including gender, birth order, maternal education, marital status, maternal age at birth, source of health insurance, zipcode of residence, birth weight and NICU admission. These data are in turn linked with data from DCYF which includes information on substantiated allegations of maltreatment, including date, source of referral and outcome (eg, foster care, etc).

⁵ The IFSP is developed based in part on a Routines-Based Interview which helps families meet the needs of their children, and their own needs, by building upon daily activities in which they already engage.

We exclude children born before 2010 or who were less than 36 months of age by December 2022. This removes children for whom we do not observe their entire EI history or those for whom we cannot yet observe post-EI outcomes. We observe post-EI maltreatment outcomes for between one and nine years post EI depending on the child's year of birth. This results in a sample of 16,088 children referred to EI, of whom 13,392 were found eligible and 2,696 ineligible, and 12,293 children with no EI involvement. Note that among the 2,696 initially found to be ineligible, 475 were re-evaluated a second time and found to be eligible. For most of the analyses we define as eligible those found eligible on their first evaluation only, though we revise this in a later analysis.

IV. Child Maltreatment: Patterns and Predictors

A. Child Maltreatment by Child Age and EI Service Receipt

In our sample, the probability of maltreatment is highest for infants, consistent with national estimates of child maltreatment by age.⁶ For those with no EI involvement, the probability of maltreatment in infancy is 0.02, declining to half (0.01) by age 2-3 after which it declines modestly through age 12 (Appendix Figure 1.2a). For children referred to EI, the probability of maltreatment in infancy is three times as large, 0.075, declining to 0.025 by age 2-3 and then declining more slowly through age 12 (Appendix Figure 1.2b). Part of the explanation for the high rates of maltreatment for those referred to EI derives from the fact that DCYF refers children to EI for evaluation when a delay is suspected. Even removing DCYF referrals from the EI sample, the probability of maltreatment is still almost twice the rate as the general population (Appendix Figure 1.2c).

B. Predictors of Child Maltreatment

⁶ Child maltreatment, as measured by reports to DCYF after 36 months of age, has either held steady or shown very modest declines over the study period, with the trend similar for those with and without EI referrals.

We explore which family and child characteristics observed in our data significantly predict any substantiated maltreatment after 36 months of age by estimating the following for all children in the sample:

$$Maltreat_{ic} = \pi_0 + \mathbf{X}_{ic}'\pi_1 + \mu_c + v_{ic} \quad (1)$$

Where $Maltreat_{ic}$ is an indicator equal to 1 if a child i in county*quarter of birth c has any substantiated case of abuse or neglect after 36 months of age. The vector μ_c represents a vector of county and quarter of birth FE which is important because the length of the follow-up period varies based on birth timing. The vector $\mathbf{X}_{ic}$ includes all characteristics of the mother and child observed at birth mentioned previously.

Children more likely to be maltreated include those born to single parents, those Medicaid-enrolled, as well as higher birth order children and those with lower birth weight (Appendix Table 1.5, column 1). A 1,000 gram increase in birthweight reduces child maltreatment by 1.1 percentage point, or 15 percent. Maternal age and education have significant but modest impacts on future maltreatment, with an additional year of maternal schooling reducing the probability of future maltreatment by only 0.004. Living with both parents, in contrast, appears ten times more protective than one year of school, as does having private health insurance (a proxy for income). The predictors of future maltreatment are similar for the eligible and ineligible (Appendix Table 1.5, columns 2 and 3).

V. Characterizing Children in Early Intervention

We compare the child and family characteristics of those in EI with those of the general population as well as those ineligible for EI. The ineligible are more similar to the EI eligible along most measures, supporting the use of the ineligible as a comparison group.

A. How do children eligible for EI differ from the general population?

Children in EI are more likely to have a substantiated case of maltreatment after 36 months of age than the general population of children: 0.073 relative to 0.041 (Table 1). They also come from more disadvantaged households: their mothers are less likely to be married (0.55 vs 0.51),

have completed less schooling (13.7 vs 13.9 years) and are less likely to have private health insurance, a proxy for income, (0.46 vs 0.51). These differences in background characteristics are very similar to those identified in the national evaluation (Hebbeler et al., 2007). Large differences emerge when we look at child-specific measures: Those enrolled in EI are more likely to be male, are characterized by lower birth weight (3,116 versus 3,354 grams) and are more likely to have been admitted to the NICU (0.21 versus 0.06). This is as expected as being born very low birth weight affects eligibility for EI and also because low birth weight predicts intellectual disability in childhood (Chen et al., 2020). On other measures (racial and ethnic composition, maternal age and median income of the zipcode), differences are relatively small.

When we construct a predicted probability of future maltreatment as a function of parental and child characteristics measured at birth via equation (1), we find that children in EI have a predicted probability of future maltreatment of 0.073 relative to 0.065 for those never referred.

B. How do children eligible for EI differ from those evaluated but found to be ineligible?

EI eligible children are more similar to the ineligible than to those never referred to EI (Table 1, columns 5 and 6). Differences in marital status decline to almost zero, differences in private health insurance decline by half (from 0.05 to 0.027) but differences in maternal education remain (0.5 years). Gaps in newborn health also decline by half: among the eligible, 22 percent were in a NICU, compared with 13 percent of the ineligible, and six percent of the general population, with similar patterns for birthweight. That some gaps in birthweight and NICU use remain is consistent with EI serving children with the greatest need. The predicted probabilities of future maltreatment for the EI eligible and ineligible are also more similar: 0.073 for the eligible vs. 0.070 for the ineligible (compared with 0.065 for the never referred). Note that the ineligible have higher rates of maltreatment than the eligible 0-36 months, a point to which we return later in our analysis.

