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The Power and Promise of Early Learning

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THE POWER AND PROMISE OF EARLY LEARNING

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Abstract

Early learning matters and can be strengthened and supported through contexts where children spend much of their time. Strong early learning experiences provide young children with opportunities to enjoy exploring their own interests and growing capabilities. Strong early learning also positively predicts well-being across a range of indicators in adulthood, including general well-being, physical and mental health, educational attainment and employment. Areas of early learning that are of particular importance include: language and literacy; numeracy and other non-verbal cognitive skills; self-regulation; emotional health, social well-being and social and emotional skills. These domains are interrelated, meaning that holistic assessment of a range of skills is necessary to understand well-being in early childhood and its implications for the future. Assessment of early learning provides an essential opportunity to reflect on whether governments, communities, schools and families are supporting the power and promise of early learning as intended.

Résumé

L'apprentissage dans les premières années de la vie est crucial et peut être favorisé et soutenu par l'environnement dans lequel les enfants grandissent. Des expériences d'apprentissage favorables représentent une opportunité pour les jeunes enfants de découvrir ce qui les intéresse et l'étendue de leurs capacités. Un solide apprentissage au cours des premières années a une influence positive sur le bien-être adulte. On mesure cet impact au travers de nombreux indicateurs, tels que le bien-être général, la santé mentale et physique, la réussite scolaire et l'emploi. Dans les premières années, les domaines d'apprentissage particulièrement importants sont les suivants: le langage et la litéracie; la numéracie et les compétences cognitives non-verbales; l'autorégulation; la santé émotionnelle, le bien-être social et les compétences socio-émotionnelles. Tous ces domaines sont liés; ainsi, une mesure globale de l'ensemble de ces compétences est nécessaire pour comprendre le bien-être des jeunes enfants et les implications sur leur avenir. L'analyse des premiers apprentissages est une formidable opportunité pour voir dans quelle mesure les gouvernements, les communautés et les écoles prennent la mesure de la force et du potentiel de ces apprentissages, et les supportent comme ils le devraient.

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Executive Summary

1. Increasingly, policymakers want to better understand the successes of government investments in the early years, and also to identify areas for improvement. The research synthesised throughout this paper demonstrates the importance of such efforts: Early learning matters and can be strengthened and supported through contexts where children spend much of their time. Assessment of early learning provides an essential opportunity to reflect on whether governments, communities, schools and families are supporting the power and promise of early learning as intended.

2. The first five years of children's lives are critical to their development. During this period, children learn at a faster rate than at any other time in their lives, developing cognitive and social and emotional skills that are fundamental to their future achievements throughout childhood and as adults. These skills are also the foundation for general well-being – laying the groundwork for how individuals cope with successes and setbacks, both professionally and in their personal lives.

3. Strong early learning experiences provide young children with opportunities to enjoy exploring their own interests and growing capabilities. High-quality interactions with other people as well as with spaces and materials support children's development as happy and healthy individuals both in the present and for the future. Effective early learning positively predicts well-being across a range of indicators in adulthood, including general well-being, physical and mental health, educational attainment and employment.

4. Multiple early skill sets predict each of these adult outcomes, highlighting the interrelatedness of the various domains and suggesting a broad framework for understanding well-being. The areas of early learning that are of particular importance for many adult outcomes include: language and literacy; numeracy and other non-verbal cognitive skills; self-regulation; emotional health, social well-being and social and emotional skills. Early learning occurs across these domains with gains in one domain contributing to gains in other domains. This ongoing cycle of reinforcement across domains means that early learning must be assessed using a whole-child approach, recognising the overlapping nature of outcomes for young children.

5. Early learning occurs through maturation, routine engagement with caregivers and environments, as well as through intentional experiences and supports. As such, the contexts where children spend much of their time can support early learning. The home learning environment and family characteristics are among the strongest predictors of children's early development. Family socioeconomic status, parenting behaviours and parental well-being contribute to both the home learning environment and to children's early outcomes.

6. Children's early learning also is supported via specific programmes and policies targeted at parents and families, as well as via high-quality early childhood education and care (ECEC) services. However, children are not all equally likely to attend high-quality

ECEC programmes and in most countries it is children from more advantaged families who are most likely to experience high-quality ECEC. In addition, both families and the programmes that serve them are embedded in broader community contexts, which also matter for early learning.

7. Young children's experiences vary. For some children, this variation will be in support of their individual needs and interests. For other children, the variation in early experiences will be inequitable, related to social, economic and political conditions of their families, schools and communities. No single context is independently accountable for early learning outcomes and as such multiple policy levers are needed to support well-being in early childhood.

8. The goal of this paper is to build on and consolidate previous work undertaken in preparation for the OECD's International Early Learning and Child Well-Being Study (IELS), providing an in-depth overview on the research base for the study. There are three specific aims of the paper: 1) to summarise research on associations between early learning and long-term outcomes; 2) to summarise research on the contexts that support early learning, and; 3) to use this research base to describe the need for better information to improve children's equitable early learning. The information presented in this paper has been shared in various ways with countries and partners throughout the process of planning for IELS. This working paper is intended to unite the empirical basis that led to the development of IELS, providing both participating countries and a wider audience with key insights about the research and principles underlying the study.

Introduction

9. The purpose of this paper is to synthesise existing research on early learning to complement international data collection efforts focused on early childhood. This synthesis builds on and consolidates previous work undertaken in preparation for the OECD's International Early Learning and Child Well-Being Study, providing an in-depth document on the research base for the study. More specifically, the information presented in this paper highlights the power of early learning to predict individuals' well-being in childhood and beyond, as well as the promise of early learning as a focus of policy attention.

10. The opportunities and experiences available to young children shape their well-being in the present, and also affect their futures across all facets of life. In the present, young children's experiences provide opportunities for them to discover and explore as active participants in their own learning. As a meaningful phase of the life course in its own right, early childhood is a time for children to engage in social and learning communities (OECD, 2001[1]). For the present and for the future, a strong start in the early years matters for individuals' abilities to interact with others, experience happiness and satisfaction and generally live healthy, productive lives.

11. Parents have immense responsibility for their young children, but governments can do much to promote well-being in early childhood. Policies that support families with young children range from provision of parental leave from the labour force, to ensuring access to adequate housing in safe environments, to rules on migration and family reunification—and beyond. Among the most direct policy levers available to governments for strengthening early learning are in the realm of early childhood education and care (ECEC) as well as direct parenting programmes and supports. Despite increased investment and a greater focus on children's early learning from governments, not all children and their families are being served equally well by these policy initiatives.

12. As such, a number of countries wish to ensure their systems related to early learning are effectively helping children to get a good start, improving their chances to be happy, to be successful in following their interests and potential, and to be good citizens. Using this holistic perspective on the goals of early learning, this paper draws on relevant research to understand the importance of early learning for outcomes later in life as well as the contexts that support early learning. Drawing on this body of evidence, the paper concludes with a discussion on the imperative for data collections that will enable informed policy discussions on investments in early childhood. Timely, reliable and valid data can inform whether such investments are meeting their goals, and how policies can be improved to realise the power and promise of early learning for all children.

13. The first aim of the paper—synthesising research on early learning related to a range of later outcomes—was initially undertaken to inform the domains of early learning that are included in IELS. Results from longitudinal research show that strong early learning positively predicts well-being across a range of domains in adulthood, including health, educational attainment and socioeconomic status. Moreover, the longitudinal

research base shows early learning from a holistic lens, as all of the outcomes in adulthood were predicted by multiple early skill sets. As such, this paper takes a broad view of well-being as a general framework for understanding more specific outcomes across the life course (OECD, 2009[2]; OECD, 2017[3]).

14. Research findings addressing the second aim—identifying contexts that support early learning—form the foundation of the IELS conceptual framework. Families, ECEC programmes and communities all matter. Families and the home learning environment are particularly important in early childhood, with parental well-being, parenting behaviours and family socioeconomic status all playing a part in predicting children's early outcomes. Although recent policy attention has focused largely on children's participation in ECEC settings, parents and families also can be supported through ECEC programmes as well as through other settings and policies.

15. In addition to the importance of families, high-quality ECEC services have the potential to support early learning. We include new analyses using 2015 Programme for International Student Assessment (PISA) data alongside the research synthesis to highlight the complexity in understanding the wide range of findings related to ECEC services. Specifically, we highlight how characteristics of children and families shape the meaning of ECEC for early learning as well as the many characteristics of ECEC settings themselves—notably programme quality—that contribute to variation across studies of ECEC and children's early learning outcomes. Because children, families and ECEC programmes all are situated in a broader community context, we review findings from the literature that address the importance of neighbourhood poverty, community resources and the broader social, political and cultural climate for early learning.

16. Finally, the third aim of the paper is to articulate the purpose of IELS as a mechanism for filling gaps in our knowledge base on what countries can do to realise the power and the promise of early learning. Programmes and jurisdictions often collect assessment data to inform improvements and monitor how well they are meeting their goals; IELS offers an opportunity for countries to learn from assessment and from one another about how to support early learning and promote equity among the youngest citizens.

What is early learning?

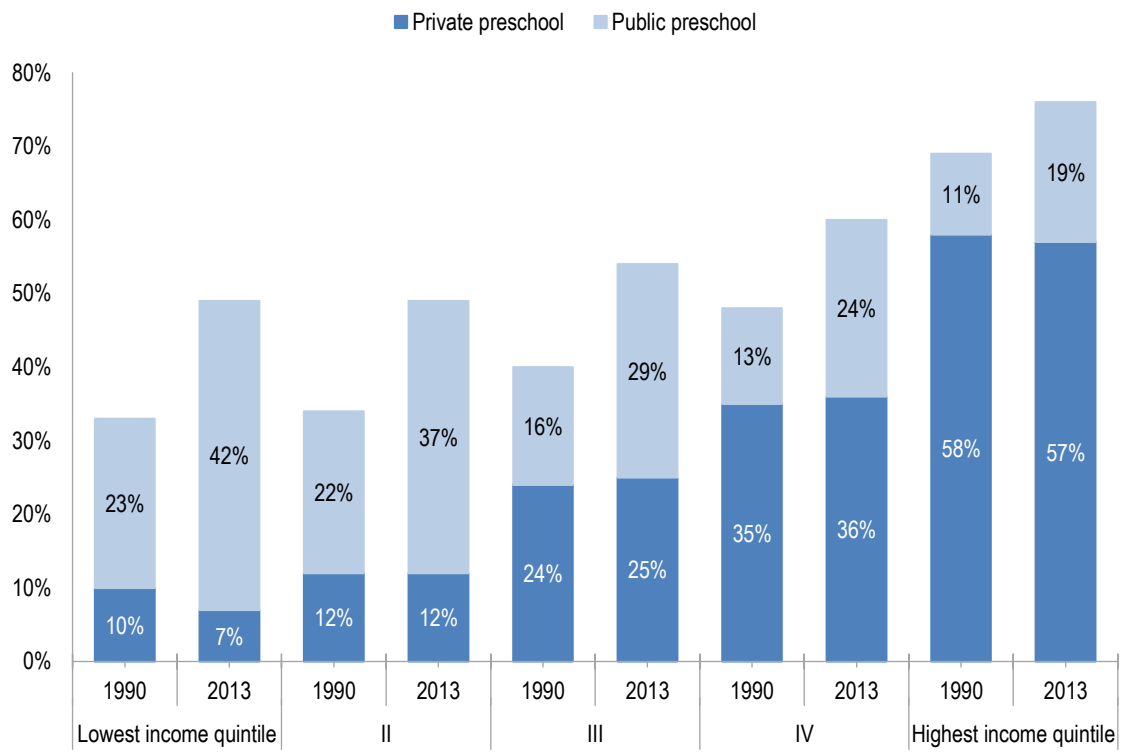
17. Learning is a lifelong process of growth, development and adaptation. Early learning refers to this dynamic process during the period from birth until entry into primary education, usually around the age of six - learning during this period is especially rapid. Early learning happens spontaneously through children's maturation and engagement with their caregivers and environments. Early learning also happens through intentional experiences and supports provided in the context of relationships with others. Domains of early learning include, but are not limited to, self-regulation, communication and language skills, social and emotional skills, as well as other cognitive skills and physical development.

18. Early learning has emerged as a major area of policy focus in recent years, in part due to burgeoning research in neuroscience and brain development that highlights the importance of early experiences for individuals' well-being across the life course (National Research Council and Institute of Medicine, 2000[4]; Stiles and Jernigan, 2010[5]). An additional body of research on ECEC programmes that looks at long-term well-being of individuals who participated suggests strong economic returns for

investments in these programmes (Campbell and Ramey, 2010[6]; Heckman et al., 2010[7]). Thus, policymakers around the world have given great attention to expanding access to ECEC in efforts to support early learning.

19. A key goal of most governments' attempts to increase access to ECEC is to improve equity in outcomes for older children and adults. Recent international data reveal that links between family socioeconomic status and educational achievement are stubbornly persistent across countries (OECD, 2017[8]). Moreover, even as access to ECEC has expanded, socioeconomically disadvantaged families continue to use ECEC at lower rates than more advantaged families (Adema, Clarke and Thévenon, 2016[9]; Chaudry and Datta, 2017[10]; European Commission/EACEA/Eurydice/Eurostat, 2014[11]) (Figure 1). In addition, policy investments have not necessarily given adequate attention to ensuring quality in ECEC settings or to other key settings of early learning, such as the home environment.

Figure 1. United States children ages 3 and 4 in public and private centre-based preschool by family income quintile, 1990 and 2013



Source: Reproduced from Chaudry and Datta (2017[10]), "The current landscape for public pre-kindergarten programs" in *The Current State of Scientific Knowledge on Pre-Kindergarten Effects*, https://www.brookings.edu/wp-content/uploads/2017/04/duke_prekstudy_final_4-4-17_hires.pdf.

