

# Reducing Socio-economic Inequality through Early Intervention: Evidence from Ireland

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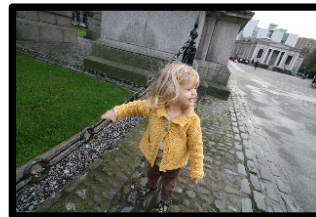
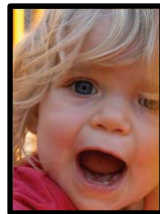


# Inequalities & Early Intervention

- Socio-economic inequalities in children skills arise in contexts of disadvantage
  - Due to monetary/cognitive constraints (Becker 1965; Mani *et al.* 2013)
- Early intervention programs to compensate for the various risk factors that potentially compromise child development (Almond and Currie, 2011)
- Home visiting programs (HVP) provide support and education to parents
  - Meta-analyses report some short & medium terms effects (e.g. Sweet & Applebaum 2004; Filene *et al.* 2013; Peacock *et al.* 2013; Avellar & Supplee 2016; Jeong *et al.* 2021)
- Well-known HVPs – Nurse Family Partnership (HICs) & Reach-Up & Learn (LMICs)
- Little evidence for countries with more generous welfare systems

# This Study

- Investigate the impact of a **5-year Irish early intervention program** in reducing inequalities in children's skills
- ***Preparing for Life (PFL)*** one of the longest running experimental early childhood intervention in Europe
- Based on the premise that providing intensive parenting supports from pregnancy until age 5 will permanently alters children's development



# Preparing for Life (*PFL*) Program

## PFL PARTICIPANTS

### HIGH TREATMENT

1. Developmental toys annually & book packs
2. Enhanced pre-school
3. Public health workshops
4. Facilitated access to local services
5. Access to social events

**N = 115**

### LOW TREATMENT

1. Developmental toys annually & book packs
2. Enhanced pre-school
3. Public health workshops
4. Facilitated access to local service
5. Access to social events