VI. Estimating the Impact of EI Receipt on Future Maltreatment

A. Impact of any EI on Future Maltreatment

1. Empirical Strategy

We present OLS estimates of the impact of EI eligibility on future maltreatment using two different counterfactual groups: (1) those never referred to EI, and (2) those referred, but found to be ineligible on their first evaluation.

$$Maltreat_{ic} = \gamma_0 + \gamma_1 Elig_{ic} + \mathbf{X}'_{ic}\gamma_2 + \mu_c + v_{ic} \quad (2)$$

where i indexes a child and c indexes a group which is defined by the child's quarter and county of birth (for which a vector of fixed effects is indicated by μ_c). The outcomes are whether the child has any DCYF-substantiated allegation of abuse or neglect after 36 months of age, or whether the child is placed in foster care after 36 months of age. We control for all observable measures of parental and child characteristics in $\mathbf{X}_{ic}$, as defined previously. We also present IPW estimates obtained by reweighting our sample using the inverse probability of treatment (eligibility in this case). The distributions of the probability of treatment by eligibility status (Figure 1) are more similar when the control group shifts from the non-EI referred (panel a), to the ineligible (panel b). We exclude extreme weights by dropping observations in the 99th percentile.

2. Results

Table 2, Panel A presents the results using the general population (non-referrals) as the counterfactual. In column 1 are estimates including only county and quarter of birth FE as controls. In the second column we add the full set of controls in $\mathbf{X}_{ic}$ and in the third column we present IPW estimates to further balance the treatment and control groups using the propensity to be eligible for EI based on their individual and family characteristics. In the regression with the most parsimonious set of controls (column 1), there is a large positive relationship between EI service receipt and future maltreatment when compared with the general population. The coefficient 0.023 suggests a 2.3 percentage point *increase* in future maltreatment associated with EI receipt. Including controls for child and family characteristics in column 2 reduces the coefficient by 25%, as expected. Including inverse probability weights reduces it slightly further but it still remains positive and precisely estimated. The same general pattern emerges for the other outcomes: neglect (column 4-5) and foster care placement (columns 6-7).

In contrast, estimates using the ineligible as control or counterfactual suggests that EI receipt decreases future maltreatment by 1 percentage point, 14 percent relative to a mean of 0.067, though the estimates are precise at the 10% level only (Table 2, Panel B). For foster care placement, the results even with the full set of controls and weights are more precise, with receipt of EI *reducing* the probability of foster care placement by 0.7 percentage points, a 25% decline relative to the mean of 0.024.

These results are consistent with recipients of EI being at higher underlying risk of maltreatment than the general population, and the EI ineligible being more similar in underlying risk, thus representing a better counterfactual or control.

To explore whether *early* receipt of EI services matters more, we estimate the impact of receipt in the first year of life on future maltreatment. Thirty seven percent of children referred to EI are referred in their first year, with a similar distribution for the eligible and ineligible (Appendix Figure 1.3). We implement multiple empirical strategies to address the fact that those referred early to EI are at higher risk of maltreatment.

B. Impact of Early EI on Future Maltreatment

Children referred to EI early differ from those referred later: They are born in worse health and their families are less advantaged. They are more likely to qualify via very low birth weight and congenital conditions (weighing 2,754 grams versus 3,327, are four times more likely to have spent time in the NICU), are less likely to have speech delays and more likely to have motor delays (Appendix Figure 1.4). With respect to family background, the mothers of early referrals are less educated and less likely to be married. Overall, early referrals to EI are at higher predicted risk of future maltreatment based on family and child characteristics measured prior to EI referral: 0.081 vs 0.068 for the later referrals.

1. OLS

For the OLS analysis, we limit the sample to those referred to EI early and compare the outcomes of the eligible and ineligible as in equation (2). The identifying assumption is that among those referred early, the eligible and ineligible are similar on unobservable characteristics.

Receipt of EI services early reduces any future report of maltreatment by 1.9 percentage points when either full controls or IPW are included (Table 2, Panel C, columns 2-3). This is driven entirely by reports of neglect and suggest that early EI receipt reduces neglect by 25 percent (columns 4-5). For foster care, including the full set of controls and inverse probability weighting (columns 6-7), suggests a 1.7 percentage point decrease in foster care placement associated with early receipt of EI services, a decline of 21 percent. The effect of receipt of EI services on neglect or foster care is roughly double the effect of EI receipt at any time zero-36 months.

2. Difference-in-Differences

We use differences between early and late EI referrals in the ineligible population to approximate the differences in unobservable characteristics for early and late referrals among the eligible population, as in a difference-in-differences framework. The identifying assumption is not that unobservables are the same for the eligible and ineligible, but that the difference in unobservables for the early versus late are similar for the eligible and ineligible.

This specification takes the following form:

$$Maltreat_{ic} = \beta_0 + \beta_1 Elig_{ic} + \beta_2 Early_{ic} + \beta_3 Elig * Early_{ic} + \mathbf{X}'_{ic}\beta_4 + \mu_c + \sigma_{ic} \quad (3)$$

As before, the variable $Elig_{ic}$, is an indicator equal to 1 if the child was found to be eligible on their first evaluation. The variable $Early$ is an indicator equal to 1 if the child was referred to EI before 12 months of age and 0 if referred in months 12-35. The coefficient on the interaction term $Early * Elig$ is the difference in future maltreatment for early vs. late referrals for EI-eligible children minus this same difference for the ineligible. β_3 represents the impact of early receipt of EI services on future maltreatment controlling for unobservables correlated with early EI receipt that might bias OLS estimates. In later specifications, we also consider impacts on maltreatment in the first 36 months of life.