20. With this somewhat limited scope, it should come as little surprise that policy efforts to make good on the promise of early learning have yielded mixed results. Nonetheless, such findings raise questions about the desired outcomes of early learning, particularly in ECEC settings, and the role of governments for promoting early learning. These questions often centre on a worry that the policy focus on ECEC promotes a

"schoolification" of programmes for young children at the expense of play and engagement in nurturing relationships.

21. High-quality ECEC can, however, support early learning in ways that prepare children for entry to primary school through developmentally-appropriate activities rooted in relationships and play (Chazan-Cohen et al., 2017[12]). Moreover, such age-appropriate activities can provide young children with opportunities to enjoy exploring their own interests and growing capabilities. The specific skills that are valued for young children will vary across families and societies, but the general desire for children to be healthy, happy and equipped to thrive in future stages of development underlies widely shared goals for early learning (National Research Council, 2008[13]; OECD, 2009[2]; Working Group on Early Childhood Education and Care under the auspices of the European Commission, 2012[14]).

22. Families and the home learning environment have a unique role during children's early years. In addition to making decisions about ECEC participation, parents are children's first teachers. As such, parents have the opportunity to foster responsive relationships with their children to engage in learning through play and daily routines together. Although ECEC and family contexts fundamentally contribute to young children's development and well-being, both are embedded in their broader communities with additional implications for early learning. Considering these contexts as well as children's individual differences is essential to fully understand early learning and its implications for children in both the present and the future.

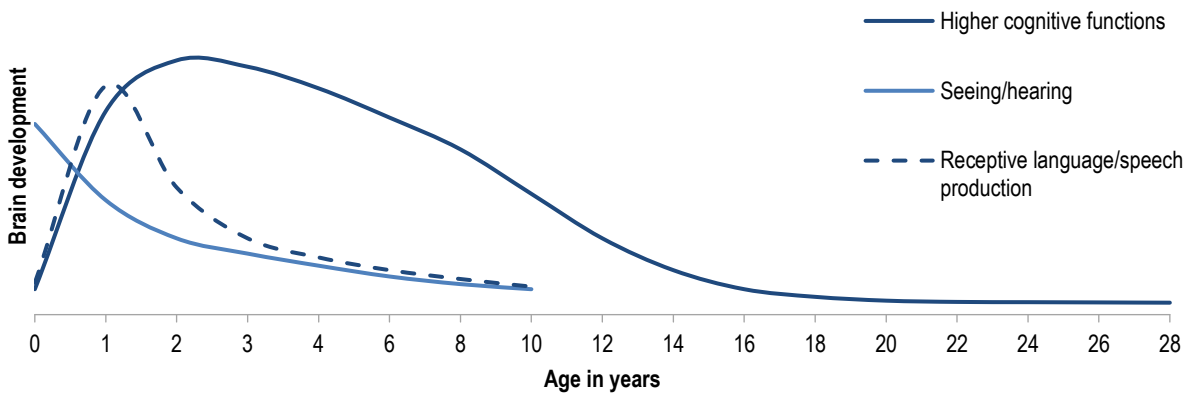
Early learning occurs through rapid development and sensitivity to contexts

23. The brain develops at an astonishing rate during early childhood and is at its highest levels of plasticity than at any other point during the life course. As a consequence, children are especially sensitive to external stimuli, such as the types of interactions they have with their caregivers. This means that early learning is highly responsive to children's experiences (Meltzoff and Kuhl, 2016[15]).

24. Children begin learning before birth and have remarkable capacity for learning through their first years of life. By age 6, the brain reaches about 90% of its adult volume (Stiles and Jernigan, 2010[5]). Moreover, during the first few years of life synapses (connections between neurons in the brain) develop at a remarkable rate: Every second more than 1 million synapses form (Center on the Developing Child at Harvard University, 2016[16]).

25. Figure 2 reveals that synaptic growth is most pronounced during the very first years of life, particularly in the areas of the brain involved in perception (i.e. seeing and hearing) and language. Further, even the growth or density of synapses in the prefrontal cortex—an area of the brain responsible for higher cognitive functions including social behaviour—is strongest in early childhood (National Research Council and Institute of Medicine, 2000[4]). Thus, before they enter school, young children are learning from the environments around them as their brains develop connections that set a foundation for ongoing learning (Meltzoff and Kuhl, 2016[15]).

Figure 2. Sensitive periods in early brain development



Source: Adapted from the National Research Council and Institute of Medicine (2000[4]), *From Neurons to Neighborhoods: The Science of Early Childhood Development*, http://www.dx.doi.org/10.17226/9824.

26. These early physical developments mean that children are not born with a fixed skill set: even skills that are often assumed to be biologically-based can be influenced by environmental factors, especially in early childhood (Raver and Blair, 2016[17]; Rogoff, 2003[18]). Cognitive, social and emotional skills are all malleable and can be developed through practice and reinforcement in daily experiences. Early childhood is a time of great sensitivity for learning across all of these skills domains but the nature and extent of this early learning depends heavily on a nurturing and stimulating environment provided by family, ECEC and the wider community.

27. In the area of social and emotional skills, during the early years children begin to form close relationships and develop expectations of behaviours for both themselves and others (Lally, 2009[19]; Rogoff, 2003[18]). They learn to control their emotions and actions, to take others' perspectives and to empathise (Hinnant and O'Brien, 2007[20]; Montroy et al., 2016[21]). These skills represent basic building blocks for later development of more complex social and emotional skills. In the domain of cognitive skills, children rapidly develop their intellectual capacities through active gathering, sorting, analysing and processing of information. Coupled with rapid development of children's physical abilities, notably sensory-motor control, young children are active participants in their own learning. The exploration of and engagement with others and their environments lays the foundation for ongoing development of individuals' language skills, attention, memory, reasoning and imagination (Goswami, 2008[22]; Bornstein and Lamb, 2011[23]). The nature and extent of this early learning depends heavily on a nurturing and stimulating environment provided by family, ECEC and the wider community.

28. Of course, learning continues throughout a child's life, but the amount of effort required for new experiences to change the brain increases over time. As children grow, the brain becomes increasingly specialised to handle the demands of day-to-day life. Although this specialisation makes the brain more efficient in many ways, it also means that older children and adults must invest more time and effort to adapt their ways of thinking and understanding (Center on the Developing Child at Harvard University, 2016[16]). For example, as young children become efficient in using their native languages, they are simultaneously losing facility to develop a similar mastery of other languages.

29. The rapid pace of learning early in life also creates a situation in which "skills beget skills" (Cunha and Heckman, 2009[24]). That is, investments made in early learning can contribute to children being able to take fuller advantage of learning opportunities later on in life. In addition, children with stronger early learning outcomes may elicit additional learning opportunities from their caregivers and environments, such as by asking questions or taking initiative to engage in new activities. This means that additional investments in education or training later in childhood, adolescence or adulthood are likely to produce greater returns when they are delivered to individuals who had strong early learning experiences compared with those who had less advantageous early learning experiences.

30. Moreover, there is great variation in how development occurs, even under similar circumstances (e.g. siblings in the same family) as well as convergence on similar outcomes even with very different developmental pathways (e.g. the road to educational attainment is not uniform) (Cicchetti and Toth, 2009[25]; Plomin and Daniels, 2011[26]). Theory and research now eschew the idea that the complexities of human development can be distilled into simple dichotomies such as the classical "nature versus nurture" argument; rather, individuals and contexts mutually influence one another (Overton, 2015[27]). In other words, individuals' characteristics are in constant interaction with contextual characteristics (e.g. features of the home and school environments). In fact, advances in epigenetic research reveal that environments can shape gene expression. For instance, exposure to chronic stress (especially early in life) can create long-term changes in genes, contributing to vulnerability for psychiatric disorders later in life (Matosin, Cruceanu and Binder, 2017[28]).

31. Thus, although skills may be heritable to varying extents, the environments that children experience matter for the ways in which they develop particular skills and also their potential for learning new skills (Kovas et al., 2007[29]). For the purposes of identifying policies that can support early learning, this environmental influence is critical; however, the reality of the interplay between children and their contexts highlights the importance of taking a holistic approach that addresses multiple domains, and multiple contexts of early learning. That is, because young children are learning through interactions in all of their settings, supporting learning across settings will be most meaningful for children's outcomes.

32. The remainder of this paper addresses key questions about early learning using existing research: A breadth and depth of research across disciplines, including neuroscience, psychology, education, economics and beyond converges to demonstrate the unique role of early childhood as a period of extraordinary growth for children physically, cognitively and in terms of social relationships. In the next section, findings from longitudinal studies are discussed to highlight how early learning can set individuals on a path towards well-being in a number of domains: general well-being, physical health, mental health, educational attainment, employment, income and socioeconomic status, and crime and delinquency, among others. The paper then addresses questions about how to support early learning, focusing on families and home learning contexts, ECEC services and communities. Finally, the paper concludes by identifying the importance of data collection related to early learning, in order to inform ongoing improvements in policy and practice to promote well-being. The research reviewed throughout this paper is not meant to be exhaustive; rather it is intended to summarise major areas of research while highlighting results from multiple countries whenever possible.

Why is early learning so important?

33. Early learning matters for the general well-being of young children. The here and now is significant in children's lives. In the present, children should have opportunities to know themselves, build and maintain relationships with others, engage with life's joys and complexities, and meet challenges in everyday life. The early childhood years are not solely preparation for the future but also about the present (OECD, 2009[2]; OECD Network on Early Childhood Education and Care, 2015[30]; OECD, 2017[3]). During this period of rapid change, early learning outcomes, such as managing emotions and learning to get along with others, have profound implications for how children experience the here and now (National Research Council and Institute of Medicine, 2000[4]).

34. In addition, longitudinal studies show relationships between early learning outcomes, experiences and outcomes for school-age children and adolescents, and outcomes in adulthood (Power, Kuh and Morton, 2013[31]). The findings are consistent across these studies that strong early learning has sustained, positive associations with a broad range of outcomes in schooling and adulthood. Conversely, for individuals who do not achieve strong early learning outcomes, the research suggests that making up ground later on in life can be difficult (Ramey and Ramey, 1998[32]). Fortunately, rich early experiences have a profound influence on early learning, meaning that children are not born with or without certain skills but instead have capacity to develop across the range of early learning domains.

35. In general, "skills beget skills," meaning that early learning makes it easier to acquire additional knowledge and skills in the future (OECD, 2015[33]). For example, children's ability to comply with demands from adults will shape their relationships with caregivers which can in turn influence opportunities for developing cognitive skills, such as by engaging in language-rich exchanges. Early learning outcomes can be understood to act as a 'reserve capacity' (Staudinger, Marsiske and Baltes, 1993[34]), enabling positive concurrent development as well as later outcomes.

How much of a difference can early learning outcomes make?

36. Early learning outcomes have powerful implications for general well-being and more specific outcomes in adulthood. Although children have remarkable capacity to adapt to the demands of their contexts, outcomes assessed during early childhood are clearly linked to adult outcomes. These associations suggest that early learning outcomes can be measured in meaningful ways and that, in the absence of specific interventions, early learning outcomes can tell us about the likelihood of diverse outcomes in adulthood. Here we highlight a few examples of the power of positive early learning to increase adult earnings and educational attainment, and to reduce later drug use and involvement in crime.

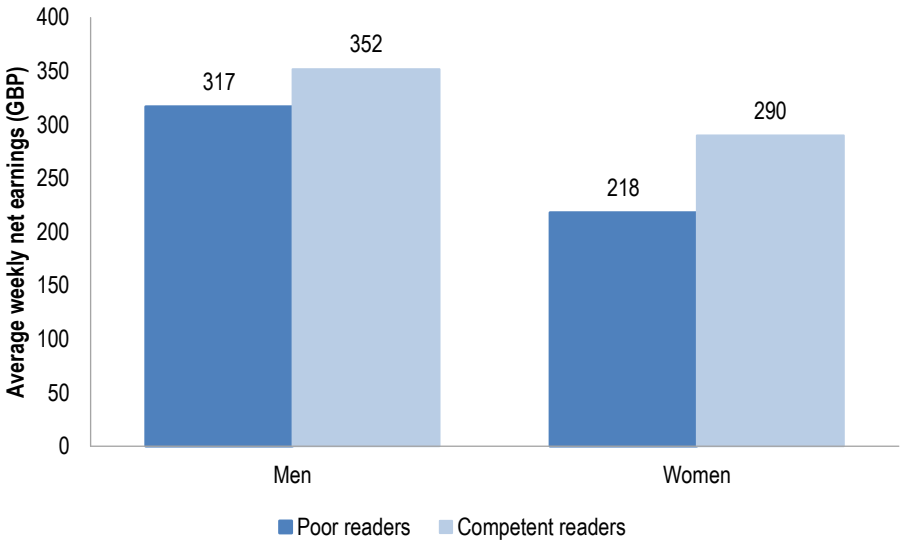
37. After accounting for self-regulation (e.g. delay of gratification, restraint in emotional expression, good conduct) in early childhood, children who increased their

self-regulation throughout childhood achieved higher incomes and socioeconomic status in their 30s, and also were less likely to have a substance dependence or criminal conviction compared with their peers who had stable or declining self-regulation across childhood (Moffitt et al., 2011[35]). To the extent interventions can help children to improve their self-regulatory skills, adult outcomes across a range of domains stand to benefit.

38. In addition, for increases in early childhood self-regulation approximately equivalent to a child moving up in the distribution of scores by one third, there would be a roughly 10% increase in the likelihood of that individual completing a degree by age 30. Further, this same improvement in self-regulation also predicts a 13% reduction in the likelihood of being in social housing and a 10% reduction in the likelihood of having poor health at age 42 (Schoon et al., 2015[36]).

