

# Child outcomes in relation to early experience

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Modern societies;

Skills for good outcomes are rising & changing, and there is still great inequality of opportunity.

Both cognitive (e.g., literacy numeracy) and non-cognitive skills (e.g., social skills, self-control) are important.

How can these be improved?

Does Early Childhood Education and Care (ECEC) have a role?

OECD 2012: Across OECD, 20% do not achieve basic minimum skills. The problem is twice as great for disadvantaged groups.

Disadvantaged groups have greater risk:

- for poor health
- Social, emotional, behavioural problems
- Attention, cognitive and language problems
- Affects educational progress, literacy, numeracy, social skills, employability, health, adjustment and criminality.

The impact of family disadvantage upon well-being is persistent.

Early experience is critical in this link: - because  
**Interactions Drive Development.**

Two arguments for investing in early childhood.

1. Moral – moral duty to optimise well-being.
2. Economic – we all benefit in the long-term

# “Education for All”, UNESCO, 2012

## Score for Early Childhood Education

1 Finland 91.8, 2 Sweden 91.7, **3 Norway 88.9, 4 UK 87.9**, 5 Belgium 84.7

6 Denmark 83.5, 7 France 81.0, 8 Netherlands 75.6, 9 New Zealand 73.9, 10 South Korea 72.5

11 Germany 71.9, 12 Austria 70.9, 13 Switzerland 69.9, 14 Spain 69.1, 15 Portugal 68.7

16 Italy 68.4, 17 Czech Republic 68.1, 18 Ireland 67.4, 19 Hong Kong 66.2, 20 Chile 63.6

21 Japan 63.5, 22 Hungary 61.6, 23 Israel 61.0, 24 USA 60.3, UAE, 60.3,

26 Canada 59.9, 27 Greece 59.4, 28 Australia 59.1, 29 Singapore 58.8, 30 Taiwan 58.4,

31 Poland 56.1, 32 Mexico 50.5, 33 Russia 49.9, 34 Argentina 43.0, 35 Turkey 39.9

36 Malaysia 39.4, 37 South Africa 38.8, 38 Thailand 37.9, 39 Brazil 35.1, 40 Ghana 34.3

41 Vietnam 31.3, 42 China 30.7, 43 Philippines 30.5, 44 Indonesia 22.1, 45 India 21.2

# Why focus on early childhood?

**3** strands of research support the importance of the early years.

**1. Neuroscience** shows the importance of early brain development;

**2. Developmental science** shows that high quality ECE improves children's life chances;

**3. Economics** shows that high quality ECE can save significant amounts of money over time.

Early childhood education helps to create the skilled workforce needed in the 21st century.

# Neuroscience

Everything we ***do***, ***feel*** and ***say*** - reflects ***brain*** function.

Birth - 100 billion neurons – all that you get

Synapses increase – 700 per second in early years

60% of nutrition is used by the brain during the first year

**By age 3**, 80% of synaptic connections are made.

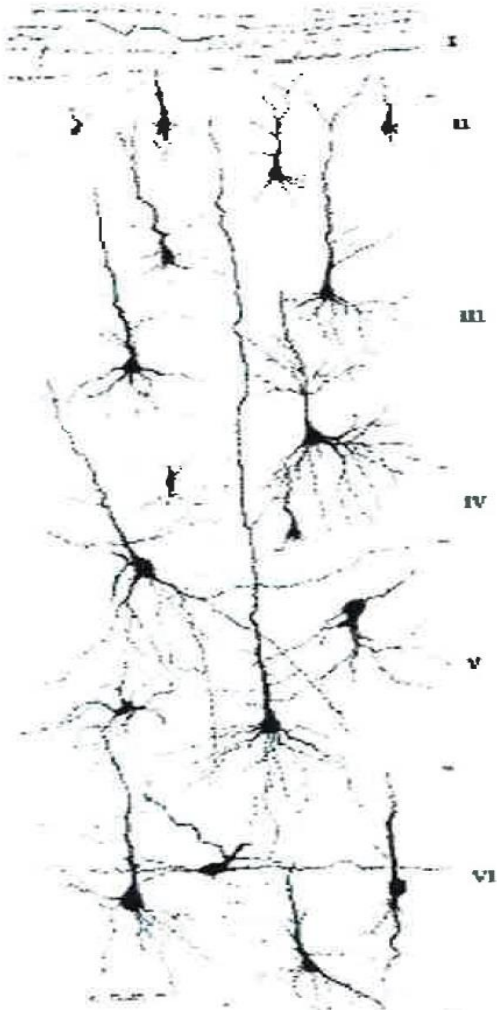
**Pruning** of synapses not reinforced by experience

**- use it or lose it**

Synapse development influences adaptation to experience.

# Synaptic Development:

(J.Conel (1939-1967) Postnatal development of the human cerebral cortex. Cambridge, MA; HUP)



Birth



Fig 92. Drawings from Golgi-Cox preparations

2 years

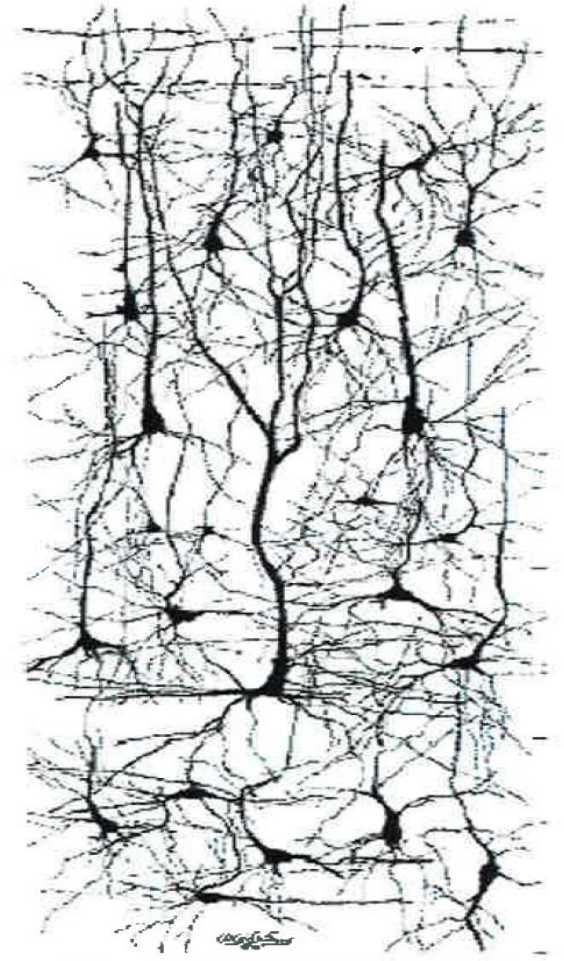
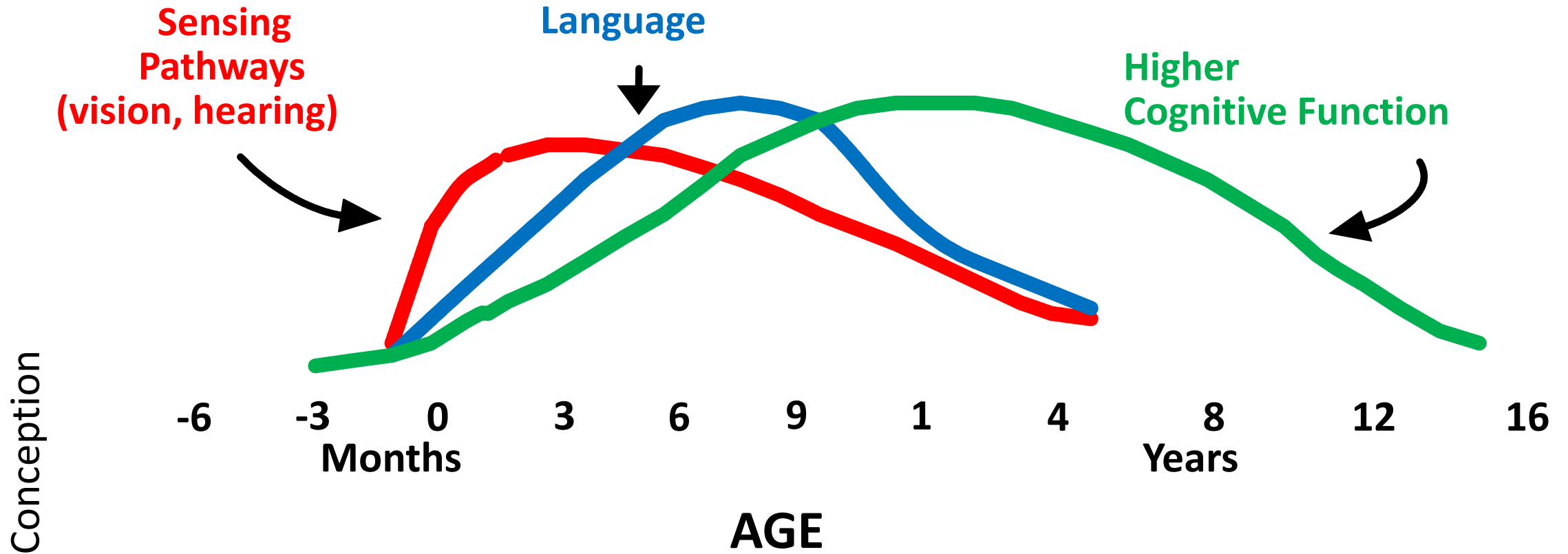


