Growing Pains: The *Preparing for Life* Trial at Age 14

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EEA Congress 2025
25-28th August 2025

UCD DUBLIN

Preparing for Life
working together for our children

Background

- Early childhood most productive period for brain development
  - Parental stimulation and sensitive caregiving shapes children's neurological processes **(Cantor *et al.* 2019; Shonkoff 2010)**

- Inequalities in children's human capital arise in contexts of disadvantage
  - Due to monetary/cognitive constraints **(Becker 1965; Mani *et al.* 2013)**

- Almost a half of the income-related gaps in children's skills attributed to differences in parenting style & home environment **(Waldfogel & Washbrook 2011)**

- Increased interest in testing effectiveness of early life parenting programs

- Yet few studies test sustained impact of parenting interventions on children's later skills

This Study

- Investigates the impact of a **5-year Irish parenting program** on children's human capital 10 years after the intervention ended
- ***Preparing for Life (PFL)*** one of the longest running experimental early intervention programs in Europe
- Program operating in one of the most disadvantaged communities in Dublin
- RCT longitudinal study with follow-ups at ages 6, 12, 18, 24, 36, 48 months & ages 5, 9, and **Age 14**






What are Home Visiting Programs?

- Home visiting programs (HVPs) educate/encourage parents to engage in practices optimize child development

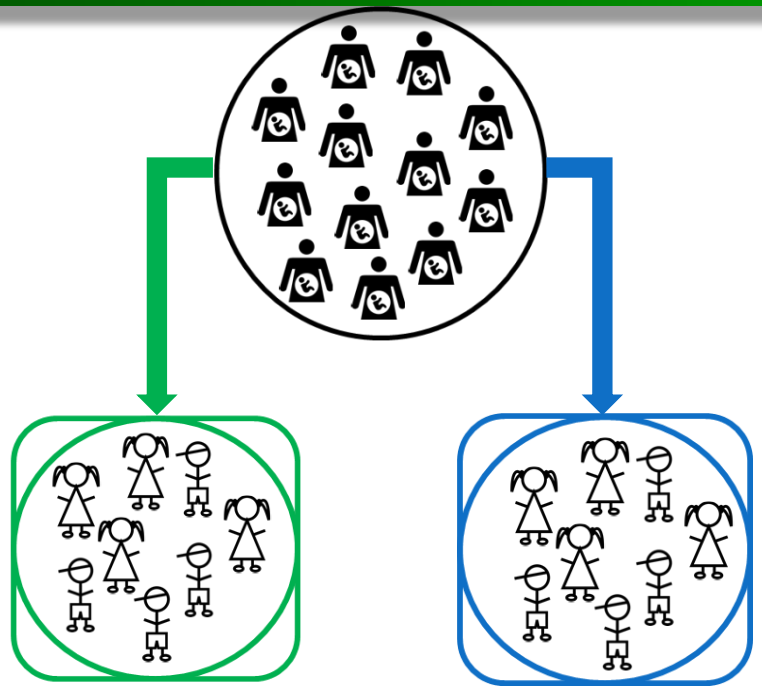
- HVPs can focus on:
  - Cognitive stimulation
  - Language development
  - Secure attachment
  - Lifestyle & healthy environment

- Well-known HVPs – Nurse Family Partnership (HICs) & Reach-Up & Learn (LMICs)

- Recent meta-analysis finds effects of **0.21SD** on child learning outcomes **(Dadisman, Nickow & Oreopoulos, 2024)**

Preparing for Life (2008-2015)

***PFL* Participants**
233



Random Assignment

HIGH

1. €100 developmental toys annually & book packs
2. Enhanced pre-school
3. Public health workshops
4. Facilitated access to local services
5. Access to social events
6. 5 year home visiting program
7. Group parenting sessions using Triple P
8. Baby massage

LOW

1. €100 developmental toys annually & book packs
2. Enhanced pre-school
3. Public health workshops
4. Facilitated access to local service
5. Access to social events

PFL Home Visiting Program

Timing: Pregnancy to school entry (age 4/5)

Treatment: Bi-monthly home-visits of ~1hr from a trained home visitor

Aim: Improve knowledge of child development and nurturing and encourage greater stimulation