For the outcome of any reported maltreatment after 36 months of age, the coefficient on early referral of 0.069 indicates that early referral to EI (within the first year) is associated with a 6.9 percentage point increase in the probability of a future report of maltreatment (Table 3, Panel A, column 1). As more controls and weights are included in columns 2 and 3, the estimate falls but is still precise. The coefficient of -0.033 on the interaction term $Elig * Early_{ic}$ in the

specification with the full set of controls and weights indicates that for those referred early, receiving EI services is highly protective, reducing future maltreatment by 3.3 percentage points, a reduction of 45% (Table 3, Panel A, column 3). This estimate is not statistically significantly different from the estimate of -0.019 based on equation (2). EI service receipt for those referred later appears to have little impact.

These results appear to be driven entirely by reports of neglect, not abuse (columns 4-5, Table 3). For future foster care placement, service receipt early continues to be very protective, lowering the probability of placement by 2 percentage points in the specification with the full set of controls and weighting (Table 3, Panel A, column 7.)

Finally, in our most conservative specification, we limit the comparison group to those most similar to children who received EI services early in life: those referred early, initially found to be ineligible, but evaluated again at a later date and found to be eligible. This group is more similar on observables. The distribution of predicted EI eligibility is nearly identical across these two groups (Figure 1c) as is the predicted probability of future maltreatment based on observables (0.073 for each). When we limit the comparison group in this way, the estimated effects increase in magnitude, with early EI receipt reducing any maltreatment by 7.5 percentage points (Table 3, Panel B, Column 5) and foster care by 5.6 percentage points (Column 7). The fact that as the control group becomes increasingly similar to the treatment group, the estimated effects increase in magnitude (though the standard errors do too), generates greater confidence that any remaining omitted variables likely bias our results towards zero.

Below we consider heterogeneous effects and conduct additional robustness exercises focusing on neglect and foster care.

3. Robustness and Heterogeneity

Duration in EI. Early referral is associated with service receipt that occurs 15 months earlier and results in approximately 6 more months of service receipt (Table 1). As such, the above findings might reflect the impact of early receipt of services but also the impact of longer duration of EI services. However, when we control for duration in estimates of equation (3), the estimates are unchanged, consistent with early receipt and not duration driving the results (Table 4, Panel A).

Maltreatment in the first 36 months. To rule out that EI is not simply increasing early detection and leaving overall maltreatment unchanged, we estimate the impact of EI on substantiated neglect and foster care in the first 36 months. Though the ineligible have higher unconditional rates of neglect in the first 36 months (Table 1), once controls are included, there is a much smaller insignificant difference between the eligible and ineligible (Table 4, Panel B). For foster care, EI eligibility significantly reduces placement both before and after EI ceases at 36 months. Survival estimates for maltreatment (Appendix Figure 1.5) are consistent with effects of EI receipt driven by reductions in maltreatment later in life.

Additional controls for differences in risk of future maltreatment. We predict the probability of future maltreatment for all children based on observables, group children based on this risk and include these group FE in the regressions. The results are largely unchanged from the regressions including the full set of controls (Table 4, Panel C).

Heterogeneous Effects. The effects do not vary significantly by race, maternal education or child gender. Excluding those referred as newborns and those whose disability was related to withdrawal does not change the point estimates, but reduces precision. The greatest difference was found when we stratified by the source of referral (Table 4, Panel D/E). For children referred by a parent or pediatrician (two thirds of the sample), the effects are smaller (though not proportionally so) and imprecise. For all other sources of referral (which includes DCYF), there are large and precisely estimated negative effects of early EI receipt on any future maltreatment (-0.065, relative to a mean of 0.11) and foster care (-0.034 relative to a mean of 0.045), suggesting the largest impacts among children at highest risk of maltreatment.

VII. Conclusions

Though the EI program is not designed per se to reduce child maltreatment and does not target families or children based on their risk of maltreatment but rather on their disability, by working with parents to help them meet the special needs of their children, the program has the effect of reducing maltreatment, particularly among those served in the first year of life, a critical window when maltreatment often initiates. Based on existing estimates of the lifetime cost of maltreatment, an EI program serving the 16,000 children in our sample would generate savings

of \$70 to \$118 million in reduced costs of maltreatment alone, excluding all other benefits to the program.⁷ However, many children eligible for EI may not receive services. Those living in the states with the lowest incomes and birthweights, where the need is likely greatest, are least likely to receive services (Friedman-Krauss and Barnett, 2023). Modifying the funding formula so that states with the greatest underlying need receive more federal support would likely increase the share of at-risk children receiving services and reduce future maltreatment and foster care placements.

⁷ Estimates of maltreatment based on Fang et al (2012) using 3% discount rate but excluding health care costs and future special education spending in order to better represent the costs of neglect, not abuse, and updated to 2024\$ is \$230,000. Based on national estimates of EI spending, these savings represent between 50 and 80% of total EI spending (IDEA ITCA, 2023), suggesting that the reductions in future neglect alone cover the majority of EI program costs. If EI reduces future special education spending (the original intent of the program) and/or improves child health and development by even modest amounts, the benefits of EI likely exceed the costs.