Fig 100. Drawings from Golgi-Cox preparations

6 years

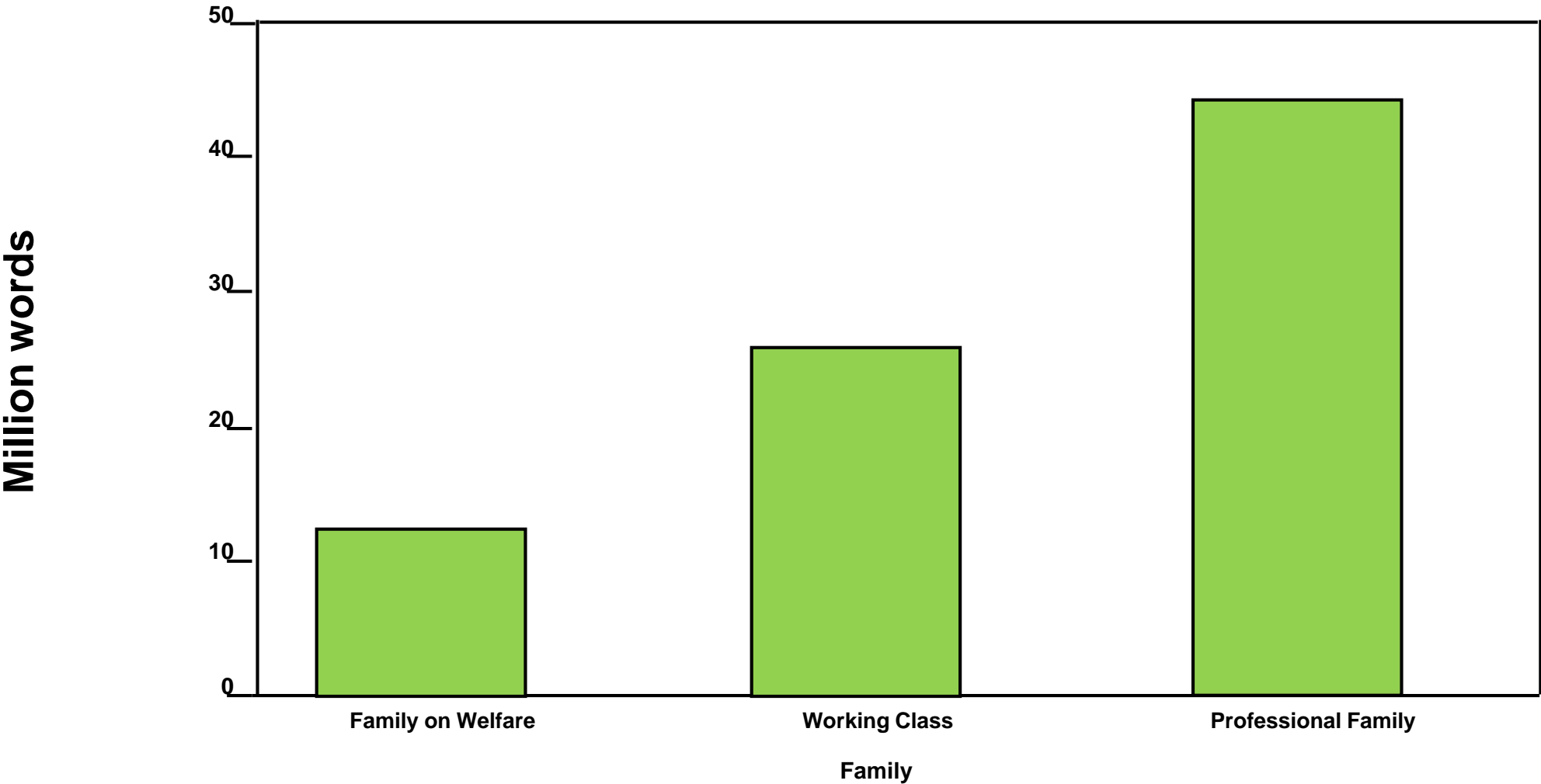


# Sensitive periods & Synaptic Development

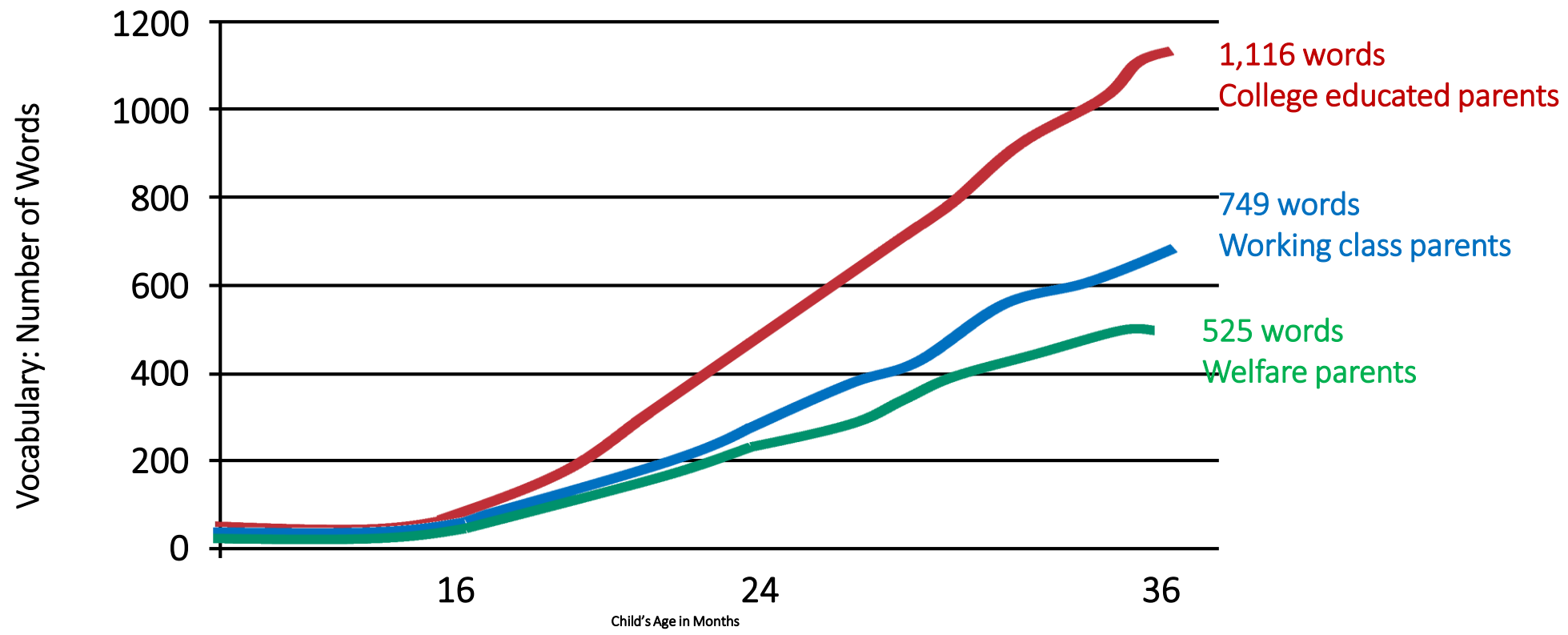


C. Nelson, in From Neurons to Neighborhoods, 2000.

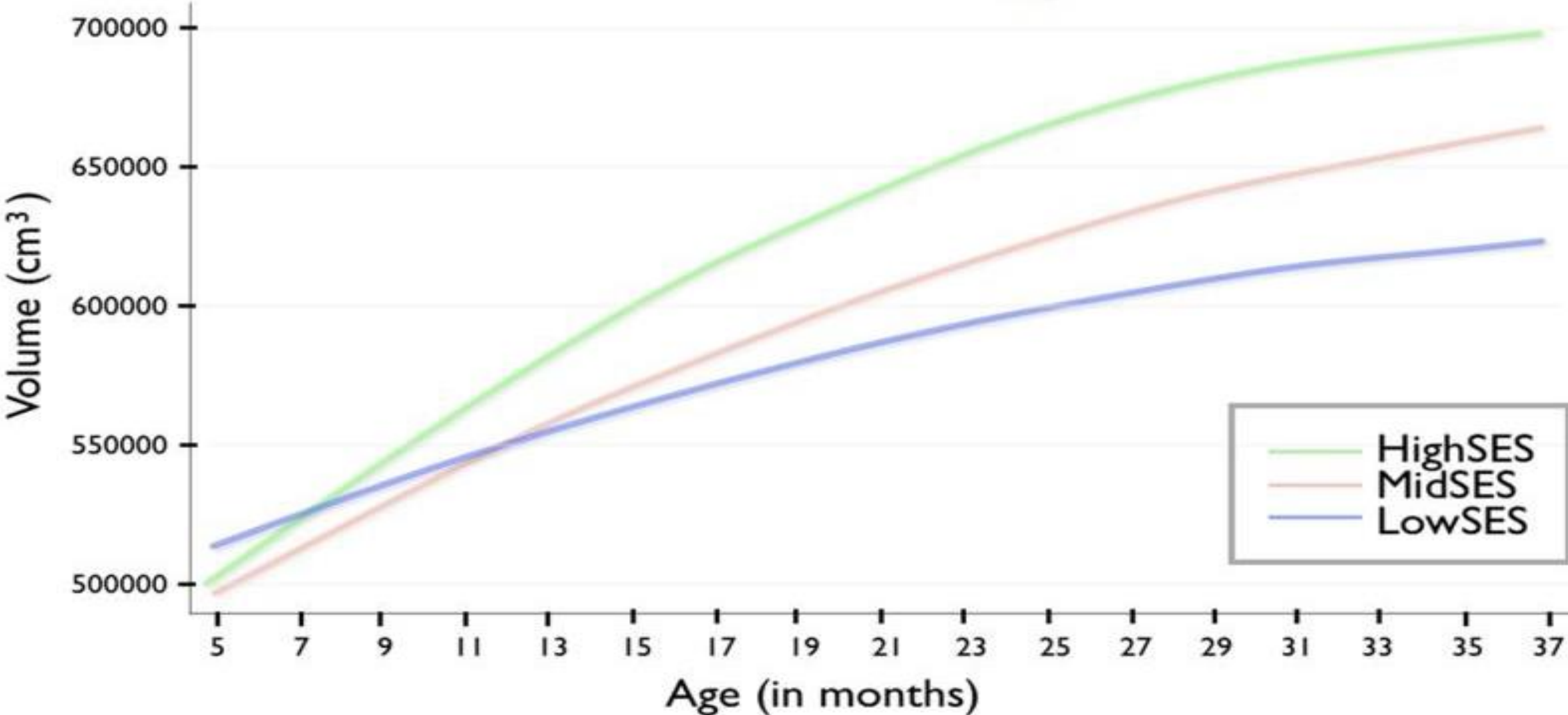
# Words Heard In first 4 Years in different families



# Achievement Gap starts early



# Infant Brain Growth - Total Grey Matter (Hanson et al., 2013)



# Developmental Science

## INTERVENTIONS with DISADVANTAGED GROUPS

### *Examples*

Abecedarian Project – ECEC 0-6 years

Perry Preschool Project – ECEC 3-6 years

# Abecedarian Project (Ramey et al., 2000)


Results up to age 21 years

- Intervention group showed

- Higher cognitive development from 18 months on
- Greater social competence in preschool
- Better school achievement – literacy etc.
- More college attendance
- Delayed child bearing
- Better employment
- Less smoking and drug use
- **Payback - Savings 2.5 times costs**

# *Perry Preschool Study*

*(Schweinhart, Barnes & Weikart, 1993)*

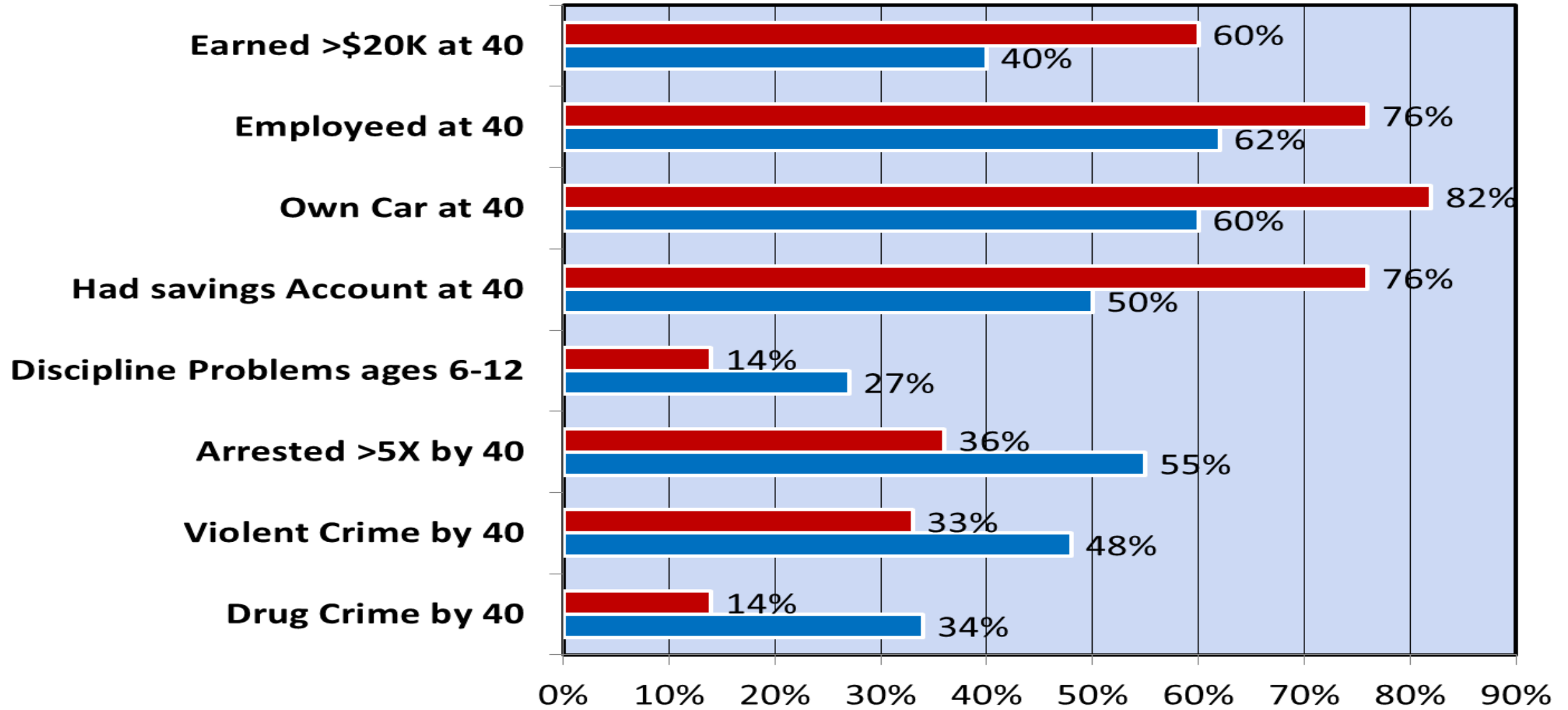
 123 young African-American children, living in extreme poverty and at risk of school failure