Trained home visitors: From different backgrounds, and monthly supervision throughout the trial

Delivery methods: Role modelling, coaching, discussion, encouragement, and feedback, as well as directly interacting with the *PFL* child

Approach: Grounded in 'Advantaged Thinking' - a strengths-based philosophy which prioritises potential, dignity, and ambition over deficits

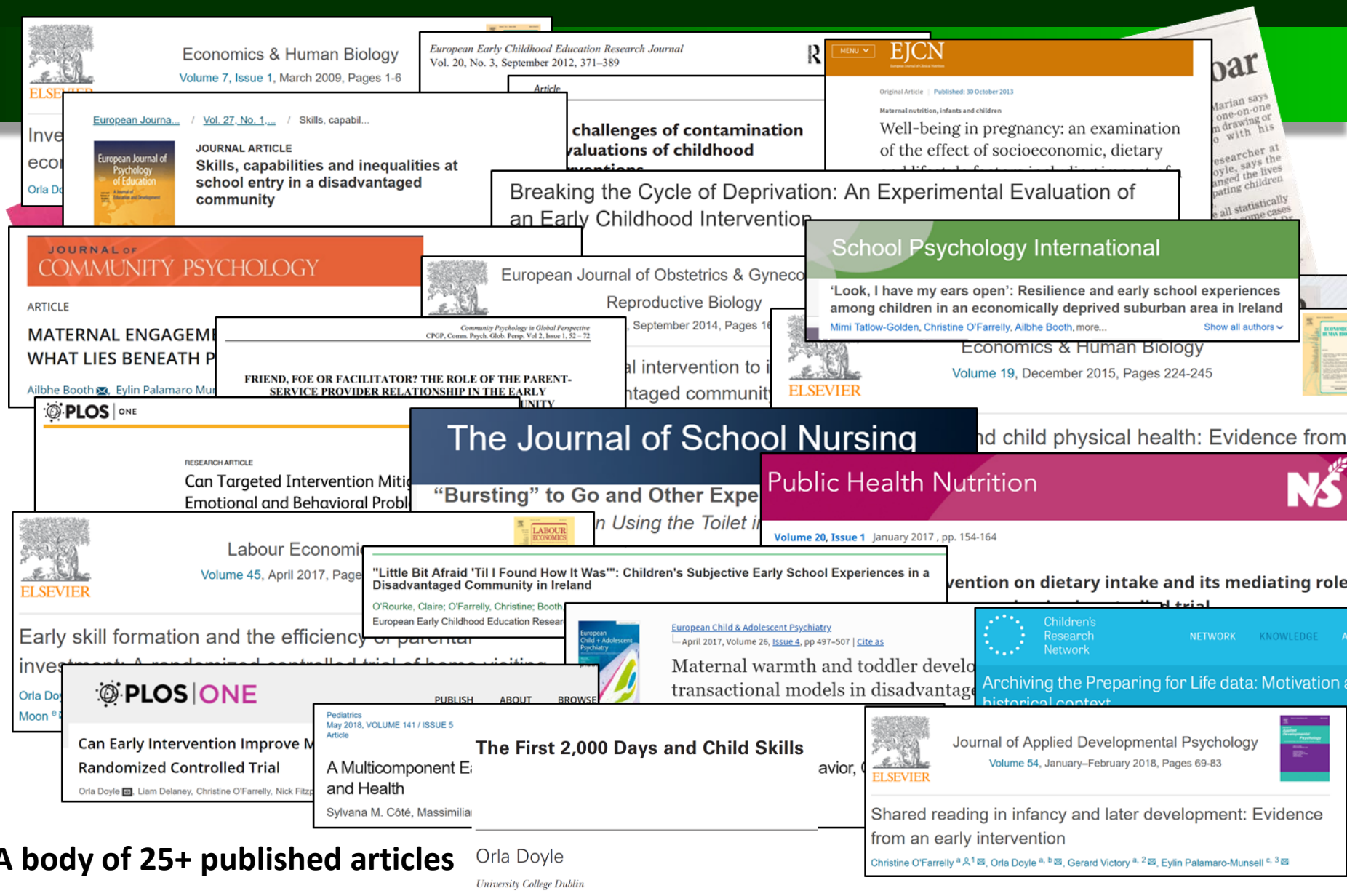
Original Trial Design

- **Eligibility Criteria:** Pregnant women residing in *PFL* catchment area between 2008-2010

