

# Can Early Intervention have a Sustained Effect on Human Capital?

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## *Online Appendix*

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## Appendix A

### *Literature on the Medium-Term Impact of Home Visiting Programs*

Tables A1-A3 below summarize studies of home visiting programs that evaluate outcomes in middle childhood. These studies were selected for inclusion as they form part of the Home Visiting Evidence of Effectiveness (HomVEE) review (<https://homvee.acf.hhs.gov/>) which assesses robust evidence of the impact of early childhood home visiting programs targeting pregnant women and children from birth until age five.

Table A1 shows that of the four studies assessing the medium-term impact of home visiting programs on children's cognitive development, only one has a statistically significant effect. Bierman *et al.* (2017) find that children who participated in Early Head Start (home based component) had improved cognitive ability at ages seven to nine. However, no effects are found for Early Head Start at age five (Chazan-Cohen, Raikes, and Vogel 2013) or the Nurse Family Partnership program at ages six-nine (Olds *et al.* 2014) or age 12 (Kitzman *et al.* 2010).

Table A2 shows that of the five home visiting studies assessing children's achievement tests in school, three identify a significant treatment effect. Bierman *et al.* (2017) find that Early Head Start had an impact on children's reading and language skills at ages seven to nine, and two studies of the Healthy Families America program identify significant effects on the percentage of children in a gifted program, receiving special education, and excelling academically in behaviors that promote learning at ages six to seven (DuMont *et al.* 2010; Kirkland and Mitchell-Herzfeld 2012). The Nurse Family Partnership program had no impact on achievement tests at ages six to 12 (Sidora-Arcoleo *et al.* 2010) or at age 12 (Kitzman *et al.* 2010).

Finally, Table A3 shows that of the ten studies assessing the medium-term impact of home visiting programs on children's socio-emotional skills, only three identify significant treatment effects. Two studies of the Early Head Start program find effects on children's behaviors, perceived competence, and approaches to learning at ages five (Chazan-Cohen, Raikes, and Vogel 2013) and ages seven to nine (Bierman *et al.* 2017). In addition, the Nurse Family Partnership program finds a reduction in internalizing disorders at age 12 (Kitzman *et al.* 2010). However, a number of other home visiting studies, including Healthy Families America at age seven (DuMont *et al.* 2010), Healthy Steps at age five (Minkowitz *et al.* 2007), Family Check-Up at age five (Sitnick *et al.* 2015) and age seven to eight (Smith *et al.* 2014), as well as the Nurse Family Partnership program at ages six to nine (Olds *et al.* 2014) and ages six to 12 (Sidora-Arcoleo *et al.* 2010), fail to identify sustained effects on children's socio-emotional skills.

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**Table A1** *Impact of home visiting programs on cognitive outcomes between ages 5-12*

<b>Outcome</b>	<b>Author</b>	<b>Sample Size</b>	<b>Programme</b>	<b>Measures</b>	<b>Significant Finding</b>	<b>Effect</b>	<b>Age (years)</b>	<b>% of original sample retained</b>
<b>Cognitive tests</b>	Bierman <i>et al.</i> (2017)	556 children	Early Head Start Home Based Option + REDI-P	Woodcock Johnson Tests of Achievement (Letter-Word Identification Scale), School Readiness Questionnaire, Learning Behaviors Scale	Woodcock Johnson Tests of Achievement	Favorable	7-9	87%
	Chazan-Cohen, Raikes and Vogel (2013)	927 families	Early Head Start Home Based Option	English receptive vocabulary, Woodcock-Johnson revised test, Leiter R sustained attention test, speech problems survey	None	None	5	Original N not reported. Retention between ages 2-5: 96% parent interviews, 92% child assessments
	Kitzman <i>et al.</i> (2010)	635 children	Nurse Family Partnership	Leiter-R sustained attention test	None	None	12	80% parent interviews, 76% child interviews, 85% school records
	Olds <i>et al.</i> (2014)	411 children	Nurse Family Partnership	Conners continuous performance test (attention dysfunction)	None	None	6-9	81% at age 6 78% at age 9

**Table A2** *Impact of home visiting programs on achievement test outcomes between ages 5-12*

<b>Outcome</b>	<b>Author</b>	<b>Sample Size</b>	<b>Programme</b>	<b>Measures</b>	<b>Significant Finding</b>	<b>Effect</b>	<b>Age (years)</b>	<b>% of original sample retained</b>
<b>Achievement tests</b>	Bierman <i>et al.</i> (2017)	556 children	Early Head Start Home Based Option + REDI-P	Test of Word Rereading Efficiency, Academic Competence Evaluation Scales (ACES; reading/language skills, mathematics), Academic Performance Rating Scale	ACES (reading/language skills)	Favorable	7-9	87%
	DuMont <i>et al.</i> (2010)	897 mothers	Healthy Families America	Partaking in a gifted program, receiving remedial services, receiving special education, repeating a grade	Participating in a gifted programme, receiving special education	Favorable	7	80% of baseline sample
	Kirkland and Mitchell-Herzfield (2012)	577 mother and child pairs	Healthy Families America	Doing poorly academically (below grade level in reading, math or positive behaviors that promote learning), excelling academically (reading and math, behaviors that promote learning), retained in 1 <sup>st</sup> grade	Excelling academically with all 3 behaviors that promote learning, retained in 1 <sup>st</sup> grade	Favorable	6-7	49% academic reports, 68% child interviews, 80% parent surveys
	Kitzman <i>et al.</i> (2010)	635 children	Nurse Family Partnership	Placement in special education, ever retained in a grade, GPA, Group achievement test scores, Peabody Individual Achievement Tests	None	None	12	80% parent interviews, 76% child interviews, 85% school records
	Sidora-Arcoleo <i>et al.</i> (2010)	721 mother and child dyads	Nurse Family Partnership	Peabody Picture Vocabulary Test-Revised	None	None	6-12 years	Not reported

**Table A3** *Impact of home visiting programs on socio-emotional outcomes between ages 5-12*

<b>Outcome</b>	<b>Author</b>	<b>Sample Size</b>	<b>Programme</b>	<b>Measures</b>	<b>Significant Finding</b>	<b>Effect</b>	<b>Age (years)</b>	<b>% of original sample retained</b>
<b>Socio-emotional skills</b>	Bierman <i>et al.</i> (2017)	556 children	Early Head Start Home Based Option + REDI-P	Social Competence Scale, Student Teacher Relationship Scale, Child Behavior Scale (excluded by peers), Perceived Competence Scale for Children, Loneliness Scale, Friendship Questionnaire	Perceived Competence Scale for Children, Child Behavior Scale	Favorable	7-9	87%
	Chazan-Cohen, Raikes and Vogel (2013)	927 families	Early Head Start Home Based Option	Child Behavior Checklist (CBCL), Family and Child Experiences Survey (FACES), negativity towards parents during play	FACES (positive approaches to learning), FACES (social behavior problems)	Favorable	5	Original N not reported. Retention between ages 2-5: 96% parent interviews 92% child assessments
	Dumont <i>et al.</i> (2010)	897 mothers	Healthy Families America	CBCL (attention problems, rule breaking and aggressive behaviors, social problems, and the anxious-depressed and withdrawn-depressed syndrome)	None	None	7	80% of baseline sample
	Kitzman <i>et al.</i> (2010)	635 children	Nurse Family Partnership	Child conduct	None	None	12	80% parent interviews, 76% child interviews, 85% school records
	Kitzman <i>et al.</i> (2010)	594 mothers, 578 children	Nurse Family Partnership	Ever arrested, externalizing disorders and internalizing disorders, total problems	Internalizing disorders	Favorable	12	80% parent interviews, 76% child interviews, 85% school records
	Minkowitz <i>et al.</i> (2007)	1308 children	Healthy Steps	CBCL (internalizing, externalizing, total problems)	None	None	5.5	57%
	Ol ds <i>et al.</i> (2014)	411 children	Nurse Family Partnership	CBCL (internalizing, externalizing, total problems)	None	None	6-9	81% at age 6, 78% at age 9

	Sidora-Arcoleo <i>et al.</i> (2010)	721 mother and child dyads	Nurse Family Partnership	CBCL (physical aggression items)	None	None	6-12	Not reported
	Sitnick <i>et al.</i> (2015)	614 families	Family Check Up for Children	CBCL (oppositional-aggressive items)	None	None	5	85%
	Smith <i>et al.</i> (2014)	612 children	Family Check Up for Children	CBCL (oppositional-aggressive items), oppositional behavior in the classroom	None	None	7-8	62%

## Appendix B

### List of *PFL* Tip Sheets

Tip Sheets	Pre-birth – 12 months	12 – 24 months	24 months – End of Program
Cognitive Development	Milestones 0-6 months; Milestones 6-12 months; Cognitive Development 0-3 months; Cognitive Development 3-6 months; Cognitive Development 6-12 months; Playing and learning; Hand-eye coordination 0-6 months; Hand-eye coordination 6-12 months; Language development 0-3 months; Language development 3-6 months; Language development 6-12 months; Developing movement 0-6 months; Developing movement 6-12 months	Milestones 12-24 months; Movement; Listening and Talking; Listening and Talking 2; First steps towards learning to read; Stories and books; First steps towards learning to write; First steps towards learning numbers; Learning through play; Messy play; Playing outdoors; Action rhymes 2	Getting Ready for Maths; Getting Ready for Writing; Children and Art 1; Children and Art 2; Children and Art 3; Basic Skills for School: Using Scissors; Basic Skills for School: Drawing Shapes; Basic Skills for School: Getting Dressed; Basic Skills for School: Hop, Skip and Jump; Basic Skills for School: Managing a Lunch Box; Basic Skills for School: Tying Shoelaces; Encouraging your Toddler's Play; Play; Sand Play; Water Play; Play Dough; Developing your Child's Language; Reading Together; Music and Learning; Milestones for 2 Years; Milestones for 3 Years; Developing Vocabulary1; Developing Vocabulary2; Developing Vocabulary3; Developing Vocabulary4; Developing Vocabulary5; Developing Vocabulary6
Social & Emotional Development	Circle of repair; Circle of trust; Circle of security; Getting to know your baby pre-birth; Getting to know your baby 0-3 months; Attachment; Secure base; Social and emotional development confidence 0-12 months; Getting to know your baby0-3 months communicating; Getting to know your baby 0-3 months regulation; Mutual gaze; Getting to know your baby 0-3 months tired signs; Getting to know your baby 0-3 months siblings; Social and emotional development 6-12 months	Child parent relationship; Self-awareness; Fear; Self-assertion; Temper tantrums; Learning to play; secure base; What is it like to be 12 months; What is it like to be 13 months; What is it like to be 14 months; What is it like to be 15 months; What is it like to be 16 months; What is it like to be 17 months; What is it like to be 18 months; What is it like to be 19 months ; What is it like to be 20 months; What is it like to be 21 months' What is it like to be 22 months; What is it like to be 23 months; What is it like to be 24 months	Caring and Sharing; Emotions; Expressing Emotions; List of Feeling Words; Creative Play; Social Skills; Disobedience; Friendships; Hurting Others; Giving Praise; Lies; Nightmares; Role Play 1; Role Play 2; Self Esteem; Separation Problems; Tantrums; The Toddler Years; Whining; Being Three; Being Four; ADD & ADHD; Sharing; Biting; Feeling Wheel
Rest & Routine / Parenting supports	Routine; Rest during pregnancy; Crying; Sleep 0-6 months; Cot death; Sleep chart; Daily routine; Sleep 6-12 months; Family planning; Extra supports for parents; Support agencies 1; Support agencies 2; Relationships mam dad baby; Relationships quality time; Relationships mam and dad; Relationships making changes; Postnatal depression; Preparing for labor; Labor; Labor birth plan; Labor and delivery; After the birth; Different types of families; Work, leave and entitlements	Routine 1; Routine 2; Daily routine; Sleeping and crying; Exercise; Looking after yourself 1-2 years; Especially for Mams and Dads; Supports	Bedtime Routine; Sleep Diary; Toilet Training