 Randomly assigned at ages 3 and 4 to

1. ECE program or 2. no-program

 ECE program - planned learning activities and weekly home visits to families

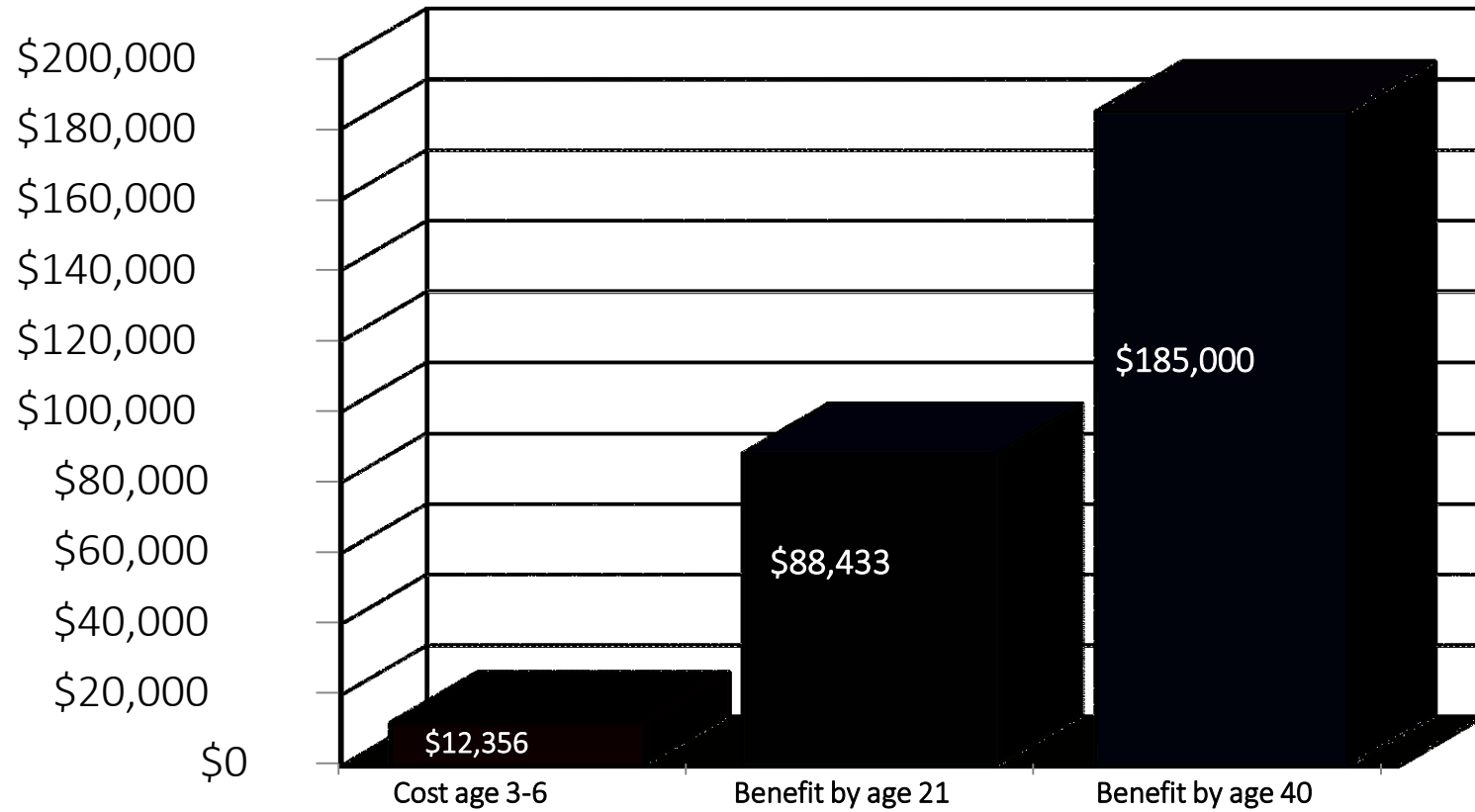
■ Program   ■ No Program





# Economics

## Return on investment



1992 dollars, 3% annual discount rate

Return on dollar  
invested age 21

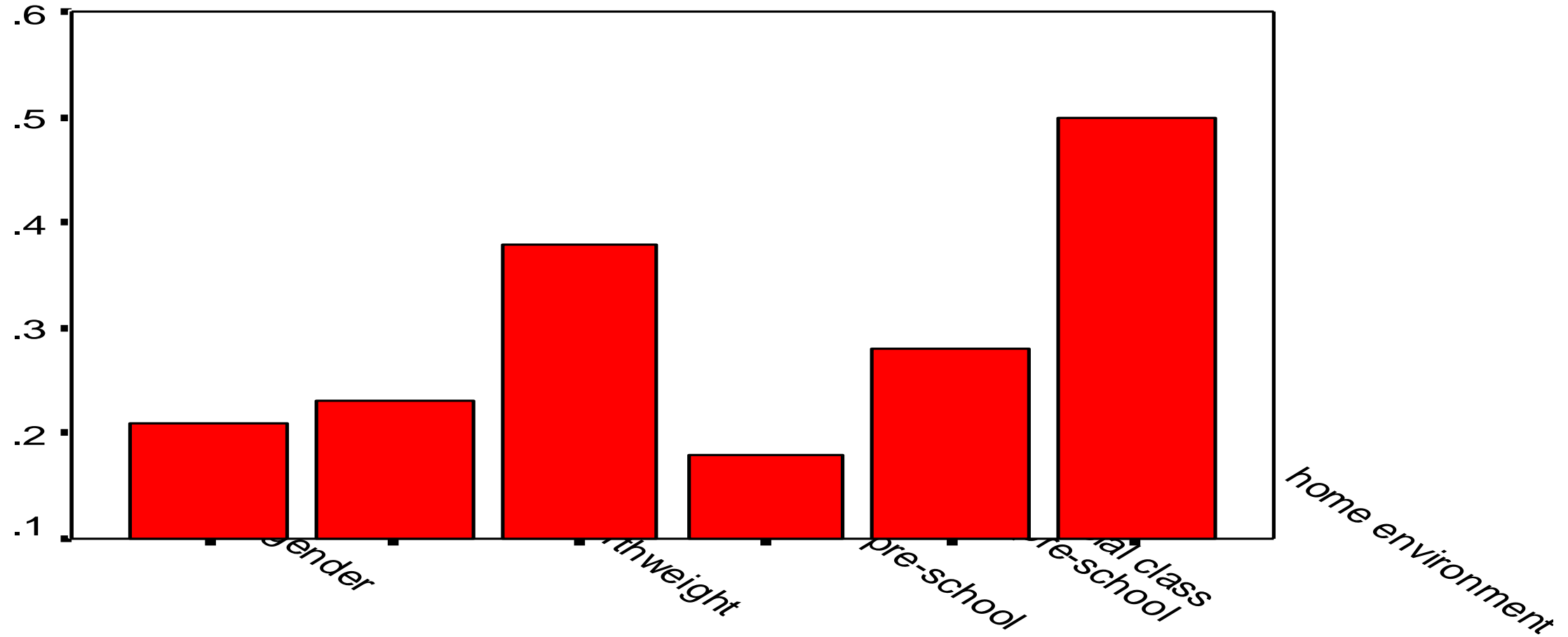
7:1

Return on dollar  
invested age 40

16:1

# Effects of child, home, and ECEC compared – EPPSE study – England

## EFFECTS UPON LITERACY



# Home Learning Environment

**Parents asked about activities in the home.**

**A home learning environment (HLE) index constructed** (Melhuish et al., 2001).

**Several activities linked to development.**

0 1 2 3 4 5 6 7

*not occur*

*very frequent*

**Reading to child**

**Library visits**

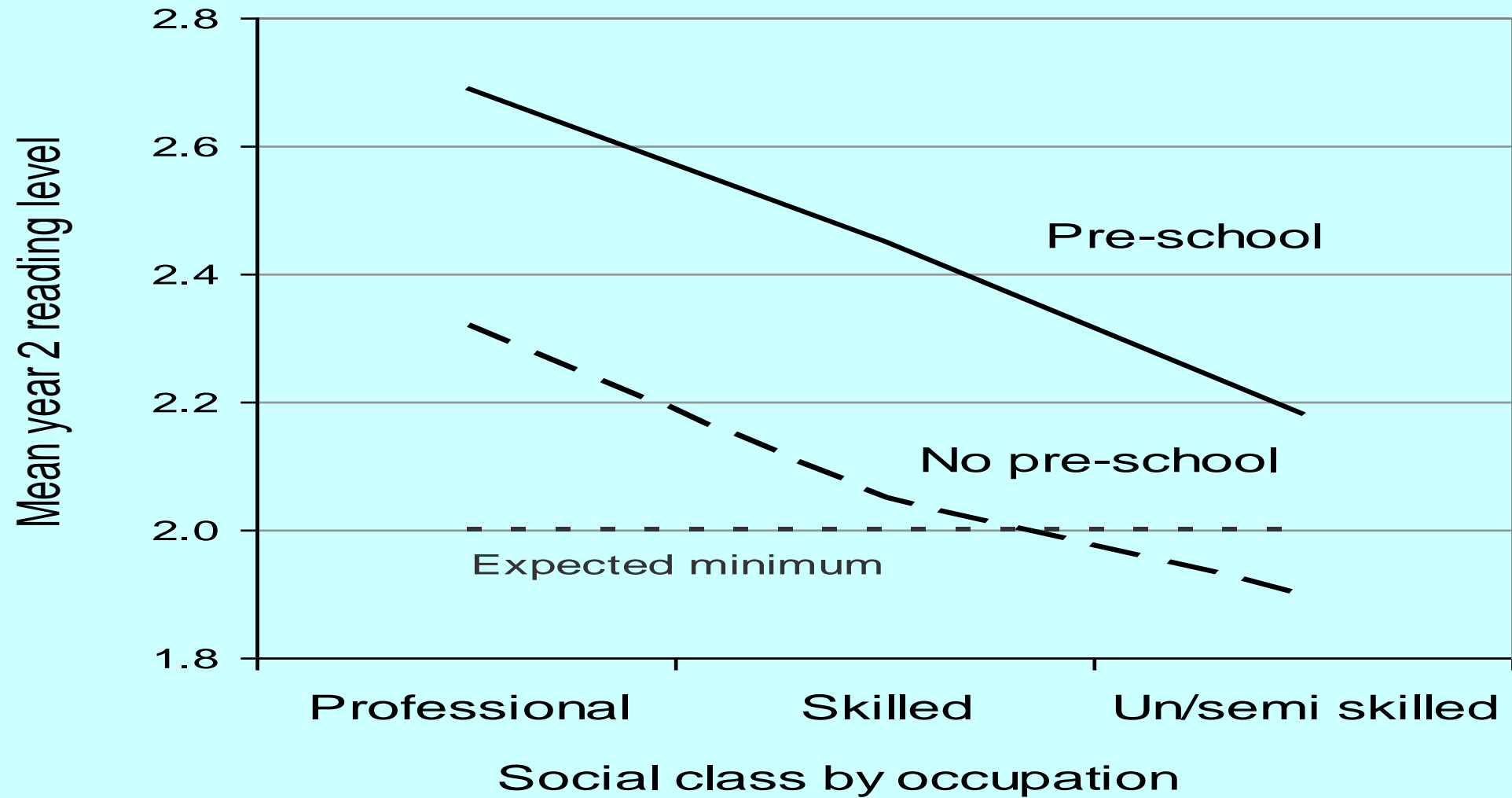
**Painting & drawing**

**Playing with letters**

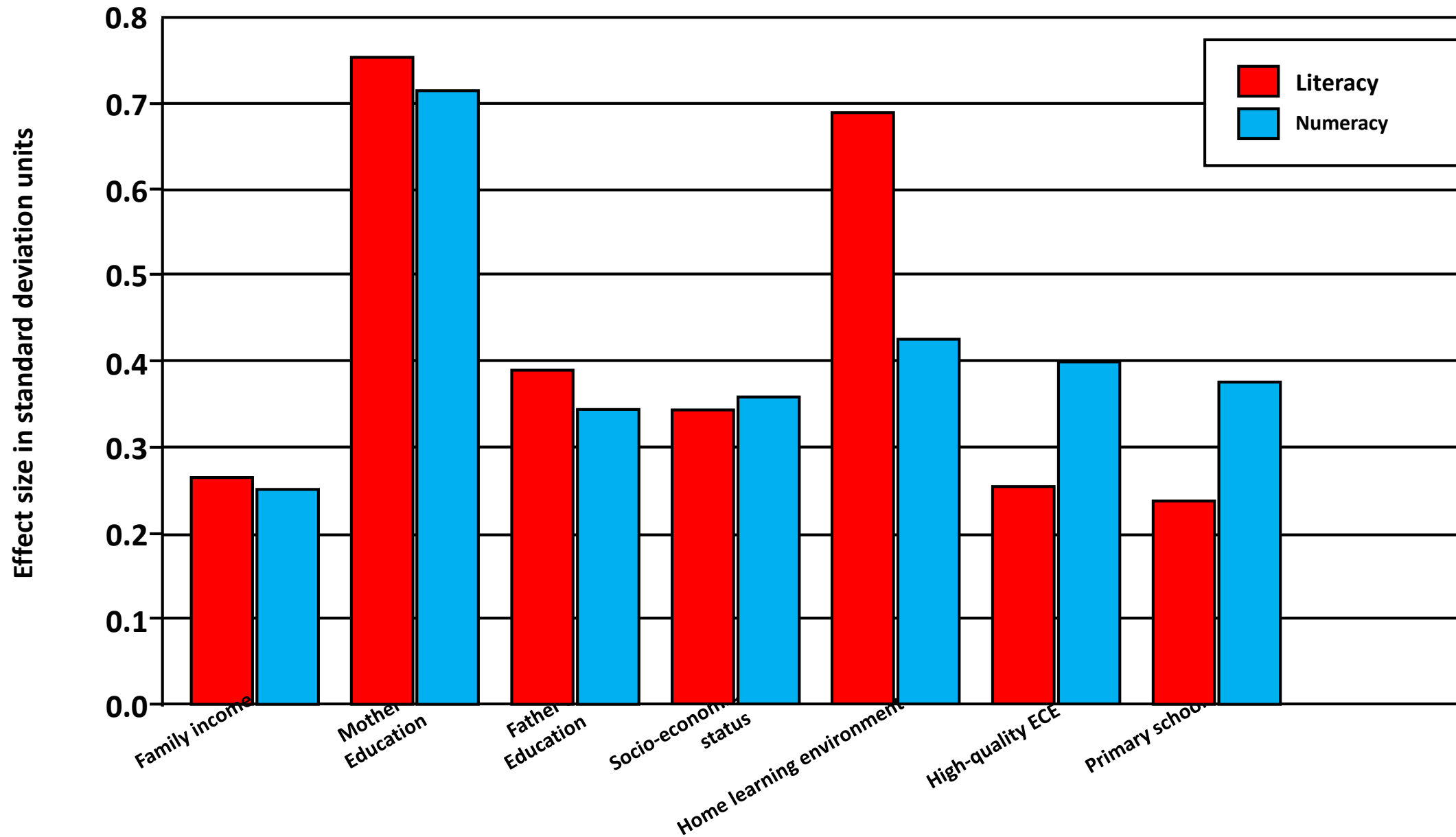
**Playing with numbers/shapes**

**Songs/ poems /nursery rhymes**

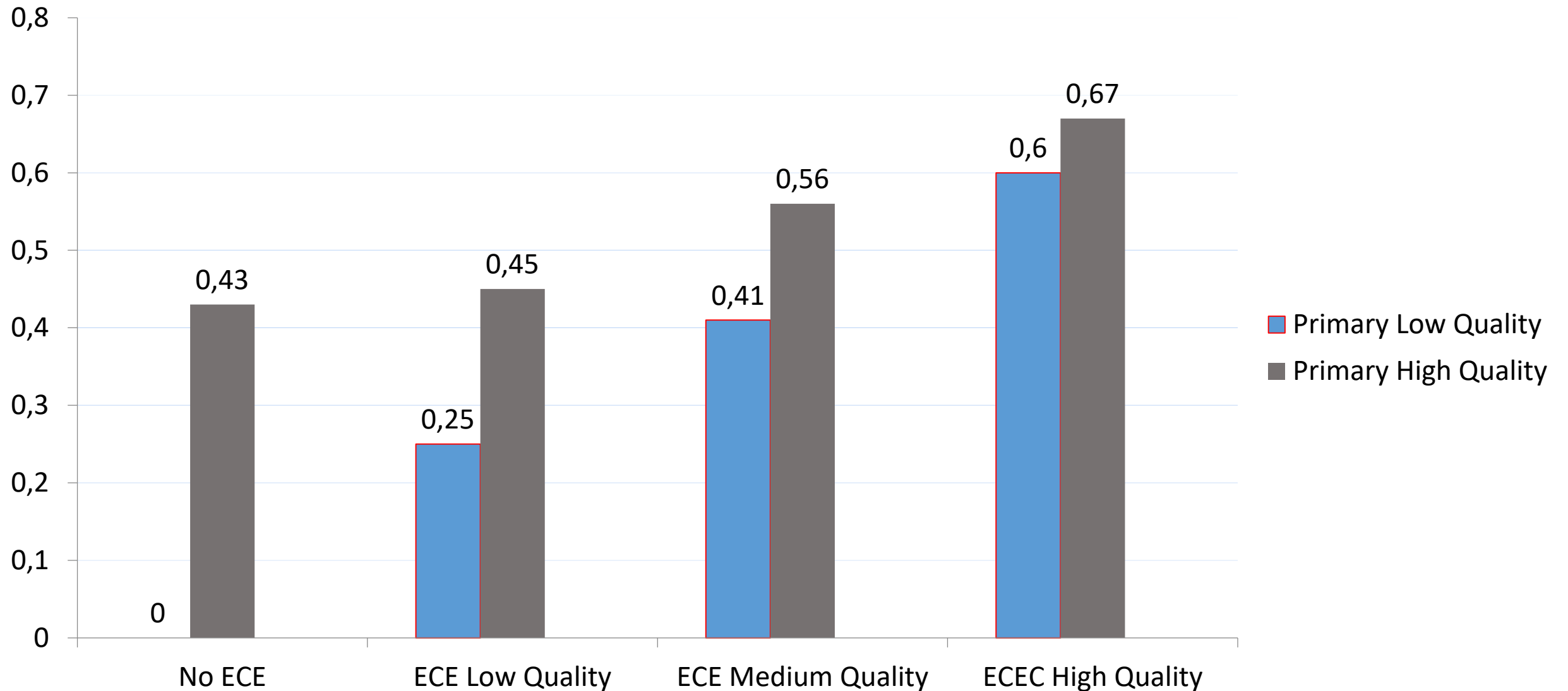
# Social class and ECEC on literacy (age 7) – EPPSE study



