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Maternal Relationship Insecurity and Depressive Symptoms as Moderators of Home Visiting Impacts on Child Outcomes

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Abstract

The purpose of this study was to determine the extent to which maternal relationship insecurity and severe depressive symptoms moderate home visiting impacts on developmental and behavioral outcomes in 2-year old children. In an experimental trial of the Healthy Families Alaska home visiting program, families ($N = 249$) were randomly assigned to home visiting ($n = 126$) or community services as usual ($n = 123$). Maternal severe depressive symptoms (CES-D 24) and relationship insecurity were measured using the Center for Epidemiologic Studies Depression Scale and the Attachment Style Questionnaire at baseline. Child cognitive and psychomotor development and behavior problems were measured with the Bayley Scales of Infant Development and the Child Behavior Checklist at follow-up. The results revealed that home visiting significantly impacted three outcomes— child cognitive development, internalizing behavior, and externalizing behavior. Home visiting impacts were limited to subgroups defined by maternal depressive symptoms and relationship insecurity. Home visiting improved cognitive development ($B = 6.02, p < .03$), and decreased internalizing behavior ($B = -3.83, p = .02$) and externalizing behavior problems ($B = -3.74, p = .03$) in children of mothers with *either* severe depressive symptoms *or* high levels of discomfort with trust at baseline, but not both. Family

engagement in home visiting seems to play a role in mediating these moderating effects. These findings reflect the importance of screening for maternal relationship insecurity and depressive symptoms to distinguish family subgroups likely to benefit from home visiting from those for whom an enhanced service model might be needed.

Keywords

Home visiting; Attachment; Depression; Child development; Child behavior

Introduction

Most early childhood home visiting programs aim to improve child development and behavior. The Patient Protection and Affordable Care Act invests \$1.5 billion in grants to states, territories and tribal organizations for the expansion and scale up of evidence-based home visiting through the Maternal, Infant, and Early Childhood Home Visiting (MIECHV) program (Patient Protection and Affordable Health Care Act 2010). States are required to monitor funded sites' progress in achieving national benchmarks; some of these benchmarks focus on parenting and child development and behavior (Design Options for Home Visiting Evaluation 2011).

Research on home visiting program impacts on child development and behavior outcomes has had mixed results, even for evidence-based models. Some studies have found that home visiting significantly improves early child development (e.g., Caldera et al. 2007; Daro and Harding 1999; Duggan et al. 1999; Robinson and Emde 2004; Olds et al. 2002). Other studies have not found significant program impacts (e.g., Kitzman et al. 1997; Olds et al. 1999; St. Pierre and Layzer 1999).

One way to explicate the mixed results of early child home visiting is to examine family characteristics, such as maternal depressive symptoms and relationship insecurity, as moderators of program impact. There is evidence that maternal depressive symptoms moderate program impacts (e.g., Duggan et al. 1999; DuMont et al. 2006). For example, research has shown positive program impacts on maternal sensitivity to infant cues for mothers who endorsed depressive symptoms (Spieker et al. 2005). Research has also shown that relationship insecurity moderates program impacts (McFarlane et al. 2013). For example, mothers with high relationship anxiety but not avoidance showed the greatest benefits in psychosocial functioning (McFarlane et al. 2013). Yet, mothers with both high relationship anxiety and avoidance experienced some adverse consequences of home visiting (McFarlane et al. 2013). Finally, there is evidence that maternal depression in combination with relationship insecurity moderate program impacts (e.g., Duggan et al. 2009; Robinson and Emde 2004). Our own research has shown that for mothers with depressive symptoms, home visiting program impact on maternal sensitivity to infant cues was attenuated as relationship insecurity increased (Duggan et al. 2009). These findings provided a foundation for the exploration of maternal severe depressive symptoms and relationship insecurity on child outcomes in the current study.

These findings are concordant with attachment theory, which suggests that caregiver-infant patterns of interaction serve as the foundation for attachment in adulthood. Longitudinal studies have shown that the quality of maternal caregiving experienced in infancy predicts attachment style through adulthood (Zayas et al. 2010). A child's cognitive and social development and ability to self regulate are highly dependent on his/her caregiver's behavior (Bowlby 1973). According to attachment theory, an adult's "internal working model of attachment" is described as a cognitive map that guides perception and behavior in close relationships (Bowlby 1973; Bretherton and Munholland 2008).

The present study examines two dimensions of adult relationship insecurity as moderators of home visiting impact. The first dimension includes discomfort with interpersonal closeness, lack of trust and discomfort depending on others; these characteristics are commonly associated with "avoidant" attachment (Mikulincer and Shaver 2007). The second dimension includes a strong desire for interpersonal closeness and a concern that close others are not sufficiently invested in the relationship; this dimension is most characteristic of adults with "attachment anxiety" (Mikulincer and Shaver 2007). Each dimension might moderate home visiting impacts. For example, avoidant mothers might have difficulty providing consistent nurturing to their child as well as difficulty trusting the home visitor and asking for and accepting parenting guidance, thereby attenuating program impact on their parenting behavior and, as a consequence, program impact on child development and behavior. High relationship anxiety might also influence the mother's caregiving and her relationship with the home visitor. In prior home visiting research, for example, we found that mothers with high relationship anxiety were less likely to trust home visitors with high relationship anxiety but more likely to trust home visitors with relationship avoidance (McFarlane et al. 2010).

According to Bowlby (1980), attachment insecurity between infancy and adolescence can lead to depression in adulthood. Research has confirmed this theoretical link in that self-reported attachment anxiety and avoidance are associated with depressive symptoms in adulthood (Mikulincer and Shaver 2007; Roberts et al. 1996; Strodl and Noller 2003; Wayment and Vierthaler 2002). In general, attachment anxiety and depression are more strongly associated than attachment avoidance and depression (Mikulincer and Shaver 2007). Each dimension of attachment has characteristics that can make one more vulnerable to developing depression (Mikulincer and Shaver 2007). The anxiously attached person's overdependence on others can make him/her more vulnerable to developing depression, while the avoidant person's extreme self-reliance can lead to social isolation that can make him/her more vulnerable to developing depression (Mikulincer and Shaver 2007).

Depression in combination with either dimension of attachment insecurity may moderate home visiting program impacts on child development and behavior outcomes. Avoidant mothers with depression may be more likely to over rely on themselves and not trust home visitors, which leads them to dismiss recommended parenting practices and could adversely affect their children's development and behavior. Anxious mothers with depression may excessively seek reassurance from home visitors, which leads them to undermine their own parenting self-efficacy and could adversely affect their children's development and behavior.

The current study draws on data collected from a multisite randomized trial of the Healthy Families Alaska (HFAK) home visiting program. As reported previously, the program had significant positive effects on child development and behavior for the full sample when the children were 2 years old (Duggan et al. 2007). Also reported previously, maternal depressive symptoms and relationship insecurity moderated program effects on maternal psychosocial and parenting outcomes (Duggan et al. 2009). Of particular relevance for the current study, program impacts in improving the quality of the home environment for learning were limited to mothers with either severe depressive symptoms or discomfort with trust/dependence, but not both. In addition, program impacts in improving maternal sensitivity to cues were observed in mothers who were not depressed and in those who were depressed but had low levels of relationship anxiety.

The purpose of the current study is to advance the field's understanding of how and why home visiting impacts might vary across subgroups of the families targeted for enrollment. The study objective is to determine if maternal depressive symptoms and relationship insecurity moderate program impacts on child development and behavior outcomes. We first report the baseline prevalence of maternal depression and attachment insecurity. Then, we examine these as moderators of program impacts on child development and behavior outcomes. We conclude by exploring the role of maternal engagement in home visiting as a potential mediator of moderating effects of severe depressive symptoms and relationship insecurity.