39. Receptive language (i.e. hearing and understanding spoken language) at age 5 predicts reading competence at age 10. By age 34, this difference in earlier reading competence translates into hourly wages (Figure 3). Among men, 46% of poor readers fell in the bottom quartile of earnings versus only 25% of competent readers. For women this difference was even starker with 66% of poor readers falling in the bottom quartile of earnings versus only 27% of competent readers (Parsons et al., 2011[37]). Thus, early receptive language differences can set children on a path towards better or worse economic well-being in adulthood.

Figure 3. Average weekly earnings at age 34 by reading competence at age 10



Source: Data from the British Cohort Study (BCS) reported in Parsons et al. (2011[37]), "Long-term Outcomes for Children with Early Language Problems: Beating the Odds", http://dx.doi.org/10.1111/j.1099-0860.2009.00274.x.

40. Investments in early learning also produce significant benefits to individuals, governments and societies. Estimates suggest that such investments can result in economic returns between 2% and 13% (García et al., 2016[38]; Karoly, 2016[39]): Even at the low end of this range, early learning represents a sound social investment. Further, recent analyses suggest that early learning in social and emotional domains provides

future economic returns comparable to early learning in cognitive domains (Paull and Xu, 2017[40]).

41. These examples of early learning outcomes translating into adult outcomes and returns on investments highlight how meaningful early learning can be. The next sections of this paper provide further details about the range of later outcomes that are associated with early learning, before turning to the ways in which early learning can be supported. Strategies for strengthening early learning outcomes will benefit children in the here and now, enhancing opportunities for young children to know themselves, build and maintain relationships with others, engage with life's joys and complexities, and meet challenges in everyday life (OECD Network on Early Childhood Education and Care, 2015[30]; OECD, 2017[3]). In addition, supporting early learning outcomes can mean that such opportunities grow throughout a child's life, contributing to enhanced well-being beyond childhood and into adulthood.

What adult outcomes are predicted by early learning?

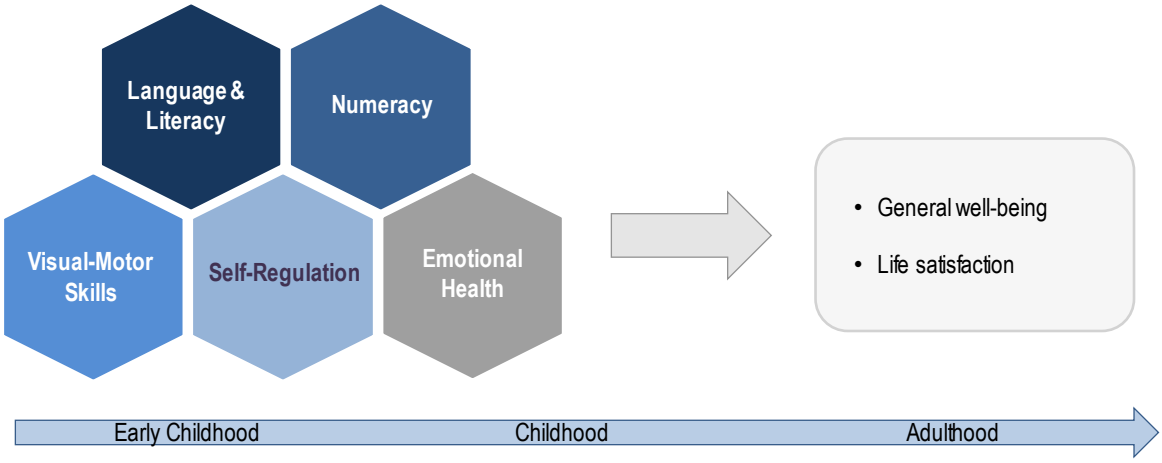
42. Later life outcomes that are linked with early learning include physical health, mental health, education, socioeconomic status, employment, antisocial or criminal behaviours, relationship quality, leadership and social engagement. These outcomes are often inter-related and can be considered as a broad framework for understanding well-being (OECD, 2009[2]; OECD, 2017[3]). Nonetheless, for organisational purposes of understanding associations between early learning and later outcomes, we utilise these domain groupings. The following sections provide an overview of research findings on the associations between early learning outcomes and each of these domains of later life course outcomes. We focus on evidence from longitudinal studies, linking early childhood skills assessed before age 6 to later outcomes, but include some studies of learning assessed before age 10. Annex A provides an overview of the major longitudinal studies included in this review.

43. The studies reviewed in this section show lasting links between early learning and adult outcomes. However, all of the studies are observational in nature and cannot address the causal influence of early learning on later outcomes. Nonetheless, all of the research presented here makes efforts to address additional factors, such as parental education and family poverty, which could potentially explain the associations observed between early childhood and later developmental stages. Given the complexity of human development and the many contexts of early learning, countless factors contribute to specific outcomes; the research reported here attempts to identify what aspects of early learning are among the most important for understanding later outcomes even if we cannot make causal connections.

Early learning is associated with overall well-being in adulthood

44. Early cognitive skills as well as self-regulation and emotional health in childhood are associated with life satisfaction and general well-being in adulthood (Figure 4). Self-regulation can be thought of as a broad set of skills that includes emotion-regulation, planning and problem-solving, among others, and is essential for individuals to adapt their behaviour to situational expectations (Jones et al., 2016[41]). Emotional health refers to low levels of worry or unhappiness.

Figure 4. Early learning outcomes associated with well-being in adulthood

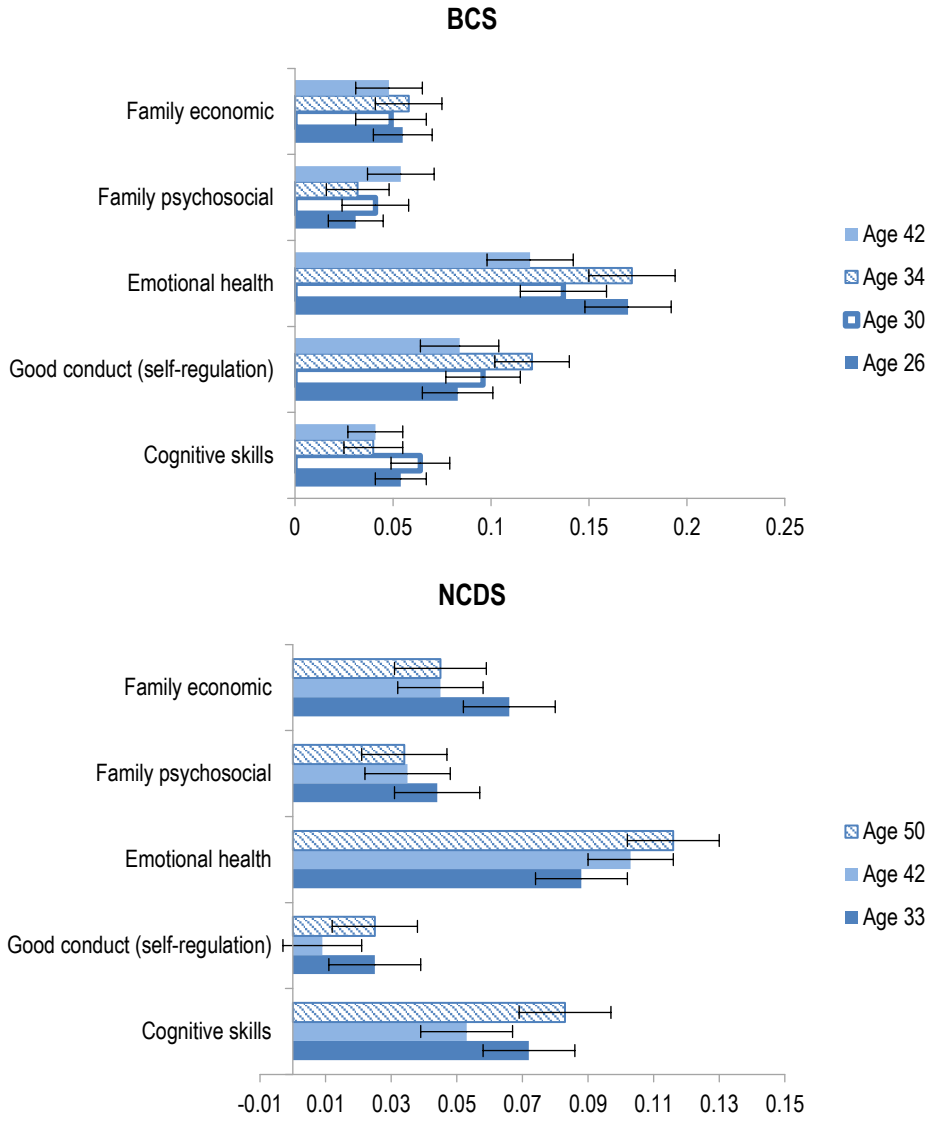


45. Findings from the British Cohort Study (BCS) and National Child Development Study (NCDS) show the range of early learning outcomes that predict life satisfaction in adulthood, as well as the importance of the home environment during childhood (Figure 5) (Clark, Flèche and Lekfuangfu, 2017[42]; Goodman et al., 2015[43]; Layard et al., 2014[44]; Prevoo and ter Weel, 2013[45]; Schoon et al., 2015[36]).

46. Notably, the BCS findings reveal that children's emotional health, reported by mothers, was the most important childhood predictor of self-perceived emotional health (e.g. depression) at age 26 and overall life satisfaction at age 34. In fact, childhood emotional health was more strongly associated with these outcomes than family economic resources, family psychosocial resources, and children's cognitive ability. About half of this link from early emotional health to adult well-being was a direct effect, meaning that it was not explained by other factors in adulthood (Clark, Flèche and Lekfuangfu, 2017[42]; Layard et al., 2014[44]).

47. Receptive language and visual-motor skills at age 5 as well as more general childhood intellectual performance also were linked with greater life satisfaction in these samples (Clark, Flèche and Lekfuangfu, 2017[42]; Schoon et al., 2015[36]).

Figure 5. Family and childhood predictors of life satisfaction at different ages in adulthood

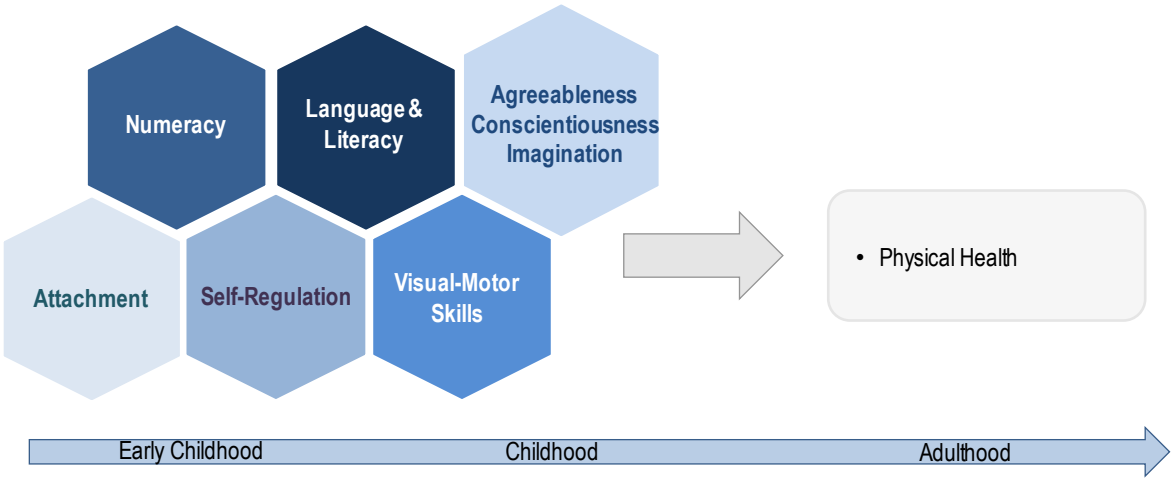


Note: Early learning domains represent composites of childhood data collected at ages 5, 10 and 16 in the BCS and at ages 7, 11 and 16 in the NCDS. Error bars represent 95% confidence intervals.
Source: Centre for Economic Performance (CEP), London School of Economics and Political Science; Discussion Paper No.1493, "The Long-Lasting Effects of Family and Childhood on Adult Wellbeing: Evidence from British Cohort Data", Andrew E. Clark, Sarah Flèche and Warn N. Lekfuangfu, July 2017. http://cep.lse.ac.uk/pubs/download/dp1493.pdf) ([42]).

Early learning sets individuals on a path towards physical health and well-being in adulthood

48. Early cognitive abilities as well as self-regulation, attachment and agreeableness, conscientiousness and imagination are linked with adult physical health (Figure 6). Children's attachment to their primary caregivers captures the trust and security present in these relationships.

Figure 6. Early learning outcomes associated with physical health in adulthood



49. Lower verbal skills among children at age 5 were associated with worse self-rated health at age 42 in the BCS (Schoon et al., 2015[36]). Further, lower mathematical ability at age 10 was highly predictive of poorer adult numeracy, which was in turn associated with deteriorating self-reported health (Sabates and Parsons, 2012[46]). Results from the Panel Study of Income Dynamics (PSID) also suggest that performance on standardised tests of academic achievement (i.e. literacy and numeracy) across childhood was linked with better self-reported health in adolescence and early adulthood (Lê-Scherban et al., 2014[47]).

50. Further, stronger visual-motor skills at age 5 were associated with better self-reported health and a lower likelihood of obesity at age 42 in the BCS (Schoon et al., 2015[36]). Similarly, higher general cognitive ability at age 10 was associated with health outcomes at age 30 for this cohort, including a more active life style (regular exercise), eating fruits and vegetables and a lower risk of premature mortality (Batty et al., 2007[48]; Batty et al., 2007[49]). Yet, stronger visual-motor skills at age 5 were unexpectedly associated with less involvement in exercise at age 42 (Schoon et al., 2015[36]): The data cannot offer a clear explanation for this counterintuitive finding, but it is possible that given the generally better adult health of individuals who had strong visual-motor skills as children, these adults were less motivated to make time for involvement in exercise.