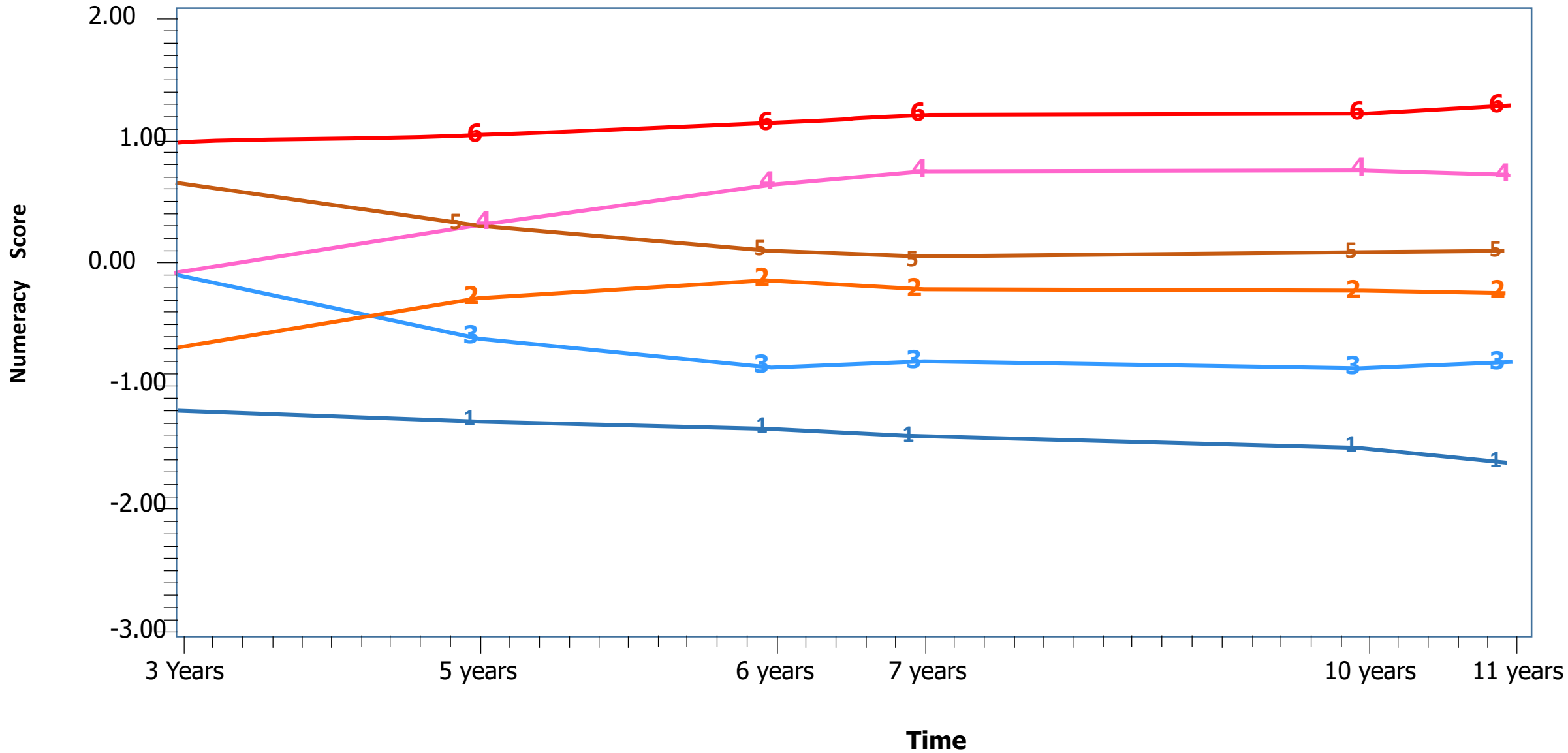
# Effects upon Age 11; literacy and numeracy – EPPSE study



# Interaction of ECE and primary school – EPPSE study

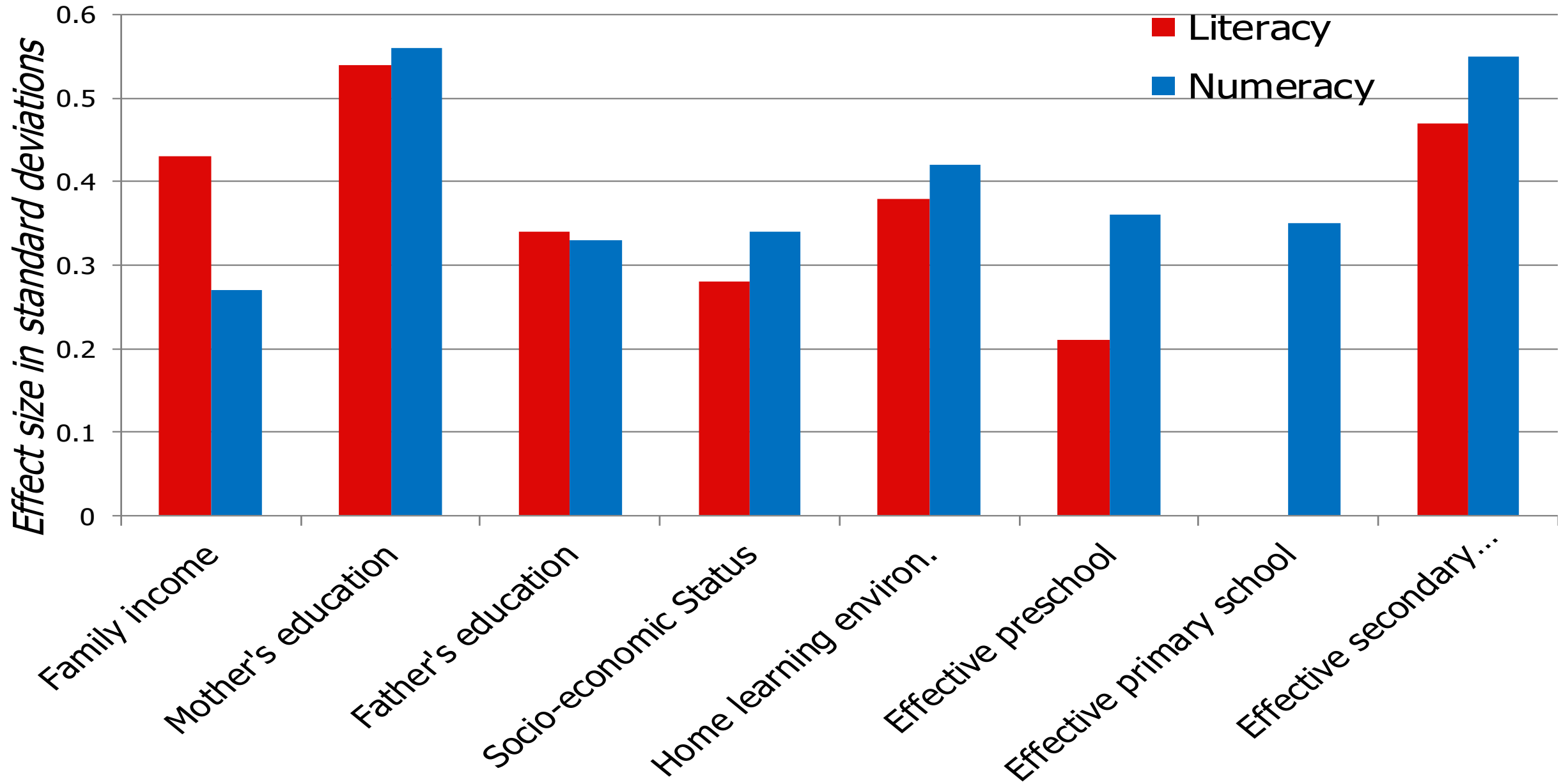


# Trajectories for Numeracy – EPPSE study



**Group %**      **1-1-1** — 8.2%      **2-2-2** — 19.6%      **3-3-3** — 18.8%      **4-4-4** — 17.3%      **5-5-5** — 23.2%      **6-6-6** — 12.9 %

# Effects at Age 16: Literacy and Numeracy – EPPSE study





# International evidence

Evidence is consistent - ECE is essential part of infrastructure for optimising global wellbeing.

**USA** – ECE improves educational attainment, particularly for disadvantaged

**NORWAY, FRANCE, SWITZERLAND** – population studies  
– all ECE increased education, employment, incomes.

**DENMARK** – high quality ECE- better 16 years outcomes

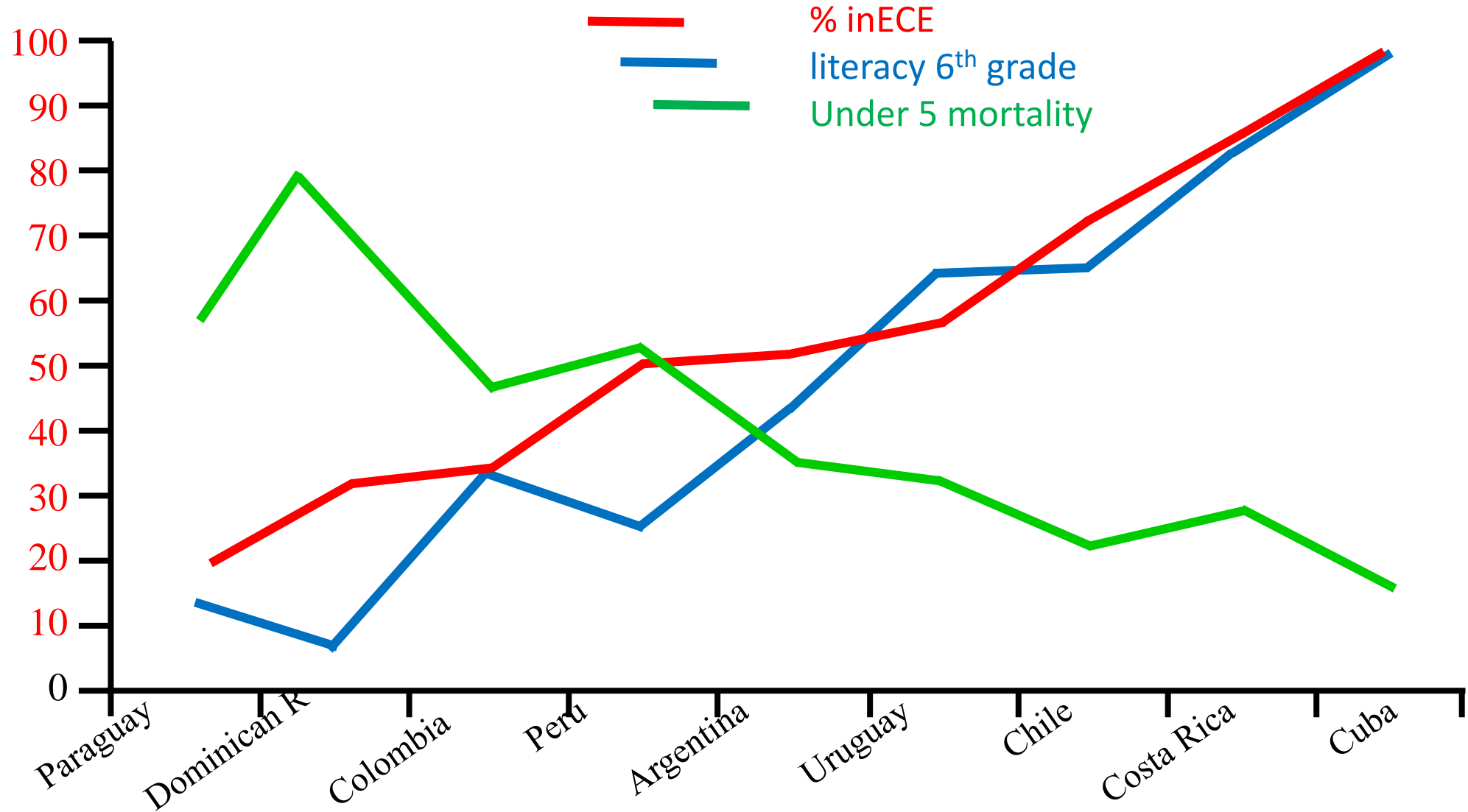
**NORTHERN IRELAND** - high quality ECE increased grades in literacy **X 2.4** and math **X 3.4**.

ECE benefits are evident in **Asia** and **South America**.

- In **Bangladesh**, children with ECE had higher attainment at primary school.
- **Uruguay** - studies identified better attainment in secondary school for children who attended ECE.
- **Argentina** found better attainment in primary school for children with at least 1 year in ECE.