Previous research has examined maternal depression and relationship insecurity as moderators of home visiting impacts on maternal psychosocial and parenting outcomes. The current study adds to the literature by examining the moderating effects of these maternal characteristics on home visiting impacts on child development and behavior. This is important in light of the Maternal, Infant and Early Childhood Home Visiting program's designation of high risk families as a priority group for home visiting, and its expectation that home visiting improve children's school readiness (Patient Protection and Affordable Health Care Act 2010).

Method

Brief Description of Healthy Families Alaska Program

The HFAK program was established in 1995, and was administered by the Alaska Department of Health and Social Services (DHSS). The HFAK program followed the Healthy Families America (HFA) service model. It targeted families at risk for child maltreatment when one or both parents scored ≥ 5 on the Kempe Family Stress Checklist (Duggan et al. 2007; Healthy Families America 2001). The program aimed to provide home visiting for up to 3 years beginning with weekly visits for the first 6 to 9 months of enrollment followed by tapered visits as family functioning improved (Healthy Families America 2001). It sought to improve family functioning and parenting and, in so doing, promote child health and development.

HFAK staff completed core and wrap-around training of the parenting curriculum that was provided by HFA-certified trainers. Training emphasized trust-building, goal-setting,

positive parenting, and identifying developmental delays in children (Duggan et al. 2009; Healthy Families America 2001). Home visitors were expected to promote positive parent-child interaction and parental empathy through parenting education, role modeling, reinforcement, and referral to community resources (Duggan et al. 2009). Home visitors were also expected to identify maternal depression and, with supervisor support, to provide referrals and to encourage and support parents in accessing professional help for depression (Duggan et al. 2009). Supervisors discussed home visitor observations as well as action plans in weekly individual supervision (Duggan et al. 2009).

Setting and Sample

The study was carried out in six of the state's seven HFAK sites, those viewed by the Alaska Department of Health and Social Services as mature enough to achieve program goals. HFAK home visitors participating in the study ($n = 53$) were 18–51 years old ($M = 35.3$, $SD = 9.1$); 30 % had a college or graduate degrees, 52 % had some college training, and 17 % had completed high school.

Procedures for study recruitment were integrated into regular HFAK program operations. HFAK staff identified potential program enrollees following their usual protocols. Families were identified primarily through program screening of mothers of newborns at hospital obstetric units and through referrals to the program from prenatal care providers and other community service providers (Bair-Merritt et al. 2008). Following the usual program protocol, family eligibility for the program was determined using a formal assessment of risks for poor parenting. Mothers were eligible for the randomized trial if they were eligible for HFAK, had no prior exposure to HFAK services, spoke English, and were willing to enroll in HFAK if randomized to the intervention group.

HFAK staff identified 388 eligible families from January 2000 to July 2001. Of these 388 eligible families, 22 (6 %) declined participation and 364 (94 %) mothers consented to participate (Duggan et al. 2007). Group assignments (HFAK $n = 179$; control $n = 185$) were predetermined using a table of random numbers, equal allocation, and randomization within site in blocks of ten (Duggan et al. 2007). Research staff completed baseline maternal interviews within 1 month of enrollment and 325 (89 %) were interviewed at baseline (HFAK $n = 162$; control $n = 163$), 12 declined, and 27 could not be located (Duggan et al. 2007). Overall 40 % of the mothers were pregnant and 60 % were postpartum at the time of the baseline interview. There was substantial attrition from the HFAK program itself; about half of the study families were still enrolled when the child was 12 months old; 32 % were still enrolled when the child was 24 months old (Caldera et al. 2007).

Since the study was designed to use an intent-to-treat approach to analysis, we attempted to collect follow-up data for all study families. Overall, 86 % ($n = 278$) of families with a baseline interview had follow-up data. For 90 % of the families with follow-up data ($n = 249$), the biological mother had custody of the child and completed the follow-up interview. For the other 10 % of the families with follow-up data, someone other than the mother had custody of the child (Duggan et al. 2009). To test moderated program impacts for child development and behavior outcomes, the subsample for the current study was limited to

these 249 families (HFAK $n = 126$; control $n = 123$). This subsample comprised 126 (78 %) of HFAK families and 123 (76 %) of control families.

To determine if the subsample of 249 families included in the analyses was biased, we compared its baseline characteristics to those of the subsample of 47 families who were lost to follow up. The two groups differed significantly only in that the mothers lost to follow-up were less likely to have been in a relationship with the child's father at baseline (34 vs. 58 %, $p < .01$). To determine if the 278 families with follow up data was biased, we compared its baseline characteristics to those of the 47 families who were lost to follow up. The two groups differed significantly only in that the mothers lost to follow-up were less likely to have been in a relationship with the child's father at baseline (34 vs. 56 %, $p < .01$).

At baseline, control group mothers were referred to other parenting and family-support services, which was the usual HFAK protocol for eligible families when program enrollment reached maximum capacity (Duggan et al. 2009). According to follow-up interviews, about 50 % of control group mothers received public health nursing and about 33 % accessed a center-based or home-based parenting program (Duggan et al. 2009).

Procedure

Baseline data came from program family assessment records and 90-min, home-based, maternal interviews conducted by research staff within 1 month of enrollment. Follow-up data were collected by maternal interview and child developmental testing when the children were 2 years old. The study was approved by the Institutional Review Boards of the Johns Hopkins University School of Medicine and the local hospitals where the mothers were recruited.

Measures

Center for Epidemiologic Studies Depression Scale (CESD; Radloff 1977). This 20-item, self-report screening measure is widely used in community-based studies. Respondents indicate how often in the past week they have experienced a symptom on a 4-point scale. Scores range from 0 to 60. Concurrent and construct validity, high internal consistency (α 's 0.85 to 0.90) and test-retest reliability (r 's = 0.51 to 0.67 in 2- to 8-week intervals) have been established (Radloff 1977). The standard cutoff score for the detection of possible clinical depression is 16 (Radloff 1977), and cutoff scores of 17 or greater are strongly associated with major depression (McDowell and Newell 1996). A cutoff score of 24 is used for the detection of severe depressive symptoms (Roberts et al. 1991). Because higher cut points have been recommended to reduce false positives (McDowell and Newell 1996), we used a cutoff score of 24 as indicative of severe depressive symptoms in the current study. In our sample, internal consistency (α) was 0.78.

Attachment Style Questionnaire (ASQ; Feeney et al. 1994) was completed by mothers. The 40-item, self-report measure of general (rather than romantic) attachment security has been linked in theoretically predicted ways to maternal depression (Feeney et al. 2003). Respondents rate each item on a scale of 1 ("totally disagree") to 6 ("totally agree"). The ASQ has good test-retest reliability (r 's = 0.75 to 0.80) and internal consistency (Feeney et

al. 1994). The ASQ was used in earlier home visiting research with a large sample of similarly at-risk mothers and infants in Hawaii. In both studies, the 34 items from the following four ASQ original subscales were used: discomfort with closeness, confidence in self, need for approval, and preoccupation with relationships. The subscale, relationships as secondary to accomplishments, was omitted to reduce respondent burden. Confirmatory factor analysis revealed that the original ASQ subscale structure was a poor fit for at-risk samples in Hawaii and Alaska, according to four indices of fit (χ^2 , RMSEA, CFI, and Tucker-Lewis Index).