<b>Nutrition</b>	<p>Nutrition during pregnancy – portion size; Nutrition during pregnancy – weight gain; Nutrition during pregnancy – nutrients; Food safety; Managing common complaints; Breastfeeding; Breastfeeding patterns; Breastfeeding getting started; Breastfeeding expressing; Storing breastmilk; Formula feeding how much; Formula feeding advance preparation; Weaning to solids introduction; Weaning to solids chart; Weaning to solids tips; Weaning to solids drinks; Spoon feeding questions</p>	<p>Allergies and constipation; Food groups; Fussy eating; General freezing and thawing; Getting the balance right; Hygiene in the kitchen; Iron and calcium; Making most of mealtimes; Recipes for children; Sample meal planner; Shopping guide; Smart drinks for smart kids; Suitable snacks; The food pyramid; Pureed recipes for children; A diary of food; Twelve ways to disguise vegetables, Be sugar smart</p>	<p>Food Groups 1; Food Groups 2; Food Groups 3; Shopping and Labels; The Food Pyramid; Iron; Healthy Eating Recipes; Meal Planner; Healthy Eating for Teeth; Healthy Lifestyle for Children; Mealtimes</p>
<b>Safety &amp; Supervision</b>	<p>Smoking; Alcohol; Drug use; Domestic violence; Immunizing; Baby health; Travelling in a car; Caring for your baby; Childhood illness 0-6 month; Temperature; Keeping baby safe 0-6 months; Teething; Keeping baby safe 6 months – 2 years; Kid safe rooms; Childhood illness 6-24 months</p>	<p>Travelling in the car; Baby’s health; Teething; Keeping baby safe 6 months – 2 years; Kid safe rooms; Childhood illness 6-24 months; Basic first aid; Caring for your child’s teeth; Playing with toys; Teaching your child safety; Head lice; Soothers</p>	<p>Television 1; Television 2; Television 3; Soothers; Thumb-sucking; Passive Smoking; Family Holidays</p>

## Appendix C

### Attrition

**Figure C1** Participant flow from baseline to age nine follow-up

<b>Randomised 233</b>	
<b>High Treatment N=115</b>	<b>Low Treatment N=118</b>
Baseline 90% (n=104)	Baseline 86% (n=101)
6-months 72% (n=83)	6-months 76% (n=90)
12-months 71% (n=82)	12-months 70% (n=83)
18-months 70% (n=80)	18-months 63% (n=74)
24-months 70% (n=81)	24-months 71% (n=84)
36-months 64% (n=74)	36-months 64% (n=76)
48-months (64% (n=74)	48-months 62% (n=73)
51-months 62% (n=71)	51-months 53% (n=63)
60-months 65% (n=75)	60-months 63% (n=74)
<b>Age 9</b>  Child sample 60% (n=69) School sample 61% (n=70) Parent sample 56% (n=64)	<b>Age 9</b>  Child sample 41% (n=48) School sample 45% (n=53) Parent sample 40% (n=47)

*Baseline measures used to predict age nine attrition*

Age	No. of health services used in last 12 months
No. of children	Has a physical health condition
Partner status	Has a mental health condition
Marital status	Activities impaired by illness
Irish Traveller	Healthy eating habits
Teenage parent	Exercises more than 3 times per week
First time parent	Smokes during pregnancy
Educational level	Drinks during pregnancy
WASI IQ score	Ever took drugs before pregnancy
Employment status	Taking health supplements
Saves money regularly	Taking folic acid
Financial difficulty	Taking iron
Social housing	Taking calcium
Medical card	Taking other supplements
Health insurance	Support from friends
TIPI Extraversion score	Meets friends regularly
TIPI Agreeableness score	Knows neighbours
TIPI Conscientiousness score	Level of satisfaction with neighbourhood
	Total number of services used in last 12 months
TIPI Emotional score	
TIPI Openness score	
WHO 5 total wellbeing score	
Pearlin mastery score	
Pearlin self-efficacy score	
Rosenberg self-esteem score	
Vulnerable attachment style score	
Consideration of future consequences score	
Knowledge of infant development inventory score	
Adult-adolescence parenting inventory score	

**Appendix Table C1 Significant baseline differences between high and low treatment groups: child, school, and parent estimation samples**

	Child Sample			School Sample			Parent Sample		
	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	$p^a$	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	$p^a$	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	$p^a$
No. of cigarettes smoke during pregnancy (if smoke)	12.129 (6.835)	7.263 (4.382)	0.004	11.969 (6.813)	7.364 (4.147)	0.003	11.828 (6.985)	7.476 (4.214)	0.009
Exercise more than 3 times per week during pregnancy	0.382 (0.490)	0.600 (0.495)	0.023	0.377 (0.488)	0.580 (0.499)	0.037	0.359 (0.484)	0.556 (0.503)	0.048
Physical health condition	~	~	~	0.783 (0.415)	0.640 (0.485)	0.078	~	~	~
No. of health services used	~	~	~	2.188 (1.047)	2.540 (1.182)	0.096	2.141 (1.021)	2.578 (1.234)	0.052
Satisfaction with neighbourhood	0.765 (0.427)	0.600 (0.495)	0.077	0.768 (0.425)	0.580 (0.499)	0.033	0.781 (0.417)	0.533 (0.505)	0.007
Used community services	0.544 (0.502)	0.378 (0.490)	0.074	0.551 (0.501)	0.360 (0.485)	0.035	0.578 (0.498)	0.356 (0.484)	0.021
Child's father unemployed	~	~	~	0.426 (0.498)	0.250 (0.438)	0.046	0.429 (0.499)	0.256 (0.441)	0.066
Child's father employed	~	~	~	0.500 (0.504)	0.667 (0.476)	0.074	0.492 (0.504)	0.674 (0.474)	0.061
Teenage mother	0.088 (0.286)	0.244 (0.435)	0.043	~	~	~	0.094 (0.294)	0.200 (0.405)	0.096
TIPI Agreeableness Score	~	~	~	5.601 (1.178)	6.020 (1.156)	0.054	5.625 (1.212)	6.056 (1.149)	0.061
VASQ Proximity Seeking Score	10.463 (2.170)	9.591 (2.117)	0.037	~	~	~	~	~	~
Intend to use childcare	0.462 (0.502)	0.682 (0.471)	0.024	0.470 (0.503)	0.673 (0.474)	0.028	0.459 (0.502)	0.682 (0.471)	0.026
Age intend to use childcare	~	~	~	~	~	~	6.852 (2.381)	5.250 (3.768)	0.064
Support from friends	~	~	~	~	~	~	3.484 (0.713)	3.222 (0.795)	0.082
AAPI Appropriate Parent-Child Roles At Risk Score	0.147 (0.357)	0.333 (0.477)	0.028	0.145 (0.355)	0.340 (0.479)	0.021	0.125 (0.333)	0.311 (0.468)	0.022
AAPI Promoting Childrens Power and Independence At Risk Score	~	~	~	0.246 (0.434)	0.120 (0.328)	0.081	0.234 (0.427)	0.111 (0.318)	0.091
Knowledge of Infant Development Inventory Score							74.152 (7.207)	71.462 (8.803)	0.098
<i>N</i>		~113			~119			~109	

**Notes:** This table reports the baseline measures on which there are statistically significant differences between the high and low treatment groups in the age nine estimation samples. Out of 117 measures, there were significant differences (at the 10 percent level) on 6.8 percent (8/117) of baseline measures for the child sample, 10.3 percent (12/117) of measures for the school sample, and 12.8 percent (15/117) of measures for the parent sample. This table only reports the significant differences.  $M_{\text{HIGH}}$  (SD) is the mean (and standard deviation) of the high treatment group.  $M_{\text{LOW}}$  (SD) is the mean (and standard deviation) of the low treatment group. All baseline measures were assessed during pregnancy prior to treatment delivery. Baseline data are missing for four participants in the age nine assessment. <sup>a</sup> two-tailed  $p$ -values calculated from permutation tests with 100,000 replications.

**Table C2** Baseline characteristics predicting stayers from non-stayers in the age 9 child sample

Maternal Characteristics	High Treatment Group			Low Treatment Group		
	$M_{\text{STAYER}}$ (SD)	$M_{\text{NON-STAYER}}$ (SD)	$p^a$	$M_{\text{STAYER}}$ (SD)	$M_{\text{NON-STAYER}}$ (SD)	$P^a$
Age	26.50 (5.59)	23.50 (5.90)	0.012	25.07 (5.82)	25.48 (6.17)	0.733
Married	0.15 (0.36)	0.14 (0.35)	0.937	0.13 (0.34)	0.21 (0.41)	0.287
First time mother	0.50 (0.50)	0.61 (0.49)	0.261	0.42 (0.50)	0.55 (0.50)	0.194
No. of children	1.97 (1.27)	1.89 (1.39)	0.809	1.96 (1.07)	1.88 (1.22)	0.666
Low education (left $\leq$ age 16)	0.29 (0.46)	0.42 (0.50)	0.239	0.31 (0.47)	0.46 (0.50)	0.124
Weschler Abbreviated Scale of Intelligence (WASI)	84.72 (11.10)	77.03 (13.08)	0.003	81.91 (14.03)	80.11 (11.94)	0.504
Employed	0.49 (0.50)	0.14 (0.35)	0.000	0.44 (0.50)	0.36 (0.48)	0.408
Resides in social housing	0.53 (0.50)	0.60 (0.50)	0.518	0.53 (0.50)	0.57 (0.50)	0.759
Medical card	0.57 (0.50)	0.64 (0.49)	0.477	0.67 (0.48)	0.66 (0.48)	0.919
Prior physical health condition	0.79 (0.41)	0.67 (0.48)	0.226	0.64 (0.48)	0.61 (0.49)	0.786
Prior mental health condition	0.31 (0.47)	0.22 (0.42)	0.272	0.27 (0.45)	0.21 (0.41)	0.594
Smoking during pregnancy	0.46 (0.50)	0.61 (0.49)	0.123	0.42 (0.50)	0.52 (0.50)	0.352
Drinking alcohol during pregnancy	0.29 (0.46)	0.17 (0.38)	0.110	0.31 (0.47)	0.23 (0.43)	0.435
<i>N</i>	68	36		56	45	

**Note:**  $M_{\text{STAYER}}$  is the mean (and standard deviation) of those who participated in the age nine assessment.  $M_{\text{NON-STAYER}}$  is the mean (and standard deviation) of those who did not participate in the age nine assessment. All baseline measures were assessed during pregnancy prior to treatment delivery except for WASI which was assessed at three months postpartum. <sup>a</sup> two-tailed  $p$ -values calculated from permutation tests with 100,000 replications.