# Latin America

Association between Preschool, Literacy and Under 5 Mortality



## OECD 2013

“Investing in high-quality early childhood education and initial schooling, particularly for children from socio-economically disadvantaged backgrounds, has proved to be an efficient strategy to ensure that all children start strong and become effective learners.

# Conclusions

- From age 2 all children benefit from ECE
- The quality of ECEC matters.
- Part-time has equal benefit to full-time.
- ECE effects persist into adulthood

# Policy Impact in the UK

- **2004** -Free ECEC place from 3 years -15hours/week
- **2013** -Free ECEC place from 2 years -15hours/week  
(40% most deprived)
- **2017** - 15 hours/week increases to 30 hours/week
  
- Maternity leave increased to 1 year
- New Early Years curriculum
- New training programs for ECEC staff
- Acceptance that ECEC is part of state responsibilities

# Study of Early Education & Development – SEED 2014 - 2021

- 3,930 children - data collected at 2, 3 and 4 years old
- 3 levels of family disadvantage:
  1. 20% most disadvantaged – “most disadvantaged”
  2. 20-40% disadvantaged - “moderately disadvantaged”
  3. 60% least disadvantaged families - “not disadvantaged”

# Types of child care

- 1. Formal group** - ECEC in a non-domestic setting and eligible for government funding (e.g., day nurseries, nursery classes or schools and playgroups)
- 2. Formal individual** - ECEC in a domestic setting and eligible for government funding (e.g., childminders)
- 3. Informal individual** - ECEC in a domestic setting and not eligible for government funding (e.g., friends, relatives, neighbours and nannies)



Child outcome, age 4	Type of ECEC)		
	Formal ECEC		Informal ECEC
	Group	Childminders	Friends, relatives, nannies
<u>Cognitive development</u>			
Naming Vocabulary (verbal)		+0.053 <sup>§</sup>	+0.048*
Picture Similarities (non-verbal)	+0.044*		
HTKS Task –self-regulation			
<u>Socio-emotional problems</u>			
SDQ Total Difficulties			
Hyperactivity			
Emotional Symptoms		-0.073* <sup>†</sup>	
Conduct Problems	+0.044* <sup>‡</sup>		
Peer Problems	-0.087***		
<u>Socio-emotional strengths</u>			
Prosocial Behaviour	+0.041*		
Behavioural Self-regulation	+0.056**		
Emotional Self-regulation			
Co-operation			

COGNITIVE CHILD OUTCOMES	Home environment					
	Home Learning Environment	Household CHAOS	Mother's psycho-logical distress	Limit setting scale	Mother child relationship- <b>negative</b> aspects	Mother child relationship- <b>positive</b> aspects
Cognitive development						
Naming Vocabulary (verbal)	+0.260***			+0.228***	-0.132***	+0.158***
Picture Similarities (nonverbal)	+0.161***			+0.123***	-0.084*	+0.070*
HTKS Task – self-regulation task	+0.178***		-0.073*	+0.121**	-0.104**	+0.082*

SOCIO-EMOTIONAL OUTCOMES	Home environment					
	Home Learning Environment	Household CHAOS	Mother's psycho-logical distress	Limit setting scale	Mother child relationship- <b>negative</b> aspects	Mother child relationship- <b>positive</b> aspects
SDQ Total Difficulties		+0.236***	+0.229***		+0.610***	-0.265***
Hyperactivity		+0.234***	+0.147***	+0.128***	+0.431***	-0.187***
Emotional Symptoms		+0.094**	+0.280***	-0.114**	+0.445***	-0.104**
Conduct Problems		+0.249***	+0.129***	+0.203***	+0.596***	-0.161***
Peer Problems		+0.074*	+0.148***	-0.196***	+0.324***	-0.356***
Prosocial Behaviour	+0.139***	-0.174***			-0.238***	+0.513***
Behavioural Self-regulation	+0.179***	-0.094**		+0.124***	-0.299***	+0.285***
Emotional Self-regulation	-0.075*	-0.251***	-0.136***	-0.089**	-0.607***	+0.136***
Co-operation		-0.185***		-0.098**	-0.415***	+0.414***

Quality measure	Child outcome		
	SDQ Emotional Symptoms	SDQ Conduct Problems	BAS Picture Similarities
Children with Wave 2 quality data, sample size N = 766			
SSTEW			+0.150*
ECERS-R	-0.116 <sup>§</sup>	-0.104 <sup>§</sup>	+0.219**
ECERS-E			+0.139 <sup>§</sup>
Overall quality (Wave 2)			+0.178*
Children with Wave 1 and Wave 2 quality data, sample size N = 354			
Overall quality (Wave 1 / Wave 2)		-0.211*	+0.189 <sup>§</sup>

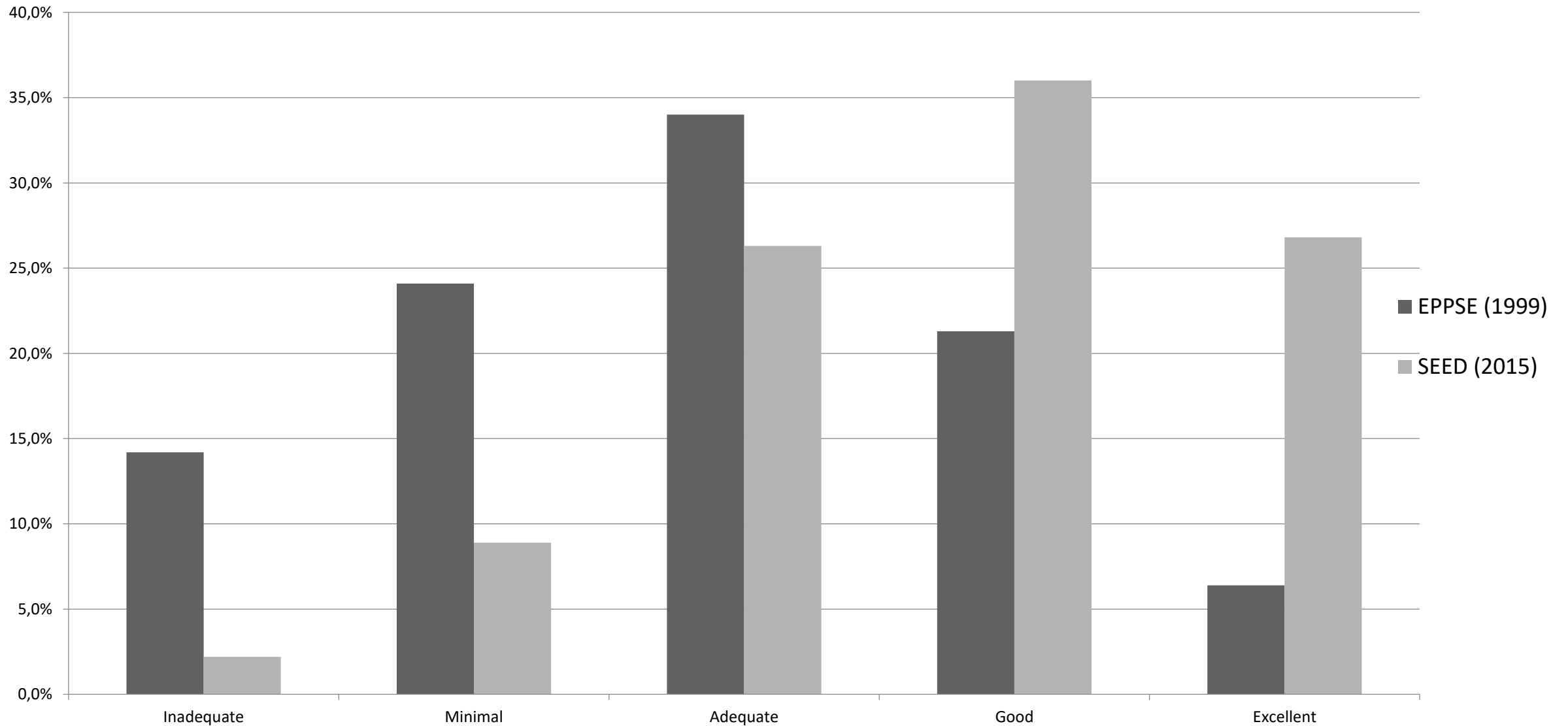
# SEED - Conclusions

- More individual ECEC, formal or informal associated with:
  - better language development at age 4.
  - fewer Emotional Symptoms for moderately disadvantaged group.
- More group ECEC associated with:
  - better cognitive non-verbal ability at age 4
  - more Prosocial Behaviour, better Behavioural Self-regulation and fewer Peer Problems.
- In most instances, associations between ECEC and child development were identified across the whole range of disadvantage in the SEED sample

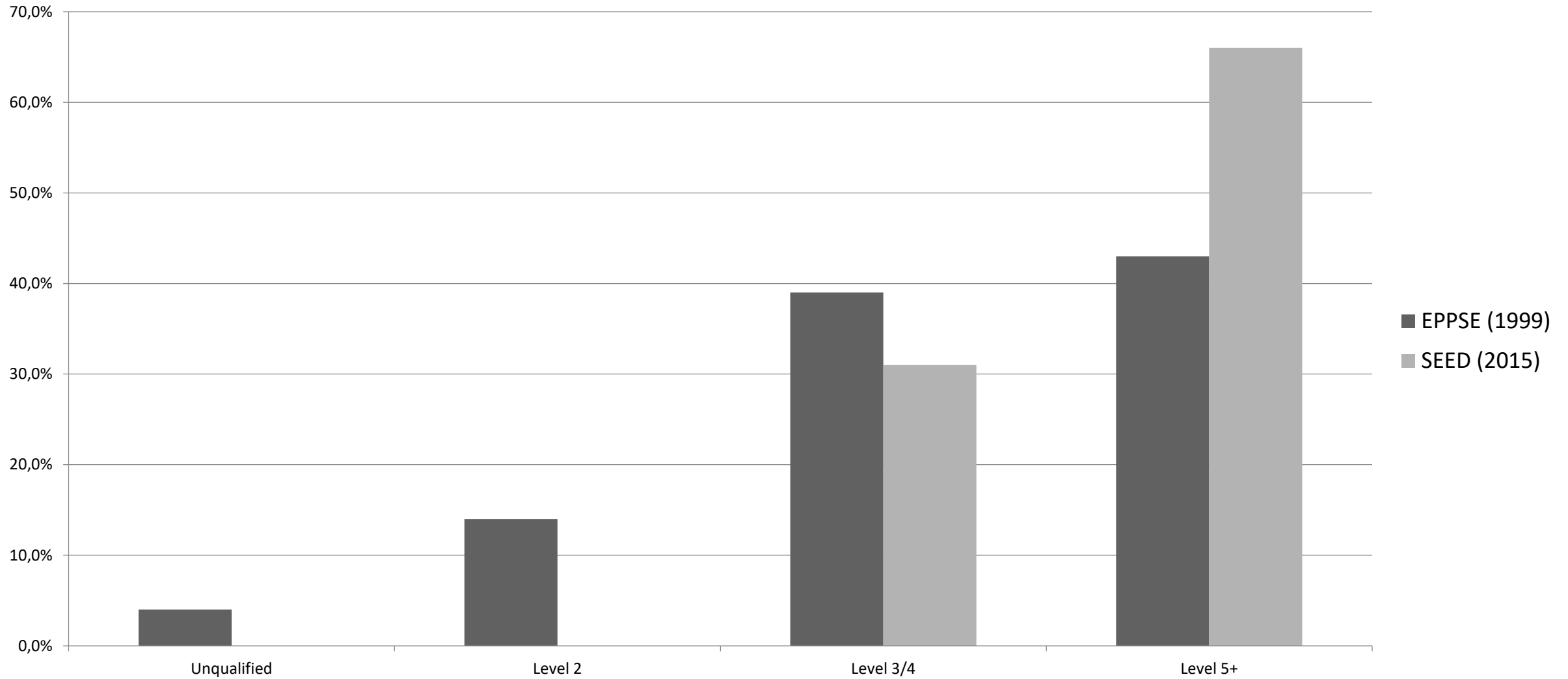
# SEED - Conclusions (continued)

- Several cognitive and socio-emotional outcomes at age 4 were significantly associated with the home environment
- Specifically, there were advantages of a more stimulating and responsive Home Learning Environment and more limit setting (active control)
- But, beneficial effects of time in ECEC are largely independent, suggesting that even children with the most positive home environments still stand to benefit from spending time in ECEC.
- Attending better quality childcare settings between ages 2 and 4 had a positive impact on some aspects of children's cognitive and socio-emotional outcomes at age 4.