**N = 118**

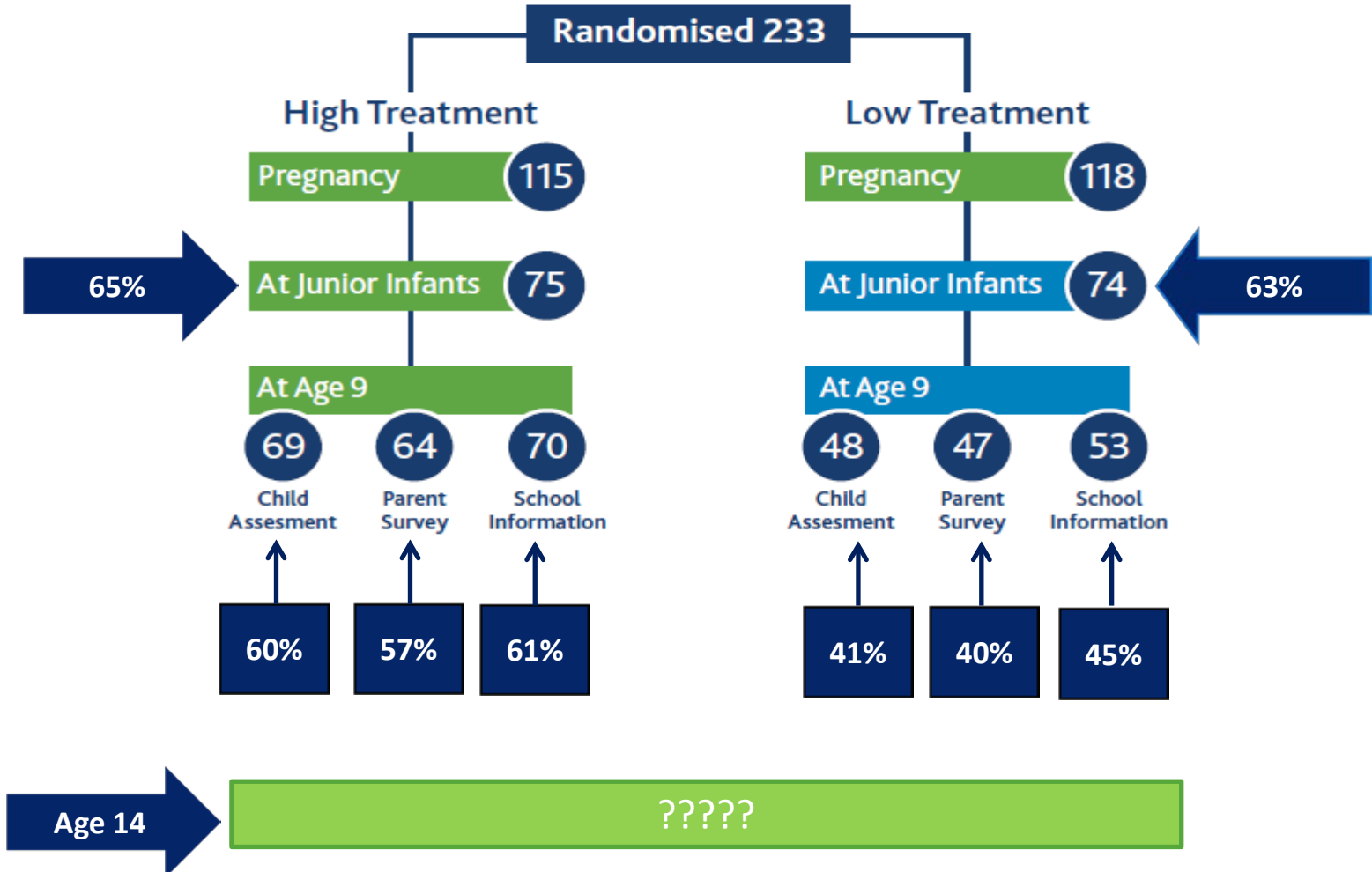
## HIGH TREATMENTS

- **Home Visiting Program** (preg–5yrs)
  - Bi-monthly home-visits of ~1hr from a trained mentor
  - Based on curriculum of ~200 Tip Sheets
- **Baby massage classes** (1<sup>st</sup>yr)
  - 5 x 2hr group baby massage sessions
- **Group parenting classes** (2-3yrs)
  - 5 x 2hr group discussion sessions using the Triple P Positive Parenting program

# Trial Design

- **Eligibility Criteria:** Pregnant women residing in *PFL* catchment area bwt Jan 2008-Aug 2010
- **Recruitment:** Maternity hospital & within the local community (~20 weeks)
- **Randomization:** Unconditional probability randomization strategy
  - 115 allocated to High Treatment and 118 allocated to Low Treatment
  - No statistical differences on 107/117 baseline measures (92%)
- **Data:** 10 rounds of data collected during the trial (interviews, medical records, direct assessments etc.)
  - All PFL data publically available in Irish Social Science Data Archive ([www.issda.ie](http://www.issda.ie))

# Attrition (2007 – 2024)



# Methods

- **Differential attrition** – inverse probability weighting (IPW) (Hofler et al. 2005)
- **Small sample inference** – permutation hypothesis testing (Heckman et al. 2010)
- **Multiple hypothesis testing** – stepdown procedure (Romano & Wolf 2005)
- All results are Intention-to-Treat estimates using IPW-adjusted permutation tests controlling for gender & adjusted for multiple hypothesis testing
- Also test robustness of the results using: standard tests, non-IPW, Lee bounds, conditional results

Economics & Human Biology  
 Volume 7, Issue 1, March 2009, Pages 1-6

European Early Childhood Education Research Journal  
 Vol. 20, No. 3, September 2012, 371-389

EJCEN  
 Original Article | Published: 30 October 2013  
 Maternal nutrition, infants and children  
 Well-being in pregnancy: an examination of the effect of socioeconomic, dietary

challenges of contamination  
 valuations of childhood

Breaking the Cycle of Deprivation: An Experimental Evaluation of an Early Childhood Intervention

Skills, capabilities and inequalities at school entry in a disadvantaged community