**Table C3** *Baseline characteristics predicting participation in the age 9 child sample*

Maternal Characteristics	Treatment status ( <i>I=high</i> )	Baseline measure	Treatment status*Baseline measure	F-test
Age	-0.375 (0.299)	-0.003 (0.008)	0.023** (0.011)	F = 4.00, p < 0 .05
Married	0.182** (0.075)	-0.137 (0.075)	0.152 (0.187)	F = 0.66, ns
First time mother	0.199** (0.098)	-0.130 (0.097)	0.029 (0.136)	F = 0.04, ns
No. of children	0.216* (0.129)	0.015 (0.043)	-0.004 (0.057)	F = 0.01, ns
Low education (left ≤ age 16)	0.187** (0.085)	-0.158 (0.099)	0.034 (0.141)	F = 0.06, ns
Weschler Abbreviated Scale of Intelligence (WASI)	-0.523 (0.441)	0.003 (0.004)	0.009* (0.005)	F = 2.75, p < 0.10
Employed	0.120 (0.085)	0.090 (0.097)	0.248* (0.137)	F = 3.28, p < 0.10
Resides in social housing	0.229** (0.103)	-0.038 (0.098)	-0.026 (0.138)	F = 0.04, ns
Medical card	0.249** (0.113)	0.007 (0.103)	-0.068 (0.142)	F = 0.23, ns
Prior physical health condition	0.117 (0.124)	0.039 (0.100)	0.115 (0.149)	F = 0.59, ns
Prior mental health condition	0.198** (0.079)	0.071 (0.114)	0.026 (0.157)	F = 0.03, ns
Smoking during pregnancy	0.235** (0.096)	-0.095 (0.097)	-0.046 (0.136)	F = 0.11, ns
Drinking alcohol during pregnancy	0.196** (0.079)	0.100 (0.110)	0.054 (0.156)	F = 0.12, ns
<i>N</i>		205		

**Note:** OLS coefficients and standard errors reported (in parentheses). Each row represents a separate regression where a baseline variable is interacted with treatment status. The dependent variable is a binary indicator representing participation in the child assessment at age nine or not. All baseline measures were assessed during pregnancy prior to treatment delivery. The F test compares the restricted model to the reported unrestricted model including the interaction term.

## Appendix D

### *Measure Description*

#### Cognitive Skills

Children's cognitive ability was assessed using the School Age *British Ability Scales III* (Elliot and Smith 2011). The BAS III School Age battery was designed to assess children's abilities in clinical, educational, and research settings for children aged from five years 0 months to 17 years 11 months. The BAS III consists of six subscales: word definitions, verbal similarities, matrices, quantitative reasoning, recognition of designs, and pattern construction. These subscales yield an overall score reflecting general cognitive ability (General Conceptual Ability, GCA), as well as three cluster scores for Verbal Ability, Non-Verbal Ability, and Spatial Ability. The GCA score assesses overall cognitive ability such as thinking logically, making decisions, and learning. The Spatial Ability score assesses problem solving, spatial visualisation, and short-term visual memory. The Non-Verbal Ability score assesses inductive reasoning. The Verbal Ability score assesses children's verbal reasoning, verbal knowledge, and expressive language. Age-based *T* scores are calculated for each domain that are standardized to have a mean of 100 and a standard deviation of 15, as well as cutoff scores indicating whether the child scores above or below average for the GCA and cluster scores.

#### Achievement Test Scores

All primary schools in Ireland are required to administer standardized achievement tests in English reading and Mathematics at the end of second grade when children are approximately 7/8 years old, some schools also continue to administer these tests at the end of each school grade. There are two published sets of standardized tests normed for the Irish population that schools can use: Drumcondra Tests for Reading and Mathematics, produced by the Educational Research Centre, or the Micra-T for English Reading and Sigma-T for Mathematics produced by Folens. These norm-referenced tests provide a standard score (mean = 100, SD = 15), with higher scores indicative of better performance. Standard scores are also converted to STen scores ranging from 1 to 10 indicating the child's approximate position with respect to the reference population. Standard and STen scores for participating children were obtained from the child's school. Scores for second and third grade, where available (equivalent to US second and third grade and UK year three and four) are used in this paper. STen scores were converted to indicators of above and below average performance based on National Council for Curriculum and Assessment STen score descriptors.

#### Absenteeism and School Resources

Information on *daily school attendance* was gathered from schools in the form of days attended and days absent for the previous school year (2017/2018) and up to the point of data collection for the year of data collection (2018/2019). This information was used to calculate the proportion of days attended in the school year for the current and previous school year.

Children with special education needs in primary schools in Ireland receive educational support to assist their integration into mainstream schools or to support their education in specialized schools. These supports normally take the form of in/out of class resource/learning support, or Special Needs Assistant depending on the child's assessed level of need. Schools were asked to indicate, yes or no, whether each child received education supports in school in the form of in-class support, out of class support, Special Needs Assistant, or other educational supports.



## Socio-emotional Skills

### *Child-reported*

The *Social Skills Improvement System Rating Scales* (SSIS-RS; Elliot and Gresham 2008) is a child report measure ( $\alpha = 0.87$ ) that assesses children's social skills and problem behavior. The current study used the behavior problems subscale, which consists of 29-items measuring: externalizing ( $\alpha = 0.79$ ), internalizing ( $\alpha = 0.84$ ), bullying ( $\alpha = 0.44$ ), and hyperactivity/inattention ( $\alpha = 0.70$ ) for children aged three to 18 years. Children indicated how true a statement about each problem behavior was for them using a 4-point scale of *not true, a little true, a lot true, and very true*. The relevant items were summed to create subscale scores. A total score was also computed and converted to a standard score using the scale norms for age and gender. Cutoff scores were also created for each of the subscales and the standardized total score to indicate whether or not the child scored above average for each score.

### *Parent-reported*

The *Brief Problems Monitor* (BPM; Achenbach, McConaughy, Ivanovaa, and Rescorla 2011) is a parent report measure for children aged six to 18 years to monitor children's functioning and responses to interventions. The BPM is based on items from the Child Behavior Checklist (CBCL), Teachers Report Form (TRF), and Youth Self Report (YSR). The measure consists of 19 items with the response options *not true, somewhat true, or very true*. The measure yields scores across three subscales: internalizing (6 items;  $\alpha = 0.76$ ), attention (6 items;  $\alpha = 0.89$ ), and externalizing (7 items;  $\alpha = 0.80$ ) problems. The scores for each of the three problems subscales were summed to create a Total Problems score. Scores were then converted to standard scores based on the child's age and gender, and binary indicators of concerning problem behavior were created based on standard scores exceeding 60.

The *Strengths and Difficulties Questionnaire* (SDQ; Goodman 1997) is a 25-item questionnaire assessing behaviors, emotions, and relationships of four to 16 years. The questionnaire covers five dimensions: conduct problems, emotional symptoms, hyperactivity, peer problems, and pro-social behavior. The 5-item Peer Problems ( $\alpha = 0.62$ ) and 5-item Pro-Social ( $\alpha = 0.72$ ) subscales were used in this study. Items were scored 0 for *not true*, 1 for *somewhat true*, and 2 for *certainly true*. The five items for each subscale were summed giving a total score of 0 to 10 for each subscale ( $\alpha = 0.90$ ). Cutoff scores were also created to indicate scores that were of clinical concern.

Binary indicators for whether or not the child has a diagnosis of Autism Spectrum Disorder/Attention Deficit Hyperactivity Disorder (*ASD-ADHD*) or whether or not the child has a diagnosed *learning difficulty* were created from parents' responses to a question asking them if their child has a developmental delay/disorder or any diagnosed learning or physical disability, and if so to list the diagnosis.

## Appendix E

### Additional Results

**Table E1** School outcomes conditional on disadvantaged status (DEIS) and type of test

	N (HIGH/LOW)	$M_{HIGH}$ (SD)	$M_{LOW}$ (SD)	$p^a$	$p^b$	ES
<i>Achievement Standardized Scores</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	99.00 (15.27)	93.65 (12.85)	0.023	0.071	0.30
2 <sup>nd</sup> Grade Math Score	117 (66/51)	98.33 (15.04)	90.10 (13.10)	0.001	0.005	0.54
3 <sup>rd</sup> Grade Reading Score	69 (40/29)	97.18 (12.30)	89.24 (10.54)	0.020	0.067	0.41
3 <sup>rd</sup> Grade Math Score	69 (40/29)	94.88 (13.78)	88.07 (13.49)	0.071	0.071	0.37
<i>Achievement Above the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	0.29 (0.46)	0.17 (0.38)	0.042	0.161	0.22
2 <sup>nd</sup> Grade Math Score	117 (66/51)	0.26 (0.44)	0.06 (0.24)	0.002	0.005	0.57
3 <sup>rd</sup> Grade Reading Score	69 (40/29)	0.23 (0.42)	0.07 (0.26)	0.152	0.288	0.15
3 <sup>rd</sup> Grade Math Score	69 (40/29)	0.15 (0.36)	0.07 (0.26)	0.308	0.308	0.07
<i>Achievement Below the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	0.32 (0.47)	0.56 (0.50)	0.008	0.038	0.41
2 <sup>nd</sup> Grade Math Score	117 (66/51)	0.35 (0.48)	0.57 (0.50)	0.009	0.046	0.38
3 <sup>rd</sup> Grade Reading Score	69 (40/29)	0.38 (0.49)	0.66 (0.48)	0.063	0.063	0.33
3 <sup>rd</sup> Grade Math Score	69 (40/29)	0.43 (0.50)	0.69 (0.47)	0.040	0.059	0.45
<i>Absenteeism &amp; School Resources %</i>						
Proportion of days present in last school year	100 (55/45)	0.93 (0.05)	0.94 (0.05)	0.526	0.952	0.05
Proportion of days present in current school year	117 (66/51)	0.94 (0.04)	0.94 (0.07)	0.242	0.584	0.19
In class supports	118 (66/52)	0.41 (0.50)	0.48 (0.50)	0.077	0.576	0.15
Out of class supports	118 (66/52)	0.24 (0.43)	0.38 (0.49)	0.118	0.471	0.24
Special Needs Assistant (SNA) supports	118 (66/52)	0.05 (0.21)	0.04 (0.19)	0.435	0.968	0.12
Other supports	118 (66/52)	0.09 (0.29)	0.17 (0.38)	0.127	0.606	0.13
No. of supports	118 (66/52)	0.79 (0.94)	1.08 (1.04)	0.946	0.946	0.21

**Note:** N' indicates the sample size. 'M' indicates the mean. 'SD' indicates the standard deviation. <sup>a</sup> one-tailed (right-sided) conditional  $p$ -value from individual permutation test with 100,000 replications. <sup>b</sup> one-tailed (right-sided) conditional  $p$ -value from stepdown permutation test with 100,000 replications. 'ES (effect size)' is the ratio of the treatment effect to the standard deviation of the low treatment group. The conditioning set includes gender, one latent index derived using confirmatory factor analysis capturing baseline imbalance in the age nine school sample, and DEIS status and type of test conducted.