Due to the compelling evidence of two major dimensions of attachment insecurity, we conducted exploratory factor analysis using a maximum likelihood algorithm and a two factor solution to identify these factors (Duggan et al. 2009). All ASQ items were included in the first step and those with factor loadings ≥ 0.40 were retained (Duggan et al. 2009). The model was rerun, again retaining only ASQ items with factor loadings ≥ 0.40 , until the loadings of all remaining items were ≥ 0.40 (Duggan et al. 2009). The ASQ items with equal loadings >0.40 on both factors were dropped (Duggan et al. 2009). Both varimax orthogonal rotation and promax (oblique) rotation generated similar factor structures (Duggan et al. 2009). For detailed descriptions of this confirmatory and exploratory analyses, please see Duggan et al. (2009).

The analysis resulted in two factors containing items that directly tap the two major dimensions of attachment insecurity: attachment anxiety and avoidance. Attachment anxiety, which we labeled “relationship anxiety,” is an 11-item factor that indicates anxiety about others not being available (e.g., “I worry that others won’t care about me as much as I care about them”). Possible scores range from 11 to 66 with high scores indicating greater relationship anxiety. Attachment avoidance, which we labeled “discomfort with trust,” is a 4-item factor that indicates discomfort with trusting and/or depending on others (e.g., “I find it difficult to depend on others”). Possible scores range from 4 to 24 with high scores indicating greater discomfort with trust. Both the relationship anxiety and discomfort with trust factors had high internal consistency ($\alpha \geq 0.80$). For both the relationship anxiety and discomfort with trust variables, in addition to the continuous scores, we created binary measures using each variable’s theoretical median as the cutoff. Thus, for relationship anxiety, the cutoff was a score of ≥ 37 and for discomfort with trust the cutoff was a score of ≥ 14 .

Bayley Scales of Infant Development (BSID; Bayley 1993) were utilized for the assessment of cognitive or mental development (MDI) and psychomotor development (PDI). Reliability and validity is established for BSID (Bayley 1993). The recommended cutoff score for a mild delay is <85 (Bayley 1993).

Child Behavior Checklist (CBCL; Achenbach 1991) was completed by mothers. This 118-item measure consists of a checklist in which a parent rates a child’s behavior on a 3-point scale that ranges from “not true” to “often true” (Achenbach 1991). The reliability and validity of the CBCL is well established (Achenbach 1991). Scores from the Internalizing scale and Externalizing scale were used in this study. The Internalizing scale is comprised of items on anxiety, depression, social withdrawal, and somatic complaints. The Externalizing

scale is comprised of items on aggression and delinquency. In the current study, the CBCL was analyzed as a continuous variable using T-scores for internalizing and externalizing behavior and analyzed as a binary variable using recommended cutpoints for normal (<60) versus borderline (60–63) and clinical scores (>63) (Achenbach and Rescorla 2000).

Home Visiting Dosage and Engagement: Three binary measures of dosage were developed from data drawn from the HFAK management information system (MIS). The first two indicators reflected length of enrollment: family still enrolled when the child was 12 months old, and still enrolled when the child was 24 months old. As part of regular HFAK operations, home visitors completed a form after each visit, marking a structured checklist of content areas to indicate those that had been included in the visit. Parenting content was defined by two content categories: child development role modeling and development activities, and education on or modeling of parent child interaction. The third indicator of dosage—receipt of 20 visits with parenting content—reflected both visit frequency and content relevant for child developmental outcomes.

Two continuous measures of maternal engagement were developed from maternal ratings of the HFAK home visitors via a self-administered questionnaire at 2 years. Items were adapted from a similar unpublished ratings instrument developed by David Olds, Ph.D., at the Kempe Prevention Research Center for Family and Child Health, University of Colorado Health Sciences Center, Denver. In this study, we focused on a 6-item rating of the mother's trust in the home visitor (e.g. "I trust her to look after my best interests") and a 4-item rating of the home visitor's attention to child development (e.g. "She helps me understand my baby's behavior"). Response choices ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Responses were summed to create a trust score that could range from 6 to 30 (Cronbach's $\alpha = 0.88$) and a child development rating score that could range from 4 to 20 (Cronbach's $\alpha = 0.86$); higher scores indicate greater trust and greater attention to the child's development. For both the trust and attention to child development ratings, in addition to the continuous scores, we created binary measures using as a cutoff the score achieved by at least agreeing with each item in the rating, that is a score of 24 or greater for the trust rating and a score of 16 or greater for the attention to child development rating. Mothers scoring above these cutoffs were considered to have given a 'high' rating to their HFAK home visitor.

Analysis Plan

Moderation of Program Impacts

To examine moderation, we built regression models incorporating hypothesized moderators (i.e. baseline severe depressive symptoms, relationship anxiety, and discomfort with trust) using conventional group-by-moderator interaction terms. For each continuous outcome, we used linear regression modeling to estimate the adjusted mean difference in scores for home visited *versus* control mothers. We began by testing a fully specified regression model incorporating all three-way interaction terms that included the intervention (i.e., home visiting * severe depressive symptoms * relationship anxiety; home visiting * severe depressive symptoms * discomfort with trust; and home visiting * relationship anxiety * discomfort with trust) and all two-way interactions and main effects. We used a step-down

approach (Aiken and West 1991) to identify the most parsimonious model of moderation of program impacts on each outcome. We first dropped non-significant ($p > .05$) three-way interactions, then dropped non-significant two-way interactions that were not a component of significant three-way interactions.

Parents' baseline relationship was included as a covariate. We used robust variance estimates to account for any correlation of outcomes within program site. The robust variance estimates adjust the models' standard errors to account for the possibility that, although observations are independent across program sites, they might not be independent within program site (Liang and Zeger 1986). We used a 10 % statistical significance criterion for a series of correlated tests examining an intervention effect. We did not use statistical corrections to correct for chance. We justified this approach by noting that (a) the analyses were exploratory and (b) we did not examine a large number of outcomes beyond those reported here.

Where we found significant three-way-interactions between study group, relationship insecurity and severe depressive symptoms, we further examined each finding by stratifying the sample into three groups based on relationship insecurity and severe depressive symptoms (e.g. neither severe depressive symptoms nor high levels of discomfort with trust, either severe depressive symptoms or high levels of discomfort with trust, both severe depressive symptoms and high levels of discomfort with trust). Linear regression was used to estimate the program impacts on the children's development and behavior scores at 2 years for each subgroup.

For each binary outcome, we used logistic regression modeling to estimate the adjusted odds ratios for home visited *versus* control mothers. We began by testing a fully specified logistic regression model incorporating all three-way interaction terms that included the intervention (i.e., home visiting * severe depressive symptoms * relationship anxiety, home visiting * severe depressive symptoms * discomfort with trust, and home visiting * relationship anxiety * discomfort with trust) and all two-way interactions and main effects. We used a step-down approach (Aiken and West 1991) to identify the most parsimonious model of moderation of program impacts on each outcome, as described earlier for linear regression modeling of continuous outcomes.

Mediation of Moderated Effects

Where we found evidence that maternal baseline depressive symptoms and relationship insecurity moderated program impact on outcomes, we explored home visiting dosage and family engagement in home visiting as potential mediators. We assessed differences in indicators of dosage and engagement among sample subgroups defined by baseline depressive symptoms and relationship insecurity using Chi square and one way analysis of variance. Where we found evidence that dosage or engagement varied across subgroups, we repeated our initial tests of moderation, limiting the home visited group to families achieving a high level of dosage or with a high maternal rating of the home visitor and using an adherers only approach to analysis (Piantadosi 1997). Where we found that evidence that moderation of program impacts was attenuated, we interpreted this as suggestive of dosage or engagement as a mediator.