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Table 1: Descriptive Statistics for All Children

	Never Referred	Referred to EI	Referred to EI				Eligible for EI	
			<12 months	≥12 months	Ineligible	Eligible	On first eval.	On 2+ eval.
Panel A: Child characteristics								
Female	0.523	0.385	0.467	0.337	0.468	0.372	0.371	0.400
White	0.625	0.660	0.665	0.657	0.667	0.659	0.660	0.638
Black	0.088	0.089	0.092	0.087	0.100	0.087	0.086	0.116
Other	0.041	0.251	0.244	0.256	0.234	0.254	0.254	0.246
Hispanic	0.308	0.326	0.307	0.337	0.304	0.329	0.328	0.360
Panel B: Family characteristics								
Mother's age	28.816	28.961	28.998	28.939	29.053	28.946	28.939	29.131
Mother's education (years)	13.948	13.656	13.480	13.759	14.055	13.592	13.588	13.703
Mother is married	0.553	0.509	0.480	0.525	0.511	0.508	0.507	0.537
Lives with both parents	0.536	0.494	0.462	0.513	0.495	0.494	0.494	0.501
ZIP median income	5.349	5.338	5.260	5.383	5.485	5.314	5.317	5.241
Panel C: Birth characteristics								
Private insurance	0.510	0.457	0.421	0.478	0.480	0.453	0.454	0.417
ICU(indicator)	0.055	0.205	0.413	0.084	0.128	0.218	0.218	0.200
Birth weight (kilos)	3.354	3.116	2.754	3.327	3.248	3.095	3.093	3.158
Birth order, 1st	0.430	0.443	0.431	0.450	0.439	0.444	0.446	0.385
Birth order, 2nd	0.342	0.329	0.324	0.332	0.358	0.325	0.323	0.379
Birth order, 3rd/4th	0.201	0.198	0.207	0.192	0.174	0.202	0.202	0.192
Birth order, 5th+	0.027	0.030	0.038	0.026	0.030	0.030	0.030	0.044
Panel D: Early intervention								
Age at referral (in months)		15.859	4.494	22.487	17.524	15.593	15.645	14.128
Age at eligibility		19.500	10.255	24.891		16.857	16.630	23.257
Length of program (in months)		11.577	15.506	9.286		13.138	13.192	11.627
Total visits		97.997	133.984	77.011		112.843	113.780	86.440
Total hours		74.393	99.207	59.923		85.511	86.294	63.447
Panel E: DCYF								
Predicted case after 36 months	0.065	0.073	0.081	0.068	0.070	0.073	0.073	0.073
Any case after 36 months	0.041	0.073	0.082	0.068	0.071	0.073	0.072	0.109
Any case before 36 months	0.042	0.118	0.179	0.082	0.147	0.113	0.112	0.158
Neglect case after 36 months	0.038	0.067	0.076	0.061	0.066	0.067	0.066	0.097
Neglect case before 36 months	0.036	0.099	0.139	0.076	0.122	0.096	0.094	0.137
Foster after 36 months	0.009	0.024	0.030	0.021	0.026	0.024	0.023	0.048
Foster before 36 months	0.007	0.056	0.101	0.030	0.069	0.054	0.052	0.114
Age first incident	38.994	26.105	18.337	33.957	21.303	26.985	27.029	26.059
Age first placement	43.608	24.615	16.959	36.237	24.558	24.627	24.763	22.783
Observations	12,293	16,088	5,926	10,162	2,221	13,867	13,392	475

The table shows summary statistics for a random sample of children with no referral to early intervention (EI), for the full sample of children referred to EI, and for children referred to EI by eligibility status (eligible and ineligible children), and by eligibility status on their first evaluation among eligible children. Predicted case after 36 months is obtained from estimation of equation 1.

Table 2: OLS Estimates of the Impact of EI and Early EI Receipt on Future Maltreatment

	Any Report			Neglect Report		Foster Placement	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Sample = Children Eligible for EI and Children Never Referred to EI							
Eligible First	0.023*** (0.003)	0.017*** (0.003)	0.016*** (0.003)	0.014*** (0.003)	0.013*** (0.003)	0.009*** (0.002)	0.009*** (0.002)
R-squared	.024	.069	.024	.064	.022	.033	.015
Outcome mean	.058	.058	.058	.054	.054	.017	.017
Observations	26,160	26,160	26,160	26,160	26,160	26,160	26,160
Panel B: Sample = Children Eligible and Ineligible for EI							
Eligible First	-0.004 (0.006)	-0.007 (0.006)	-0.010* (0.006)	-0.007 (0.005)	-0.010* (0.006)	-0.007* (0.004)	-0.008** (0.004)
R-squared	.026	.081	.037	.076	.035	.044	.034
Outcome mean	.073	.073	.073	.067	.067	.024	.024
Observations	16,088	16,088	16,088	16,088	16,088	16,088	16,088
Panel C: Sample = Children Eligible and Ineligible for EI (Only those referred before 12 months)							
Eligible First	-0.034*** (0.011)	-0.019* (0.011)	-0.019* (0.010)	-0.019* (0.011)	-0.019* (0.010)	-0.017** (0.008)	-0.017** (0.007)
R-squared	.068	.12	.093	.11	.092	.081	.082
Outcome mean	.082	.082	.082	.076	.076	.03	.03
Observations	5,924	5,924	5,924	5,924	5,924	5,924	5,924
Controls	Y			Y		Y	
Inverse Probability Weight	Y			Y		Y	

The table shows estimation results for equation 2 using any reported maltreatment (abuse and neglect), neglect only, and foster placement as outcomes. All three are measured after 36 months of age. An early referral takes place between 0-12 months of age. All regressions include county $\times$ quarter of birth fixed effects. Additionally, when indicated, the vector of controls includes: race, sex, ethnicity, mother's education, mother's age, mother's marital status, median ZIP household income, insurance type, number of parents in household, birth weight, ICU stay indicator, and birth order. Robust standard errors in parentheses. This same set of controls is used to compute inverse probability weights for some specifications, as indicated. Stars denote statistical significance as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Difference in Differences Estimates of Impact of Early Intervention on Future Maltreatment