# Comparing ECE quality before and after policy change; 1999 versus 2015

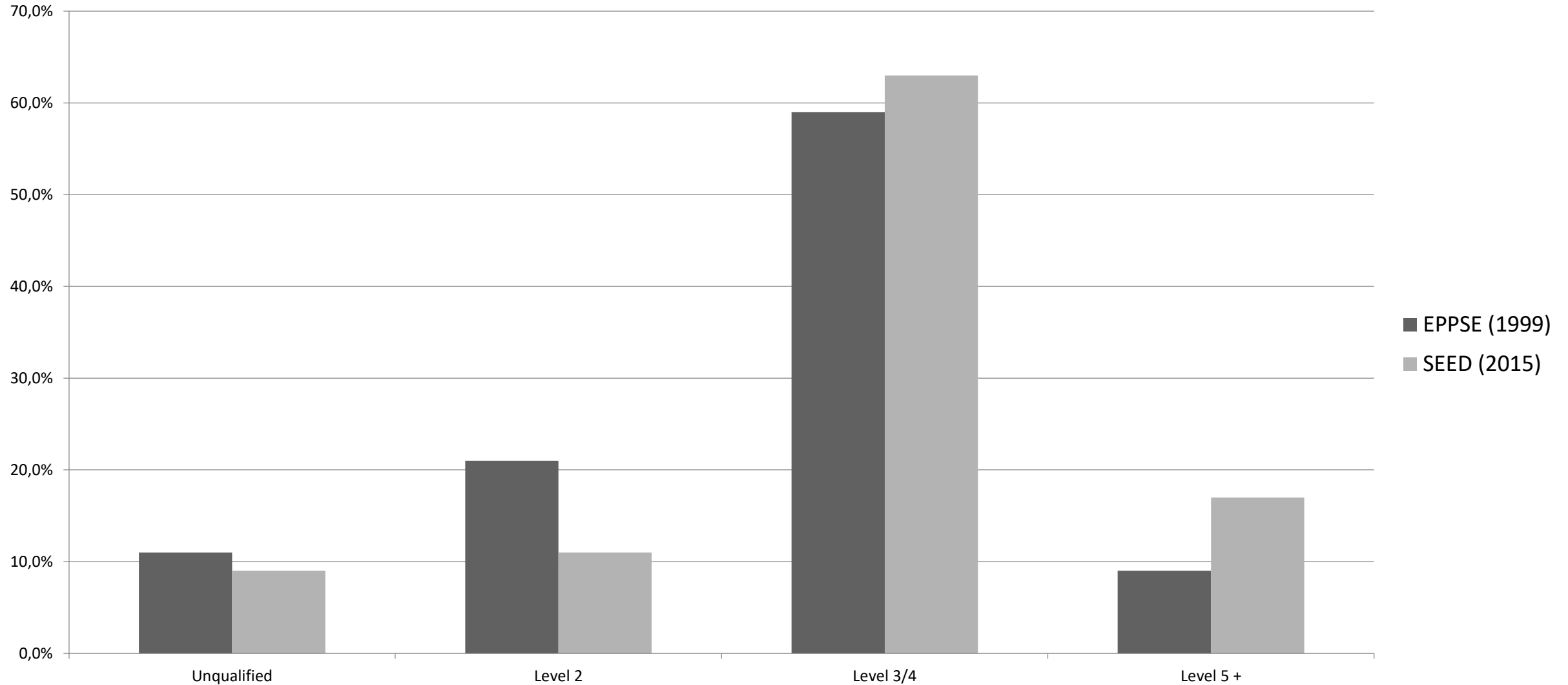


# Comparing 1999 with 2015 ECE managers' qualifications





# Comparing 1999 with 2015 ECE staff qualifications



# Gains from ECE

## Education and Social Adjustment

- Educational Achievement improved
- Special education and grade repetition reduced
- Behaviour problems, delinquency and crime reduced
- Employment, earnings, and welfare dependency improved
- Smoking, drug use, depression reduced

## Decreased Costs to Government

- Schooling costs
- Social services costs
- Crime costs
- Health care costs

What is the role of non-cognitive skills for educational outcomes?

Non-cognitive skills are individual attributes that are not derived from cognitive abilities, e.g., social skills, personality

# Child's non-cognitive skills at age 5

- **Self-regulation**
- **Social skills**
- **Cooperation**
- **Antisocial/worried Behaviour**
- **Prosocial behaviour**
- **Confidence**

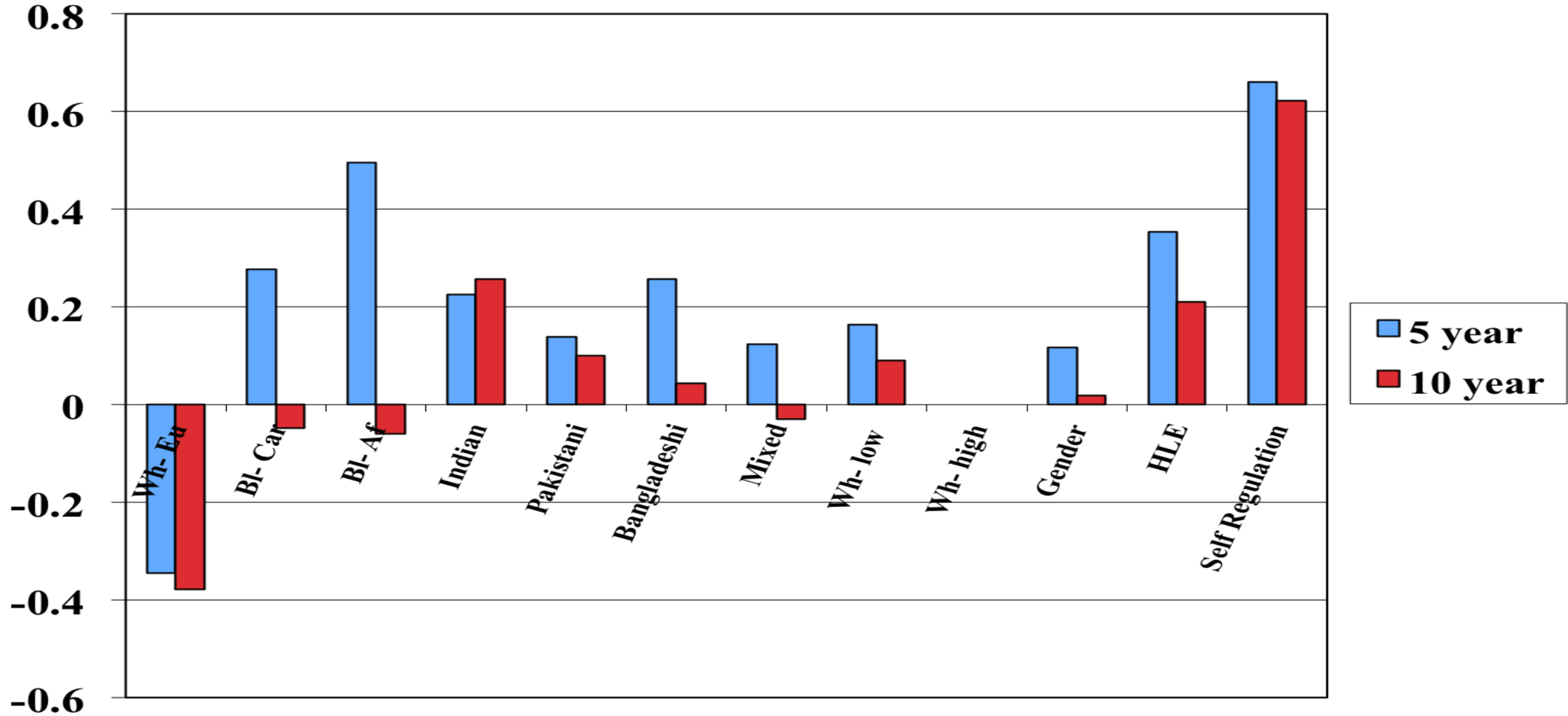
*Tested for effects upon cognitive outcomes (5, 6, 7 & 10 years)  
Only self-regulation had significant independent effect (similar all years)*

# Self-Regulation

- A child's ability to regulate behavior and emotions plays a role in becoming a competent individual.
- The learning of this ability starts in early life.
- Children become able to think before acting, control their anger or need to cry.
- Involves conscious & unconscious processes

# Predicting 5 & 10 years literacy - – EPPSE study

-ethnic groups compared with white – mid/high SES



## Self-Regulation in 5 year olds

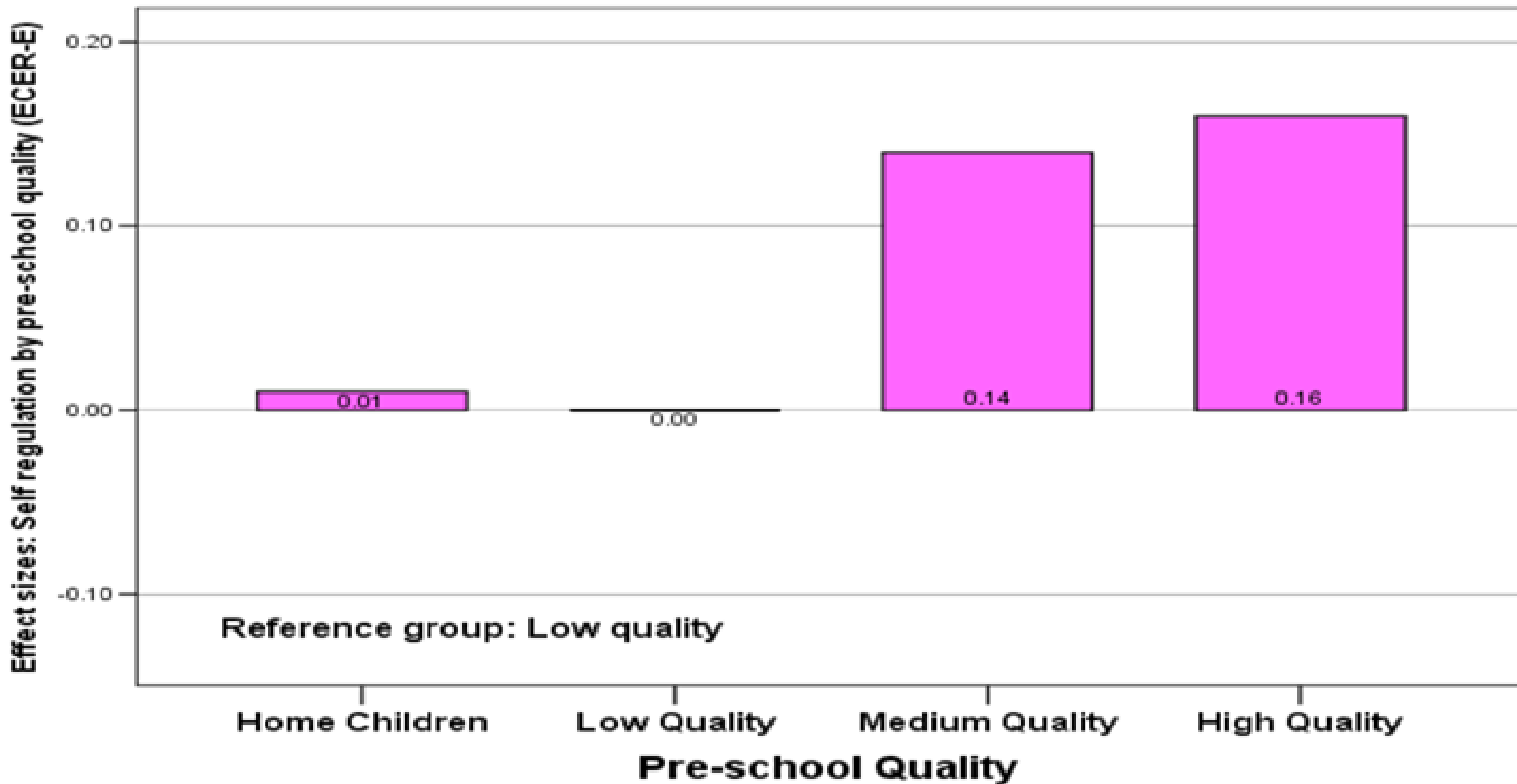
- Thinks things out before acting
- Not easily distracted
- Can move to new activity upon completion of task
- Can independently select activities
- Does not fidget or squirm about
- Perseveres in face of difficulty
- Likes to work things out for self
- Not restless
- Sees task through to end

# What influences self-regulation

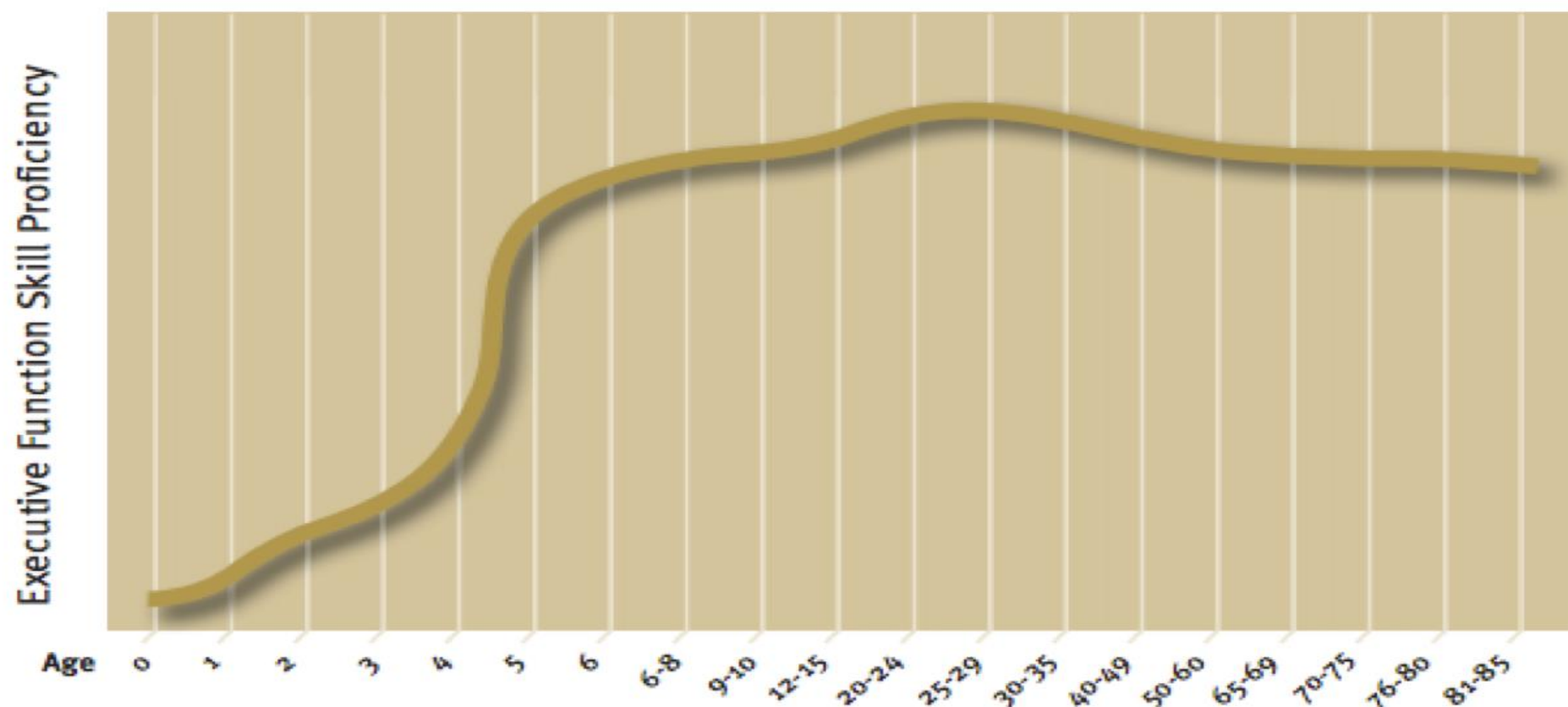
<b>Age</b>	- older -better
<b>Gender</b>	- girls -better
<b>Birth weight</b>	- low birth weight - worse
<b>Developmental problems</b>	- worse
<b>Home Language not English</b>	- worse
<b>Siblings</b>	- 1 or 2 best
<b>FSM – measure of poverty</b>	- lower
<b>Mothers education</b>	- higher -better
<b>Fathers education</b>	- higher -better
<b>SES</b>	- higher -better
<b>HLE</b>	- higher -better
<b>Preschool quality</b>	- higher -better
<b>Preschool duration</b>	- more -better