Results

Baseline Comparison of Study Groups

Although careful monitoring of family group assignment revealed no deviations from the study protocol, there were some baseline differences between the HFAK and control groups (Table 1). The HFAK and control groups were comparable in terms of all demographics except that mothers in the control group were more likely to be married to or living with their child's father (64 vs. 52 %, $p = .05$). All subsequent analyses of group impacts controlled for this variable.

Mothers in the control group were also more likely than HFAK mothers to score positive for severe depressive symptoms at baseline (32 vs. 19 %, $p < .05$). Mothers in the control group had a higher mean score for relationship anxiety than those in the HFAK group (34.6 vs. 32.4, $p < .05$) and were more likely to score high for discomfort with trust (72 vs. 59 %, $p < .05$).

Joint Prevalence of Severe Depressive Symptoms and Relationship Insecurity

The sample was quite heterogeneous with regard to relationship anxiety and discomfort with trust. Overall, of a possible range of 11 to 66 for relationship anxiety, mothers scored from 12 to 59 ($M = 33.4$, $SD = 7.7$). Of a possible range of 4 to 24 for discomfort with trust, mothers scored from 4 to 24 ($M = 14.9$, $SD = 3.8$). Overall, 29 % of mothers scored negative for severe depressive symptoms, relationship anxiety, and discomfort with trust. About a third of mothers (35 %) scored positive for discomfort with trust only, but few scored positive for severe depressive symptoms only (2 %) or relationship anxiety only (2 %). A fifth (20 %) of mothers scored positive for two risks, but not all three; 10 % were positive for severe depressive symptoms and discomfort with trust, 9 % were positive for severe depressive symptoms and relationship anxiety, and 1 % were positive for relationship anxiety and discomfort with trust). Finally, 11 % of mothers scored positive for all three risks.

Overall Program Impacts on Outcomes

Child cognitive development scores were significantly higher in home visited families ($M = 88.0$, $SD = 11.6$ vs. $M = 84.8$, $SD = 11.9$, $p < .05$, see Table 2). Children in the home visited group showed a trend toward lower externalizing behavior problem scores ($M = 50.8$, $SD = 9.4$ vs. $M = 53.0$, $SD = 9.1$, $p < .10$) and had significantly lower internalizing behavior problem scores ($M = 48.28$, $SD = 9.1$ vs. $M = 51.0$, $SD = 10.41$, $p < .01$). Home visiting had significant positive impacts in reducing the proportion of children scoring delayed for cognitive development and scoring in the borderline or clinical range for both externalizing and internalizing behavior.

Moderation of Program Impacts on Child Cognitive Development

The most parsimonious model of moderation of home visiting impact on child cognitive development scores incorporated a significant three-way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust ($B = -1.86$, $p < .05$; see Fig. 1). This model did not include relationship anxiety as a moderating variable. Among children of

mothers with *severe depressive symptoms* at baseline, home visiting impact did not vary by discomfort with trust ($B = -0.52, p = .52$), nor was there an impact on child cognitive development scores overall ($B = 0.67, p = .88$). Among children of mothers *without severe depressive symptoms* at baseline, home visiting impact did not vary by level of maternal discomfort with trust ($B = 1.09, p = .18$). However, there was a significant positive impact of home visiting on cognitive development scores overall for children of all mothers without severe depressive symptoms at baseline ($B = 0.48, p < .05$; see bold, solid line in Fig. 1).

The interaction of baseline maternal severe depressive symptoms and discomfort with trust as moderators of home visiting impact was evident when stratifying the sample by whether the mother had neither severe depressive symptoms nor discomfort with trust, only one of these characteristics, or both characteristics at baseline. Among children of mothers with either but not both severe depressive symptoms and high levels of discomfort with trust at baseline, cognitive development scores were significantly higher in the home visited group versus the control group ($B = 6.02, p < .03$; Table 3).

In models with a binary cognitive development outcome variable, there were no statistically significant three-way or two-way interactions of maternal depressive symptoms, relationship anxiety, or discomfort with trust with study group. While the prevalence of delay was in the expected direction and consistent with the findings using the continuous cognitive development outcome variable, there were no significant group impacts on child cognitive development when stratifying the sample into subgroups defined by maternal severe depressive symptoms and relationship security status at baseline (Table 4).

Moderation of Program Impacts on Child Psychomotor Development

There were no significant group impacts on child psychomotor development when stratifying the sample into subgroups defined by maternal severe depressive symptom and relationship security status at baseline. There were no significant group impacts on child psychomotor development when analyzed as a binary outcome.

Moderation of Program Impacts on Child Externalizing behavior

The most parsimonious model of moderation of program impact on child externalizing behavior scores incorporated a significant three-way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust ($B = 1.93, p < .05$; see Fig. 2). This model did not include relationship anxiety as a moderating variable. The influence of maternal discomfort with trust as a moderator of impacts varied significantly for mothers with versus without severe depressive symptoms at baseline. However, two-way interactions of home visiting * discomfort with trust were not statistically significant either for children of mothers with severe depressive symptoms nor for mothers without severe depressive symptoms at baseline ($B = 1.14, p = .11$; and $B = -0.84, p = .12$, respectively). Further, neither for children of mothers with severe depressive symptoms ($B = -1.51, p = .35$) nor for children of mothers without severe depressive symptoms ($B = -2.11, p = .11$) was there an overall statistically significant home visiting impact on externalizing behavior problem scores.

The interaction of baseline maternal severe depressive symptoms and discomfort with trust as moderators of home visiting impacts was clear in analyses stratifying the sample by whether the mother had neither, only one, or both of these baseline characteristics at baseline. Among children of mothers with severe depressive symptoms or high levels of discomfort with trust, but not both, externalizing behavior problem scores were significantly lower at follow-up for those in the home visited group versus the control group ($B = -3.74$, $p = .03$).

In models with a binary child externalizing behavior outcome variable, there were no statistically significant three-way or two-way interactions of maternal depressive symptoms, relationship anxiety, or discomfort with trust with study group. While the prevalence of borderline or clinical externalizing behavior was in the expected direction and consistent with the findings using a continuous child externalizing behavior outcome variable, there were no significant group impacts on child externalizing behavior when stratifying the sample into subgroups defined by maternal severe depressive symptoms and relationship security status at baseline (Table 4).

Moderation of Program Impacts on Child Internalizing Behavior

The most parsimonious model of moderation of home visiting impact on child internalizing behavior scores incorporated a significant three-way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust ($B = 1.66$, $p < .001$; see Fig. 3). This model did not include relationship anxiety as a moderating variable. In families where the mother did not have severe depressive symptoms at baseline, maternal discomfort with trust did not moderate home visiting impact ($B = -0.12$, $p = .65$). For this subset of families, there was a significant overall program effect in reducing children's internalizing behavior scores in the home visited group versus the control group ($B = -2.54$, $p < .05$; see bold, solid line in Fig. 3).

In contrast, maternal discomfort with trust attenuated program impact for children of mothers with severe depressive symptoms at baseline ($B = 1.51$, $p < .01$). Among children of mothers with severe depressive symptoms, program impact was significant only if the mother's discomfort with trust fell into the low to moderate range, as shown by the bold portion of the dotted line in Fig. 3.