51. Self-regulation in early childhood also is associated with adult health outcomes. For instance, research using the Dunedin Study found that self-regulation measured throughout childhood was associated with better adult physical health (e.g. absence of metabolic abnormality, periodontal disease, airflow limitation) (Moffitt et al., 2011[35]). Similar findings emerge from the BCS: Children with better self-regulation at age 5, as demonstrated through better parent-rated conduct and fewer behaviour problems, were less likely to be obese at age 30 and had better self-rated health at age 42 (Schoon et al., 2015[36]; White et al., 2012[50]). Furthermore, conduct difficulties in 7-year-old children in the NCDS were associated with increased risk of mortality by the age of 42 (Jokela, Ferrie and Kivimäki, 2009[51]).

52. These robust findings from large, longitudinal studies are supported by recent findings from Germany: lower levels of self-regulatory skills in primary school were related to particular eating styles that may be associated with the development of weight problems (Groppe and Elsner, 2015[52]). In addition, in a small sample from the United

States the ability to delay gratification at age 4 was correlated with lower body mass index (BMI) at age 34 (Schlam et al., 2013[53]).

53. However, better emotional health at age 5 was linked with worse self-rated health at age 42 in the BCS (Schoon et al., 2015[36]). Once again, the data do not provide a clear explanation for this unexpected result. Nonetheless, this counterintuitive finding may reflect the intertwined nature of skills and behaviours in early childhood: The models that were used to estimate adult outcomes included a broad array of early learning outcomes. As such, this finding might reflect nuances of the shared variance in emotional health with other early outcomes, but further research will be needed to clarify the ways in which early emotional health predicts physical health in adulthood.

54. Turning to other aspects of early social and emotional outcomes, children who exhibited more agreeableness, conscientiousness and intellect/imagination were shown to have better health as adults. These links identified in the Hawaii Personality and Health cohort occurred through the mechanisms of higher educational attainment, healthier eating habits, and being less likely to smoke (Hampson et al., 2007[54]).

55. Children who were insecurely attached (suggesting lower levels of trust and security) at 18 months were more likely to report an inflammation-based illness in adulthood than those classified as securely attached during early childhood in the Minnesota Study (Puig et al., 2013[55]). Another study using data from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B) suggests that insecure attachment may be related to the development of childhood obesity (Anderson and Whitaker, 2010[56]): Children with an insecure attachment style at age 2 were at increased risk of obesity at 4.5 years, taking into account mother-child interaction during play, parenting practices related to obesity and maternal BMI.

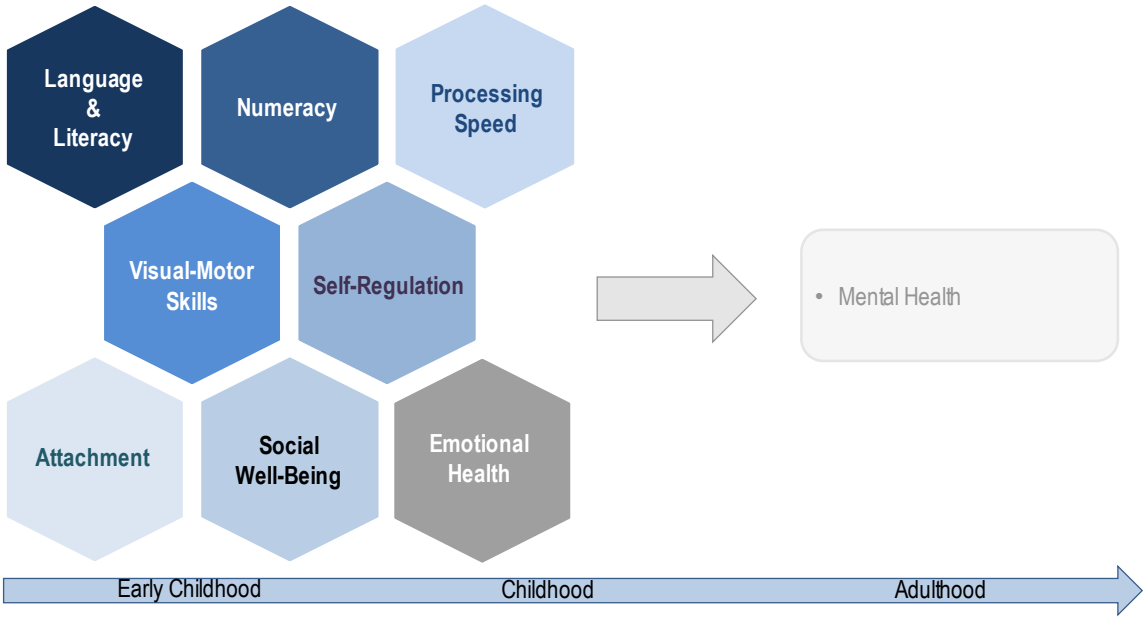
Strong mental health has roots in early learning

56. Early cognitive skills, self-regulation, attachment, emotional health and social well-being are all associated with better mental health in adulthood (Figure 7). Social well-being refers to children's comfort interacting in social situations, marked by a lack of social inhibition, withdrawal and anxiety. In addition to these predictors of adult mental health, research also links early childhood openness to experiences to later mental health; however, the associations differ based on children's gender and thus are discussed in this section but not included among the more generally predictive early learning outcomes in Figure 7.

57. Children with better receptive language skills at age 5 were more likely to have positive mental health outcomes at age 32 as well as lower malaise (e.g. depression, psychological distress) at age 42 in the BCS (Schoon et al., 2010[57]; Schoon et al., 2015[36]). Findings from this sample also suggest that better visual-motor skills at age 5 were associated with lower malaise at age 42 (Schoon et al., 2015[36]). In the National Survey of Health and Development (NSHD), higher cognitive ability at age 8 was associated with fewer self-reported symptoms of anxiety and depression in women at age 53 (Hatch et al., 2007[58]).

58. Further, results from the Dunedin Study found that individuals diagnosed with schizophrenia in adulthood exhibited developmental lags across the ages of 7 to 13 on tests indexing processing speed, attention, visual-spatial problem-solving ability, and working memory (Reichenberg et al., 2010[59]).

Figure 7. Early learning outcomes associated with mental health in adulthood



59. Several studies also find convincing evidence for the role of poor self-regulation in predicting psychological disorders. In the Dunedin Study, children classified as undercontrolled (e.g. impulsive, distractible) at age 3 showed high negative emotionality at age 26 relative to those who were classified as well-adjusted (Caspi et al., 2003[60]). In the NCDS, externalising behaviours at age 7 were associated with poor mental health at age 33 (Buchanan, Flouri and Ten Brinke, 2002[61]). Associations between internalising (e.g. worries, fearful) and externalising behaviours at age 7 and midlife psychological disorders may be particularly strong for men (Clark et al., 2007[62]). Conversely, children in the BCS who were rated as having good self-regulation at age 5 reported lower levels of malaise at age 42 (Schoon et al., 2015[36]).

60. There is a substantial body of evidence linking childhood emotional well-being to mental health in later life: The roots of several psychological disorders are thought to be detectable through emotional states in early childhood (Rutter, Kim-Cohen and Maughan, 2006[63]). For example, analyses using the BCS show that parent-reported emotional difficulties as early as age 5 are predictive of midlife psychological disorders such as depression and anxiety through their association with emotional problems at ages 10 and 16 (Flouri and Malmberg, 2011[64]). Further, three-quarters of adults with depression in this sample had received a psychiatric diagnosis before age 18 (Kim-Cohen et al., 2003[65]).

61. Early social inhibition and withdrawal also have robust associations with adult mental health. In the Dunedin Study, children classified as inhibited at age 3 (showing signs of social withdrawal and shyness) were prone to depression and suicidal feelings at age 21 and were less likely to be socially engaged at age 26, compared with children classified as well-adjusted (i.e. those who demonstrated greater social well-being) at age 3 (Caspi et al., 1996[66]; Caspi, 2000[67]).

62. Parent-reported anxiousness and withdrawal at ages 7 to 9 were predictive of a range of mood, anxiety and phobic disorders between the ages of 16 and 30 in the Christchurch Health and Development Study (Goodwin, Fergusson and Horwood,

2004[68]; Jakobsen, Horwood and Fergusson, 2012[69]). Along these same lines, using the Mater-University of Queensland Study of Pregnancy, associations were found between social withdrawal at age 5 and depression in early adulthood (Katz et al., 2011[70]). In a small sample of German children, low assertiveness at age 5 was linked to increased internalising symptoms at age 9 (Groeben et al., 2011[71]).

63. Similarly, a Dutch general population study showed associations between mood and anxiety disorders assessed between the ages of 6 and 14 years through parental reports and the existence of psychological disorders 14 years later. Anxiety disorders predominantly started in childhood and early adolescence, whereas the incidence of mood disorders increased sharply in adolescence and young adulthood (Roza et al., 2003[72]).

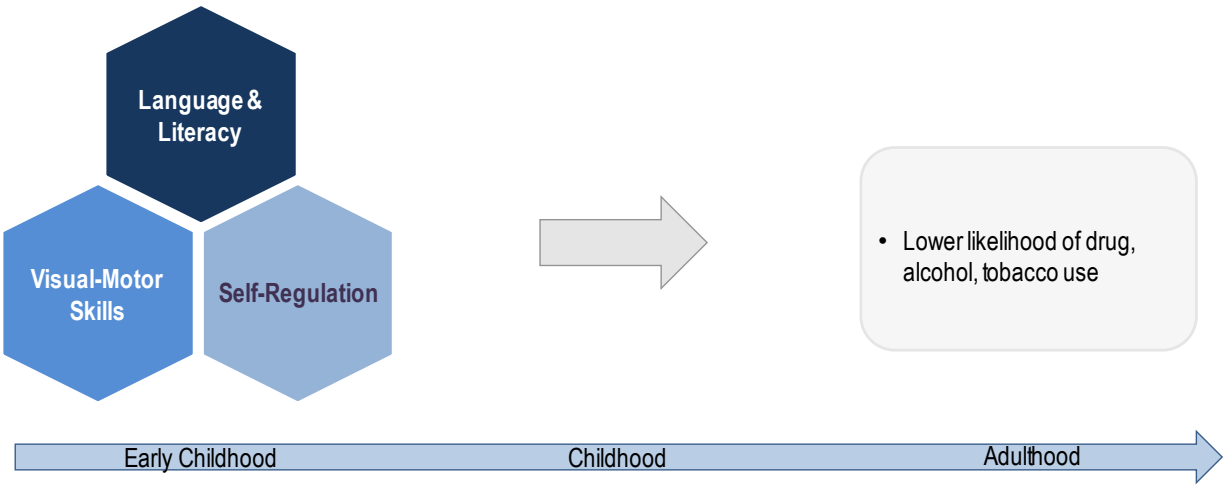
64. In addition to these large-scale studies, two studies with smaller samples suggest links between early openness to experience and later mental health. The first looked at emotional and cognitive outcomes of individuals at age 23, in relation to their scores on a pre-school scale of openness to experience (Gjerde and Cardilla, 2009[73]). The researchers found that pre-school openness predicted later openness, with gender differences in additional outcomes. Males with higher openness in pre-school reported being more extroverted, conscientious, emotionally positive, and higher in self-esteem at age 23. In contrast, females with higher openness in preschool reported being significantly more neurotic, depressed, anxious, shy, susceptible to anger and emotionally negative as young adults. In the second small study, openness to experience at age 3.5 was associated with sophisticated play behaviour at age 5 and self-confidence in adolescence (mean age 12 years); possible gender differences were not tested in this sample (Abe, 2005[74]).

65. There are a number of studies linking early attachment relationships to the development of psychological disorders on the one hand, and interpersonal competences on the other (Morley and Moran, 2011[75]; Ranson and Urichuk, 2008[76]). The majority of these rely on small samples but some are relatively long term. For example, insecure attachment in early childhood has been linked to poor mental health in adolescence (Carlson, 1998[77]; Warren et al., 1997[78]). A Swedish study showed that by age 8 or 9, securely attached infants reported less social anxiety and were generally more positive and popular than their insecurely attached peers (Bohlin, Hagekull and Rydell, 2000[79]). Further, attachment at age 1 predicted children's ability to recognise complex emotional experiences of others at age 6 (Steele et al., 1999[80]).

Can early learning outcomes help understand propensity to use drugs, alcohol and tobacco?

66. Strong early literacy and visual-motor skills as well self-regulation are associated with a lower likelihood of drug, alcohol and tobacco use in adulthood (Figure 8); however, complex associations between other aspects of early learning and this set of outcomes exist.

Figure 8. Early learning outcomes associated with a lower likelihood of drug, alcohol and tobacco use in adulthood



67. Stronger visual-motor skills at age 5 were associated with lower likelihoods of smoking and engaging in high risk drinking at age 42 in the BCS (Schoon et al., 2015[36]). In addition, low literacy skills at age 10 were associated with increased smoking among adult men in this sample (Sabates and Parsons, 2012[46]). However, higher general cognitive ability was a risk factor for alcohol abuse in both the BCS and the NSHD (Batty et al., 2008[81]; Hatch et al., 2007[58]).

68. The BCS data also show that better self-regulation at age 5 was associated with lower likelihoods of smoking and engaging in high-risk drinking in adulthood (Schoon et al., 2015[36]). Similarly, children in the Dunedin Study who exhibited better self-regulation throughout childhood were less likely to be dependent on substances in adulthood, including tobacco, alcohol, cannabis, street or prescription drugs (Moffitt et al., 2011[35]).