School Psychology International  
 'Look, I have my ears open': Resilience and early school experiences among children in an economically deprived suburban area in Ireland  
 Mimi Tatlow-Golden, Christine O'Farrelly, Ailbhe Booth, more... Show all authors

JOURNAL OF COMMUNITY PSYCHOLOGY  
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European Journal of Obstetrics & Gynecology  
 Reproductive Biology  
 September 2014, Pages 16

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 CPGP, Comm. Psych. Glob. Persp. Vol 2, Issue 1, 52-72

FRIEND, FOE OR FACILITATOR? THE ROLE OF THE PARENT-SERVICE PROVIDER RELATIONSHIP IN THE EARLY

Economics & Human Biology  
 Volume 19, December 2015, Pages 224-245

PLOS ONE  
 RESEARCH ARTICLE  
 Can Targeted Intervention Mitigate  
 Emotional and Behavioral Problems

The Journal of School Nursing  
 "Bursting" to Go and Other Experiences  
 Using the Toilet in

Public Health Nutrition  
 Volume 20, Issue 1 January 2017, pp. 154-164

Labour Economics  
 Volume 45, April 2017, Page

"Little Bit Afraid 'Til I Found How It Was": Children's Subjective Early School Experiences in a Disadvantaged Community in Ireland  
 O'Rourke, Claire; O'Farrelly, Christine; Booth

European Child & Adolescent Psychiatry  
 April 2017, Volume 26, Issue 4, pp 497-507 | Cite as

Maternal warmth and toddler development: transactional models in disadvantaged

Children's Research Network  
 Archiving the Preparing for Life data: Motivation and historical context

PLOS ONE  
 Can Early Intervention Improve Maternal  
 Randomized Controlled Trial  
 Orla Doyle, Liam Delaney, Christine O'Farrelly, Nick Fitzgibbon

Pediatrics  
 May 2018, VOLUME 141 / ISSUE 5  
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 The First 2,000 Days and Child Skills  
 A Multicomponent Early Childhood  
 and Health  
 Sylvana M. Côté, Massimilia

Journal of Applied Developmental Psychology  
 Volume 54, January-February 2018, Pages 69-83  
 Shared reading in infancy and later development: Evidence from an early intervention  
 Christine O'Farrelly, Orla Doyle, Gerard Victory, Eylín Palamaro-Munshell

**A body of 25+ published articles** Orla Doyle  
University College Dublin



# WHAT DO WE FIND?

A few results.....

# Cognitive Skills at Age 5

## British Ability Scales II: Early Years Battery (BAS II; Elliott et al. 1997)

BAS Scores Age 5	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size	<i>p</i>
General Conceptual Ability	97.7 (14.4)	88.0 (12.6)	0.72	<b>0.000</b>
Spatial Ability	96.0 (17.0)	86.0 (15.3)	0.62	<b>0.000</b>
Pictorial Reasoning	99.2 (12.9)	93.2 (10.9)	0.51	<b>0.002</b>
Verbal Ability	98.6 (13.1)	90.3 (12.4)	0.65	<b>0.002</b>

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

# Cognitive Skills at Age 9

## British Ability Scales III: School Age Battery (BAS III; Elliott et al. 2011)

BAS Scores Age 9	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size	$p$
General Conceptual Ability	88.12 (11.85)	80.13 (12.11)	0.67	<b>0.006</b>
Spatial Ability	94.09 (14.26)	86.75 (16.27)	0.48	<b>0.045</b>
Non-Verbal Ability	84.63 (11.67)	76.53 (9.70)	0.76	<b>0.001</b>
Verbal Ability	92.22 (11.70)	87.27 (13.67)	0.39	<b>0.043</b>

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

# Intergenerational transmission of IQ

- Black, Devereux, and Salvanes (2009) find correlation in the IQ scores of fathers and sons of **0.38**
- Correlation between IQ scores of mothers & children in **low** treatment group
  - **Age 5:  $r=0.31$ ;  $p=0.018$**
  - **Age 9:  $r=0.57$ ;  $p=0.001$**
- Correlation between IQ scores of mothers & children in **high** treatment group
  - **Age 5:  $r=0.07$ ;  $p=0.562$**
  - **Age 9:  $r=0.18$ ;  $p=0.148$**
- Some evidence that program reduced intergeneration transmission of low IQ