	Any Report			Neglect Report		Foster Placement	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: All Children Referred to EI							
Eligible First	0.014** (0.006)	0.002 (0.006)	0.006 (0.007)	0.001 (0.006)	0.005 (0.007)	-0.001 (0.004)	0.000 (0.004)
Early Referral	0.069*** (0.012)	0.036*** (0.012)	0.054*** (0.012)	0.035*** (0.011)	0.052*** (0.012)	0.025*** (0.008)	0.029*** (0.008)
Eligible First x Early	-0.052*** (0.013)	-0.023* (0.012)	-0.033*** (0.013)	-0.022* (0.012)	-0.032*** (0.012)	-0.017** (0.008)	-0.020*** (0.008)
R-squared	.03	.082	.038	.077	.037	.045	.033
Outcome mean	.073	.073	.073	.067	.067	.024	.024
Observations	16,088	16,088	16,088	16,088	16,088	16,088	16,088
Panel B: All Children Eligible for EI							
Eligible First	0.017 (0.017)	-0.017 (0.016)	0.008 (0.020)	-0.015 (0.015)	0.012 (0.018)	-0.004 (0.007)	0.005 (0.010)
Early Referral	0.125*** (0.032)	0.066** (0.031)	0.098*** (0.032)	0.060** (0.030)	0.096*** (0.030)	0.056*** (0.021)	0.067*** (0.020)
Eligible First x Early	-0.107*** (0.033)	-0.052* (0.031)	-0.077** (0.032)	-0.047 (0.030)	-0.075** (0.030)	-0.049** (0.022)	-0.056*** (0.020)
R-squared	.033	.084	.083	.078	.08	.046	.08
Outcome mean	.073	.073	.073	.067	.067	.023	.023
Observations	13,729	13,729	13,729	13,729	13,729	13,729	13,729
Controls	Y			Y	Y	Y	Y
Inverse Probability Weight	Y			Y	Y	Y	Y

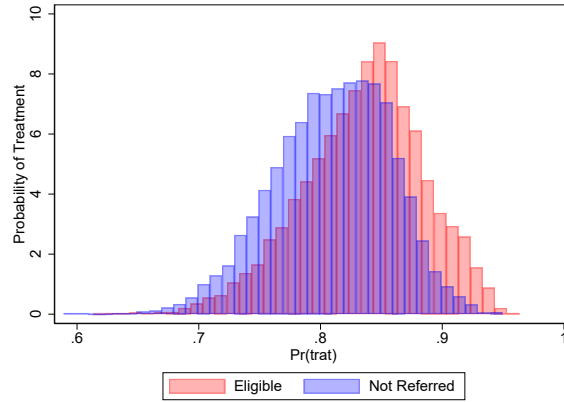
The table shows estimation results for equation 3 using any reported maltreatment (abuse and neglect), neglect only, and foster placement as outcomes. All three are measured after 36 months of age. An early referral takes place between 0-12 months of age. All regressions include county $\times$ quarter of birth fixed effects. Additionally, when indicated, the vector of controls includes: race, sex, ethnicity, mother's education, mother's age, mother's marital status, median ZIP household income, insurance type, number of parents in household, birth weight, ICU stay indicator, and birth order. Robust standard errors in parentheses. This same set of controls is used to compute inverse probability weights for some specifications, as indicated. Stars denote statistical significance as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Robustness and Heterogeneity

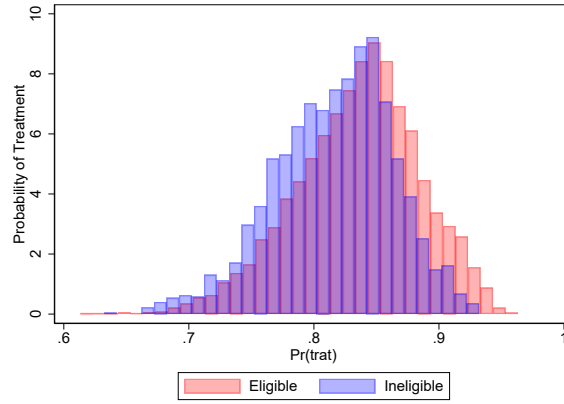
	Neglect Report	Foster Placement
	(1)	(2)
Panel A: Controlling for duration of EI services		
Eligible First x Early	-0.035*** (0.013)	-0.023*** (0.009)
R-squared	.037	.034
Outcome mean	.067	.024
Observations	16,088	16,088
Panel B: Reported Maltreatment during 0-36 months		
Eligible First x Early	-0.019 (0.015)	-0.026** (0.013)
R-squared	.04	.049
Outcome mean	.099	.056
Observations	16,088	16,088
Panel C: Controlling for Predicted Maltreatment after 36 months		
Eligible First x Early	-0.023* (0.012)	-0.019** (0.008)
R-squared	.079	.046
Outcome mean	.067	.024
Observations	16,088	16,088
Panel D: Other referral sources		
Eligible First x Early	-0.065** (0.025)	-0.034* (0.018)
R-squared	.11	.1
Outcome mean	.11	.045
Observations	5,240	5,240
Panel E: Referred by parents or pediatricians		
Eligible First x Early	-0.013 (0.014)	-0.008 (0.007)
R-squared	.034	.023
Outcome mean	.048	.013
Observations	10,684	10,684
Inverse Probability Weight	Y	Y