69. Links between lower emotional stability (e.g. calm, well-balanced) in childhood and greater alcohol use in adulthood were observed in the Hawaii Personality and Health Cohort Study (Hampson et al., 2006[82]). However, such links were not observed in the Finnish Jyväskylä Longitudinal Study of Personality and Social Development (JYLS) after accounting for adverse experiences in adolescence (Pitkänen et al., 2008[83]). Further, unexpected findings emerged from the BCS regarding strong emotional health at age 5, which predicted a higher likelihood of smoking at age 42. In addition, better social skills at age 5 predicted more high-risk drinking at age 42 for this sample (Schoon et al., 2015[36]).

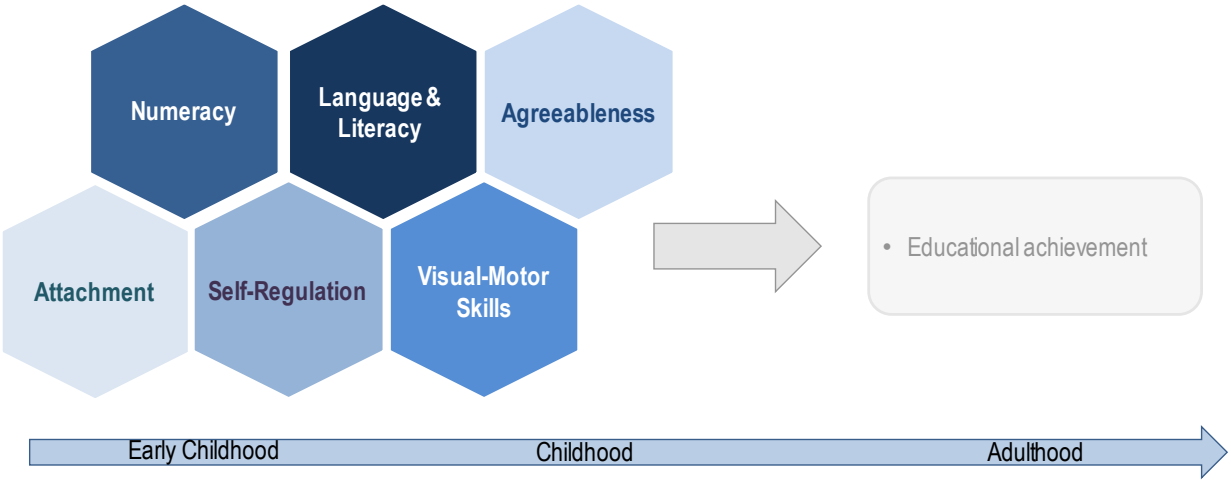
70. Children who were extroverts at age 10 also were more likely to engage in unhealthy behaviours at age 34, such as smoking and using cannabis, in the BCS (Prevoo and ter Weel, 2013[45]). However, in the Dunedin Study, children classified as inhibited at age 3 were at higher risk for substance abuse at age 21 compared with children who were classified as well-adjusted at age 3 (Caspi et al., 1996[66]; Caspi, 2000[67]).

71. The range of findings presented in this section demonstrates the potential for early learning to contribute to adult outcomes. However, these findings related to drug, alcohol and tobacco use also underscore the importance of understanding individual pathways as some early outcomes may act as both risk and protective factors, depending on the specific adult outcomes of interest.

Strong early learning sets the stage for educational attainment

72. Not surprisingly, early academic skills like language, literacy and numeracy are positively associated with educational attainment in adulthood. In addition, visual-motor skills, self-regulation, attachment and agreeableness in early childhood all predict adult educational attainment (Figure 9). In addition, some smaller scale studies suggest that children's persistence, motivation and styles of play may predict future educational attainment, although further research is needed with larger samples over longer periods to confirm these associations.

Figure 9. Early learning outcomes associated with educational attainment in adulthood



73. Early academic skills are strongly associated with educational attainment during later childhood and adolescence. In a meta-analysis and subsequent study using the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K), both reading and numeracy skills at the beginning of kindergarten were strongly related to reading achievement at age 10 to 11 (Claessens, Duncan and Engel, 2009[84]; Duncan et al., 2007[85]). Likewise, in the BCS receptive language skills at age 5 were associated with competent reading by age 10, as well as the number of General Certificates of Secondary Education (GCSE)[1] attained by age 16 and the likelihood of completing a degree by age 30 (Parsons et al., 2011[37]; Schoon et al., 2015[36]). This result is replicated in smaller, more selective samples, including from Australia, Israel and the United States (Aram, 2005[86]; Athanasou, 2011[87]; Reese et al., 2000[88]).

74. With regard to numeracy skills, low mathematical scores at age 10 were highly predictive of poor numeracy levels at age 32 in the BCS (Sabates and Parsons, 2012[46]). Further, in the NCDS, numeracy ability at age 7 was associated with higher global intelligence scores at age 16 and higher rates of school completion (Ritchie and Bates, 2013[89]). Performance on assessments of both reading and maths at entry to primary school were associated with performance in both reading and maths at the end of secondary school in a large English sample (Tymms, Merrell and Bailey, 2017[90]).

[1] The General Certificate of Secondary Education (GCSE) is an academically rigorous, internationally recognised qualification awarded in a specified subject. It is generally taken in a number of subjects by pupils in secondary education.

75. Early visual-motor skills also appear to have implications for adult educational attainment: Better visual-motor skills at age 5 were associated with more GCSEs obtained by age 16 and a greater likelihood of obtaining a degree by age 30 in the BCS (Schoon et al., 2015[36]). Notably, early advantages in visual-motor skills did not result in the same later advantages for children from low socioeconomic households, suggesting that some contexts may fail to build on strong early learning (Feinstein and Duckworth, 2006[91]); we return to this point in later sections on contexts.

76. Executive function refers to individuals' skills related to working memory, inhibitory control and mental flexibility (attention shifting and control)—it can be considered a key element of self-regulation (Jones et al., 2016[41]). Working memory is the ability to store and manipulate or use information in order to complete a task. Inhibitory control represents the ability to overcome strong tendencies to react in a habitual manner, whereas mental flexibility represents the capacity to shift between rules or changing circumstances.

77. There is consistent evidence linking measures of executive function, as well as its component skills, to educational achievement (Alexander, Entwisle and Horsey, 1997[92]; Howse et al., 2003[93]; Turney and McLanahan, 2015[94]; Yen, Konold and McDermott, 2004[95]). These links between aspects of executive function and achievement remain even after controlling for early literacy and numeracy skills (Duncan et al., 2007[85]). For example, in a study using data from the Colorado Adoption Project, children's attention span persistence (e.g. *"Child persists at a task until successful,"* reported by mothers when children were age 4) significantly predicted mathematics and reading test scores at age 21. Moreover, an individual's attention span persistence was a stronger predictor of college completion by age 25 than reading or math scores at age 7 or age 21 (McClelland et al., 2013[96]).

78. Similarly, children with higher scores on a measure of executive function in early elementary school displayed higher scores on a verbal analogies task at age 15 in the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD) sample (Richland and Burchinal, 2013[97]). In studies using data from ECLS-K, scores on the Approaches to Learning scale (which includes items assessing attentiveness and task persistence) at school entry were positively associated with achievement in mathematics and reading throughout elementary school (DiPerna, Lei and Reid, 2007[98]; Duncan et al., 2007[85]; Li-Grining et al., 2010[99]).

79. There is also a proliferation of small-scale evidence showing that attention regulation and executive function are associated with early academic achievement in both reading and mathematics (Bull, Espy and Wiebe, 2008[100]; Clark, Pritchard and Woodward, 2010[101]; Clark et al., 2013[102]; Fuhs et al., 2014[103]; Neuenschwander et al., 2012[104]; Ng et al., 2015[105]; Sasser, Bierman and Heinrichs, 2015[106]; Toll et al., 2011[107]). Other small-scale longitudinal studies have found that early executive function (parent rated or directly assessed with children) is related to later teacher-reported measures of school adjustment and classroom behaviour (Brock et al., 2009[108]; Davies et al., 2008[109]; Neuenschwander et al., 2012[104]). Further, a number of studies focus on low-income or at-risk groups and suggest that early executive function could be a 'protective factor' mediating the relationship between family socioeconomic status and later academic outcomes (Blair et al., 2015[110]; Nesbitt, Baker-Ward and Willoughby, 2013[111]; Razza, Martin and Brooks-Gunn, 2012[112]).

80. Similarly, self-regulation at ages 6 and 8 was related to educational attainment in adulthood in the Christchurch Health and Development Study (Fergusson, Boden and Horwood, 2013[113]; Fergusson and Horwood, 1998[114]). Further, in a series of studies examining self-regulation among a sample of United States pre-schoolers from a university community, delay of gratification at age 4 was associated with higher levels of cognitive and self-regulatory competence and coping at age 16, including higher scores on the standardised college entrance exams (SAT) (Shoda, Mischel and Peake, 1990[115]). Other studies also show that self-regulation predicts educational attainment even after adjusting for previous educational attainment (Duckworth, Tsukayama and May, 2010[116]). Moreover, findings from the PSID show that greater externalising behaviours in childhood predicted lower literacy skills 14 years later (Kremer et al., 2016[117]). These findings all are consistent with the associations noted earlier between early self-regulation and the number of GCSEs obtained by age 16 and a higher likelihood of completing a degree by age 30 from the BCS (Schoon et al., 2015[36]).

81. The links between self-regulation and educational attainment may be particularly pronounced for boys. Findings from the Avon Longitudinal Study of Parents and Children (ALSPAC) suggest that parent-reported inattention at age 47 months was strongly related to boys' failure to attain five GCSEs at a basic threshold-level for progression in education (Washbrook, Propper and Sayal, 2013[118]).

82. A number of small-scale studies from the United States, Australia and Finland find that early interest, task motivation and persistence are linked with stronger academic outcomes and behaviours throughout childhood and beyond (Daniels, 2014[119]; Gilmore, Cuskelly and Purdie, 2003[120]; Martin, Ryan and Brooks-Gunn, 2013[121]; Mokrova et al., 2013[122]; Nurmi and Aunola, 2005[123]; Sasser, Bierman and Heinrichs, 2015[106]; Shiner, Masten and Roberts, 2003[124]). However, not all small studies find support for associations between young children's motivation and later academic success (Alexander, Entwisle and Horsey, 1997[92]; Howse et al., 2003[93]; Stipek and Ryan, 1997[125]). Further research is needed to better understand any links between these early skills and educational attainment in adulthood.

83. The evidence suggests that early emotional health is not directly related to later educational attainment. A meta-analysis of six large, longitudinal studies from different countries examined the influence of pre-school socio-emotional indicators on later academic attainment (Duncan et al., 2007[85]). Results show that internalising behaviours measured before age 5 were not significant predictors of educational attainment when controlling for prior cognitive skills, attention regulation and family background factors. This result remains after various robustness checks and has been subsequently repeated using data from the Fragile Families and Child Wellbeing Study (Turney and McLanahan, 2015[94]).

84. Yet, one study with the BCS finds that better emotional health at age 5 is associated with obtaining fewer GCSEs by age 16 and a lower likelihood of obtaining a degree by age 30 (Schoon et al., 2015[36]). However, similar to the findings regarding emotional health and physical health discussed earlier, these associations were present only in multivariate models (controlling for numerous other child and family characteristics), raising the possibility of complex associations between multiple aspects of early learning, family context and educational attainment.

85. Some researchers have theorised that play styles, in particular children's ability to engage in pretend play and role-play, could also be a developmental precursor to creative, versatile and symbolic thinking. There are a few small-scale longitudinal studies

demonstrating this. For example, children's play involving the use of props or objects in pretence at age 5 predicted reading and maths skills at age 8 (Hanline, Milton and Phelps, 2008[126]). Similarly, a small-scale study of girls found that early pretend play predicted divergent thinking and maths achievement over a 4 year period (Wallace and Russ, 2015[127]).

86. Several studies find evidence linking early agreeableness and later educational attainment. In the Hawaii Personality and Health cohort, agreeableness at age 6 was associated with higher academic attainment (Hampson et al., 2007[54]). Similarly, in the Project Competence Longitudinal Study, childhood agreeableness at age 8 was associated with higher academic attainment as well as rule-abiding conduct and better quality friendships at age 30, even after adjustment for earlier cognitive ability (Shiner, Masten and Roberts, 2003[124]). Two small studies from Italy and the United States show that prosocial behaviour is a factor in shaping attainment in adolescence and adulthood (Caprara et al., 2000[128]; Eron and Huesmann, 1984[129]).

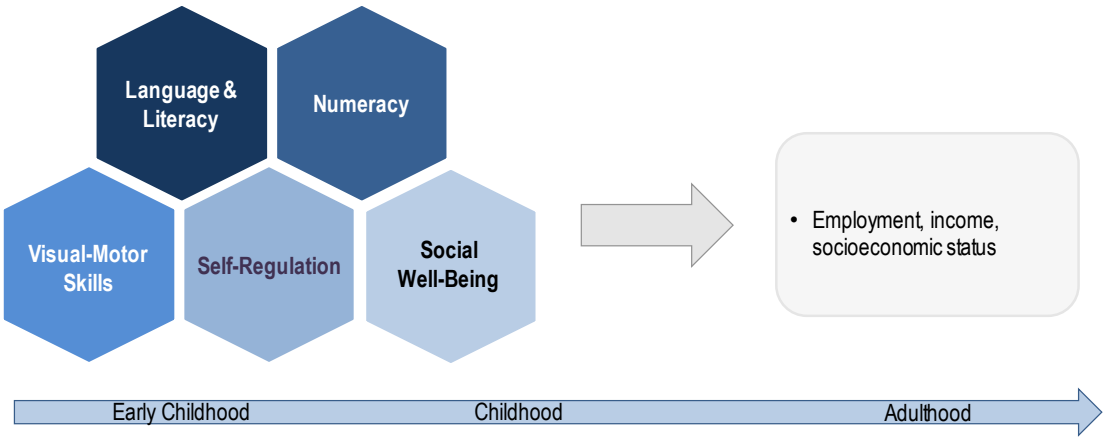
87. Early attachment style may also contribute to later school behaviour and engagement. Results from a meta-analysis of the association between infant attachment (at 12-24 months) and intelligence and language development shows that secure attachment is related to stronger language development in early childhood (IJzendoorn, Dijkstra and Bus, 1995[130]). Although this topic has not been studied extensively using longer-term longitudinal data, analysis based on the NICHD SECCYD suggests that early attachment relationships aid the development of self-regulation and the ability to navigate the school environment (Drake, Belsky and Fearon, 2014[131]). The study also suggests that early attachment has an impact on school engagement in Grade 5, via social self-regulation. Similarly, early relationships between teachers and children are predictive of later school behaviour and attitudes towards work, controlling for gender, IQ, ethnicity and other aspects of behaviour (Hamre and Pianta, 2001[132]).