# Executive Functioning at Age 9

## NIH Toolbox for Assessment of Neurological and Behavioral Function Cognition Battery (NIH Toolbox; Zelazo and Bauer 2013)

	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size	$p$
Inhibitory Control	98.01 (16.64)	89.51 (11.39)	0.61	<b>0.049</b>
Attention Flexibility	102.33 (21.68)	91.07 (12.45)	0.66	<b>0.054</b>
Working Memory	96.27 (13.43)	89.83 (9.48)	0.56	<b>0.008</b>
Composite Executive Function Score	0.39 (1.03)	0.22 (0.64)	0.73	<b>0.016</b>

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

# School Achievement Tests at Age 9

## Drumcondra Tests for Reading and Mathematics or the Micra-T for English Reading and Sigma-T for Mathematics

	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size	$p$
2 <sup>nd</sup> class Reading score (n=118)	99.55 (15.10)	94.93 (12.63)	0.33	<b>0.038</b>
2 <sup>nd</sup> class Maths score (n=118)	97.42 (14.62)	89.73 (12.89)	0.56	<b>0.015</b>
3 <sup>rd</sup> class Reading score (n=70)	97.51 (11.97)	89.67 (9.30)	0.74	<b>0.013</b>
3 <sup>rd</sup> class Maths score (n=70)	94.92 (14.05)	88.05 (12.96)	0.47	<b>0.080</b>

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

# Behavioral Problems at Ages 2-4

## Child Behavior Checklist (CBCL: Achenbach and Rescorla 2000)

% Cutoff Scores	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size (Odds Ratio)	p
<b>CBCL Externalizing Cutoff</b>	%	%		
24 Months	0.00	0.04	~	<b>0.009</b>
36 Months	0.01	0.07	7.45	<b>0.021</b>
48 Months	0.00	0.16	~	<b>0.005</b>
<b>CBCL Internalizing Cutoff</b>				
24 Months	0.02	0.09	4.85	<b>0.041</b>
36 Months	0.07	0.07	1.00	0.513
48 Months	0.03	0.20	8.08	<b>0.023</b>

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

# Behavioral Problems at Age 9

% cutoff scores	$M_{\text{HIGH}}$ (SD)	$M_{\text{LOW}}$ (SD)	Effect size	$p$
<b>Maternal report</b>	%	%		
BPM Internalizing problems	0.21	0.22	0.02	0.695
BPM Externalizing problems	0.07	0.16	0.23	0.491
BPM Attention problems	0.13	0.14	0.03	0.657
<b>Child report</b>	%	%		
SSIS Internalizing Problems	0.11	0.11	0.04	0.376
SSIS Externalizing Problems	0.08	0.09	0.04	0.559
SSIS Bullying	0.01	0.04	0.17	0.456
SSIS Hyperactivity/Inattention	0.11	0.13	0.09	0.521

IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.



# Economic Benefits of PFL

- Program costs: \$2,250 child per year, or **\$10,125** in total
- Cost savings:
  - *Health-related cost savings: \$1,582* (reduced hospital use)
  - *Reduced incidence of caesarean section from 25% to 15%: average cost of c-section ~ \$6,095* (Health Service Executive 2007)
  - *Reduced % of clinical behavioral problems from 17% to 2%: cost saving of moving from above to below the clinical cutoff generates a once-off cost saving of \$15,241 at age 30* (O'Neill et al. 2013)
  - *Increased IQ scores by 8 points on average: a one-unit increase in IQ scores generates an annual increase in earnings of \$1,518 by age 35* (Vergunst et al. 2019) OR generates **\$15,180** additional earnings over 10 years
- PFL is likely to generate a positive return on investment!

# Summary of Findings

- *PFL* has a sustained impact on cognitive skills and achievement, although no medium-term impact on socio-emotional skills or health
- *PFL* starts **earlier** and is **longer** in duration than most HVPs
  - Quality of the mentor-parent relationship had time to build and develop
- **Multi-treatment** approach may help engage families who favor one particular form of treatment over another
- *PFL* added to the US's Department of Health and Human Services **HomVEE** list in meeting their criteria for “evidence-based early childhood home visiting service delivery model”.