The table shows estimation results for equation 3 using neglect reported maltreatment, and foster placement as outcomes. An early referral takes place between 0-12 months of age. All regressions include county $\times$ quarter of birth fixed effects. A set of controls is used to compute inverse probability weights. This vector of controls includes: race, sex, ethnicity, mother's education, mother's age, mother's marital status, median ZIP household income, insurance type, number of parents in household, birth weight, ICU stay indicator, and birth order. Robust standard errors in parentheses. Panels A, C, D, and E use outcomes measured after 36 months of age. Panel B uses outcomes measured during 0-36 months of age, when children are still potentially eligible for EI. Additionally, Panel A controls for duration. Panel C includes fixed effects for quintiles based on predicted maltreatment after 36 months. Panel D and E show results for subsamples defined by referral source. Stars denote statistical significance as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

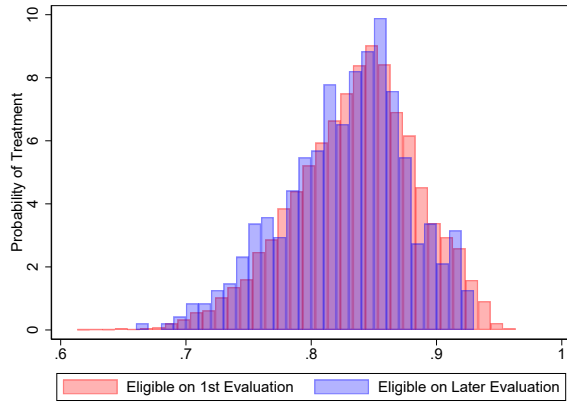
Figure 1: Distribution of predicted EI eligibility



(a) All children: By EI referral status



(b) All EI referrals: By EI eligibility status



(c) All eligible children: By eligibility on first evaluation

The figure shows the distribution of the predicted probability of being eligible for EI services based on individual characteristics (race, sex, ethnicity, and birth order), family characteristics (mother's education, mother's age, mother's marital status, median ZIP household income, insurance type, and number of parents in household), and health indicators (birth weight, and ICU stay indicator). Panel (a) shows the distribution separately for children eligible for EI and children who were never referred. Panel (b) shows the distribution by eligibility status, and panel (c) shows the distribution by eligibility on the first evaluation among children who were found eligible.

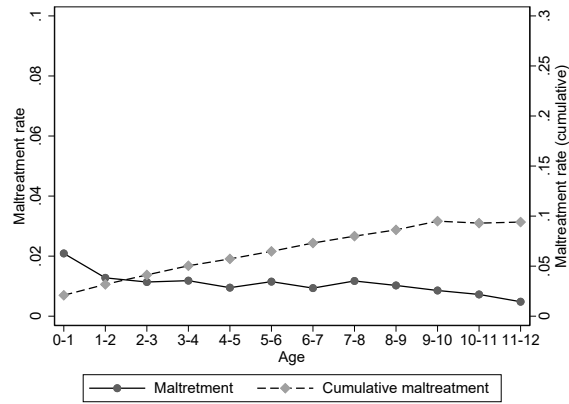
1 Appendix

Table 1.5: Predictors of Any Substantiated Maltreatment after 36 Months of Age

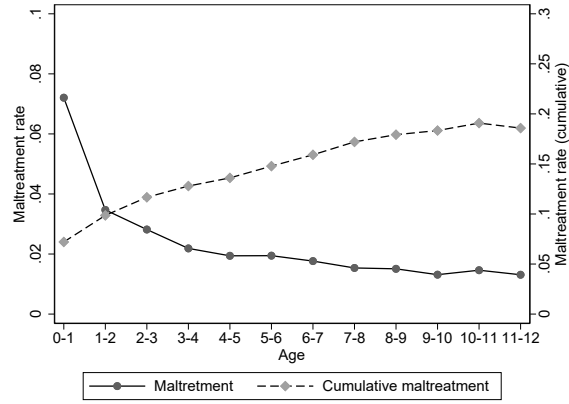
	Referred to EI (1)	Ineligible (2)	Eligible (3)	Eligible on 1st eval. (4)	Eligible on 2nd+ eval. (5)
Mother's education	-0.004*** (0.001)	-0.007*** (0.002)	-0.004*** (0.001)	-0.004*** (0.001)	-0.010 (0.007)
Mother's age	-0.004*** (0.000)	-0.003*** (0.001)	-0.004*** (0.000)	-0.004*** (0.000)	-0.001 (0.004)
Mother is married	-0.008 (0.009)	0.004 (0.025)	-0.008 (0.010)	-0.010 (0.010)	0.049 (0.061)
Median ZIP HH income	-0.002 (0.001)	0.007* (0.004)	-0.003* (0.002)	-0.002 (0.002)	-0.019 (0.012)
Private insurance	-0.045*** (0.005)	-0.063*** (0.015)	-0.042*** (0.006)	-0.041*** (0.006)	-0.035 (0.047)
ICU	-0.008 (0.006)	0.022 (0.020)	-0.014** (0.007)	-0.014** (0.007)	0.010 (0.049)
Lives with both parents	-0.044*** (0.009)	-0.059*** (0.023)	-0.043*** (0.010)	-0.038*** (0.010)	-0.152** (0.061)
Birth weight	-0.011*** (0.003)	0.003 (0.010)	-0.013*** (0.003)	-0.014*** (0.003)	-0.011 (0.029)
Birth order, 2nd	0.009** (0.005)	-0.005 (0.012)	0.012** (0.005)	0.012** (0.005)	0.061* (0.036)
Birth order, 3rd/4th	0.031*** (0.006)	0.026 (0.018)	0.031*** (0.007)	0.030*** (0.007)	0.077 (0.058)
Birth order, 5th+	0.053*** (0.016)	0.001 (0.033)	0.063*** (0.017)	0.068*** (0.018)	0.006 (0.101)
Black	-0.015* (0.009)	-0.043** (0.021)	-0.009 (0.010)	-0.005 (0.010)	-0.121** (0.055)
Other	-0.023*** (0.005)	-0.011 (0.016)	-0.025*** (0.006)	-0.023*** (0.006)	-0.105** (0.048)
Female	-0.003 (0.004)	-0.000 (0.011)	-0.003 (0.005)	-0.003 (0.005)	0.029 (0.034)
Hispanic	-0.039*** (0.005)	-0.052*** (0.015)	-0.036*** (0.006)	-0.035*** (0.006)	-0.058 (0.042)
R-squared	.081	.17	.082	.081	.27
Outcome mean	.073	.071	.073	.072	.1
Observations	16,088	2,208	13,867	13,392	438