Employment, income and socioeconomic status in adulthood are linked to early learning

88. Strong early cognitive skills, self-regulation and social well-being have clear associations with employment, income and socioeconomic status in adulthood (Figure 10).

89. Studies show that early verbal and literacy skills are associated with several labour market outcomes, including employment, income and socioeconomic status. Stronger verbal skills at age 5 among children in the BCS were linked with a greater likelihood of being employed, greater family income, higher gross wages and a lower likelihood of living in social housing at age 42 (Schoon et al., 2015[36]). Also in the BCS, literacy skills at age 10 were associated with higher incomes at the age of 34 and significant increases in income—both gross hourly wages and weekly earnings—particularly from the ages of 38 to 42. In addition to being more likely to be employed at a single time point as adults, children with high literacy levels also had fewer periods of worklessness by the age of 34 (Crawford and Cribb, 2015[133]; Parsons et al., 2011[37]). Further, in an analysis using the NCDS, early reading ability at age 7 was associated with higher socioeconomic status at age 42, as indicated by higher income, home ownership, and having a non-manual occupation (Ritchie and Bates, 2013[89]).

Figure 10. Early learning outcomes associated with employment, income and socioeconomic status in adulthood



90. Similarly, early numeracy skills in childhood are associated with several labour market outcomes in adulthood. For example, again in the NCDS sample, children with better numeracy at age 7 were more likely to have attained higher socioeconomic status by age 42 (Ritchie and Bates, 2013[89]). In addition, stronger visual-motor skills at age 5 are linked with a greater likelihood of being employed at age 42, as well as greater family income, greater net wealth, higher gross wages and a lower likelihood of living in social housing at age 42 for the BCS sample. Greater conceptual maturity at age 5 was also linked with a greater likelihood of being employed and a lower likelihood of living in social housing at age 42 in this sample (Schoon et al., 2015[36]). Generally, better early test scores among children growing up in poverty in the BCS were associated with a better likelihood of these children escaping poverty as adulthoods (Blanden, 2006[134]).

91. A number of studies show that aspects of self-regulation during childhood are important in explaining later labour market outcomes. For instance, in the Dunedin Study, lack of self-regulation at age 3 was almost as strongly associated with different indicators of socioeconomic attainment (i.e. lower income, low socioeconomic status and more self-reported financial difficulties) at age 32 as early cognitive ability (Moffitt et al., 2011[35]). Similarly, in the Christchurch Health and Development Study, better self-regulation at age 6 was related to a range of adult outcomes including a lower likelihood of welfare dependence and higher-income levels (Fergusson, Boden and Horwood, 2013[113]).

92. Further, higher scores on a measure of self-regulation at age 5 were associated with higher incomes at age 30 as well as greater job satisfaction and a lower likelihood of living in social housing at age 42 in the BCS, independent of factors such as educational attainment (Blanden, Gregg and Macmillan, 2007[135]; Schoon et al., 2015[36]). Evidence from the BCS as well as the NCDS also suggests that childhood self-regulation is negatively associated with unemployment throughout the adult years (Daly et al., 2015[136]; Schoon et al., 2015[36]). Finnish and Swedish longitudinal studies (the JYLS and the Individual Development and Adaptation Study, respectively) confirm this finding; however, most of the association between early self-regulation and adult employment operated via low academic attainment in these samples (Kokko, Bergman and Pulkkinen, 2003[137]).

93. Yet another study found that high self-regulation of emotions, including exhibiting constructive and compliant behaviours, was indirectly associated with higher career orientation at age 36 (Pulkkinen, Ohranen and Tolvanen, 1999[138]). Conversely,

externalising conduct problems (suggesting poor self-regulation) at age 8 also were associated with a risk of unemployment by age 18 (Fergusson and Horwood, 1998[114]).

94. Social competence measured at age 8 was associated with better work competence (i.e. a record of holding down a job successfully and carrying out responsibilities well) at age 20 in the Project Competence Longitudinal Study. Furthermore, work competence was shown to be stable over a 10-year period throughout early adulthood (Masten et al., 2010[139]). Evidence from the BCS suggests that social competence in childhood also predicted entrepreneurial status at age 34, continuity in entrepreneurial activity (age 30 and 34), as well as earnings among the self-employed at age 34 (Obschonka et al., 2012[140]); Extraversion at age 10 was similarly associated with becoming an entrepreneur by age 34 in this sample (Schoon and Duckworth, 2012[141]).

95. Furthermore, males in the BCS who were more extroverted at age 10 had lower levels of unemployment over the ages 16 to 29, after controlling for cognitive ability (Macmillan, 2013[142]). Conversely, findings from the Dunedin Study suggests that children classified as inhibited at age 3 were more likely to experience unemployment between the ages of 15 and 21 and left school earlier, compared to well-adjusted children. However, it should be noted that inhibited children were less likely to be unemployed or leave school due to being expelled compared to children who were classified as under-controlled (e.g. restless, impulsive and distractible) (Caspi, 2000[67]).

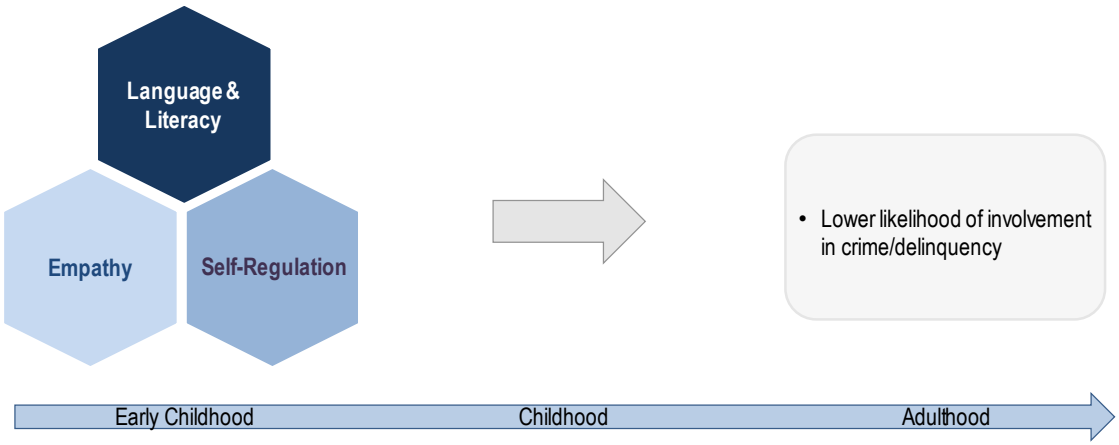
96. Similarly, teacher-rated anxiety at age 8 was predictive of low career orientation at age 36 for women, while extraversion promoted high career aspirations in the Finnish JYLS. For men, an unstable career was also predicted by anxiety and passivity at age 8, but these effects were rooted in family socioeconomic status (Pulkkinen, Ohranen and Tolvanen, 1999[138]). In addition, both Finnish and Swedish data showed that timidity at age 8 was related to adult unemployment (Kokko, Bergman and Pulkkinen, 2003[137]); once again these effects mainly operated through socioeconomic status, school achievement and earlier emotional problems.

97. Two studies using the BCS find unexpected results, which the authors caution may stem from complex relations among early skills. One of these studies looked at emotional health at age 5 (Schoon et al., 2015[36]) and the other at age 10 (Goodman et al., 2015[43]), and both examined outcomes at age 42. Both studies found that stronger early emotional health was associated with a greater likelihood of relying on social housing. Further, in the former, better early emotional health was associated with lower gross wages. These surprising findings may be related to the analytic methodologies used for the two studies, as the counterintuitive results were only present after controlling for a wide range of child and family factors. Further research is warranted to better understand the meaning of these findings (as well as other surprising findings noted from the BCS) for this particular cohort of British adults as well as for other populations.

Strong early learning is associated with a lower likelihood of involvement in crime and delinquency

98. Strong language skills, self-regulation and empathy in early childhood predict a lower likelihood of involvement in crime and delinquency in adulthood (Figure 11). Aspects of social well-being, particularly prosocial behaviours, also are important predictors of a lower likelihood of crime and delinquency later in life. Early social inhibition also may be protective against these adult outcomes and thus social well-being is not included in Figure 11 as the nuance in early social behaviours is important to understand.

Figure 11. Early learning outcomes associated with a lower likelihood of involvement in crime and delinquency in adulthood



99. Variation in early language skills is associated with criminal activity in adulthood. For instance, in a sample of at-risk children from the Kauai Longitudinal Study, age-appropriate language development at ages 2 and 10 was associated with reduced likelihood of engaging in criminal delinquency by the age of 32 (Werner, 1989[143]).

100. Poor self-regulation at age 6 was related to violent offending in adulthood in the Christchurch Health and Development Study (Fergusson, Boden and Horwood, 2013[113]). Similarly, low self-regulation at age 5 in the BCS was linked with a greater likelihood of having a criminal conviction in adolescence or adulthood (Murray et al., 2010[144]). Conversely, in the Dunedin Study higher early self-regulation was associated with fewer criminal convictions at age 32. Further, a lack of self-regulation at ages 3 and 5 predicted an increased number of violent offences committed by the age of 18 (Caspi et al., 1996[66]; Henry et al., 1996[145]), a greater variety of self-reported offences committed in the last 12 months and a greater number of conviction records by the age of 21 (Henry et al., 1999[146]). Children classified as under-controlled were more likely than children classified as inhibited to have been convicted of two or more crimes by the age of 21; thus, although early social inhibition may be detrimental for mental health and employment outcomes in adulthood, it is not necessarily uniformly negative (Caspi, 2000[67]).

101. Convicted men at age 32 in the JYLS exhibited more aggressive and lower prosocial behaviours at age 8. Furthermore, those with earlier convictions (between the ages of 15 and 16) were shown to have been more aggressive at age 8 than those convicted in later adolescence (17 to 20 years) (Hämäläinen and Pulkkinen, 1995[147]).

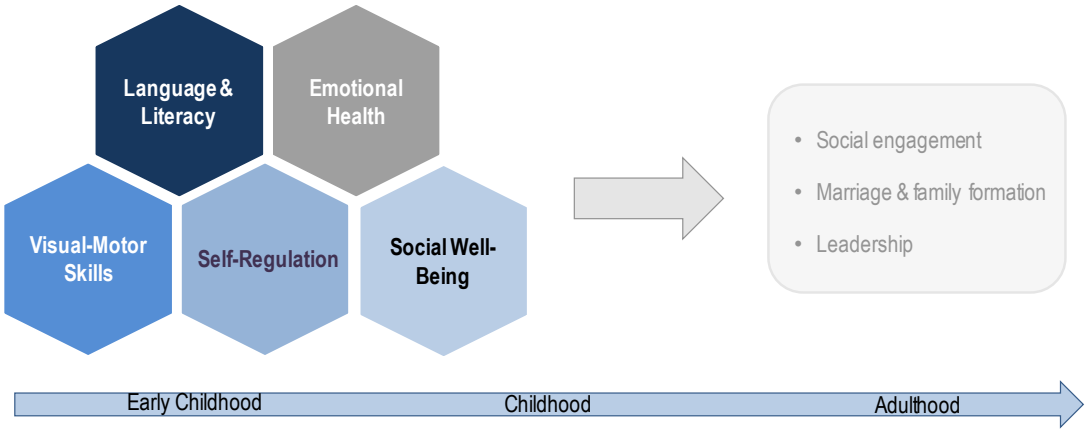
102. A lack of empathy also is associated with negative outcomes in adolescents. British children in the Twins Early Development Study who exhibited callous-unemotional traits (in part indicated by a lack of empathy) at age 7 reported more antisocial and delinquent behaviours at age 12. The study notes that children and adolescents with high callous-unemotional traits, and associated antisocial and delinquent behaviours, are at increased risk of adult psychopathology (Fontaine et al., 2011[148]).

What other outcomes are linked with individuals' early learning?

103. The adult outcomes presented so far are well-researched using longitudinal studies, allowing clear connections to be made with early learning. However, well-being

is multi-faceted and many additional adult outcomes are of interest. Although the research base is smaller, studies suggest that early learning outcomes predict social engagement, marriage and family formation and leadership skills in adulthood. Early language, visual-motor skills, self-regulation, emotional health and social well-being are meaningful for understanding these additional adult outcomes (Figure 12).

Figure 12. Early learning outcomes associated with additional outcomes in adulthood



104. Verbal skills, conceptual maturity, and better self-regulation at age 5 were associated with individuals' interest in politics at age 42 in the BCS sample, suggesting that these early skills contribute to social engagement in adulthood (Schoon et al., 2015[36]). Similarly, researchers using the Swiss Survey of Children and Youth, COCON, found that sympathy (example item: *"When I see another child who is hurt or upset, I feel sorry for him or her"*) and moral reasoning at ages 6 and 9 were associated with social justice values, such as the belief in treating others fairly and minimising inequalities, at age 12 (Daniel et al., 2014[149]).