- **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 collection – all publicly available at www.issda.ie



A body of 25+ published articles

Key Results to Date

- **End of trial:** **Doyle (2020)** shows that *PFL* had a large and substantive impact on children's skills at age 4/5
  1. Raised overall cognitive skills by 0.77SD
  2. Reduced incidence of externalizing (0.43SD) & internalizing (0.41SD) behavioral problems

- **Age 9 Follow-up:** **Doyle (2024)** shows *PFL* has a sizeable impact on cognitive skills and achievement tests 5 years after finishing the program
  1. Raised overall cognitive skills by 0.67SD & math/reading scores by 0.40-0.50SDs
  2. No effect on externalizing & internalizing behavioral problems

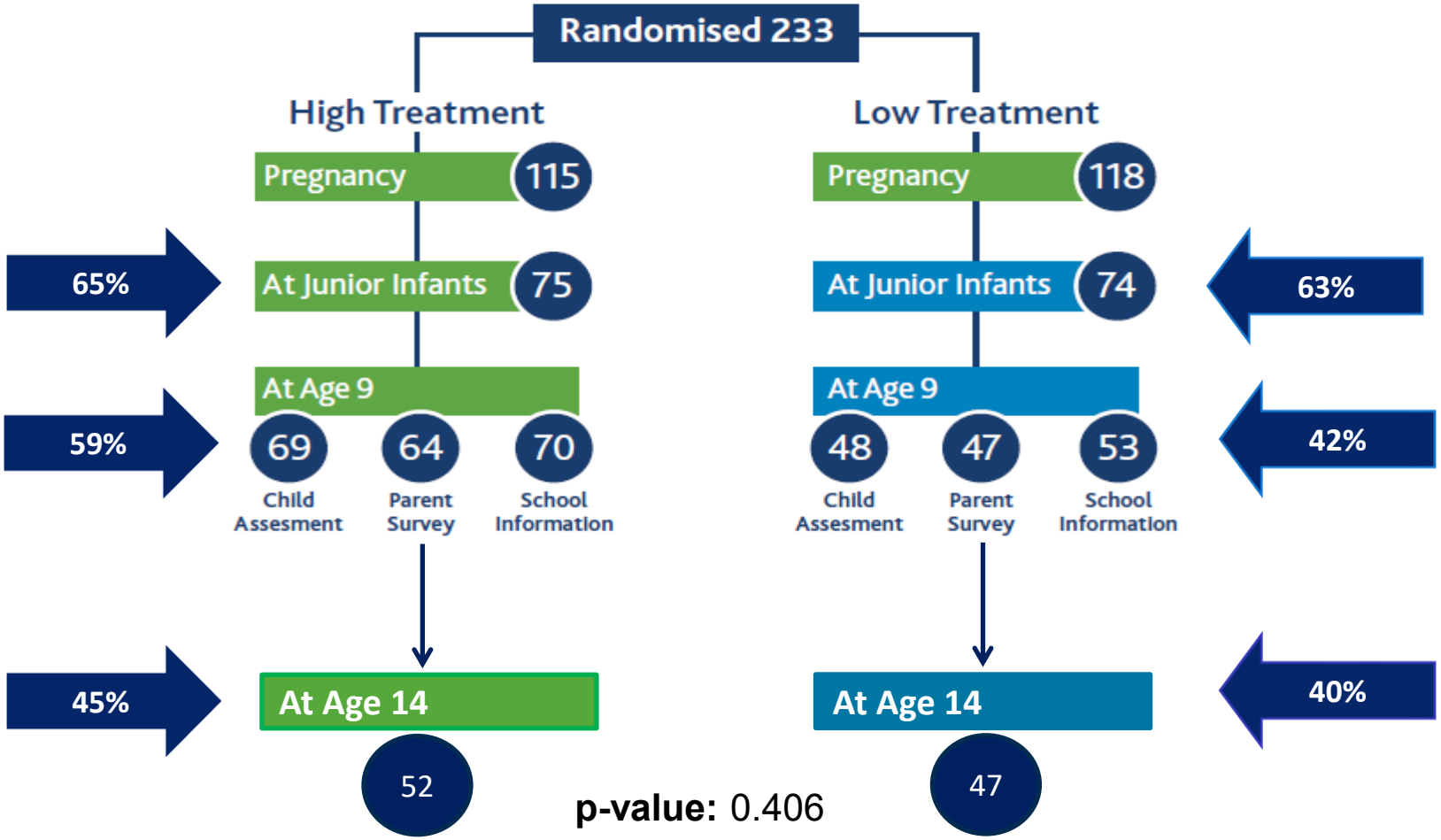
Doyle, O. (2020) "The first 2000 days and children's skills". *Journal of Political Economy*, 128(6) 2067–2122.