The interaction of baseline maternal severe depressive symptoms and discomfort with trust as moderators of home visiting impact was clear in analyses stratifying the sample on these two characteristics. Among children of mothers with one but not both of these characteristics, internalizing behavior scores were significantly lower for those in the home visited group versus the control groups ($B = -3.83$, $p = .02$; Table 3).

In models with a binary child internalizing behavior outcome variable, there were no statistically significant three-way or two-way interactions of maternal depressive symptoms, relationship anxiety, or discomfort with trust with study group. While the prevalence of borderline or clinical internalizing behavior was in the expected direction and consistent with the findings using a continuous child internalizing behavior outcome variable, there were no significant group impacts on child internalizing behavior when stratifying the

sample into subgroups defined by maternal severe depressive symptoms and relationship security status at baseline (Table 4).

Dosage and Family Engagement as Mediators of Moderating Effects

The subgroups of mothers defined by baseline depressive symptoms and relationship security did not differ on indicators of dosage (Table 5). However, mothers with both severe depressive symptoms and high levels of discomfort with trust at baseline gave their HFAK home visitors lower ratings on education around child development and there was a trend toward lower ratings of trust.

These ratings of the home visitor appear to mediate partially the moderating effects of severe depressive symptoms and discomfort with trust on program impact on child cognitive development. When repeating the initial analysis of moderation using an adherers only approach, the three way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust was not significant ($B = -1.36, p = .19$ when limiting the analysis to home visited mothers with high ratings on child development; $B = -1.25, p = .16$ when limiting the analysis to home visited mothers with high ratings on trust).

Maternal ratings of the home visitor's education on child development appeared to play a weaker role in mediating the moderating effects of severe depressive symptoms and discomfort with trust on program impact on child behavior. When repeating the initial analysis of moderation and limiting the home visited group to mothers with high ratings home visitor education on child development, the three way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust was weaker for impacts on both externalizing behavior ($B = 1.50, p = .08$) and internalizing behavior ($B = 1.15, p = .02$).

Maternal ratings of trust in the home visitor did not appear to mediate the moderating effects of severe depressive symptoms and discomfort with trust on program impact on child behavior. When repeating the initial analysis of moderation and limiting the home visited group to mothers with high ratings trust in the home visitor, the three way interaction of home visiting * baseline severe depressive symptoms * discomfort with trust was essentially the same as in the original analyses for both externalizing behavior ($B = 1.97, p = .02$) and internalizing behavior ($B = 1.57, p < .01$).

Discussion

This study examined how maternal severe depressive symptoms and relationship insecurity moderated home visiting program impacts on child development and behavior when children were 2 years old. Home visiting had a significant overall impact on three outcomes—child cognitive development, internalizing behavior, and externalizing behavior. For each of these, we found that impacts were limited to subgroups defined by maternal severe depressive symptoms and relationship insecurity. Home visiting improved cognitive development and decreased internalizing and externalizing behavior problems in children of mothers with *either* severe depressive symptoms *or* high levels of discomfort with trust at baseline, but not both. It also improved cognitive development and reduced internalizing

behavior for children of mothers with *neither* severe depressive symptoms *nor* high levels of discomfort with trust. We did not find a reduction in externalizing behavior problems in this subgroup, but the externalizing behavior problems scores for children in the control group were low, leaving little room for improvement. Home visiting did not impact cognitive development or behavior in children of mothers with *both* severe depressive symptoms *and* high levels of discomfort with trust. Home visiting did not have a significant overall impact on child psychomotor development, and we found no evidence of moderation of impacts by maternal depressive symptoms or relationship insecurity for this outcome.

When moderation analyses were repeated with the binary versions of the child development and child behavior outcomes, the results did not achieve statistical significance. However, the results were in the same direction as those in the continuous analysis. We speculate that the differences in findings using continuous and binary outcome measures may have been due to greater statistical power to detect differences when using continuous measures.

Previous analyses of data from this study have shown similar moderating effects of maternal depressive symptoms and relationship insecurity for program impacts on maternal psychosocial outcomes and parenting behavior (Duggan et al. 2009). For most of the outcomes examined, the presence of both severe depressive symptoms and high discomfort with trust attenuated program impacts. Overall home visiting effects in improving these outcomes did not extend to mothers with both depressive symptoms and high levels of discomfort with trust (Duggan et al. 2009). For example, discomfort with trust attenuated home visiting program impacts on poor Infant-Toddler Home Observation for Measurement of the Environment (HOME) scores among mothers with depressive symptoms. These previous findings are concordant with our current findings that home visiting did not improve developmental and behavioral outcomes of children of mothers with both severe depressive symptoms and high levels of discomfort with trust.

It is also possible to compare the results of the current study with those of our randomized trial of home visiting impacts on maternal psychosocial functioning in Hawaii (McFarlane et al. 2013). As in the current study, we used the Attachment Style Questionnaire to measure maternal relationship anxiety and discomfort with trust. Unlike the current study, we did not measure maternal depression at baseline and so could not test it as a moderator. However, as previously reported, depressive symptoms were positively associated with relationship anxiety and discomfort with trust among mothers in our Alaska study (Duggan et al. 2009). In the Hawaii study, positive home visiting impacts were most evident for mothers who scored high on relationship anxiety only; outcomes were either attenuated or adverse for mothers scoring high on both relationship anxiety and discomfort with trust (McFarlane et al. 2013). It is possible that the observed attenuation of effects for mothers with both high relationship anxiety and discomfort with trust in the Hawaii study is similar to that observed for mothers with both severe depressive symptoms and discomfort with trust in the current study.

This evidence of the moderating effects of maternal depressive symptoms and relationship insecurity extends previous research showing the moderating effects of maternal depressive symptoms alone (e.g., Duggan et al. 1999) and in combination with relationship insecurity

(e.g., Duggan et al. 2009; DuMont et al. 2006; Robinson and Emde 2004). The analyses reported here build on previous work by focusing on the interactive effects of depressive symptoms and relationship insecurity and by testing the effects of both relationship anxiety and discomfort with trust, the two major dimensions of relationship insecurity.

The current study also extends previous research by exploring service dosage and family engagement as mediators of the moderating effects of baseline severe depressive symptoms and discomfort with trust. We found that mothers with both severe depressive symptoms and discomfort with trust were similar to other mothers in terms of retention and receipt of visits with parenting content. However, they gave poorer ratings of trust in their home visitor and poorer ratings of their home visitor's provision of education on child development. These ratings appear to mediate partially the observed moderation of program effects on child development. To a lesser extent, ratings of the home visitor's education on child development mediated the observed moderation of program effects on child behavior.

Methodological Considerations

To our knowledge, this is the first study to measure and test the interactive effects of baseline severe depressive symptoms and relationship insecurity as moderators of home visiting impacts on child development and behavior outcomes. Several methodological limitations should be considered when interpreting the results. First, our study was limited to a single home visiting model in a single state and a sample that was limited to families identified as at risk for child maltreatment; all of these study characteristics limit generalizability. Second, the size of some sample subgroups was small, which reduced study power to detect moderating effects. Third, the analyses consider only maternal depressive symptoms as measured at baseline; we did not assess the course of depressive symptoms as a moderator of program impacts on outcomes. Fourth, all of the measures relied on maternal report, except for the Bayley Scales; this resulted in shared method bias. The use of alternative data sources and observational measures may have produced different findings. Fifth, follow-up data were collected only when the children were 2 years old and so we could not determine if moderating effects on program impacts endured. Sixth, while we aimed to use an intent-to-treat approach, we lacked follow-up data for 19 % of mothers; this may have biased the results. Seventh, the study did not focus on the possible role of intimate partner violence, which is also common among families targeted for home visiting and which might interact with maternal depression and relationship security in moderating program impacts on child outcomes. Last, our measures of dosage were rudimentary and we obtained maternal ratings of the home visitor only at the 2-year follow up. These limitations in measurement likely diminished our ability to assess dosage and engagement as mediators.