**Table E2** IPW-adjusted cognitive outcomes

	N (HIGH/LOW)	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	$p^{\text{a}}$	$p^{\text{b}}$	ES
<i>BAS Composite Scores</i>						
General Conceptual Ability	116 (69/47)	88.12 (11.85)	80.13 (12.11)	0.002	0.006	0.67
Spatial Ability	117 (69/48)	94.09 (14.26)	86.75 (16.27)	0.032	0.045	0.48
Non-Verbal Ability	117 (69/48)	84.63 (11.67)	76.53 (9.70)	0.000	0.001	0.76
Verbal Ability	116 (69/47)	92.22 (11.70)	87.27 (13.67)	0.043	0.043	0.39
<i>BAS Above the Norm %</i>						
General Conceptual Ability	116 (69/47)	0.02 (0.14)	0.00 (0.00)	0.038	0.239	0.29
Spatial Ability	117 (69/48)	0.11 (0.31)	0.10 (0.31)	0.406	0.679	0.01
Non-Verbal Ability	117 (69/48)	0.03 (0.17)	0.00 (0.00)	0.023	0.156	0.36
Verbal Ability	116 (69/47)	0.05 (0.22)	0.07 (0.26)	0.659	0.659	0.08
<i>BAS Below the Norm %</i>						
General Conceptual Ability	116 (69/47)	0.58 (0.50)	0.78 (0.42)	0.029	0.029	0.42
Spatial Ability	117 (69/48)	0.34 (0.48)	0.66 (0.48)	0.007	0.018	0.67
Non-Verbal Ability	117 (69/48)	0.70 (0.46)	0.89 (0.31)	0.009	0.017	0.51
Verbal Ability	116 (69/47)	0.33 (0.47)	0.60 (0.49)	0.027	0.036	0.58

**Notes:** N' indicates the sample size. 'M' indicates the IPW-adjusted mean. 'SD' indicates the IPW-adjusted standard deviation. <sup>a</sup> one-tailed (right-sided) conditional  $p$ -value from individual IPW-adjusted permutation test with 100,000 replications. <sup>b</sup> one-tailed (right-sided) conditional  $p$ -value from IPW-adjusted stepdown permutation test with 100,000 replications. 'ES (effect size)' is the ratio of the treatment effect to the pooled standard deviation.

**Table E3** IPW-adjusted school outcomes

	N (HIGH/LOW)	$M_{HIGH}$ (SD)	$M_{LOW}$ (SD)	$p^a$	$p^b$	ES
<i>Achievement Standardized Scores</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	99.55 (15.10)	94.93 (12.63)	0.038	0.038	0.33
2 <sup>nd</sup> Grade Math Score	117 (66/51)	97.42 (14.62)	89.73 (12.89)	0.007	0.015	0.56
3 <sup>rd</sup> Grade Reading Score	70 (41/29)	97.51 (11.97)	89.67 (9.30)	0.002	0.013	0.74
3 <sup>rd</sup> Grade Math Score	70 (41/29)	94.42 (14.05)	88.05 (12.96)	0.060	0.080	0.47
<i>Achievement Above the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	0.26 (0.44)	0.19 (0.39)	0.180	0.180	0.19
2 <sup>nd</sup> Grade Math Score	117 (66/51)	0.22 (0.42)	0.05 (0.21)	0.002	0.010	0.55
3 <sup>rd</sup> Grade Reading Score	70 (41/29)	0.26 (0.44)	0.05 (0.22)	0.006	0.020	0.64
3 <sup>rd</sup> Grade Math Score	70 (41/29)	0.14 (0.36)	0.05 (0.22)	0.064	0.164	0.34
<i>Achievement Below the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	118 (66/52)	0.31 (0.47)	0.47 (0.50)	0.043	0.043	0.34
2 <sup>nd</sup> Grade Math Score	117 (66/51)	0.34 (0.48)	0.55 (0.50)	0.041	0.087	0.43
3 <sup>rd</sup> Grade Reading Score	70 (41/29)	0.34 (0.48)	0.62 (0.49)	0.024	0.098	0.57
3 <sup>rd</sup> Grade Math Score	70 (41/29)	0.45 (0.50)	0.72 (0.46)	0.042	0.059	0.55
<i>Absenteeism &amp; School Resources %</i>						
Proportion of days present in previous school year	104 (59/45)	0.92 (0.05)	0.93 (0.06)	0.762	0.762	0.20
Proportion of days present in current school year	122 (70/52)	0.94 (0.04)	0.94 (0.06)	0.561	0.763	0.00
In class supports	123 (70/53)	0.40 (0.49)	0.54 (0.50)	0.126	0.325	0.27
Out of class supports	123 (70/53)	0.24 (0.43)	0.38 (0.49)	0.092	0.309	0.31
Special Needs Assistant (SNA) supports	123 (70/53)	0.06 (0.25)	0.05 (0.21)	0.499	0.798	0.08
Other supports	123 (70/53)	0.11 (0.31)	0.14 (0.35)	0.198	0.606	0.10

**Notes:** N' indicates the sample size. 'M' indicates the IPW-adjusted mean. 'SD' indicates the IPW-adjusted standard deviation. <sup>a</sup> one-tailed (right-sided) conditional  $p$ -value from individual IPW-adjusted permutation test with 100,000 replications. <sup>b</sup> one-tailed (right-sided) conditional  $p$ -value from IPW-adjusted stepdown permutation test with 100,000 replications. 'ES (effect size)' is the ratio of the treatment effect to the pooled standard deviation.

**Table E4** IPW-adjusted socio-emotional outcomes

	N (HIGH/LOW)	$M_{HIGH}$ (SD)	$M_{LOW}$ (SD)	$p^a$	$p^b$	ES
<i>Child-report Scores</i>						
SSIS Internalizing Problems	117 (69/48)	7.50 (5.92)	8.24 (5.38)	0.264	0.523	0.13
SSIS Externalizing Problems	117 (69/48)	6.42 (4.02)	5.24 (5.60)	0.760	0.760	0.25
SSIS Bullying	117 (69/48)	1.11 (1.23)	0.89 (1.90)	0.606	0.700	0.14
SSIS Hyperactivity/Inattention	117 (69/48)	6.43 (3.53)	6.40 (4.36)	0.428	0.643	0.01
<i>Child-report Cutoff %</i>						
SSIS Internalizing Problems	117 (69/48)	0.10 (0.31)	0.10 (0.30)	0.505	0.505	0.02
SSIS Externalizing Problems	117 (69/48)	0.07 (0.26)	0.14 (0.35)	0.285	0.377	0.22
SSIS Bullying	117 (69/48)	0.01 (0.10)	0.10 (0.31)	0.112	0.177	0.45
SSIS Hyperactivity/Inattention	117 (69/48)	0.12 (0.32)	0.11 (0.32)	0.495	0.625	0.01
<i>Parent-report Scores</i>						
SDQ Peer Problems	111 (64/47)	1.59 (1.61)	2.11 (1.73)	0.060	0.209	0.31
SDQ Prosocial Behavior	111 (64/47)	8.85 (1.71)	8.78 (1.34)	0.279	0.490	0.05
BPM Internalizing Problems	110 (63/47)	57.61 (6.35)	57.74 (6.13)	0.348	0.348	0.02
BPM Externalizing Problems	110 (63/47)	53.79 (5.74)	54.79 (6.25)	0.282	0.437	0.17
BPM Attention Problems	110 (63/47)	53.89 (7.46)	56.71 (7.10)	0.038	0.136	0.39
<i>Parent-report Cutoff %</i>						
SDQ Peer Problems	111 (64/47)	0.13 (0.34)	0.18 (0.39)	0.224	0.508	0.15
SDQ Prosocial Behavior	111 (64/47)	0.08 (0.27)	0.01 (0.12)	0.899	0.899	0.34
BPM Internalizing Problems	110 (63/47)	0.21 (0.41)	0.24 (0.43)	0.244	0.566	0.07
BPM Externalizing Problems	110 (63/47)	0.07 (0.27)	0.18 (0.39)	0.187	0.325	0.31
BPM Attention Problems	110 (63/47)	0.13 (0.33)	0.15 (0.36)	0.350	0.459	0.07
<i>Other</i>						
SSIS Problem Behaviors Total Score	117 (69/48)	96.65 (10.20)	97.42 (14.64)	0.381	~	0.06
SSIS Problem Behaviors >85%ile %	117 (69/48)	0.04 (0.20)	0.10 (0.30)	0.869	~	0.23
BPM Total Problems Standardized Score	110 (63/47)	54.60 (6.87)	56.70 (6.46)	0.079	~	0.32
Child has ASD-ADHD %	111 (64/47)	0.08 (0.27)	0.04 (0.20)	0.622	~	0.14
Child has learning difficulty %	111 (64/47)	0.06 (0.23)	0.12 (0.33)	0.177	~	0.22

**Notes:** N' indicates the sample size. 'M' indicates the IPW-adjusted mean. 'SD' indicates the IPW-adjusted standard deviation. <sup>a</sup> one-tailed (right-sided) conditional  $p$ -value from individual IPW-adjusted permutation test with 100,000 replications. <sup>b</sup> one-tailed (right-sided) conditional  $p$ -value from IPW-adjusted stepdown permutation test with 100,000 replications. 'ES (effect size)' is the ratio of the treatment effect to the pooled standard deviation.