# PFL Projects in Progress

- Currently conducting the Age 14 follow-up
  - Directly assessed cognitive skills, executive functioning, risk & time preferences
  - Health, weight & saliva samples (biological aging)
  - Socio-emotional skills, health behaviors, puberty development, school behaviors, time use, parental attachment, antisocial behaviour
  - Results available late Summer 2024
- Currently designing a replication of PFL in Chicago with the Centre for the Economics of Human Development at University of Chicago: **Creциendos Juntos**



# Thank you

## Questions:

[Orla.doyle@ucd.ie](mailto:Orla.doyle@ucd.ie)

Programme website: [www.preparingforlife.com](http://www.preparingforlife.com)

Evaluation website: <http://geary.ucd.ie/preparingforlife/>

*The*  
**A T L A N T I C**  
*Philanthropies*



Northside  
Partnership



An Roinn Leanaí  
agus Gnóthaí Óige  
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IRISH RESEARCH COUNCIL  
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Health Research Board



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# PFL Community

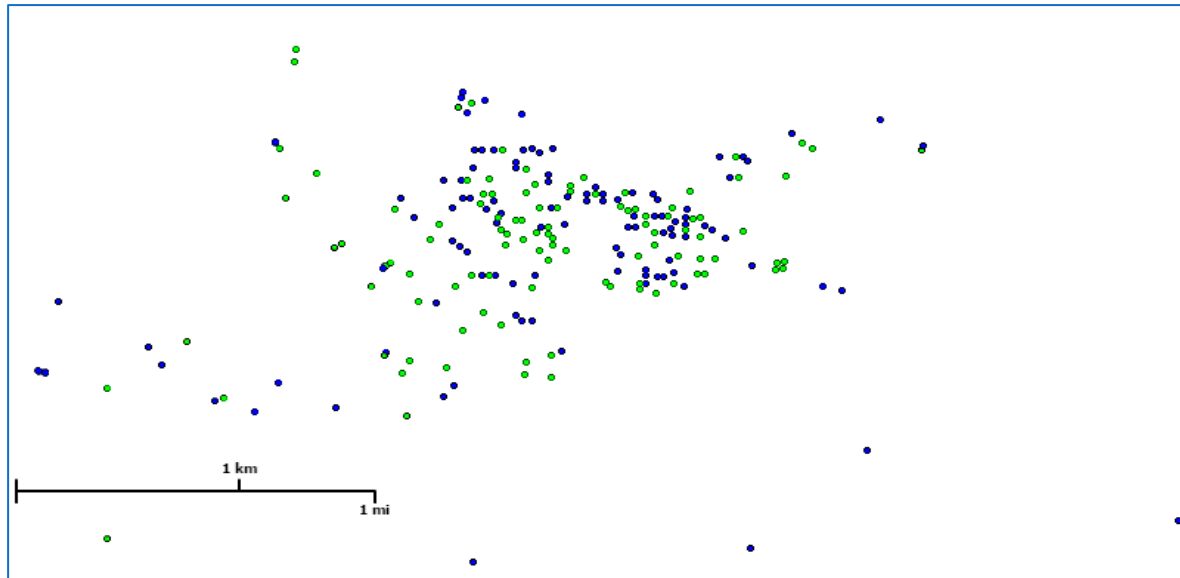
- **Designated Disadvantaged Community**
  - 33% dependent on social welfare
  - 42% live in social housing (>3 times national average)
  - 47% lone mothers (29% national average)
  - 12% unemployed (3 times national average)
  - 66% early school leavers (38% national average)
  - 5% third level education (29% national average)

*Census 2006*

# Contamination

- Potential for contamination is high in *PFL* – *1.1 square miles*
  - Members of the high and low treatment groups may be friends, neighbours, colleagues, same family!