The table shows the estimates from equation 1. The excluded category for race is “white”, and for birth order is 1st child. Mother's education is measured in years. Median ZIP household income is measured in \$10,000. Birth weight is measured in kilograms. ICU is an indicator of having spent time in ICU. Robust standard errors in parenthesis. Stars denote statistical significance as follows: *** p<0.01, ** p<0.05, * p<0.1.

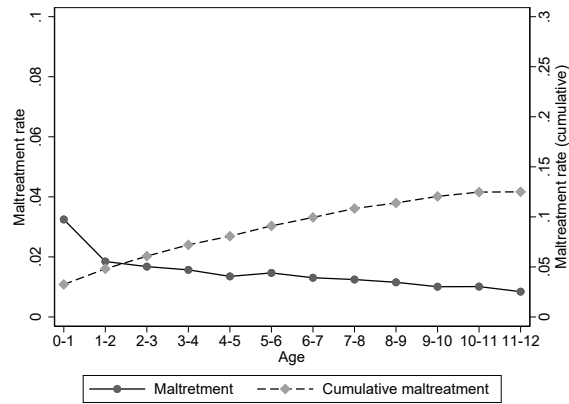
Figure 1.2: Reported Maltreatment by Age and EI Eligibility



(a) Never referred



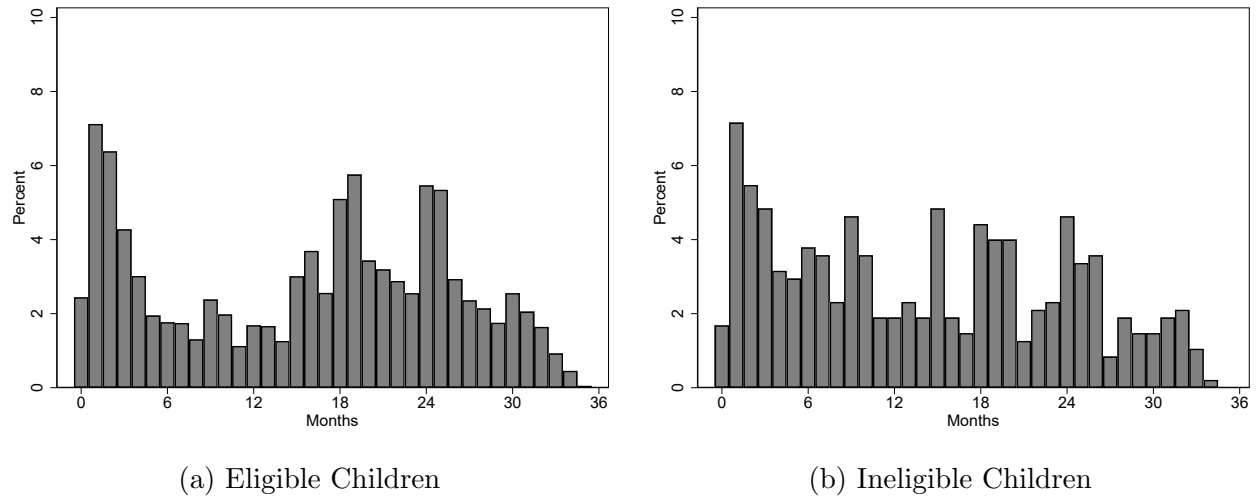
(b) All EI Referrals



(c) All EI referrals excluding those referred by DCYF

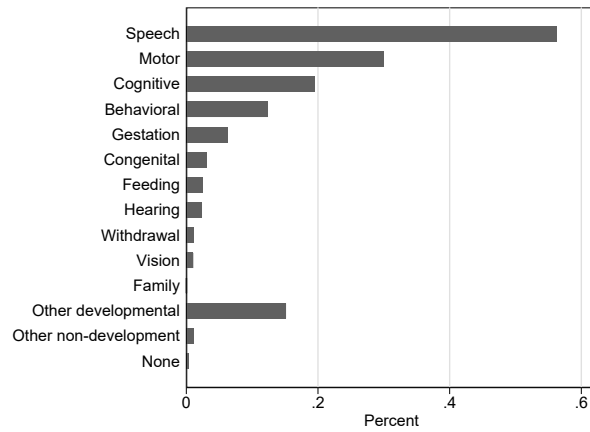
The figure shows the share of children with a DCYF maltreatment report at each year of life up to 12 years old among children referred to EI. The solid line (left axis) shows the share of children with a report during a specific age and the dashed line (right axis) shows the share of children who have had a report during a specific age or before. Panel (a) includes a random 20% sample of children with no EI involvement. Panel (b) corresponds to children who were referred for an EI evaluation. Panel (c) corresponds to children who were referred for an EI evaluation excluding those referred through DCYF.