Implications

At the time this study was conducted, most home visiting programs did not formally screen parents for depression. Thus, in the current study, it is likely that home visitor identification of severe depressive symptoms was poorer than in current practice. Then, as now, however, home visitors were expected to provide referrals and encourage parents to seek professional help for depression (Duggan et al. 2009). For mothers with severe depressive symptoms at baseline, 42 % (42 % of HFAK group mothers and 42 % of control group mothers) had

received professional mental health services within 2 years of the birth of the child. At the time of the family follow-up interviews, 18 % of mothers with severe depressive symptoms at baseline were receiving professional mental health services (21 % in the HFAK group and 16 % in the control group).

Mothers enrolling in home visiting varied substantially in terms of baseline depressive symptoms and relationship insecurity. Previous analyses showed that these factors moderated program impacts on maternal psychosocial functioning and parenting (Duggan et al. 2009). The current report shows that these factors moderated impacts on child developmental and behavioral outcomes as well, and that for cognitive development, moderation was explained in part by maternal engagement in home visiting, though not by dosage. These results suggest the importance of screening for these factors and for tailoring services accordingly. They argue as well for additional research that examines more closely the influence of these maternal characteristics on engagement in home visiting.

Home visiting is a costly and complex intervention. It is important to target services to families most likely to benefit (see, for example, Chaffin 2004; Gomby 2007; Guterman 1999; Kitzman et al. 1997; Olds et al. 1999, 2002). The findings from the current study and our earlier report on moderation (Duggan et al. 2009) suggest the importance of identifying mothers with both severe depressive symptoms and relationship insecurity. Research is needed to determine effective and efficient ways to augment current screening methods to incorporate screening for depression and relationship insecurity. Use of such tools is important for assessing moderation of program impacts in future studies and for determining the need for tailored mental health services for families such as those targeted by HFA programs.

Although our single sample of HFAK participants should not dictate eligibility criteria for HFA and other home visiting programs, important consideration should be given to mothers with severe depressive symptoms and high levels of discomfort with trust. These mothers comprised about one-fifth of our study sample. The current study found no significant program impacts on child outcomes for this subset of targeted mothers; our previous research found adverse program impacts on maternal depressive symptoms and on child maltreatment (Duggan et al. 2009). For mothers with severe depressive symptoms and high levels of discomfort with trust, home visiting alternatives and enhancements should be tested. Service models could be enhanced by adding licensed mental health professionals to the service team or by referring families for therapy. Research has established the effectiveness of adding mental health professionals to home visiting teams to address maternal depression (Ammerman et al. 2005, 2007, 2012, 2013a, b). In addition, several studies have shown that both depressed and non-depressed individuals with high relationship insecurity significantly benefit from individual, couple and family therapy (e.g., Diamond and Stern 2003; Dolan et al. 1993; Halchuk et al. 2010; Holmes 1997; Slade 1999). More research is needed to ascertain the best approaches for mothers with severe depressive symptoms and high levels of discomfort with trust in the context of existing and emerging models of home visiting.

Home visiting aims to improve a broad range of outcomes for at-risk families. Research is needed to test the moderating effects of maternal depression and relationship insecurity across these outcomes, and to deepen our understanding of whether and how these maternal characteristics give rise to improvements in some outcomes while leading to adverse consequences for other outcomes. Research is needed as well to deepen our understanding of how maternal depression and relationship security influence family engagement in home visiting, the mother's relationship with the home visitor, and the content and quality of home visiting.

References

- Achenbach, TM. Manual for the child behavior checklist and the 1991 profile. Burlington, VT: University of Vermont, Department of Psychiatry; 1991.
- Achenbach, TM.; Rescorla, LA. Manual for the ASEBA preschool forms and profiles. Burlington, VT: University of Vermont, Research Center for Children, Youth, and Families; 2000.
- Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Newbury Park, CA: Sage; 1991.
- Ammerman RT, Peugh JL, Putnam FW, Van Ginkel JB. Predictors of treatment response in depressed mothers receiving in-home cognitive behavioral therapy and concurrent home visiting. *Behavior Modification*. 2012; 36(4):462–481. [PubMed: 22718282]
- Ammerman RT, Putnam FW, Altaye M, Stevens J, Teeters AR, Van Ginkel JB. A clinical trial of in-home CBT for depressed mothers in home visitation. *Behavior Therapy*. 2013a
- Ammerman RT, Putnam FW, Altaye M, Teeters AR, Stevens J, Van Ginkel JB. Treatment of depressed mothers in home visiting: Impact on psychological distress and social functioning. *Child Abuse and Neglect*. 2013b
- Ammerman RT, Putnam FW, Kopke JE, Gannon TA, Short JA, Van Ginkel JB, et al. Development and implementation of a quality assurance infrastructure in a multisite home visitation program in Ohio and Kentucky. *Journal of Prevention and Intervention in the Community*. 2007; 34:89–107. [PubMed: 17890195]
- Ammerman RT, Putnam FW, Stevens J, Holleb LJ, Novak AL, Van Ginkel JB. In-home cognitive behavior therapy for depression: An adapted treatment for first-time mothers in home visitation. *Best Practices in Mental Health*. 2005; 1:1–14.
- Bair-Merritt MH, Crowne SS, Burrell L, Caldera D, Cheng TL, Duggan AK. Impact of intimate partner violence on children's well-child care and medical home. *Pediatrics*. 2008; 121(3):473–480.
- Bayley, N. Bayley Scales of infant development. 2nd ed.. San Antonio, TX: The Psychological Corporation, Harcourt Brace & Company; 1993.
- Bowlby, J. Attachment and loss, Vol. 2: Separation. New York, NY: Basic Books; 1973.
- Bowlby, J. Attachment and loss, Vol. 3: Loss, sadness and depression. New York, NY: Basic Books; 1980.
- Bretherton, I.; Munholland, KA. Internal working models in attachment relationships: Elaborating a central construct in attachment theory. In: Cassidy, J.; Shaver, P., editors. *Handbook of attachment: Theory, research and clinical application*. 2nd ed.. New York: Guilford; 2008.
- Caldera D, Burrell L, Rodriguez K, Shea-Crowne S, Rohde C, Duggan A. Impact of statewide home visiting program on parenting and on child health and development. *Child Abuse and Neglect*. 2007; 31:829–852. [PubMed: 17822765]
- Chaffin M. Is it time to rethink healthy start/healthy families? *Child Abuse and Neglect*. 2004; 28:589–595. [PubMed: 15193850]
- Daro DA, Harding KA. Healthy Families America: Using research to enhance practice. *The Future of Children*. 1999; 9:152–176. [PubMed: 10414015]
- Design Options for Home Visiting Evaluation (DOHVE). DOHVE compendium of measurement tools for MIECHV grantees. 2011 Sep. Retrieved from http://www.mdrc.org/dohve/DOHVE%20TA%20Compendium_Updated.pdf