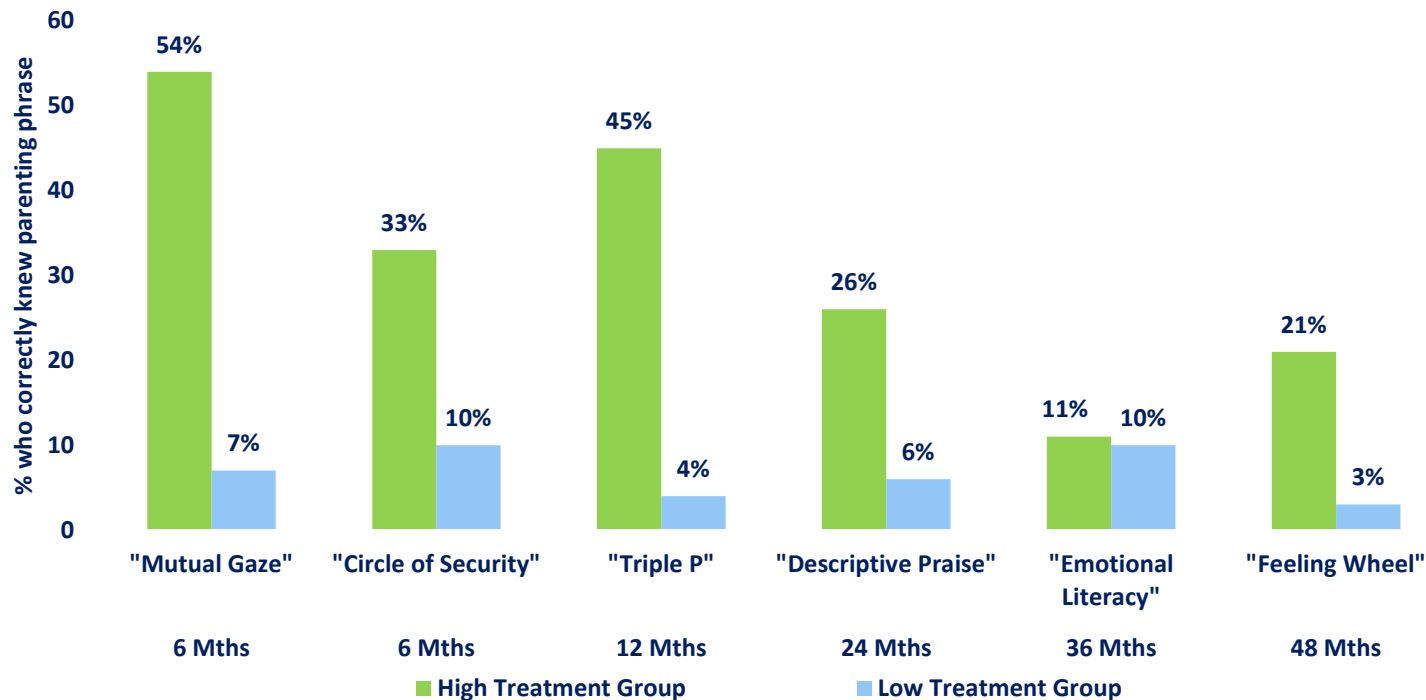
## ***Geographical Location of High and Low Treatment Participants***



# Contamination

## Test using 'blue-dye' questions

- Ask high and low treatment groups questions about their knowledge of child development/parenting terms found in *PFL* Tip Sheets



# Tests of Attrition Age 9

Predictors of Age 9 Participation	Treatment status* Baseline measure
Age	<b>0.023**</b> (0.011)
Married	0.152 (0.187)
First time mother	0.029 (0.136)
No. of children	-0.004 (0.057)
Low education (left ≤ age 16)	0.034 (0.141)
Weschler Abbreviated Scale of Intelligence	<b>0.009*</b> (0.005)
Employed	<b>0.248*</b> (0.137)
Resides in social housing	-0.026 (0.138)
Medical card	-0.068 (0.142)
Prior physical health condition	0.115 (0.149)
Prior mental health condition	0.026 (0.157)
Smoking during pregnancy	-0.046 (0.136)
Drinking alcohol during pregnancy	0.054 (0.156)