Doyle, O. (2024) "Can Early Intervention have a Sustained Effect on Human Capital?" *Journal of Human Resources,* 59(5).

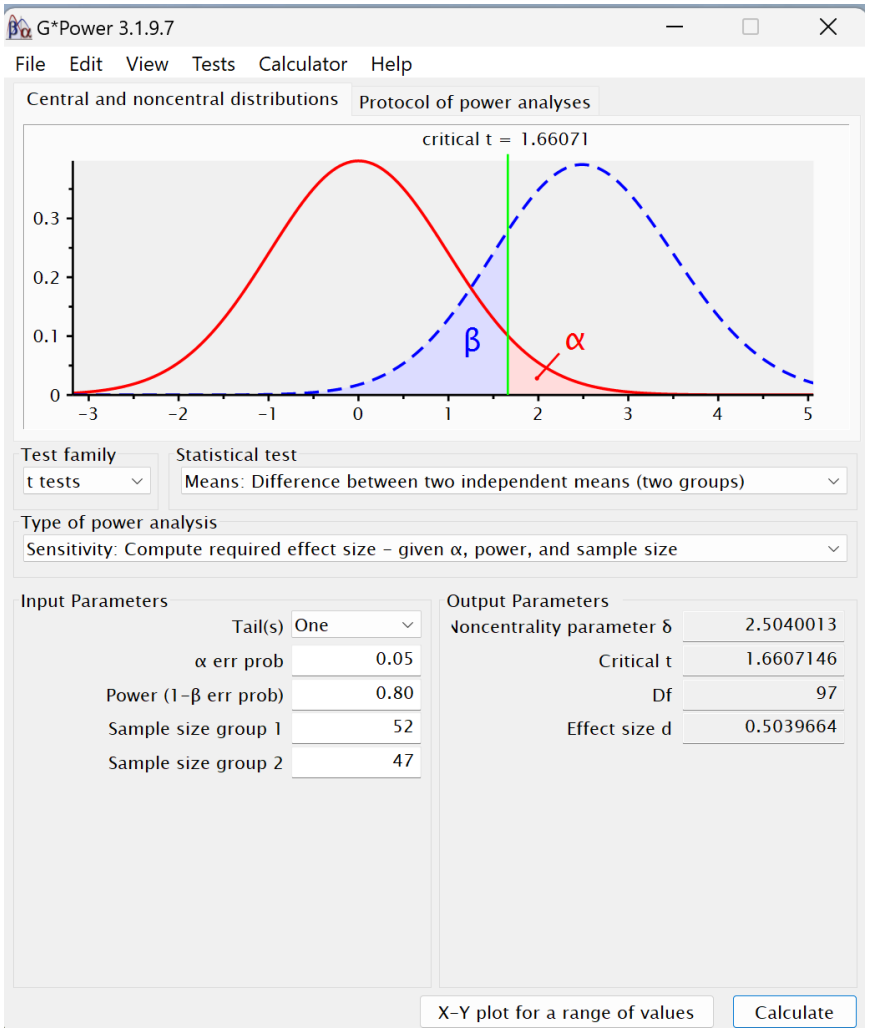
Age 14 Follow-Up

- To track the continuity or dissolution of *PFL* treatment effects at age 14
- Relatively few longitudinal follow-ups of home visiting programs into adolescence - with few exceptions, no impact on child outcomes **(Kitzman *et al.* 2010; Olds *et al.* 1998)**
- **Data collection period**: Feb-Aug 2024
- **Assessments**
  - Direct assessments
  - Self-complete questionnaire
  - Physical measurements