- Diamond, GS.; Stern, RS. Attachment-based family therapy for depressed adolescents: Repairing attachment failures. In: Johnson, SM.; Whiffen, VE., editors. Attachment processes in couple and family therapy. New York: Guilford Press; 2003. p. 191-212.
- Dolan R, Arnkoff D, Glass C. Client attachment style and the psychotherapist's interpersonal stance. *Psychotherapy: Theory Research and Practice*. 1993; 30:408–412.
- Duggan AK, Berlin LD, Cassidy J, Burrell L, Tandon SD. Examining maternal depression and attachment insecurity as moderators of the impacts of home visiting for at-risk mothers and infants. *Journal Consulting and Clinical Psychology*. 2009; 77:788–799.
- Duggan AK, Caldera D, Rodriguez K, Burrell L, Rohde C, Crowne SS. Impact of a statewide home visiting program to prevent child abuse. *Child Abuse and Neglect*. 2007; 31:829–852. [PubMed: 17822765]
- Duggan AK, McFarlane E, Windham AM, Rohde CA, Salkever DS, Fuddy L, et al. Evaluation of Hawaii's healthy start program. *The Future of Children, Home Visiting: Recent Program Evaluations*. 1999; 9:66–90.
- DuMont, K.; Mitchell-Herzfeld, S.; Greene, R.; Lee, E.; Lowenfels, A.; Rodriguez, M. Working Paper Series Evaluating Healthy Families, OCFS Working Paper #1. 2006. Healthy Families New York (HFNY) randomized trial: Impacts on parenting after the first 2 years.
- Feeney JA, Alexander R, Noller P, Hohauser L. Attachment insecurity, depression, and the transition to parenthood. *Personal Relationships*. 2003; 10:475–493.
- Feeney, JA.; Noller, P.; Hanrahan, M. Assessing adult attachment. In: Sperling, MB.; Berman, WH., editors. Attachment in adults: Clinical and developmental perspectives. New York: Guilford; 1994. p. 128-152.
- Gomby DS. The promise and limitations of home visiting: Implementing effective programs. *Child Abuse and Neglect*. 2007; 31:793–799. [PubMed: 17822761]
- Guterman NB. Enrollment strategies in early home visitation to prevent physical child abuse and neglect and the “universal versus targeted” debate: A meta-analysis of population-based and screening-based programs. *Child Abuse and Neglect*. 1999; 23:863–890. [PubMed: 10505901]
- Halchuk R, Makinen J, Johnson SM. Resolving attachment injuries in couples using emotionally focused therapy: A 3 years follow-up. *Journal of Couple and Relationship Therapy*. 2010; 9:31–47.
- Healthy Families America. Healthy families America training participant's manual-program manager, supervisor, family support worker and assessment worker. Chicago, IL: Prevent Child Abuse America; 2001.
- Holmes J. Too early, too late: Endings in psychotherapy—An attachment perspective. *British Journal of Psychotherapy*. 1997; 14:159–171.
- Kitzman H, Olds DL, Henderson CR Jr, Hanks C, Cole R, Tatelbaum R, et al. Effect of prenatal and infancy home visitation by nurses on pregnancy outcomes, childhood injuries, and repeated childbearing: A randomized controlled trial. *Journal of the American Medical Association*. 1997; 278:644–652. [PubMed: 9272896]
- Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.
- McDowell, I.; Newell, C. Depression. In: McDowell, I.; Newell, C., editors. Measuring health: A guide to rating scales and questionnaires. 2nd ed. New York: Oxford University Press; 1996. p. 238-286.
- McFarlane E, Burrell L, Crowne S, Cluxton-Keller F, Fuddy L, Leaf PJ, et al. Maternal relationship security as a moderator of home visiting program impacts on maternal psychosocial functioning. *Prevention Science*. 2013; 14(1):25–39. [PubMed: 23104075]
- McFarlane E, Burrell L, Fuddy L, Tandon SD, Derauf DC, Leaf P, et al. Association of home visitors' and mothers' attachment style with family engagement. *Journal of Community Psychology*. 2010; 38:541–556.
- Mikulincer, M.; Shaver, PR. Attachment in adulthood: Structure, dynamics, and change. New York: Guilford; 2007.

- Olds DL, Henderson CR, Kitzman HJ, Eckenrode JJ, Cole RE, Tatelbaum RC. Prenatal and infancy home visitation by nurses: Recent findings. *The Future of Children*. 1999; 9:44–65. [PubMed: 10414010]
- Olds DL, Robinson J, O'Brien R, Luckey DW, Pettitt LM, Henderson C, et al. Home visiting by paraprofessionals and by nurses: A randomized, controlled trial. *Pediatrics*. 2002; 110:486–496. [PubMed: 12205249]
- Piantadosi, S. *Clinical trials: A methodologic perspective*. Vol. 323. Hoboken, NJ: Wiley and Sons; 1997.
- Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Roberts JE, Gotlib IH, Kassel JD. Adult attachment styles and symptoms of depression: The mediating role of dysfunctional attitudes and low self-esteem. *Journal of Personality and Social Psychology*. 1996; 70:310–320. [PubMed: 8636884]
- Roberts RE, Lewinsohn PM, Seeley JR. Screening for adolescent depression: A comparison of depression scales. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1991; 30:58–66. [PubMed: 2005065]
- Robinson J, Emde RN. Mental health moderators of early head start on parenting and child development: Maternal depression and relationship attitudes. *Parenting: Science and Practice*. 2004; 4:73–97.
- Slade, A. Attachment theory and research: Implications for the theory and practice of individual psychotherapy with adults. In: Cassidy, J.; Shaver, PR., editors. *Handbook of attachment: Theory, research, and clinical applications*. New York: Guilford Press; 1999. p. 575-594.
- Spieker, S.; Nelson, D.; DeKlyen, M.; Staerkel, F. Enhancing early attachments in the context of early head start: Can programs emphasizing family support improve rates of secure infant-mother attachments in low-income families?. In: Berlin, LJ.; Ziv, Y.; Amaya-Jackson, L.; Greenberg, MT., editors. *Enhancing early attachments: Theory, research, intervention and policy*. New York: Guilford; 2005. p. 250-275.
- St. Pierre RG, Layzer JI. Using home visits for multiple purposes: The comprehensive child development program. *The Future of Children*. 1999; 9:134–151. [PubMed: 10414014]
- Strodl E, Noller P. The relationship of adult attachment dimensions to depression and agoraphobia. *Personal Relationships*. 2003; 10:171–185.
- United States Congress. Patient Protection and Affordable Care Act, Public Law No. 111–148. Government publications office; Available at: <http://www.gpo.gov:80/fdsys/pkg/PLAW-111publl48/pdf/PLAW-111publl48.pdf> [Accessed 23 March 2010]
- Wayment HA, Vierthaler J. Attachment style and bereavement reactions. *Journal of Loss and Trauma*. 2002; 7:129–149.
- Zayas V, Mischel W, Shoda Y, Aber JL. Roots of adult attachment: Maternal caregiving at 18 months predicts adult peer and partner attachment. *Social Psychological and Personality Science*. 2010; 000:1–9.

Fig. 1.

Program impacts on Bayley Scales of Infant Development Mental Development (MDI) scores as moderated by baseline maternal level of discomfort with trust and maternal severe depressive symptoms. The *dotted line* represents the AORs for mothers with severe depressive symptoms. The *solid line* represents the AORs for mothers without severe depressive symptoms. For this outcome, the *entire solid line is bold*, indicating that the impact of home visiting on MDI scores was significant for children of mothers without severe depressive symptoms at baseline across all levels of discomfort with trust

Fig. 2. Program impacts on Achenbach Child Behavior Checklist (CBCL) Externalizing (Ext) scores as moderated by baseline maternal level of discomfort with trust for children of mothers with severe depressive symptoms or high levels of discomfort with trust. The *dotted line* represents the AORs for mothers with severe depressive symptoms. The *solid line* represents the AORs for mothers without severe depressive symptoms. For this outcome, no portions of the *dotted line* or *solid line* are *bold*, indicating that the impact of home visiting on CBCL Externalizing scores was not significant

Fig. 3.