**Table E5** Lee bounds cognitive outcomes

	Lower bound	Upper bound	90% CIs
<i>BAS Composite Scores</i>			
General Conceptual Ability	5.86* (3.05)	9.29*** (3.05)	[1.82, 13.32]
Spatial Ability	4.67 (3.37)	7.09** (3.52)	[-0.03, 12.00]
Non-Verbal Ability	7.72** (9.87)	9.87*** (2.71)	[3.29, 13.66]
Verbal Ability	2.73 (3.07)	5.97* (3.16)	[-1.37, 10.19]
<i>BAS Above the Norm %</i>			
General Conceptual Ability	0.00 (0.00)	0.03 (0.02)	.
Spatial Ability	-0.01 (0.11)	0.04 (0.08)	[-0.18, 0.16]
Non-Verbal Ability	0.01 (0.06)	0.04* (0.02)	[-0.08, 0.07]
Verbal Ability	-0.08 (0.08)	-0.02 (0.05)	[-0.19, 0.05]
<i>BAS Below the Norm %</i>			
General Conceptual Ability	-0.26* (0.14)	-0.18* (0.11)	[-0.45, -0.03]
Spatial Ability	-0.24** (0.10)	-0.21** (0.10)	[-0.39, -0.06]
Non-Verbal Ability	-0.24** (0.11)	-0.19* (0.10)	[-0.40, -0.04]
Verbal Ability	-0.23** (0.10)	-0.17* (0.10)	[-0.37, -0.03]

**Note:** Each row represents estimation of Lee bounds with bounds tightened using a binary indicator of the predicted probability score from a model of attrition using baseline variables. Imbens and Manski (2004) 90% confidence intervals reported in the final column capture both uncertainty about the selection bias and the sampling error. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E6** Lee bounds school outcomes

	Lower bound	Upper bound	90% CIs
<i>Achievement Standardized Scores</i>			
2 <sup>nd</sup> Grade Reading Score	0.24 (3.77)	12.18*** (3.34)	[-4.59, 16.46]
2 <sup>nd</sup> Grade Math Score	2.19 (3.62)	14.86*** (3.37)	[-2.45, 19.18]
3 <sup>rd</sup> Grade Reading Score	1.49 (4.21)	15.53*** (4.06)	[-3.90, 20.73]
3 <sup>rd</sup> Grade Math Score	0.06 (4.12)	15.51*** (4.21)	[-5.23, 20.90]
<i>Achievement Above the Norm %</i>			
2 <sup>nd</sup> Grade Reading Score	-0.10 (0.15)	0.19* (0.10)	[-0.29, 0.33]
2 <sup>nd</sup> Grade Math Score	-0.03 (0.15)	0.28*** (0.09)	[-0.23, 0.40]
3 <sup>rd</sup> Grade Reading Score	-0.08 (0.05)	0.26** (0.13)	[-0.15, 0.43]
3 <sup>rd</sup> Grade Math Score	-0.08 (0.05)	0.15 (0.11)	[-0.15, 0.29]
<i>Achievement Below the Norm %</i>			
2 <sup>nd</sup> Grade Reading Score	-0.46 (0.15)	-0.18 (0.11)	[-0.66, -0.03]
2 <sup>nd</sup> Grade Math Score	-0.41*** (0.15)	-0.10 (0.12)	[-0.61, 0.06]
3 <sup>rd</sup> Grade Reading Score	-0.66*** (0.25)	-0.13 (0.19)	[-0.99, 0.11]
3 <sup>rd</sup> Grade Math Score	-0.59** (0.23)	-0.06 (0.20)	[-0.89, 0.20]
<i>Absenteeism &amp; School Resources %</i>			
Proportion of days present in last school year	-0.01 (0.01)	0.02 (0.01)	[-0.03, 0.04]
Proportion of days present in current school year	-0.03** (0.01)	0.01 (0.01)	[-0.05, 0.03]
In class supports	-0.28* (0.14)	0.06 (0.13)	[-0.46, 0.23]
Out of class supports	-0.40*** (0.07)	-0.07 (0.11)	[-0.49, 0.07]
Special Needs Assistant (SNA) supports	-0.04 (0.03)	0.06 (0.05)	[-0.08, 0.12]
Other supports	-0.16*** (0.05)	-0.04 (0.07)	[-0.23, 0.05]
No. of supports used	-0.73*** (0.28)	0.01 (0.25)	[-1.09, 0.32]

**Note:** Each row represents estimation of Lee bounds. Imbens and Manski (2004) 90% confidence intervals reported in the final column capture both uncertainty about the selection bias and the sampling error. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E7** Lee bounds socio-emotional outcomes

	Lower bound	Upper bound	90% CIs
<i>Child-report Scores</i>			
SSIS Internalizing Problems	-1.62 (1.62)	-0.56 (1.42)	[-3.89, 1.43]
SSIS Externalizing Problems	-0.57 (1.23)	0.18 (1.27)	[-2.31, 1.98]
SSIS Bullying	-0.15 (0.43)	0.07 (0.37)	[-0.77, 0.61]
SSIS Hyperactivity/Inattention	-0.48 (1.05)	0.14 (1.01)	[-1.96, 1.57]
<i>Child-report Cutoff %</i>			
SSIS Internalizing Problems	-0.07 (0.08)	-0.03 (0.07)	[-0.19, 0.06]
SSIS Externalizing Problems	-0.07 (0.08)	-0.04 (0.06)	[-0.19, 0.05]
SSIS Bullying	-0.09** (0.04)	-0.08* (0.05)	[-0.15, -0.01]
SSIS Hyperactivity/Inattention	-0.06 (0.09)	-0.03 (0.07)	[-0.19, 0.08]
<i>Parent-report Scores</i>			
SDQ Peer Problems	-0.58 (0.50)	-0.32 (0.41)	[-1.30, 0.27]
SDQ Prosocial Behavior	-0.26 (0.43)	0.01 (0.87)	[-0.91, 1.33]
BPM Internalizing Problems	-0.60 (1.84)	0.09 (1.60)	[-3.34, 2.46]
BPM Externalizing Problems	-1.56 (2.09)	-0.96 (1.25)	[-4.73, 0.94]
BPM Attention Problems	-2.63 (3.10)	-1.84 (1.52)	[-7.37, 0.49]
<i>Parent-report Cutoff%</i>			
SDQ Peer Problems	-0.07 (0.14)	-0.02 (0.07)	[-0.29, 0.09]
SDQ Prosocial Behavior	0.02 (0.07)	0.07 (0.05)	[-0.18, 0.15]
BPM Internalizing Problems	-0.06 (0.14)	-0.02 (0.09)	[-0.28, 0.11]
BPM Externalizing Problems	-0.11 (0.09)	-0.08 (0.06)	[-0.24, 0.01]
BPM Attention Problems	0.01 (0.14)	0.04 (0.07)	[-0.20, 0.14]
<i>Other</i>			
SSIS Problem Behaviors Total Score	-3.31 (3.62)	-1.26 (3.37)	[-8.48, 3.55]
SSIS Problem Behaviors >85%ile %	-0.13 (0.08)	-0.10* (0.06)	[-0.25, -0.01]
BPM Total Problems Standardized Score	-2.28 (2.59)	-1.50 (1.45)	[-6.20, 0.70]
Child has ASD-ADHD %	-0.01 (0.14)	0.04 (0.06)	[-0.21, 0.13]
Child has learning difficulty %	-0.12 (0.09)	-0.08 (0.06)	[-0.25, 0.01]

**Note:** Each row represents estimation of Lee bounds with bounds tightened using a binary indicator of the predicted probability score from a model of attrition using baseline variables. Imbens and Manski (2004) 90% confidence intervals reported in the final column capture both uncertainty about the selection bias and the sampling error. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.



**Table E8 Comparison of school characteristics**

	$M_{\text{HIGH}}$ ( $SD$ )	$M_{\text{LOW}}$ ( $SD$ )	$p^a$
School has DEIS status %	0.73 (0.45)	0.68 (0.47)	0.558
Single gender school %	0.27 (0.45)	0.21 (0.41)	0.408
Average class size (no. pupils)	11.64 (3.94)	12.40 (3.97)	0.299
School outside <i>PFL</i> catchment area %	0.46 (0.50)	0.45 (0.50)	0.976
Driving distance from school to <i>PFL</i> village centre (in kms)	5.51 (14.98)	3.97 (7.25)	0.543
<i>N</i>	70	53	

**Note:** <sup>a</sup> two-tailed  $p$ -values calculated from permutation tests with 100,000 replications.

**Table E9 Comparison of school community characteristics**

% in the School Community	$M_{\text{HIGH}}$ ( $SD$ )	$M_{\text{LOW}}$ ( $SD$ )	$p^a$
Married	0.30 (0.09)	0.28 (0.10)	0.413
White Irish	0.89 (0.14)	0.90 (0.11)	0.532
Single Parent Households	0.16 (0.09)	0.17 (0.10)	0.551
Social/Public Housing	0.27 (0.31)	0.34 (0.32)	0.196
Unemployed	0.12 (0.08)	0.14 (0.09)	0.266
Professional Worker	0.04 (0.04)	0.04 (0.04)	0.844
Managerial & Technical Worker	0.18 (0.11)	0.18 (0.13)	0.798
Non-manual Worker	0.17 (0.07)	0.17 (0.08)	0.620
Skilled Manual Worker	0.16 (0.06)	0.15 (0.05)	0.253
Semi-skilled Manual Worker	0.15 (0.06)	0.15 (0.07)	0.539
Unskilled Worker	0.05 (0.03)	0.06 (0.03)	0.366
Primary Education	0.20 (0.10)	0.23 (0.10)	0.224
Secondary Education	0.41 (0.07)	0.41 (0.07)	0.702
Vocational Education	0.16 (0.04)	0.16 (0.05)	0.810
Undergraduate Degree	0.10 (0.07)	0.09 (0.07)	0.735
Postgraduate Degree	0.05 (0.05)	0.05 (0.06)	0.989
Reporting Bad Health	0.02 (0.02)	0.02 (0.02)	0.502
<i>N</i>	70	53	

**Note:** Data from Census 2016 Small Area Population Statistics. <sup>a</sup> two-tailed  $p$ -values calculated from permutation tests with 100,000 replications.