Retention Rates



Post-hoc Power Analysis



- With a n=99 (52=High; 47 Low), can identify effects of **~0.50SD** with 80% power

- Effects of 0.20SD have 26% power
- Effects of 0.30SD have 44% power
- Effects of 0.40SD have 63% power

Age 14 Estimation Sample – Balancing tests

- High and low treatment groups did not differ on **89%** of baseline measures

Maternal baseline characteristics	M_{HIGH} (*SD*)	M_{LOW} (*SD*)	*p**
Age	26.69 (5.78)	25.81 (6.03)	0.462
Married	0.23 (0.43)	0.10 (0.31)	**0.090**
No. of children	1.94 (1.19)	1.98 (1.17)	0.891
First time mother	0.48 (0.50)	0.47 (0.50)	0.921
Low education (left ≤ age 16)	0.27 (0.45)	0.23 (0.43)	0.779
IQ: WASI	85.25 (11.75)	81.61 (14.49)	0.178
Employed	0.48 (0.50)	0.45 (0.50)	0.727
Resides in social housing	0.54 (0.50)	0.55 (0.50)	0.952
Medical card	0.58 (0.50)	0.64 (0.49)	0.462
Prior physical health condition	0.77 (0.43)	0.70 (0.46)	0.453
Prior mental health condition	0.31 (0.47)	0.28 (0.45)	0.767
Smoking during pregnancy	0.40 (0.50)	0.47 (0.50)	0.484
Drinking alcohol during pregnancy	0.33 (0.47)	0.32 (0.47)	0.922
N	52	47	

*two-tailed *p*-values calculated from permutation tests with 100,000 replications.

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

WHAT DO WE FIND?

A few results……

Cognitive Skills Age 14

- **British Ability Scales III: School Age Battery** (BAS III; Elliott et al. 2011)
  - ***General Conceptual Ability*** (GCA) - overall score reflecting general cognitive ability
    - ***Spatial Ability Score*** - assesses problem solving, spatial visualisation, short-term visual memory
    - ***Non-Verbal Reasoning Score*** - assesses inductive reasoning
    - ***Verbal Ability Score*** - assesses verbal reasoning, verbal knowledge, expressive language

BAS Score at Age 14	M_{HIGH} (*SD*)	M_{LOW} (SD)	Effect size	*IPW-p*	*IPW-step p*
General Conceptual Ability	85.41 (14.04)	76.76 (10.74)	0.70	**0.003**	**0.010**
Spatial Ability	94.09 (17.77)	86.28 (13.02)	0.51	**0.012**	**0.012**
Non-Verbal Ability	82.94 (12.36)	76.57 (11.62)	0.53	**0.015**	**0.023**
Verbal Ability	87.39 (12.82)	80.42 (9.89)	0.61	**0.016**	**0.023**

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

Executive Functioning Age 14

- **National Institutes of Health Toolbox for Assessment of Neurological and Behavioral Function Cognition Battery** (NIH Toolbox; Gershon et al. 2013)
  - Flanker task assessed **inhibitory control**
  - Dimensional Change Card Sort task assessed **attention flexibility**
  - List Sorting task assessed **working memory**

	M_{HIGH} (*SD*)	M_{LOW} (SD)	Effect size	*IPW-p*	*IPW-step p*
Inhibitory Control	95.10 (17.78)	98.27 (17.57)	-0.18	0.790	0.790
Attention Flexibility	111.49 (20.52)	113.94 (19.84)	-0.12	0.624	0.794
Working Memory	102.44 (16.20)	94.68 (13.89)	0.52	**0.023**	**0.052**
Composite Standardised Executive Function Score	0.07 (0.75)	0.00 (0.78)	0.09	0.342	~