Program impacts on CBCL Internalizing scores as moderated by baseline maternal level of discomfort with trust for children of mothers with severe depressive symptoms and low to moderate levels of discomfort with trust. The *dotted line* represents the AORs for mothers with severe depressive symptoms. The *solid line* represents the AORs for mothers without severe depressive symptoms. For this outcome, the *entire solid line* and *bottom half* of the *dotted line* are **bold**, indicating that the impact of home visiting on CBCL Internalizing scores was significant for all children of mothers without severe depressive symptoms and for those of depressed mothers with low to moderate levels of discomfort with trust

Table 1

Baseline characteristics of HFAK and control groups

	Overall (N = 249)	HFAK (n = 126)	Control (n = 123)	<i>p</i>
Maternal age: <i>M (SD)</i>	23.5 (5.6)	23.6 (5.9)	23.4 (5.4)	.78
Mother graduated from high school	61 %	64%	58 %	.35
Below poverty level	53 %	54%	53 %	.86
Index child is/will be first birth	53 %	50%	56%	.34
Index child is female	52%	55 %	50%	.41
Mother's primary race/ ethnicity				.66
Alaska native	20%	23 %	18 %	
Caucasian	56%	56%	57 %	
Multiracial	8 %	8 %	7 %	
Other	16%	14%	18 %	
Parents married or living together	58 %	52%	64%	.04
Partner violence	30%	30%	31 %	.79
Maternal substance use	53 %	54%	53 %	.88
Maternal severe depressive symptoms (SDS)	25 %	19%	32%	.02
Maternal relationship insecurity				
Relationship anxiety score: <i>M (SD)</i>	33.4 (7.7)	32.4 (7.5)	34.6 (7.8)	.03
High relationship anxiety ^a	23 %	18 %	29%	.05
Discomfort with trust score (DwT): <i>M (SD)</i>	14.9 (3.8)	14.6 (4.0)	15.3 (3.6)	.16
High DwT ^a	65 %	59%	72 %	.03

HFAK Healthy Families Alaska program group. *N*'s ranged from 238 to 249^a Scores cut at the theoretical median

Table 2

Child development and behavior scores overall and by study group^a

	Overall M ± SD	HFAK M ± SD	Control M ± SD	B	95 % CI	ES	p
Bayley Scales MDI Score	86.8 ± 11.8	88.0 ± 11.6	84.8 ± 11.9	3.2	1.2, 5.2*	0.27	<.05
Bayley Scales PDI Score	97.2 ± 11.5	98.1 ± 11.8	96.0 ± 11.0	2.1	-1.2, 5.4	0.18	.16
CBCL Externalizing Score	51.4 ± 9.4	50.8 ± 9.4	53.0 ± 9.1	-2.2	-5.0, 0.5 [†]	-0.24	.09
CBCL Internalizing Score	48.9 ± 9.9	48.2 ± 9.1	51.0 ± 10.4	-2.8	-4.2, -1.5**	-0.29	<.01
	%	%	%	AOR	95 % CI		p
Bayley Scales MDI Delay ^b	45	42	52	0.64	0.4, 1.0		.04
Bayley Scales PDI delay	17	15	20	0.74	0.4, 1.4		.35
CBCL Ext. behavior problems ^c	19	18	23	0.68	0.5, 0.9		<.01
CBCL Int. behavior problems	16	13	21	0.48	0.3, 0.8		<.01

Models controlled for mother's baseline relationship status with the infant's father

[†] $p < .10$

* $p < .05$

** $p < .01$

^a Sample is children of biological mothers with custody of index child at follow-up (HFAK, n = 126; control, n = 123). For the Bayley Scales, 50 cases were excluded because the child was not awake or not at home during the follow-up, or had known pervasive delays at birth (HFAK, n = 105; control, n = 94)

^b Bayley scores <85

^c CBCL scores in the borderline (60–63) or clinical range (>63)

Table 3

Program impacts on continuous child development and behavior outcomes

	N	HFAK M ± SD	Control M ± SD	B	CI	ES	p
Cognitive development							
Neither SDS nor DwT	62	88.0 ± 11.3	85.1 ± 12.2	3.00	-0.5, 6.5	0.25	.08
SDS or DwT	95	90.3 ± 11.0	84.3 ± 11.6	6.02	0.9, 11.2	0.53	.03*
SDS and DwT	41	83.4 ± 13.4	85.7 ± 12.8	-2.30	-10.3, 5.7	0.18	.50
Externalizing behavior score							
Neither SDS nor DwT	77	48.9 ± 7.9	49.1 ± 9.9	-0.28	-8.0, 7.4	0.02	.93
SDS or DwT	118	50.0 ± 10.1	53.5 ± 9.5	-3.74	-6.8, -0.7	0.36	.03*
SDS and DwT	53	53.4 ± 10.2	55.1 ± 7.0	-1.71	-5.3, 1.9	0.20	.28
Internalizing behavior score							
Neither SDS nor DwT	77	46.1 ± 8.6	48.8 ± 11.4	-3.03	-8.6, 2.6	0.27	.22
SDS or DwT	118	47.2 ± 9.3	50.9 ± 10.0	-3.83	-6.7, -1.0	0.39	.02*
SDS and DwT	53	51.2 ± 8.8	52.9 ± 10.0	-1.57	-8.2, 5.1	0.18	.57

SDS severe depressive symptoms, DwT discomfort with trust

*
p < .05

Table 4

Program impacts on binary child development and behavior outcomes

	n	HFAK (%)	Control (%)	AOR	CI	p
Poor cognitive development ^a						
Neither SDS nor DwT	62	38	54	0.52	0.2, 1.4	.20
SDS or DwT	95	36	49	0.58	0.2, 1.4	.23
SDS and DwT	41	59	56	1.16	0.4, 3.8	.80
Externalizing behavior problems ^b						
Neither SDS nor DwT	77	11	15	0.68	0.1, 3.4	.64
SDS or DwT	118	12	24	0.42	0.1, 1.3	.12
SDS and DwT	53	35	21	2.07	0.7, 6.5	.21
Internalizing behavior problems ^b						
Neither SDS nor DwT	77	7	11	0.55	0.1, 3.3	.51
SDS or DwT	118	10	17	0.48	0.2, 1.3	.16
SDS and DwT	53	21	33	0.55	0.2, 1.5	.24

SDS severe depressive symptoms, DwT discomfort with trust

^a Bayley Scales of infant development mental development (MDI) score <85^b Child behavior checklist (CBCL) scores in the borderline range (60–63) or clinical range (>63)

Table 5

Actual HF/AFK service dosage and engagement by family subgroup

	n	Indicators of Dosage		Maternal ratings of home visitor		
		Active at 12 months	Active at 24 months	20 Visits with parenting content	Child development (M ± SD)	Trust (M ± SD)
Neither SDS nor DwT	48	62%	44%	31 %	17.1 ± 2.3	24.7 ± 4.3
SDS or DwT	58	50%	31 %	29 %	17.2 ± 2.0	23.5 ± 4.2
SDS and DwT	20	55 %	50%	45 %	15.3 ± 4.2	21.3 ± 6.1
<i>p</i>		.43	.22	.42	<.05	.06

SDS severe depressive symptoms, DwT discomfort with trust