**Table E10 Cognitive outcomes – Tests for heterogeneous effects**

	Gender <sup>a</sup>			Birth Order <sup>b</sup>		
	<i>Treatment X Gender</i>	<i>Treatment</i>	<i>Gender (female)</i>	<i>Treatment X Birth order</i>	<i>Treatment</i>	<i>Birth order (first born)</i>
<i>BAS Composite Scores</i>						
General Conceptual Ability	1.622 (4.858)	7.538** (3.773)	0.775 (3.795)	5.169 (4.997)	6.431* (3.494)	-4.163 (4.106)
Spatial Ability	5.272 (5.878)	4.825 (4.578)	-0.462 (4.584)	6.466 (5.980)	5.052 (4.146)	-6.069 (4.913)
Non-Verbal Ability	3.928 (4.483)	7.848** (3.492)	-1.687 (3.497)	2.710 (4.622)	9.185*** (3.204)	-1.682 (3.797)
Verbal Ability	-4.145 (5.289)	6.218 (4.108)	2.944 (4.132)	2.741 (5.406)	2.952 (3.780)	-2.028 (4.442)
<i>BAS Above the Norm %</i>						
General Conceptual Ability	0.008 (0.051)	0.034 (0.040)	0.001 (0.040)	0.062 (0.052)	0.005 (0.037)	-0.007 (0.043)
Spatial Ability	0.109 (0.122)	0.009 (0.095)	-0.013 (0.095)	0.162 (0.125)	-0.011 (0.087)	-0.078 (0.103)
Non-Verbal Ability	-0.019 (0.061)	0.071 (0.048)	0.003 (0.048)	-0.012 (0.063)	0.074* (0.044)	-0.032 (0.052)
Verbal Ability	-0.110 (0.104)	0.083 (0.081)	0.046 (0.081)	-0.067 (0.108)	0.035 (0.075)	0.080 (0.088)
<i>BAS Below the Norm %</i>						
General Conceptual Ability	0.065 (0.182)	-0.333** (0.141)	-0.135 (0.142)	-0.148 (0.186)	-0.232* (0.130)	0.160 (0.153)
Spatial Ability	-0.295 (0.191)	-0.073 (0.148)	0.053 (0.149)	-0.202 (0.196)	-0.153 (0.136)	0.204 (0.161)
Non-Verbal Ability	-0.005 (0.155)	-0.256** (0.121)	-0.080 (0.121)	-0.201 (0.156)	-0.157 (0.108)	0.099 (0.128)
Verbal Ability	0.347* (0.193)	-0.331** (0.150)	-0.149 (0.151)	-0.062 (0.199)	-0.119 (0.139)	0.041 (0.164)

**Note:** <sup>a</sup> Estimated using OLS regressions including a gender by treatment status interaction term, gender (girl=1), and treatment status. <sup>b</sup> Estimated using OLS regressions including a birth order by treatment status interaction term, birth order (firstborn=1), treatment status. Controls also include a latent index of baseline imbalance in the age nine child sample (not shown). OLS coefficients and standard errors (in parenthesis) reported. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E11 School outcomes – Tests for heterogeneous effects**

	Gender <sup>a</sup>			Birth Order <sup>b</sup>		
	Treatment X Gender	Treatment	Gender (female)	Treatment X Birth order	Treatment	Birth order (first born)
<i>Achievement Standardized Scores</i>						
2 <sup>nd</sup> Grade Reading Score	-4.493 (5.481)	8.687** (4.357)	7.539* (4.216)	-0.274 (5.515)	5.951 (3.868)	2.911 (4.231)
2 <sup>nd</sup> Grade Math Score	1.046 (5.609)	7.279 (4.472)	-3.299 (4.347)	1.156 (5.625)	6.647* (3.907)	2.719 (4.338)
3 <sup>rd</sup> Grade Reading Score	3.683 (5.711)	3.751 (4.706)	1.129 (4.507)	-0.431 (5.835)	6.618* (3.878)	2.369 (4.674)
3 <sup>rd</sup> Grade Math Score	2.429 (7.019)	3.959 (5.784)	-3.639 (5.539)	4.309 (7.176)	3.767 (4.769)	1.342 (5.748)
<i>Achievement Above the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	-0.234 (0.163)	0.274** (0.130)	0.256** (0.126)	0.096 (0.166)	0.069 (0.116)	0.051 (0.127)
2 <sup>nd</sup> Grade Math Score	-0.106 (0.144)	0.264** (0.115)	0.001 (0.112)	0.094 (0.146)	0.148 (0.101)	-0.015 (0.112)
3 <sup>rd</sup> Grade Reading Score	0.028 (0.177)	0.055 (0.146)	0.080 (0.140)	-0.232 (0.184)	0.183 (0.122)	0.118 (0.147)
3 <sup>rd</sup> Grade Math Score	-0.114 (0.163)	0.099 (0.134)	0.089 (0.128)	-0.060 (0.172)	0.042 (0.114)	0.087 (0.138)
<i>Achievement Below the Norm %</i>						
2 <sup>nd</sup> Grade Reading Score	0.033 (0.188)	-0.269* (0.150)	-0.127 (0.145)	0.301 (0.184)	-0.387*** (0.129)	-0.258* (0.141)
2 <sup>nd</sup> Grade Math Score	0.112 (0.193)	-0.280* (0.154)	-0.078 (0.150)	0.295 (0.190)	-0.315** (0.132)	-0.283* (0.147)
3 <sup>rd</sup> Grade Reading Score	0.063 (0.245)	-0.262 (0.202)	-0.160 (0.193)	0.060 (0.245)	-0.268 (0.163)	-0.118 (0.196)
3 <sup>rd</sup> Grade Math Score	0.097 (0.254)	-0.286 (0.209)	0.036 (0.200)	-0.166 (0.257)	-0.173 (0.171)	0.065 (0.206)
<i>Absenteeism &amp; School Resources %</i>						
Proportion of days present in previous school year	0.032 (0.022)	-0.026 (0.018)	-0.016 (0.017)	-0.009 (0.022)	-0.002 (0.015)	0.006 (0.017)
Proportion of days present in current school year	0.011 (0.020)	0.001 (0.016)	-0.012 (0.016)	-0.004 (0.020)	0.010 (0.014)	0.006 (0.016)
In class supports	-0.059 (0.192)	-0.043 (0.151)	-0.016 (0.148)	0.128 (0.191)	-0.173 (0.134)	0.047 (0.148)
Out of class supports	-0.142 (0.175)	-0.031 (0.138)	0.113 (0.135)	0.108 (0.176)	-0.161 (0.124)	-0.066 (0.136)
Special Needs Assistant (SNA) supports	-0.051 (0.093)	0.032 (0.073)	-0.077 (0.072)	0.149* (0.088)	-0.055 (0.062)	-0.065 (0.068)
Other supports	0.091 (0.127)	-0.124 (0.100)	-0.154 (0.098)	-0.174 (0.122)	-0.009 (0.085)	0.161* (0.094)

**Note:** <sup>a</sup> Estimated using OLS regressions including a gender by treatment status interaction term, gender (girl=1), and treatment status. <sup>b</sup> Estimated using OLS regressions including a birth order by treatment status interaction term, birth order (firstborn=1), treatment status. Controls also include a latent index of baseline imbalance in the age nine school sample (not shown). OLS coefficients and standard errors (in parenthesis) reported. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E12** Socio-emotional outcomes – Tests for heterogeneous effects

	Gender <sup>a</sup>			Birth Order <sup>b</sup>		
	Treatment X Gender	Treatment	Gender (female)	Treatment X Birth order	Treatment	Birth order (first born)
<i>Child-report Scores</i>						
SSIS Internalizing Problems	-0.280 (2.451)	-1.674 (1.909)	-1.504 (1.911)	-2.595 (2.483)	-0.947 (1.721)	2.344 (2.039)
SSIS Externalizing Problems	-2.016 (1.926)	-0.003 (1.500)	-0.226 (1.502)	-1.858 (1.960)	-0.841 (1.358)	2.449 (1.610)
SSIS Bullying	-0.277 (0.619)	-0.114 (0.482)	-0.359 (0.483)	0.006 (0.634)	-0.324 (0.440)	0.227 (0.521)
SSIS Hyperactivity/Inattention	-0.894 (1.612)	-0.347 (1.256)	-0.784 (1.257)	-1.141 (1.636)	-0.644 (1.134)	1.276 (1.344)
<i>Child-report Cutoff %</i>						
SSIS Internalizing Problems	-0.154 (0.133)	0.007 (0.103)	0.034 (0.103)	-0.075 (0.137)	-0.065 (0.095)	0.086 (0.113)
SSIS Externalizing Problems	-0.103 (0.121)	-0.014 (0.094)	0.093 (0.094)	0.033 (0.125)	-0.102 (0.087)	0.033 (0.103)
SSIS Bullying	-0.063 (0.079)	-0.038 (0.061)	0.037 (0.061)	-0.006 (0.081)	-0.085 (0.056)	0.042 (0.067)
SSIS Hyperactivity/Inattention	-0.029 (0.143)	-0.065 (0.111)	-0.027 (0.111)	-0.045 (0.147)	-0.078 (0.102)	0.061 (0.121)
<i>Parent-report Scores</i>						
SDQ Peer Problems	-0.514 (0.658)	-0.260 (0.489)	-0.356 (0.504)	0.472 (0.669)	-0.748 (0.451)	-0.382 (0.517)
SDQ Prosocial Behavior	0.127 (0.619)	-0.030 (0.460)	0.765 (0.473)	-0.522 (0.620)	0.297 (0.418)	-0.111 (0.479)
BPM Internalizing Problems	0.093 (2.507)	-0.852 (1.864)	-2.111 (1.913)	0.971 (2.564)	-0.812 (1.732)	-0.965 (1.974)
BPM Externalizing Problems	-1.824 (2.261)	0.809 (1.682)	1.454 (1.726)	2.099 (2.322)	-1.272 (1.569)	-1.402 (1.788)
BPM Attention Problems	-2.782 (2.744)	-0.689 (2.041)	-0.960 (2.094)	0.896 (2.806)	-2.542 (1.896)	0.182 (2.160)
<i>Parent-report Cutoff %</i>						
SDQ Peer Problems	-0.002 (0.139)	-0.076 (0.103)	-0.088 (0.106)	-0.012 (0.139)	-0.047 (0.094)	-0.055 (0.108)
SDQ Prosocial Behavior	-0.081 (0.087)	0.092 (0.065)	-0.053 (0.067)	0.149* (0.088)	-0.028 (0.060)	-0.040 (0.068)
BPM Internalizing Problems	0.052 (0.164)	-0.127 (0.122)	-0.221* (0.125)	-0.159 (0.165)	0.004 (0.111)	0.121 (0.127)
BPM Externalizing Problems	-0.103 (0.108)	0.045 (0.081)	0.128 (0.083)	0.113 (0.112)	-0.064 (0.075)	-0.044 (0.086)
BPM Attention Problems	-0.151 (0.128)	0.090 (0.095)	-0.006 (0.097)	0.118 (0.127)	-0.022 (0.086)	-0.053 (0.098)
<i>Other</i>						
SSIS Problem Behaviors Total Score	-2.744 (5.220)	-2.623 (4.065)	-0.276 (4.071)	-4.818 (5.308)	-2.998 (3.679)	5.488 (4.360)
SSIS Problem Behaviors >85%ile %	-0.085 (0.112)	-0.091 (0.087)	0.035 (0.087)	-0.002 (0.115)	-0.138* (0.080)	-0.030 (0.095)
BPM Total Problems Standardized Score	-2.372 (2.645)	-0.026 (1.968)	0.312 (2.019)	2.211 (2.718)	-2.311 (1.837)	-0.910 (2.093)
Child has ASD-ADHD %	-0.084 (0.106)	0.042 (0.079)	-0.079 (0.081)	0.080 (0.109)	-0.054 (0.073)	-0.008 (0.084)
Child has learning difficulty %	0.020 (0.114)	-0.090 (0.085)	-0.064 (0.087)	0.215* (0.114)	-0.169** (0.077)	-0.213** (0.088)