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

Socio-emotional skills Age 14 – BPM Scores

Brief Problems Monitor (19 items, Achenbach et al. 2011)	M_{HIGH} (*SD*)	M_{LOW} (SD)	Effect size	*IPW-p*	*IPW-step p*
BPM Scores					
BPM Internalizing problems	58.80 (7.60)	58.56 (7.45)	-0.03	0.655	0.655
BPM Externalizing problems	55.14 (6.12)	55.55 (6.56)	0.06	0.392	0.625
BPM Attention problems	60.75 (7.67)	65.31 (7.26)	0.61	**0.007**	**0.015**
BPM Cutoff Scores					
BPM Internalizing problems %	0.29 (0.46)	0.23 (0.43)	-0.13	0.776	0.776
BPM Externalizing problems %	0.09 (0.29)	0.12 (0.33)	0.11	0.280	0.528
BPM Attention problems %	0.41 (0.50)	0.63 (0.49)	0.46	**0.033**	**0.067**
Non-stepdown measures					
BPM Total Score	59.62 (7.52)	61.56 (7.60)	0.26	0.147	~
BPM Total Cutoff Score %	0.37 (0.49)	0.44 (0.50)	0.14	0.263	~

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

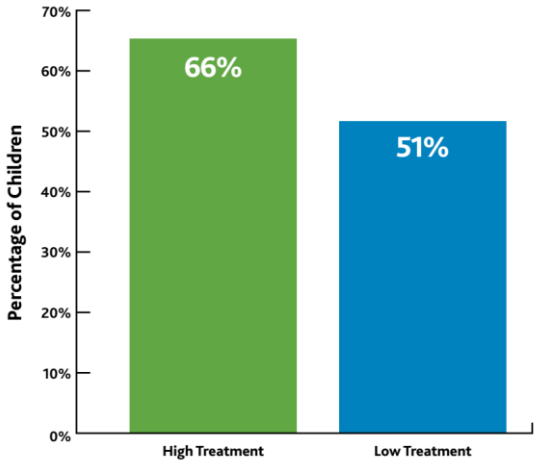
Health at Age 14

	M_{HIGH} (*SD*)	M_{LOW} (SD)	Effect size	*IPW-p*	*IPW-step p*
Self-assessed					
Self-rated health %	0.79 (0.41)	0.77 (0.42)	0.04	0.517	0.764
Never eats breakfast %	0.14 (0.35)	0.25 (0.44)	0.29	0.098	0.440
Never eats fruit %	0.19 (0.40)	0.25 (0.44)	0.13	0.303	0.740
Never eats vegetables %	0.19 (0.40)	0.23 (0.42)	0.09	0.250	0.758
Eats fast food up to 6 times per week %	0.19 (0.39)	0.19 (0.40)	0.01	0.486	0.486
Puberty Development Scale Score	3.10 (0.42)	3.07 (0.51)	0.06	0.097	0.758
Direct assessment					
Height (cms)	166.63 (8.04)	167.96 (7.45)	-0.15	0.864	0.864
Waist measurement (cms)	78.37 (11.43)	84.79 (14.09)	0.51	**0.015**	**0.040**
Waist-to-height ratio	0.47 (0.06)	0.51 (0.08)	0.46	**0.031**	**0.062**
High WTH ratio %	0.16 (0.37)	0.44 (0.50)	0.64	**0.004**	**0.011**

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

Educational Engagement at Age 14

	M_{HIGH} (*SD*)	M_{LOW} (SD)	Effect size	*IPW-p*	*IPW-step p*
Likes school %	0.76 (0.43)	0.68 (0.47)	0.18	0.301	0.610
School engagement score (std)	0.14 (0.92)	0.13 (1.14)	0.27	0.188	0.468
School belonging score (std)	0.14 (0.96)	0.00 (0.93)	0.15	0.280	0.280
School absence (% never)	0.57 (0.50)	0.48 (0.50)	0.17	0.304	0.474
Intention of going to university/college %	66.34 (28.55)	50.73 (32.58)	0.51	**0.012**	0.100