105. Marriage and family formation also have associations with early learning outcomes. In the JYLS, childhood anxiety was associated with poor quality marriages at age 36 (Kinnunen and Pulkkinen, 2003[150]). In the BCS, verbal skills, visual-motor skills, and lower hyperactivity (suggesting better self-regulation) in early childhood were linked with a greater likelihood of living with a partner at age 42 (Schoon et al., 2015[36]). In this sample poorer emotional health among girls at age 10 was associated with having children (versus not having children) at age 42 (Goodman et al., 2015[43]); however in the full sample (both girls and boys), poorer emotional health at age 5 was associated with a *lower likelihood* of having children at age 42 (Schoon et al., 2015[36]). In addition, stronger early verbal skills were associated with having fewer children by age 42, whereas stronger early social skills predicted having more children by age 42 (Schoon et al., 2015[36]). These complex findings suggest gender differences as well as potential different meanings of child-bearing for individuals.

106. Delay of gratification, an indicator of self-regulation, has been associated with adolescent coping competencies. For example, pre-schoolers who could delay gratification for a longer period of time at age 4 were better able to cope with frustration and stress in adolescence, according to parents' reports (Schlam et al., 2013[53]). Similarly, findings from the Dunedin Study suggest that individuals who were classified as undercontrolled at age 3 were more than twice as likely to engage in gambling at ages 21 and 32 as children who were not considered undercontrolled (Slutske et al., 2012[151]).

107. Extraversion, assertiveness and lack of inhibition during early childhood may be early indicators of future leadership potential. For instance, findings from the Fullerton Longitudinal Study showed that those classified as uninhibited at age 2 were more likely to be extroverts in adolescence, and subsequently to possess leadership skills at age 29 (Guerin et al., 2011[152]).

Which early learning outcomes are important?

108. The literature reviewed suggests that all of the adult outcomes examined are predicted by multiple early skill sets: There is not one silver bullet that can address positive adjustment across domains or regarding one specific domain. It is important to note that individual skills are associated with development both within and across domains. In other words, learning in one area has positive consequences for learning in other areas. For example, children with strong language skills may have an easier time building relationships with peers and teachers, enhancing their opportunities to learn new social skills and to practice various aspects of self-regulation.

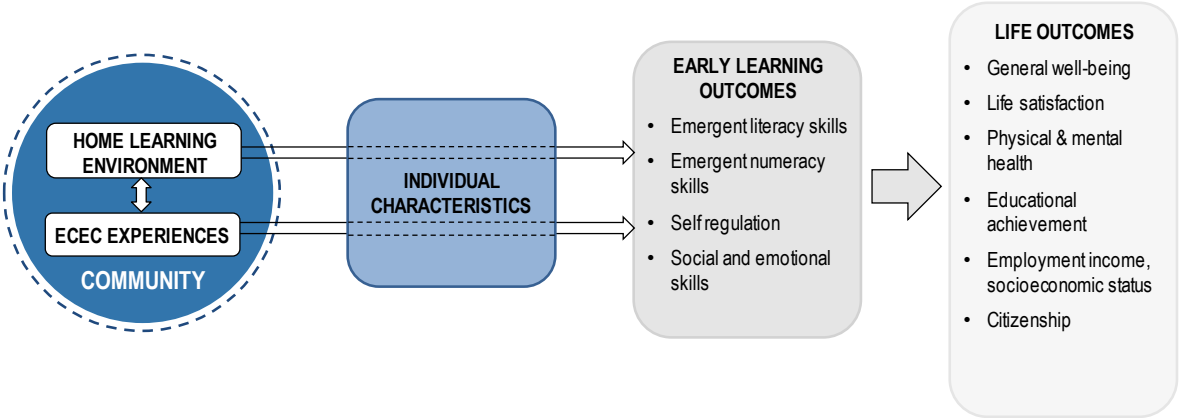
109. Therefore, it is necessary to build-up and support the development of different early learning outcomes in a holistic manner to facilitate adaptive development throughout the life course. As such, there are likely substantial benefits in providing effective and well-informed interventions to enhance social, emotional, self-regulatory and cognitive outcomes in early childhood. The returns to policies which simultaneously improve multiple skills are potentially greater than regarding policies focusing on single skills only.

110. The research on well-being across the life course identifies these domains as being of particular importance during early childhood:

- Language and literacy skills;
- Numeracy and other non-verbal cognitive skills;
- Self-regulation; and,
- Emotional health, social well-being, social and emotional skills.

111. Physical development, health, hygiene and nutrition also form a central foundation for well-being in early childhood and beyond. Traditionally, countries collect relevant information on aspects of children's physical health (e.g. birthweight, vaccination rates) because of the central importance of this domain for overall well-being. In addition, in part because physical well-being creates conditions for learning in other domains, all OECD countries have policies in place to support healthy physical development before, during and after birth (OECD, 2009[2]). Given the longstanding commitment to children's physical health made by governments and the associated availability of national data on this topic, IELS and this paper concentrate on the other early learning domains noted above and in Figure 13 in an effort to expand the focus of early childhood data collection beyond physical health.

Figure 13. Early learning outcomes



112. Although for practical reasons we distinguish among broad domains of early learning outcomes, we acknowledge that returns to investment will likely be greater when a more holistic approach is applied. Moreover, the domains of early learning are less differentiated than the outcomes that can be observed in older children and adults (National Research Council, 2008[13]). The undifferentiated nature of skills in early childhood is due, in part, to the fact that early learning occurs across domains with gains in one domain contributing to gains in other domains (Demtriou, Merrell and Tymms, 2017[153]). This ongoing cycle of reinforcement across domains means that early learning must be assessed using a whole-child approach, recognising the overlapping nature of outcomes for young children. Cognitive, self-regulatory, social and emotional skills interact and cross-fertilise each other, empowering individuals to adjust to ever changing contexts, with no clear-cut differentiation among the domains.

113. Further, early learning occurs in the context of relationships (Chazan-Cohen et al., 2017[12]). Thus, children's social and emotional skills form a foundation for engaging with their environments in ways that ultimately support learning in the cognitive domain as well as opportunities to develop more complex social and emotional skills. Moreover, emerging abilities for self-regulation, which occur both as part of physical maturation and through opportunities for practice, enhance learning in social, emotional and cognitive domains.

114. This strong overlap in early skills domains and the reinforcing nature of development across domains means that there is not generally a direct correspondence between early and later skills. For example, adaptive social skills among adults entail different behaviours than adaptive social skills among young children. Thus, it can be challenging to know which behaviours to measure at which ages to best understand continuity and change in individuals' development. Even within early childhood, the nature of skills and the meaning of behaviours change rapidly. For instance, infant babbling does not predict children's first words, but babbling is a prerequisite for language development. Nonetheless, as the literature review shows, it is possible to meaningfully measure early learning—particularly after age 3—and to reveal links between early outcomes and subsequent well-being.

What contexts support strong early learning outcomes?

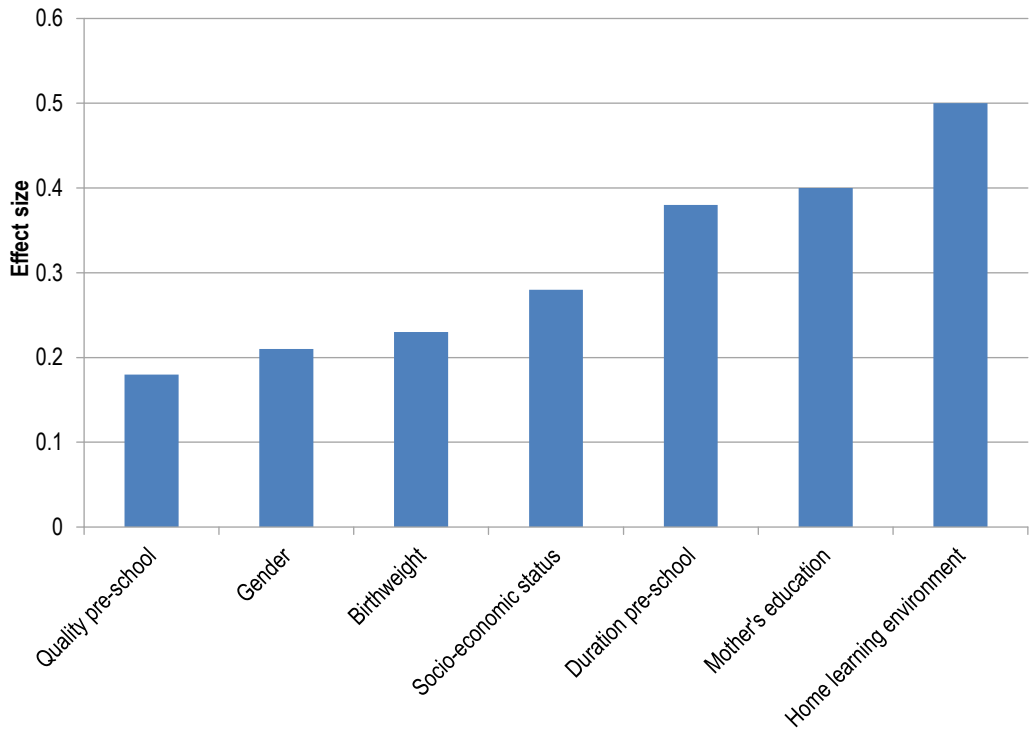
115. Between the neuroscience suggesting that our brains are the most malleable in early childhood and the economic arguments for the greater return on investments when early learning is strong, it is clear that early childhood is a time of great promise. Yet, young children's experiences vary dramatically due to their individual differences, differences in families and ECEC participation and differences in society more broadly. For some children this variation will mean that their contexts are responsive to their individual interests and needs, whereas for others the variation will simply reflect a lack of opportunities. Thus, it is critical that children's development is monitored at both an individual level and at a systems level. Although each child is unique, the basic patterns, or principles, of growth and development are universal, predictable and orderly (Working Group on Early Childhood Education and Care under the auspices of the European Commission, 2012[14]).

116. The home learning environment and family background have a primary role in children's development (see Figure 14). Nonetheless, given young children's receptivity to their environment and experiences, early learning occurs across a broad array of settings. A substantial body of research examines the value of ECEC settings to support children's well-being, demonstrating that ECEC is an additional key factor in children's early learning. The broader community and societal features also contribute to early learning; we review each of these three contexts in turn.

Families and the home environment matter for early learning

117. Parents and primary caregivers play a part in all aspects of young children's experiences, from the homes and neighbourhoods in which they live to the activities available to their children both within and outside the home. IELS identifies two broad subdomains of the ways in which families and the home environment contribute to early learning: Home contexts (i.e. the socioeconomic environment) and home learning environments (i.e. parenting practices and children's activities). The components of each of these aspects of the home and family environment work together to shape children's experiences and early learning opportunities. In this section research supporting the importance of each subdomain is presented in turn although intersections between the domains are highlighted.

Figure 14. Impact of contextual factors on child's literacy performance at age 5 in the United Kingdom



Note: Effect size compares the relative strength of different factors that influence children's literacy proficiency at age 5. It is expressed in the units of standard deviations where an effect of 0.1 is relatively weak, one of 0.40 is moderately strong, and an effect of 0.70 is strong.
Source: Melhuish et al. (2008[154]), "Effects of the Home Learning Environment and Preschool Center Experience upon Literacy and Numeracy Development in Early Primary School".

Home socioeconomic contexts set the stage for early experiences

118. Family structure (e.g. parents' marital status, presence of extended family in the home, number of children) contributes to early learning in myriad ways. For instance, the presence of multiple adults in the household who can provide care for young children may mean that children have more opportunities to engage with an adult in a range of stimulating activities. Moreover, the presence of more adults in a household can facilitate parental employment outside the home, increasing a family's economic well-being and thereby facilitating additional supports for young children. Yet, households with many people can also become problematic for young children if conditions are crowded, chaotic or unsafe. Crowded household conditions (e.g. more than one person per room in a household) and poor quality housing are adversely associated with early learning outcomes (Coley et al., 2013[155]; Evans et al., 2010[156]).

119. In addition to family structure, maternal education and employment as well as household socioeconomic status are robust predictors of early learning outcomes. It is very difficult to determine the unique impact of any of these specific features of the economic and social environment on children's outcomes (Duncan, Magnuson and Votruba-Drzal, 2017[157]); however a large body of non-experimental research suggests each of these factors is important.

120. Maternal education is a powerful predictor of early learning outcomes. On average, more highly-educated mothers spend more time working than mothers with less education, they also, on average, spend more time with their children (Carneiro, Meghir and Parey, 2013[158]; Duncan, Magnuson and Votruba-Drzal, 2015[159]). Differences in maternal education and time spent engaging with children can interact with children's individual characteristics in meaningful ways: Analyses with the PSID reveal that highly-educated mothers invest time more heavily in their low birthweight children whereas less-educated mothers invest time more heavily in their normal birthweight children. For low birthweight children of highly-educated mothers, this extra time compensates for some disadvantages related to low birthweight (Hsin, 2012[160]). In this way, parents' educational background can set otherwise similar children on very different developmental pathways.

121. Nonetheless, highly-educated mothers are likely to be employed outside the home, a situation that has led to much policy interest and research on maternal employment. For instance, the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD) was launched in the United States in 1991 in part to address policy questions around the implications of maternal employment for young children. Findings from this study and from the National Longitudinal Survey of Youth (NLSY) suggest that full-time maternal employment during a child's first year of life can be detrimental, although these associations are often weak and not present for all families (e.g. this pattern is not evident among single-parent families) (Brooks-Gunn, Han and Waldfogel, 2010[161]; Han, Waldfogel and Brooks-Gunn, 2001[162]).