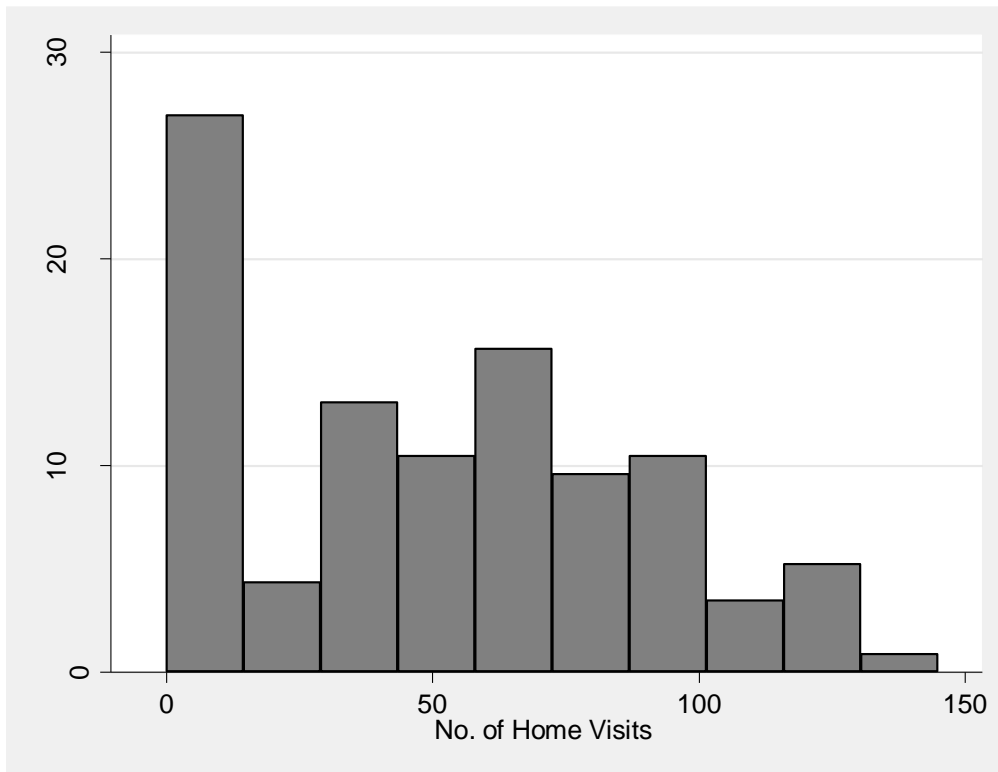
**Note:** <sup>a</sup> Estimated using OLS regressions including a gender by treatment status interaction term, gender (girl=1), and treatment status. <sup>b</sup> Estimated using OLS regressions including a birth order by treatment status interaction term, birth order (firstborn=1), treatment status. Controls also include a latent index of baseline imbalance in the age nine child/parent sample (not shown). OLS coefficients and standard errors (in parenthesis) reported. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E13** *Quantile regression models*

Continuous cognitive scores	Q25	Q50	Q75	p <sup>a</sup>
BAS General Conceptual Ability Score	6.23* (3.23)	11.02*** (3.66)	5.25 (3.54)	0.275
2 <sup>nd</sup> Grade Reading Score	4.94 (4.24)	10.92*** (3.26)	10.33** (4.86)	0.736
2 <sup>nd</sup> Grade Math Score	11.54** (5.79)	11.0*** (4.06)	10.0*** (3.68)	0.781

**Note:** Estimated using simultaneous quantile regressions controlling for gender and a latent index of baseline imbalance with bootstrapped standard errors (500 reps). <sup>a</sup> p-values are based on tests comparing differences in the coefficients for the 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> percentiles of the distribution. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Figure E1** Distribution of home visits within the high treatment group



**Table E14 Dose-response models**

	IV			OLS			OLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total GCA Score	2 <sup>nd</sup> Grade Reading Score	2 <sup>nd</sup> Grade Math Score	Total GCA Score	2 <sup>nd</sup> Grade Reading Score	2 <sup>nd</sup> Grade Math Score	Total GCA Score	2 <sup>nd</sup> Grade Reading Score	2 <sup>nd</sup> Grade Math Score
No. of home visits	0.127*** (0.040)	0.090** (0.039)	0.118*** (0.042)	0.052* (0.031)	0.053 (0.035)	0.063* (0.035)	0.278*** (0.087)	0.245** (0.099)	0.311*** (0.099)
No. of home visits squared	~	~	~	~	~	~	-0.002*** (0.001)	-0.002** (0.001)	-0.002*** (0.001)
Observations	116	118	117	116	118	117	116	118	117
Angrist-Pischke F-statistic	265.9	258.3	259.88	~	~	~	~	~	~
Durbin-Wu-Hausman test ( <i>p</i> value)	0.007	0.167	0.033	~	~	~	~	~	~
Test for quadratic functional form ( <i>p</i> value)	~	~	~	~	~	~	0.010	0.043	0.013
Standardized effect size	0.010	0.006	0.008	0.004	0.004	0.004	~	~	~
Extrapolated estimates for 130 home visits	16.51	11.70	15.34	6.76	6.89	8.19	~	~	~
Turning point (no. of visits)	~	~	~	~	~	~	62.7	65.2	64.1

**Note:** Columns 1-3 show estimates from 2SLS models using treatment assignment as an instrument for the number of home visits where all low treatment participants and all high group participants who did not receive any home visits are assigned zero home visits. Columns 4-6 show estimates from OLS models and Columns 7-9 shows estimates from OLS models with a quadratic term included. All models include child gender and a latent index of baseline imbalance. The standardized effect size is equal to the coefficient on the number of home visits divided by the standard deviation of the outcome variable. Robust standard errors in parentheses. \*\*\**p* < 0.01, \*\**p* < 0.05, \**p* < 0.10.

**Table E15** Baseline predictors of dosage – No. of home visits received & Non-Compliance

	Number of home visits received <sup>1</sup>		Non-compliance <sup>2</sup>
	Child Sample	School Sample	High treatment sample only
Age	1.087 (0.687)	0.751 (0.655)	0.001 (0.005)
Married	1.782 (11.307)	-3.967 (10.431)	0.055 (0.092)
No. of children	0.983 (3.330)	0.739 (3.278)	0.017 (0.019)
First time mother	2.522 (7.900)	3.947 (7.659)	-0.033 (0.056)
Low education (left ≤ age 16)	-0.237 (8.600)	-1.463 (8.258)	0.042 (0.062)
Weschler Abbreviated Scale of Intelligence (WASI)	0.380 (0.319)	0.372 (0.312)	0.000 (0.001)
Employed	9.630 (7.847)	9.355 (7.610)	-0.136** (0.056)
Resides in social housing	0.249 (7.900)	-1.310 (7.667)	0.101** (0.049)
Medical card	-8.506 (8.044)	-7.660 (7.789)	0.025 (0.055)
Prior physical health condition	7.737 (8.897)	8.711 (8.502)	-0.038 (0.070)
Prior mental health condition	1.227 (8.670)	2.053 (8.461)	-0.024 (0.058)
Smoking during pregnancy	-2.589 (7.933)	-3.827 (7.671)	-0.023 (0.055)
Drinking alcohol during pregnancy	1.535 (8.525)	1.910 (8.258)	-0.120* (0.061)
<i>N</i>	113	119	104

**Note:** <sup>1</sup> Coefficients (standard errors) from individual OLS models where ‘Number of home visits received’ is the dependent variable. <sup>2</sup> Marginal effects (standard errors) from individual probit models where ‘Non-compliance’ is the dependent variable. Non-compliance is a binary variable equal to 1 if the high treatment participant did not receive any home visits and 0 otherwise. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10



**Table E16** Post-intervention parental investment at age nine

<i>Parenting Outcomes</i>	N (HIGH/LOW)	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	$p^1$	$p^2$	ES
Family Involvement Questionnaire (Home-based subscale)	111 (64/47)	38.45 (6.31)	39.55 (6.66)	0.740	0.942	0.10
Attentional Control Scale (Attentional focusing subscale)	110 (63/47)	27.34 (4.01)	28.91 (3.400)	0.991	0.991	0.47
Always supervises internet use %	105 (60/45)	0.52 (0.50)	0.56 (0.50)	0.503	0.413	0.01
Rules in place to restrict internet access %	103 (59/44)	0.92 (0.28)	0.87 (0.32)	0.342	0.726	0.01
Restrictions in place to restrict internet access %	103 (59/44)	0.81 (0.39)	0.82 (0.39)	0.562	0.845	0.05

**Notes:** N' indicates the sample size. 'M' indicates the mean. 'SD' indicates the standard deviation. <sup>1</sup> one-tailed (right-sided) conditional  $p$ -value from individual permutation test with 100,000 replications. <sup>2</sup> one-tailed (right-sided) conditional  $p$ -value from stepdown permutation test with 100,000 replications. The conditioning set includes gender and one latent index derived using confirmatory factor analysis capturing baseline imbalance in the age nine parent sample 'Effect size' is the ratio of the treatment effect to the pooled standard deviation.