# Effects of ECE on self-regulation at age 10



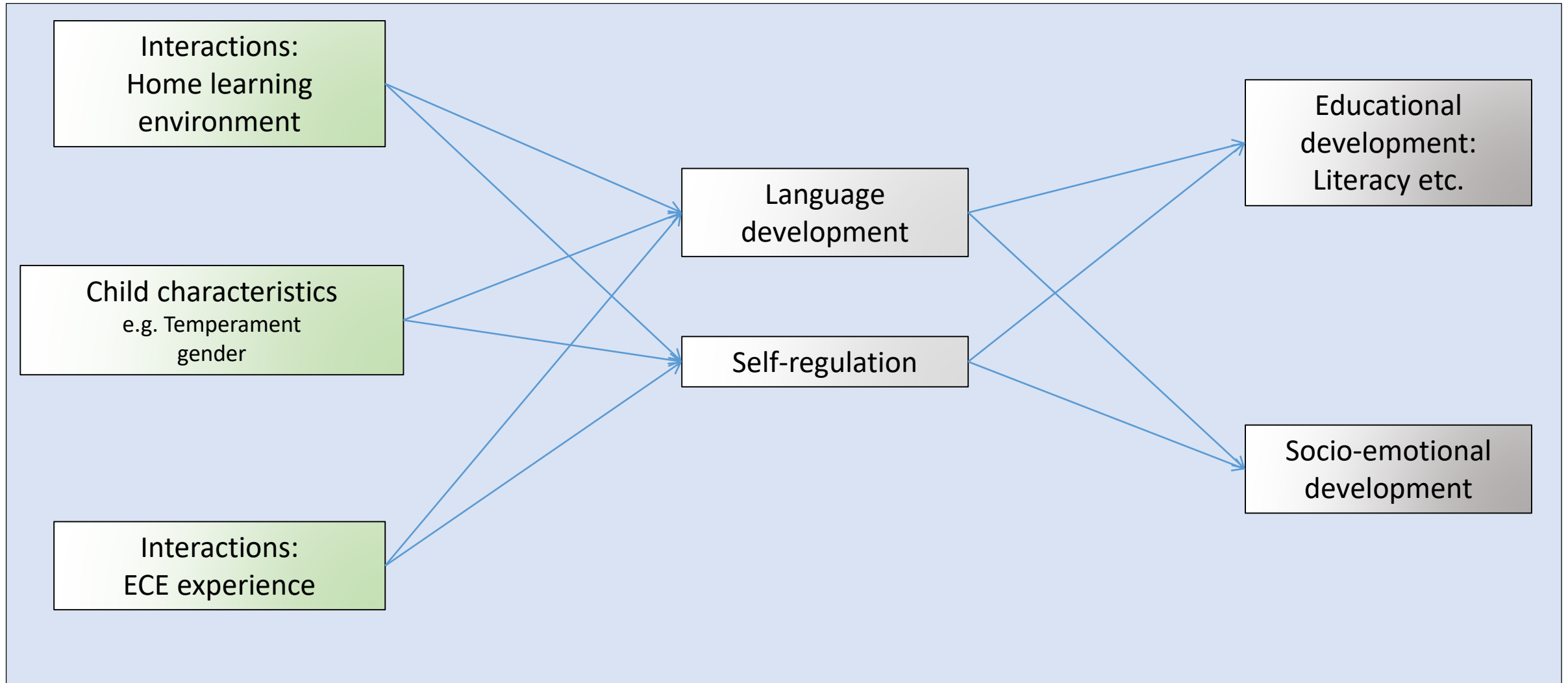
## Executive Function Skills Build Throughout Childhood and Adolescence



A range of tests measuring different forms of executive function skills indicates that they begin to develop shortly after birth, with ages 3 to 5 providing a window of opportunity for dramatic growth in these skills. Growth continues throughout adolescence and early adulthood; proficiency begins to decline in later life.

Source: Weintraub et al. (In Press).<sup>99</sup>

# Model for understanding influences on child development



# Interactions Drive Development

Interactions both in the home (HLE) and in ECE (quality of ECE) have effects on developmental outcomes.

The effects in the early years for **language development** and **self-regulation**

are important for long-term outcomes.

-interactions fostering language development and self-regulation are important aspects of quality in ECE.

# Effective ECE

- The EPPSE study identified which ECE centres were having the most benefit for children's development.
- Then case studies of very effective and average centres to ask what made a difference?
- ANSWER:-
- **Interactions Drive Development**

## **Effective ECE**

**Five areas differentiated effective ECEC centres:**

- **Quality of the adult-child verbal interaction.**
- **Knowledge and understanding of the curriculum.**
- **Knowledge of how young children learn.**
- **Adults skill in supporting children in resolving conflicts.**
- **Helping parents provide learning interactions at home.**

# Sustained Shared Thinking

- In effective ECE centres a specific type of interaction occurred more often.
- We called this

Sustained Shared Thinking – SST

Where adult and child interact to jointly solve a problem, the adult feeding the child the information needed for the child to come up with the solution.

**Both adult and child contribute to the thinking and it must develop and extend thinking.**

# Fostering Effective Early Learning (FEEL) study

1. Implement a comprehensive professional development (PD) intervention for ECE teachers, that was based on research
2. Evaluate the PD with a cluster randomised control trial evaluating effects on:
  - ECEC quality; and,
  - Child development (e.g., literacy and numeracy)



# Fostering Effective Early Learning (FEEL) study

## Measures of ECE Centres

### Quality Rating Scales

- Early Childhood Environmental Rating Scale – Extension (ECERS-E)
- Sustained Shared Thinking and Emotional Well-being (SSTEW) Scale

## Measures of Child Development

### Language Development

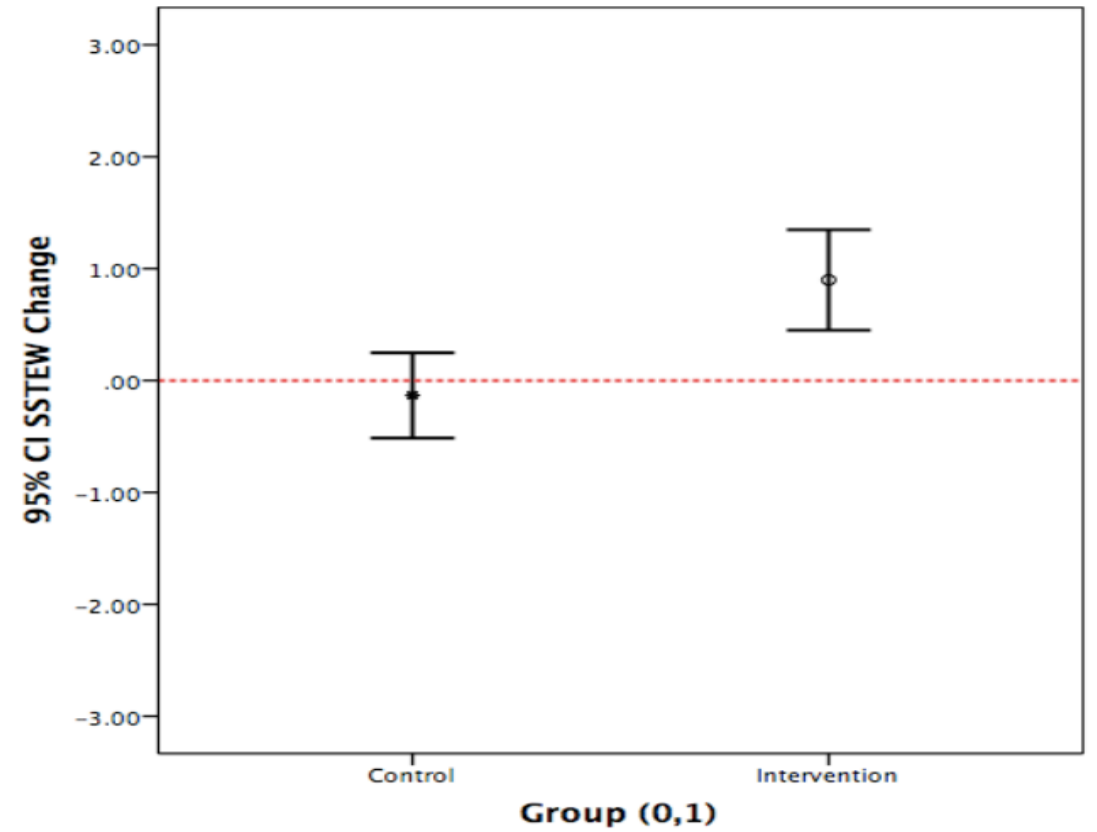
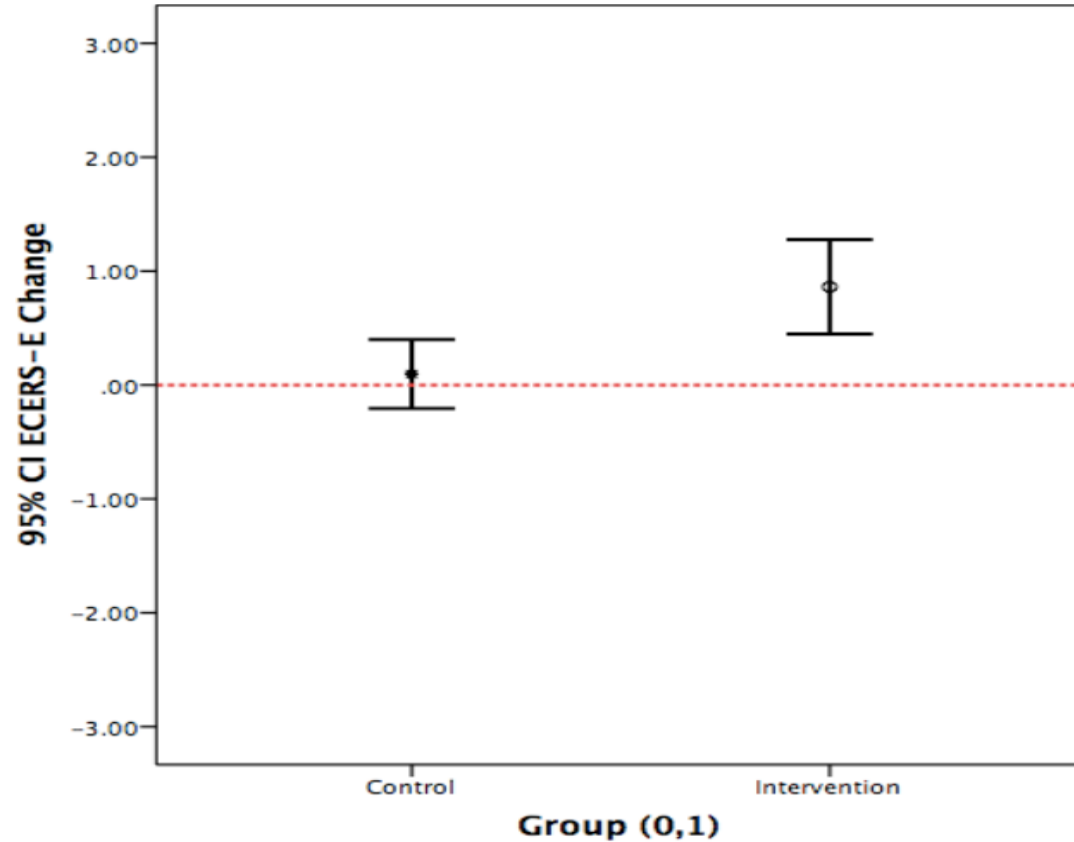
- Verbal Comprehension
- Expressive Vocabulary