Figure 1.3: Distribution of Age at Referral to Early Intervention by Eligibility

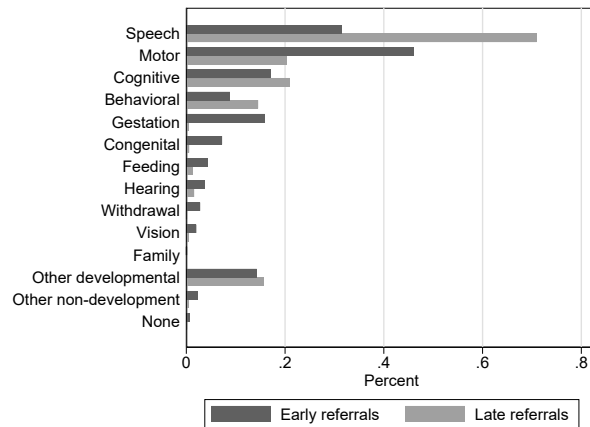


The figure shows the distribution of children referred to early intervention (EI) by age at referral to EI. Age at referral is measured in months. Panel (a) shows the distribution for children who were found eligible for EI. Panel (b) shows the distribution for children who were found ineligible in all evaluations.

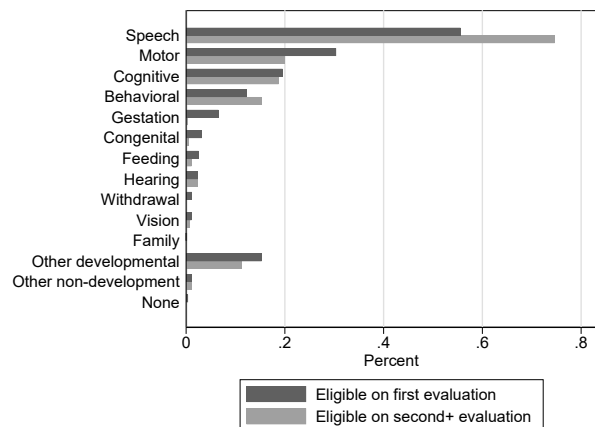
Figure 1.4: Diagnoses of Children Eligible for Early Intervention



(a) All children eligible for EI



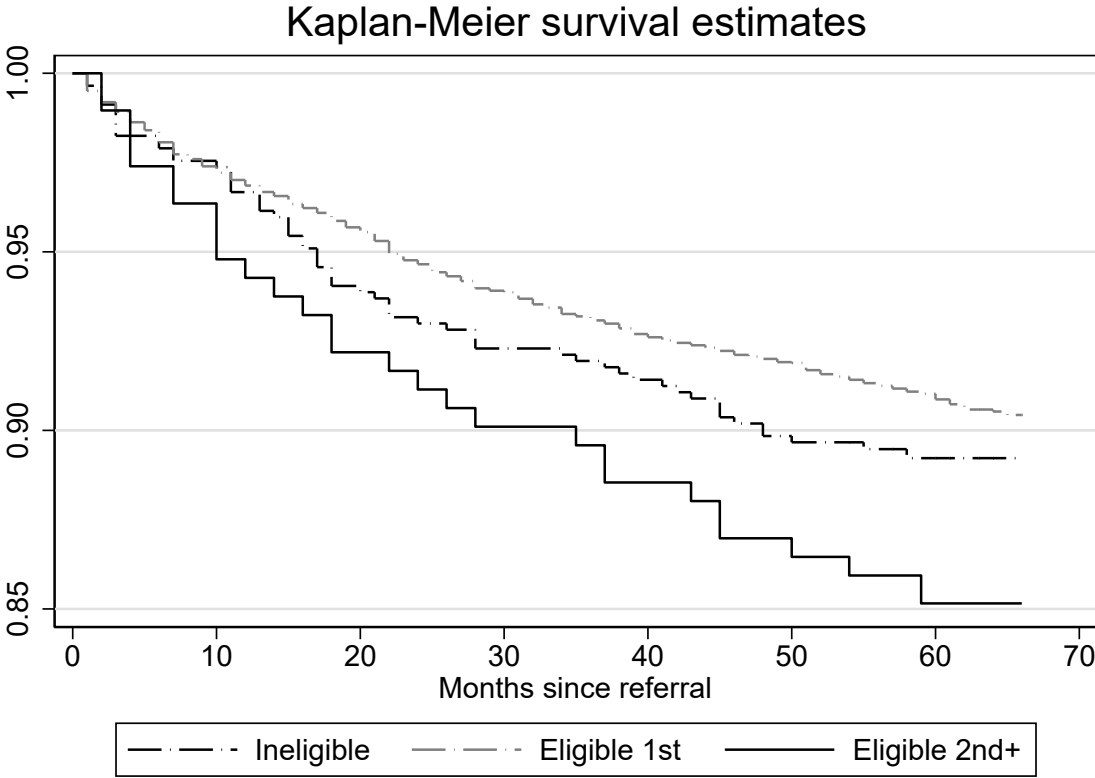
(b) By age at EI referral



(c) By first evaluation

The figure shows the distribution of all children eligible for early intervention (EI) by type of diagnosis. Diagnosis is defined at the evaluation stage and is only available for children who were found eligible. Panel (a) shows the distribution for all eligible children. Panel (b) shows the distribution separately for eligible children referred to EI early (between 0-12 months of age) and referred late (after 12 months of age). Panel (c) shows the distribution separately for eligible children who were found eligible and ineligible on their first evaluation.

Figure 1.5: Survival Curves for Maltreatment after EI Referral



The figure shows survival curves for different groups of children referred to EI, based on eligibility and age at referral. The event is any maltreatment report after referral.