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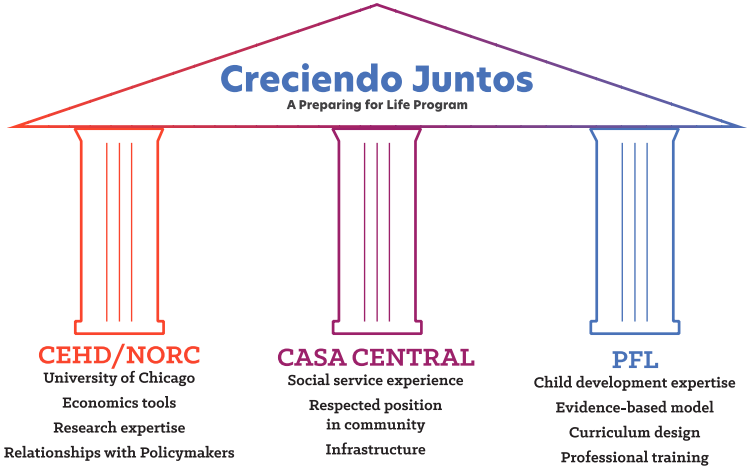
Summary of Effects

- Sustained effects on cognitive development – effects size 0.70SDs
- No effects on time & risk preferences; socio-emotional skills; school engagement
- (Some) effects on working memory; attention; health (waist-height ratio); expectations (go to college); and parent-child relationship
- **Individual tests**: 105 outcomes tested, 25 significant: 24%
- **Stepdown tests:** 20 groups tested, 7 significant: 35%
- No differential by gender
- *PFL* starts **earlier** and is **longer** in duration than most other HVPs

Current Status of *PFL*

- *PFL* operating in **10 sites** around Ireland – training hub for other sites
- In 2023, *PFL* added to the US's Department of Health and Human Services **HomVEE** list in meeting criteria for "evidence-based early childhood home visiting service delivery model" making it eligible for HVP funds
- Currently conducting a second *PFL* trial in Chicago with the Center for the Economics of Human Development at University of Chicago



Thank you

Questions:
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Additional information see:
www.preparingforlife.com
http://geary.ucd.ie/preparingforlife/
https://cehd.uchicago.edu/creciendojuntos

An Roinn Leanaí, Comhionannais, Míchumais, Lánpháirtíochta agus Óige
Department of Children, Equality, Disability, Integration and Youth

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Preparing for Life
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TUSLA
An Ghníomhaireacht um Leanaí agus an Teaghlach
Child and Family Agency