### Number Concept Development

- Early Number Concepts
- Preschool Early Numeracy

# Fostering Effective Early Learning (FEEL) study

## Results: Quality Ratings

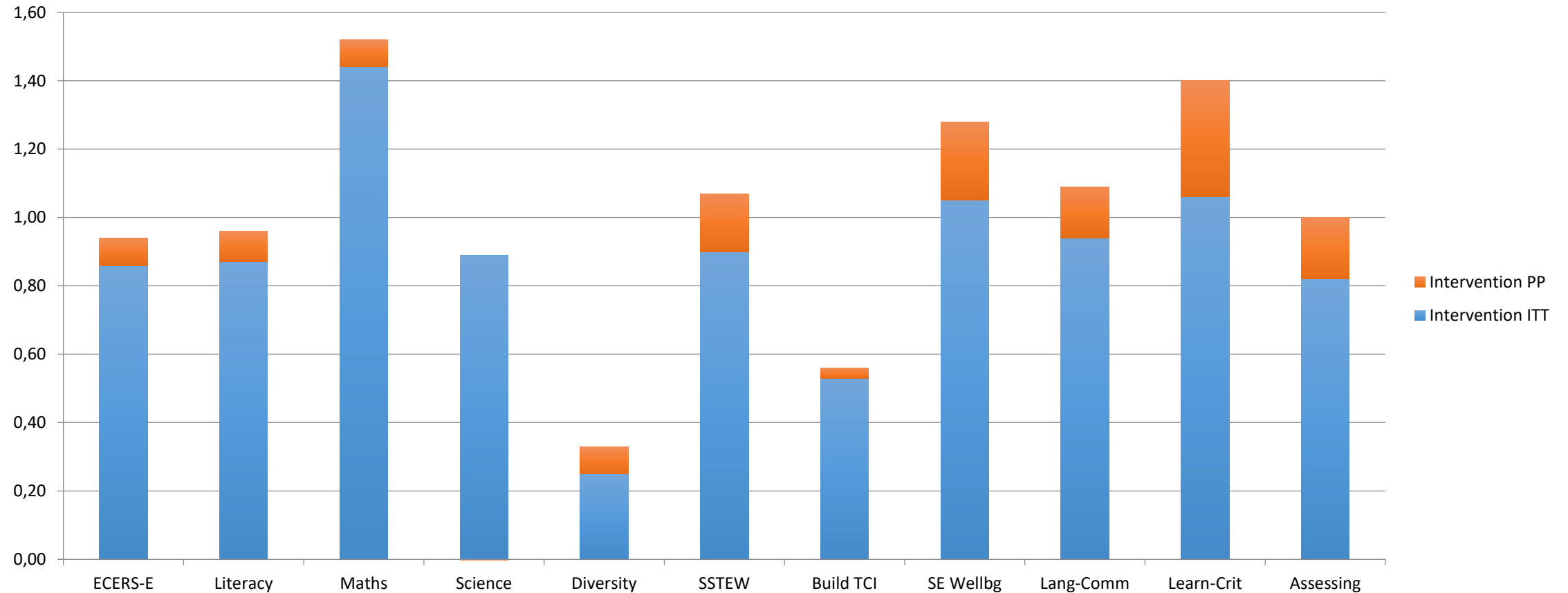


Quality ratings revealed significant improvement for PD group

# Fostering Effective Early Learning (FEEL) study

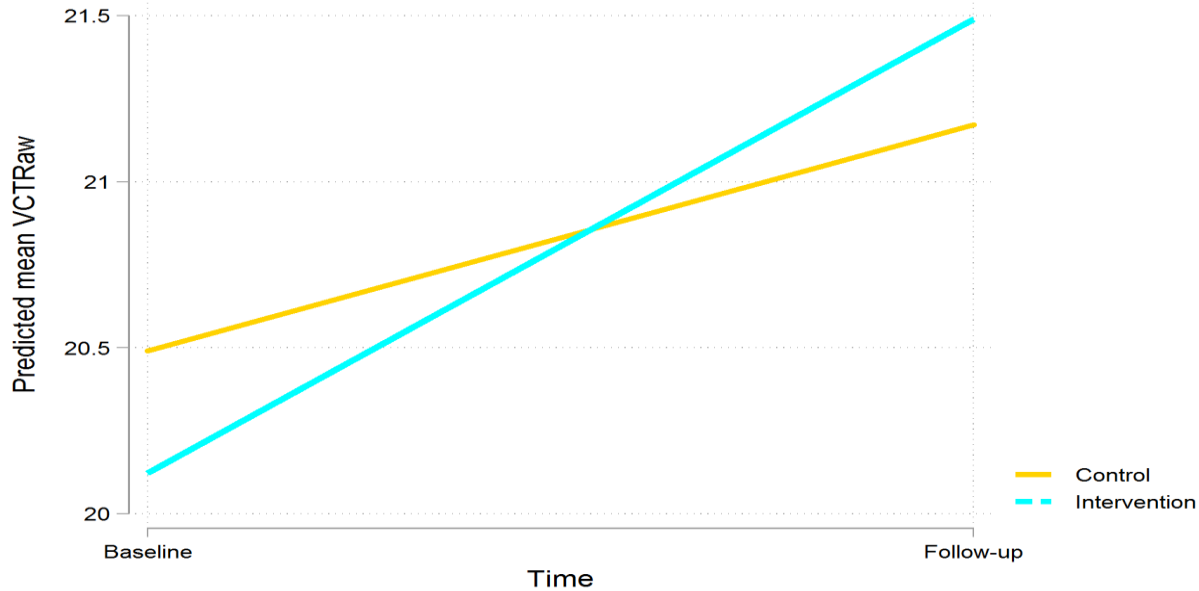
## Results: Quality Ratings (PP)

Intervention group change greater than control group



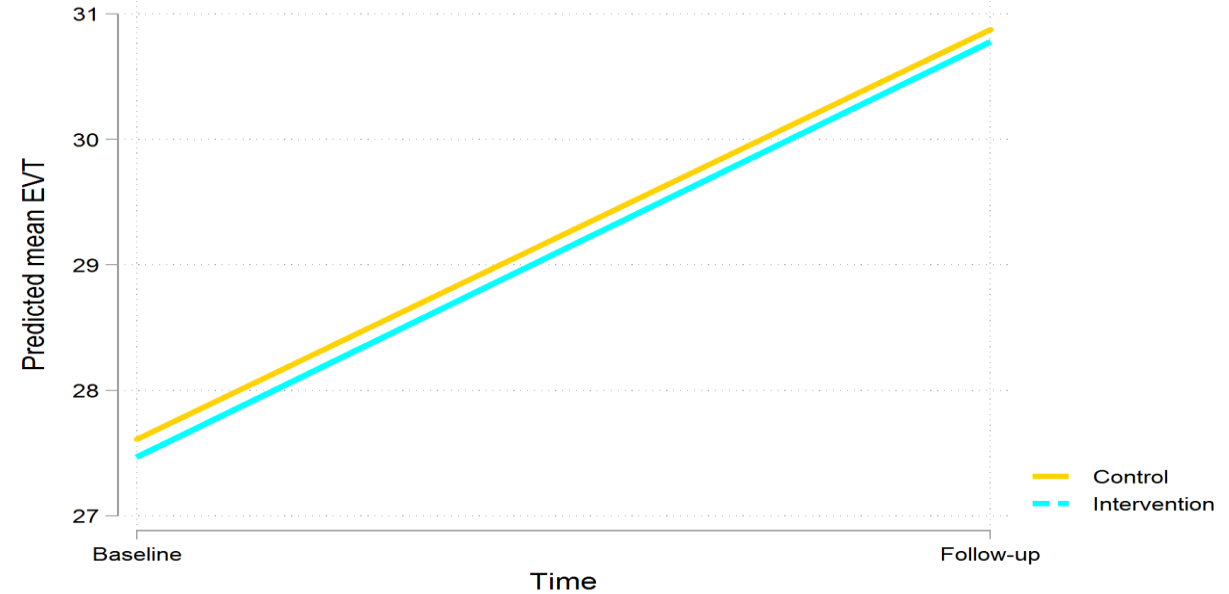
# Fostering Effective Early Learning (FEEL) study

## Results: Child Language



Verbal comprehension

- There was a significant effect of the PD on verbal comprehension

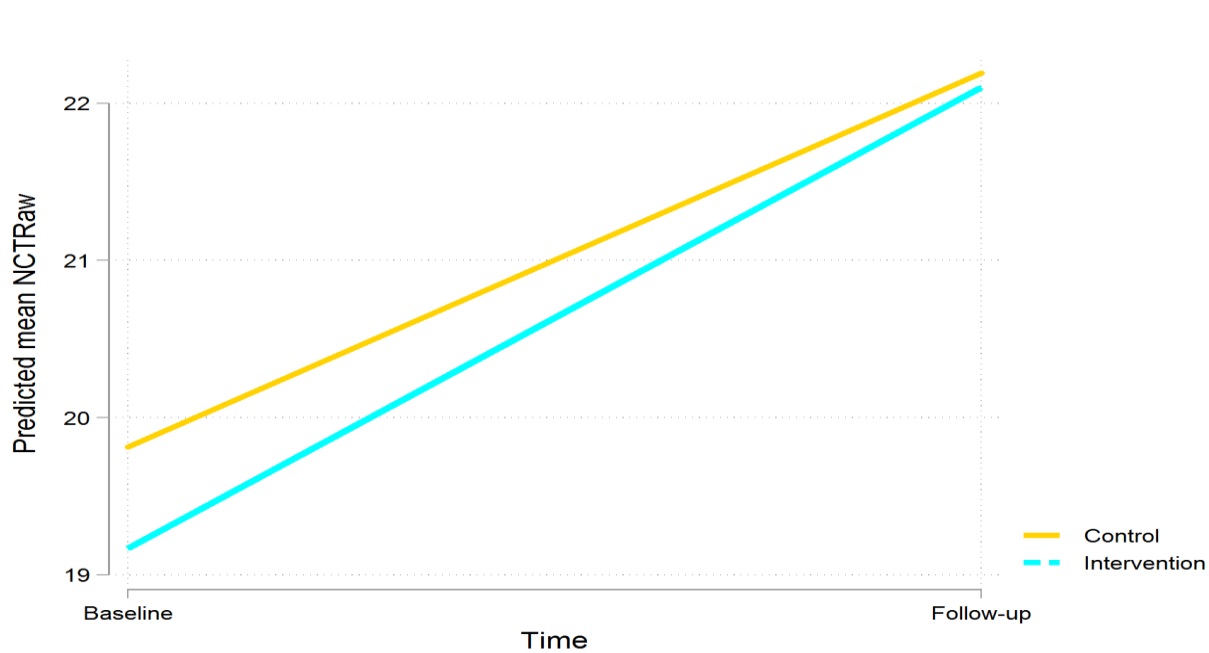


Expressive vocabulary

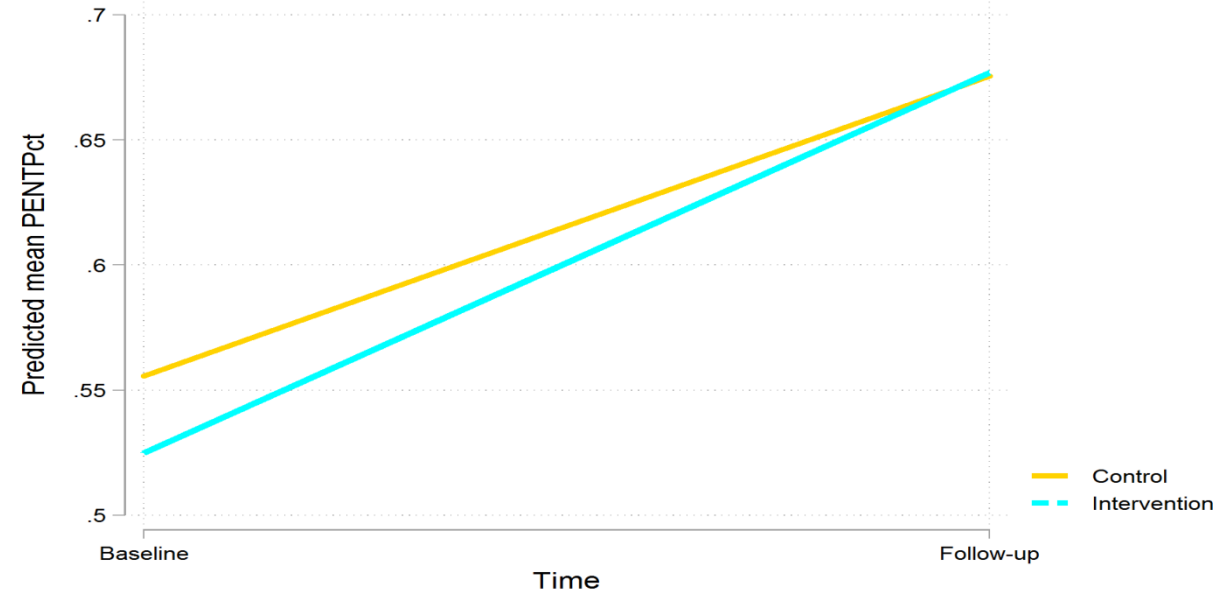
- There was no significant effect of the PD on expressive vocabulary

# Fostering Effective Early Learning (FEEL) study

## Results: Child Numeracy



Number Concepts



Preschool Early Numeracy

- There was a significant effect of the PD on early number concepts

- There was a significant effect of the PD on early numeracy

# Fostering Effective Early Learning (FEEL) study

## Summary of Results

- PD centres showed improvement in quality
  - greater than control centres
- Children in the PD group showed small, but consistent improvement – greater than control centres – on three of the four child outcomes

# Fostering Effective Early Learning (FEEL) study

## Qualitative Results

**Personal growth** (shifts in personal pedagogy, philosophical and attitudinal shifts; renewed sense of purpose; increased confidence and motivation; more goal oriented in practice)

**Improved pedagogy and practice** (increased used of Sustained Shared Thinking (SST), use of questioning to extend children and small groups; increased awareness of the important role of high quality interactions)

**Increased awareness and understanding** (better understanding of the educational and socio-emotional needs of children; deeper understanding of the role of the educator in the lives of children and families)

# Fostering Effective Early Learning (FEEL) study

## Impact on Children

### **Changes to children's engagement and motivation and increased learning and problem-solving**

- more engaged (60%)
- asking more questions (43%)
- more active problem solvers (60%)
- more confident in their interactions (19%)
- engaged in sustained shared thinking (25%)

*“The children are so much more involved in their learning, more engaged and interested in discovering new things and even extending upon their prior knowledge. They have taken their learning to a new level that is deeper, where they are eager to use trial error with things and investigate without being worried about being wrong or right. They show a sense of being proud of their achievements and really want to share these achievements with others” ECT - Supervisor)*



# Fostering Effective Early Learning (FEEL) study

## Impact on Families

- **Enhanced connections and increased involvement with families (61%)** - sharing of ideas, supporting parents in their interactions with their children, families showed greater understanding of their children's learning
- **Positive feedback from families (28%)**
- **Increased use of strategies to engage parents in children's learning (47%)**

# LESSONS

1. Early years are very important
2. ECE is part of infrastructure for a successful society
3. High quality ECE boosts development
4. Parenting is also very important
5. ECE can lift the whole population.
6. Disadvantaged children benefit greatly from high quality ECE.
7. Professional development can improve ECE quality and boost child outcomes

# Example References

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