**Table E17** List of parental inputs between 6 and 48 months

PSDQ Authoritative parenting @ 36 & 48 months	<i>ACT Interaction with Baby Score @ 6 &amp; 18 &amp; 36 months</i>
PSDQ Authoritarian parenting @ 36 & 48 months	<b>Reads to the child everyday @ 12 &amp; 18 months</b>
<b>PSDQ Permissive parenting @ 36 &amp; 48 months</b>	PSI Parenting distress @ 6 & 24 & 36 months
PLOC Parental efficacy @ 6 months	<b>PSI Parent-child dysfunctional interactions @ 6 &amp; 24 &amp; 48 months</b>
PLOC Parental responsibility @ 6 months	PSI Difficult child @ 6 & 24 & 48 months
PLOC Child control of parent's life @ 6 months	<b>HOME Parent responsive to the child's behavior @ 6 &amp; 18 &amp; 36 months</b>
PLOC Parental control of child's behaviour @ 6 months	<b>HOME Parental acceptance of negative behavior @ 6 &amp; 18 &amp; 36 months</b>
<b>PLOC Parental belief in fate @ 6 months</b>	HOME Routine, safety, and community supports @ 6 & 18 & 36 months
PACOTIS Parental self-efficacy @ 6 & 24 months	HOME Appropriateness of play materials @ 6 & 18 & 36 months
<b>PACOTIS Perceived parental impact @ 6 &amp; 24 months</b>	<b>HOME Parent involved in the child's learning @ 6 &amp; 18 &amp; 36 months</b>
PACOTIS Parental hostile-reactive behaviors @ 6 & 24 months	<b>HOME Visitation of people and attendance of activities @ 6 &amp; 18 &amp; 36 months</b>
<b>PACOTIS Parental overprotection @ 6 &amp; 24 months</b>	Home Learning Environment Index @ 48 months
PACOTIS Parental warmth @ 6 & 24 months	Birthweight
PACOTIS How parent compares baby to other babies @ 6 & 24 months	No. of health problems taken to GP/health centre/hospital @ 6 & 12 & 18 & 24 & 36 & 48 months
CMAS Quality of attachment @ 6 & 24 months	Child received appropriate immunizations up to @ 4 & 6 & 12 months
CMAS Absence of hostility @ 6 & 24 months	<b>Meets recommended daily allowance (RDA) of grains @ 12 &amp; 18 &amp; 24 &amp; 36 &amp; 48 months</b>
<b>CMAS Pleasure in interaction @ 6 &amp; 24 months</b>	<b>Meets recommended daily allowance (RDA) of dairy @ 12 &amp; 18 &amp; 24 &amp; 36 &amp; 48 months</b>
<b>Maternal Separation Anxiety Scale @ 18 months</b>	<b>Meets recommended daily allowance (RDA) of protein @ 12 &amp; 18 &amp; 24 &amp; 36 &amp; 48 months</b>
PARQ Warmth/affection @ 36 months	<b>Meets recommended daily allowance (RDA) of fruit and veg @ 12 &amp; 18 &amp; 24 &amp; 36 &amp; 48 months</b>
PARQ Hostility/aggression @ 36 months	Meets recommended daily allowance (RDA) of other foods @ 12 & 18 & 24 & 36 & 48 months
PARQ Indifference/neglect @ 36 months	
PARQ Undifferentiated rejection 36 months	

**Note:** Inputs in bold are significantly associated with cognitive scores and are included in the confirmatory factor analysis.

PSDQ = Parenting Styles and Dimensions Questionnaire

PLOC = Parental Locus of Control

PACOTIS = Parental Cognition and Conduct Toward the Infant Scale

CMAS = Condon Maternal Attachment Scale

PARQ = Parental Acceptance-Rejection Questionnaire

PSI = Parenting Stress Index

HOME = Home Observation for Measurement of the Environment

**Table E18** Confirmatory factor analysis fit indices for five-factor model of parental inputs

Parenting Style		Parenting Beliefs		Parent-child Relationship		Parental Simulation		Parental Health Inputs	
PSDQ Permissive parenting @36 months	0.800*** (0.078)	PLOC Parental belief in fate @6 months	0.520*** (0.149)	Maternal Separation Anxiety Scale @18 months	0.889*** (0.092)	Reads to the child everyday @12 months	0.441*** (0.118)	Meet recommended daily allowance (RDA) of dairy @12 months	0.326*** (0.114)
PSDQ Permissive parenting @48 months	0.854*** (0.079)	PACOTIS Perceived parental impact @24 months	0.483*** (0.144)	CMAS Pleasure in interaction @24 months	0.422*** (0.100)	HOME Parent responsive to the child's behavior @6 months	0.565*** (0.129)	Meets RDA of grains @12 months	0.510*** (0.098)
PSI Parent-child dysfunctional interactions @48 months	0.393*** (0.105)			PACOTIS Parental overprotection @24 months	0.717*** (0.092)	HOME Parent involved in the child's learning @6 months	0.475*** (0.131)	Meets RDA of dairy @24 months	0.355*** (0.114)
						HOME Parental acceptance of negative behavior @18 months	0.195 (0.154)	Meets RDA of grains @36 months	0.418*** (0.107)
						HOME Parent involved in the child's learning @36 months	0.380*** (0.125)	Meets RDA of protein @36 months	0.574*** (0.093)
						HOME Visitation of people and attendance of activities @36 months	0.258** (0.125)	Meets RDA of dairy @36 months	0.739*** (0.077)
								Meets RDA of fruit and veg @36 months	0.503*** (0.099)

$\lambda^2$  Test (p-value) = 203.03 (0.105)

$\lambda^2/df = 1.134$

Root Mean Square Error of Approximation (RMSEA) [CIs] = 0.040 [0.000, 0.065]

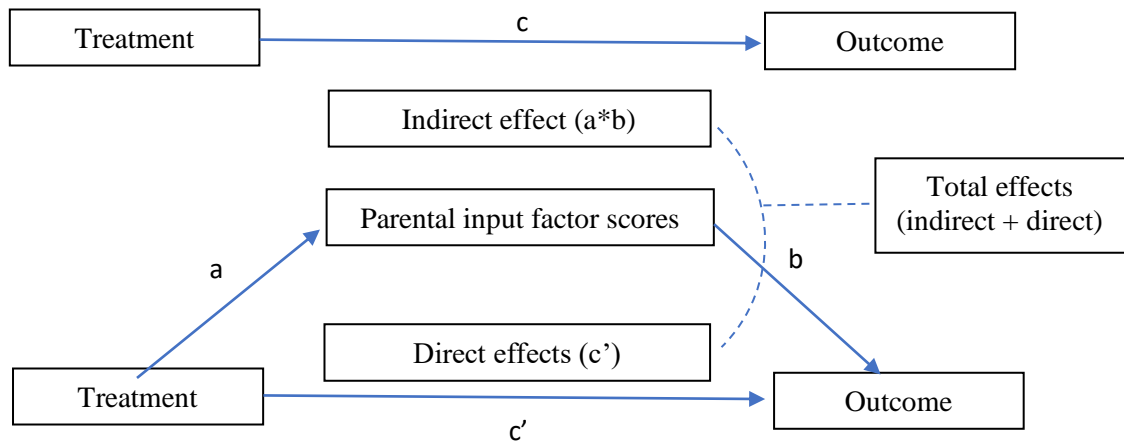
Probability RMSEA  $\leq$  .05 = 0.719

Comparative fit index (CFI) = 0.912

Tucker-Lewis index (TLI) = 0.897

**Note:** Factor loadings and fit statistics based on the confirmatory factor analysis using a five-factor model. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Figure E2** Conceptual model of mediation analysis



**Note:** “c” is the relationship between the treatment and the outcome not adjusted for parental input latent factor scores; “a” is the relationship between the treatment and parental input scores; “b” is the relationship between parental input scores and the outcome; and “c’ ” (c-prime) is the relationship between the treatment and the outcome adjusted for parental input scores.

**Table E19** Mediation analysis - cognitive outcomes

GCA Scores	(1) Impact of Treatment on Mediator	(2) Impact of Treatment on Outcome (GCA)	(3) Impact of Treatment and all mediators on Outcome (GCA)	(4) % of effect mediated by individual mediators
Treatment	~	8.443*** (2.614)	5.235** (2.385)	~
Parental style	1.079*** (0.392)	~	0.043 (0.604)	0.55%
Parental beliefs	0.604** (0.259)	~	3.673*** (0.993)	26.27%
Parental health inputs	0.050* (0.030)	~	18.882** (8.395)	11.18%
Indirect effect			0.123** (0.048) [0.03, 0.22]	
Direct effect			0.200** (0.090) [0.04, 0.38]	
Total effect			0.323*** (0.089) [0.17, 0.50]	
% of total effect mediated				38%

**Note:** Parent-Child Relationships and Parental Stimulation are not significant mediators and are excluded from the model. All models include child gender and a latent index derived using confirmatory factor analysis capturing baseline imbalance in the age nine sample. Rounded brackets show robust standard errors. Square brackets show 95 percent bias-corrected confidence intervals. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

**Table E20** Mediation analysis - reading scores

Reading Scores	(1) Impact of Treatment on Mediator	(2) Impact of Treatment on Outcome (Read)	(3) Impact of Treatment and all mediators on Outcome (Read)	(4) % of effect mediated by individual mediators
Treatment	~	6.004** (2.871)	3.968 (2.936)	~
Parental style	0.915** (0.383)	~	0.191 (0.789)	2.91%
Parental beliefs	0.567** (0.252)	~	2.157* (1.254)	21.07%
Parental stimulation	0.050** (0.023)	~	19.762 (21.012)	16.62%
Parental health inputs	0.064** (0.029)	~	-6.243 (17.529)	-6.70%
Indirect effect			0.070 (0.043) [-0.00, 0.17]	
Direct effect			0.137 (0.089) [-0.04, 0.31]	
Total effect			0.207** (0.092) [0.04, 0.39]	
% of total effect mediated				33.90%

**Note:** Parent-Child Relationships is not a significant mediator and is excluded from the model. All models include child gender and a latent index derived using confirmatory factor analysis capturing baseline imbalance in the age nine sample. Rounded brackets show robust standard errors. Square brackets show 95 percent bias-corrected confidence intervals. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.

**Table E21** Mediation analysis - math scores

Math Scores	(1) Impact of Treatment on Mediator	(2) Impact of Treatment on Outcome (Math)	(3) Impact of Treatment and all mediators on Outcome (Math)	(4) % of effect mediated by individual mediators
Treatment	~	7.910*** (2.908)	5.185* (2.800)	
Parental style	0.873** (0.383)	~	-0.743 (0.728)	-8.21%
Parental beliefs	0.591** (0.254)	~	4.257*** (1.194)	31.81%
Parental stimulation	0.051** (0.024)	~	15.510 (19.979)	10.07%
Parental health inputs	0.065** (0.029)	~	0.948 (16.664)	0.78%
Indirect effect			0.092** (0.046) [0.01, 0.19]	
Direct effect			0.175** (0.086) [0.00, 0.35]	
Total effect			0.267*** (0.091) [0.08, 0.44]	
% of total effect mediated				34.46%

**Note:** Parent-Child Relationships is not a significant mediator and is excluded from the model. All models include child gender and a latent index derived using confirmatory factor analysis capturing baseline imbalance in the age nine sample. Rounded brackets show robust standard errors. Square brackets show 90 percent bias-corrected confidence intervals. \*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10.