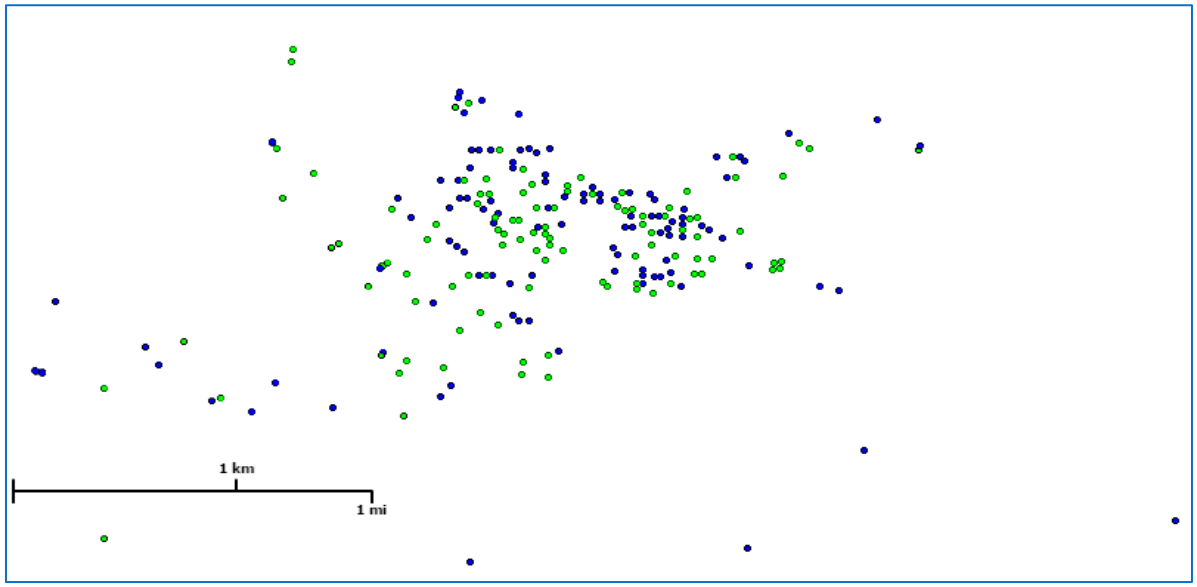
Northside Partnership

HSE

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!

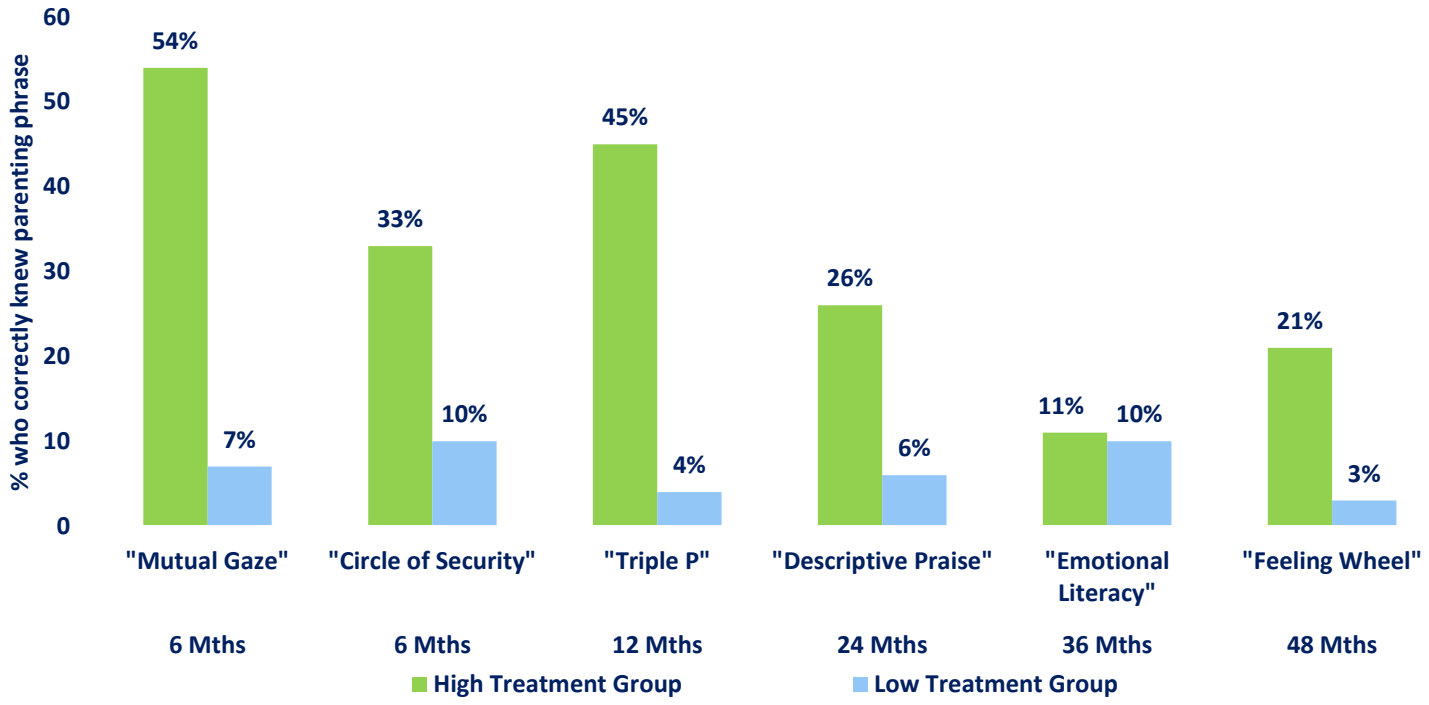
Geographical Location of High and Low Treatment Participants



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



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!