122. Studies on maternal employment during early childhood from the United States cannot be assumed to generalise to other countries: The United States is unique in the lack of guaranteed maternity leave, contributing to an earlier return of new mothers to the labour force. Studies from multiple countries that capitalise on policy variations and reforms related to maternity leave generally suggest little impact on child outcomes based on the length of leave mothers can access (Baker and Milligan, 2011[163]; Dustmann and Schönberg, 2012[164]; Liu and Skans, 2010[165]; Washbrook et al., 2011[166]) (but see Carneiro, Meghir and Parey (2013[158]) for an exception). However, mothers' return to work within six months of children's birth may be negatively associated with children's cognitive outcomes, especially if mothers work full-time. These associations are primarily observed in intact (two-parent) families with high levels of education (OECD, 2011[167]).

123. Part-time work and maternal employment after the first year of life more consistently have neutral or positive associations with children's outcomes (Baum, 2003[168]; Berger, Hill and Waldfogel, 2005[169]; Brooks-Gunn, Han and Waldfogel, 2002[170]; Ruhm, 2004[171]). Yet, the economic advantages of mothers entering the workforce for children's outcomes may be isolated to early childhood: When mothers of older children and adolescents return to work, there do not appear to be benefits for children's outcomes (Duncan, Magnuson and Votruba-Drzal, 2017[157]).

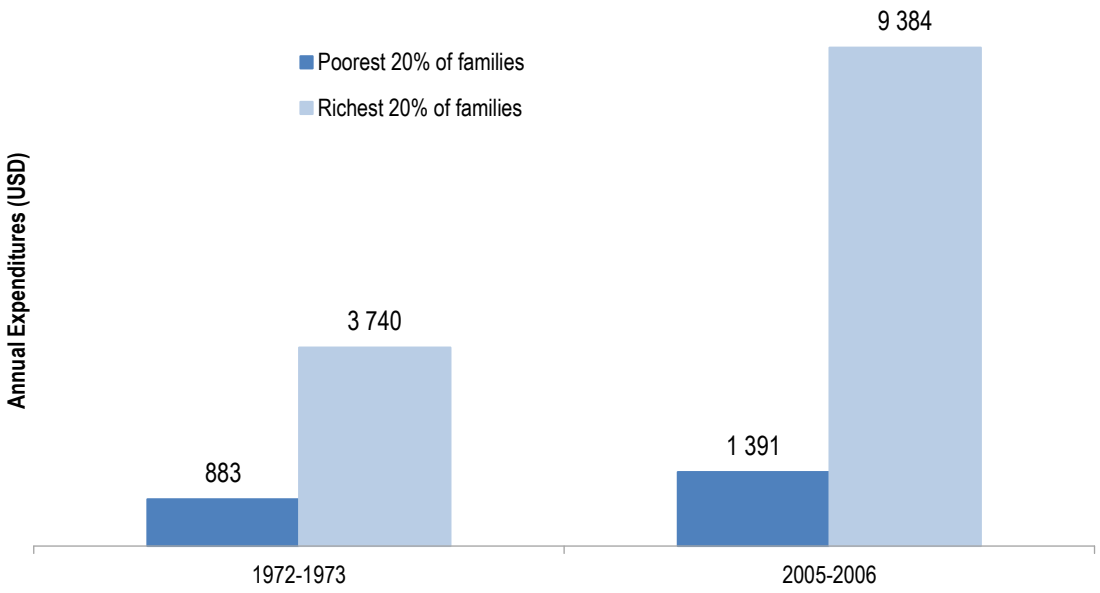
124. These patterns of findings suggest two things. First, negative child outcomes associated with maternal employment may be related to the quality of the care infants receive when their mothers are working: This perspective is supported by findings that the quality of the supply of ECEC is generally insufficient for children younger than age 1. Further, maternal stress related to the demands of full-time employment and having a new infant could also partially explain deleterious associations with children's

outcomes. Second, the stronger outcomes for children who are slightly older when their mothers engage in full-time employment may be associated with the financial benefits of employment: When mothers are employed, families may have fewer financial worries and be able to invest more in their children, including access to high-quality early learning settings outside the home.

125. Maternal education and employment are both critical determinants of household economic resources, with children of more educated mothers generally experiencing more economic benefits. A large body of research demonstrates that greater household income (and the family characteristics that go along with it) is associated with children's better academic achievement, educational attainment and social and emotional skills (Akee et al., 2010[172]; Black et al., 2012[173]; Dahl and Lochner, 2011[174]; Duncan, Morris and Rodrigues, 2011[175]; Macours, Schady and Vakis, 2012[176]; Milligan and Stabile, 2009[177]; Milligan and Stabile, 2011[178]; Schoon et al., 2011[179]). This body of work further suggests that household income during early childhood may be especially important for concurrent and long-term outcomes (Blanden and Gregg, 2004[180]; Duncan et al., 1998[181]) as well as for children's cognitive skills (Schoon et al., 2010[182]).

126. Some of these benefits may stem from the fact that higher-income households spend substantially more money on learning activities for children, including school tuition, books, magazines and other educational materials, school supplies, participation in organised activities (e.g. clubs, performing arts), recreational activities and lessons, entertainment, sports, trips and childcare (Kaushal, Magnuson and Waldfogel, 2011[183]). Further, between 1972 and 2007 parental spending on children in the United States increased among both low- and high-income households, with a greater increase among high-income households (Figure 15) (Duncan and Murnane, 2011[184]). Also, expenditures over this period shifted from the teenage years to early childhood and young adulthood (Kornrich and Furstenberg, 2013[185]).

Figure 15. Family enrichment expenditures on children in the United States, 1972-2006



Source: Duncan and Murnane (2011[184]), "Introduction: The American Dream, then and now" in *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*.

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127. Cohort comparisons suggest that the association between family economic resources in childhood and educational outcomes is strengthening (Blanden and Gregg, 2004[180]; Duncan and Murnane, 2011[184]). In other words, educational stratification between children who grow up in less affluent versus more affluent homes has increased in recent decades. This is likely due in part to the greater growth in family spending on children among wealthier households during this period (see Figure 15, above). Still, the strength of this association seems to differ across countries (OECD, 2017[186]).

128. Given the links between different aspects of socioeconomic status, household structure and investments in children (both money and time), as well as the fact that each of these can contribute to early learning outcomes, it is challenging to separate the importance of the various factors. For example, although household income is consistently associated with children's outcomes, it is difficult to say that the former *causes* the latter (Duncan, Magnuson and Votruba-Drzal, 2017[157]). This difficulty arises precisely because sociodemographic characteristics are tightly intertwined. Moreover, shared genes between children and their parents further complicate our ability to isolate the relative importance of any single predictor of child well-being.

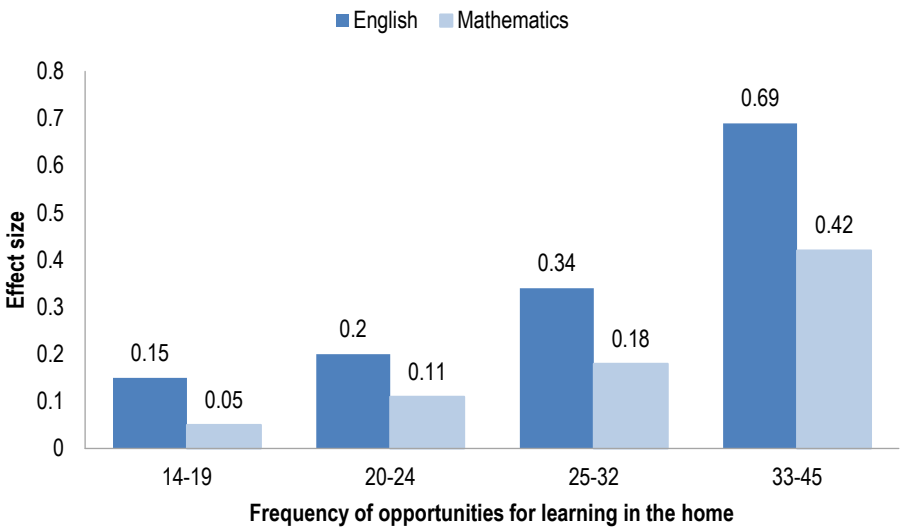
129. Finally, data on the socioeconomic context of households, such as those presented in Figure 15, do not reveal the quality of parents' interactions with their children nor do they reveal the quality of the enrichment experiences families purchase. In the next section we address the ways in which low-income families nevertheless support strong early learning, but systematic differences in experiences for children of different socioeconomic backgrounds highlight the inequalities that can contribute to gaps in early learning and well-being across the life course.

What parents do is more important than who they are[2]

130. The importance of household socioeconomic context notwithstanding, parents' behaviours and the home learning environments they create are critical for early learning outcomes: In addition to direct expenditures on their children, parents invest in their children through the quality of the interactions they have together. As shown in Figure 14 (above), findings from the United Kingdom suggest the home learning environment is in fact the strongest predictor of early literacy. Access to developmentally-appropriate books, toys and cultural resources promotes early learning (Chiu and McBride-Chang, 2006[187]) (Figure 16) and may be particularly important for supporting children with weak early language skills (Law et al., 2018[188]). Further, the Effective Pre-school, Primary and Secondary Education (EPPSE) Project in England found that the quality of the home learning environment during early childhood was positively associated with children's social, emotional and educational outcomes at age 16 (Sylva et al., 2014[189]).

[2] Sylvia et al. (2004[252]).

Figure 16. Impact of early childhood home learning environment on English and mathematics attainment at age 11 in the United Kingdom



Note: Effect size compares the relative strength of different factors that influence children's literacy proficiency at age 5. It is expressed in the units of standard deviations where an effect of 0.1 is relatively weak, one of 0.40 is moderately strong, and an effect of 0.70 is strong.
Source: Melhuish (2010[190]), "Why children, parents and home learning are important" in Sylva et al. (eds.), *Early Childhood Matters: Evidence from the Effective Pre-school and Primary Education Project*.

131. Importantly, the interactions parents have with their children around these resources provides substantial benefit to children's early literacy and numeracy, as well as later academic achievement (National Research Council and Institute of Medicine, 2000[4]). Engaging in language-rich interactions, including through reading books and having conversations, is strongly related to children's verbal skills (Huttenlocher et al., 2010[191]; Pan et al., 2005[192]; Rowe, 2017[193]). Notably, data from the 2015 Programme for International Student Assessment (PISA) show that parents who report *"spending time just talking"* with their children have adolescents who report higher levels of life satisfaction (OECD, 2017[3]). Thus, beyond promoting early social, emotional and cognitive skills, parents' verbal interactions with their children support more general well-being. This finding is consistent with results from the BCS that suggest parents showing interest in their children can compensate, to some extent, for lower engagement in home reading activities (Blanden, 2006[134]).

132. For example, widely cited findings from a small, in-depth study in the United States suggest that family socioeconomic status is closely associated with the amount of language exposure young children have: At age 3, in an average hour, children from poor families heard fewer than one third the number of words that children from families with professional parents heard (Hart and Risley, 1995[194]).

133. More recent findings suggest that children's verbal interactions with their parents, not only the words they hear, contribute to patterns of brain activation when listening to a story (Romeo et al., 2018[195]). That is, these early verbal interactions appear to contribute to neural language processing capabilities that can partly account for differences in language abilities for children from varying socioeconomic backgrounds. Both parental education and income are positively associated with parents reading with their children

(Hartas, 2011[196]) and language and literacy research suggests these family-level factors are also important for children's early learning (see Figure 14).

134. Decades of research shows that when families confront economic hardship, parents experience stress that increases the risk of mental health problems, such as depression or anxiety and substance abuse. In turn, the stress and mental health concerns can lead parents to be less emotionally engaged with their children. As a consequence, child development suffers (Conger and Donnellan, 2007[197]). Mothers in poverty have rates of depression two to three times higher than mothers in the general population (National Research Council and Institute of Medicine, 2000[4]). This situation is notable because young children of depressed mothers have a greater likelihood of deleterious early learning outcomes across domains, compared with children of non-depressed mothers (Bornstein, 2015[198]). Depressed mothers may also invest less time and effort in creating a stimulating environment that can support early learning (Frank and Meara, 2009[199]). Further, maternal emotional distress appears to be a key link between family socioeconomic disadvantage and children's early social and emotional outcomes (Schoon et al., 2010[182]). Yet, socioeconomically disadvantaged families are not homogenous and many low-income parents are able to maintain warm and responsive relationships with their children. When this is the case, low-income children demonstrate better academic achievement (Watkins and Howard, 2015[200]).

135. More generally, parents' poor mental health can place children at risk of insecure attachment with their caregivers (Bornstein, 2015[198]). Attachment with caregivers is important as it sets the stage for children's future relationships and is a robust predictor of early learning in social and emotional domains (National Research Council and Institute of Medicine, 2000[4]). Attachment theory situates infants' relationships with their caregivers as a foundation for future relationships, creating expectations for how individuals react in relationships with one another. Secure attachments are characterised by responsive, sensitive and mutual interactions that provide groundwork for children to develop trust in others. This secure base of trust facilitates early learning related to co-operation, self-regulation, feelings of competence and efficacy in social interactions (Bornstein, 2015[198]; National Research Council and Institute of Medicine, 2000[4]).

136. There is also variation across families in the ways parents use discipline or express negative emotions. Harsh and physically aggressive parenting practices (e.g. scolding, hand slapping) are unfavourably associated with children's behaviours and with children's early academic success, whereas parental warmth and responsiveness are favourably associated with these outcomes (Brooks-Gunn and Markman-Pithers, 2005[201]; Calkins et al., 2001[202]; Denham et al., 2000[203]). Notably, harsh parenting behaviours are associated with increases in children's aggressive behaviours, perhaps because children come to view physical aggression as an appropriate tool to manage challenging situations. Further, children who are spanked by their parents are more likely to assume that other individuals have hostile intentions in social situations, creating barriers for these children in building new relationships that involve trust and empathy (Gershoff, 2013[204]). As such, frequent use of harsh parenting strategies, including spanking, may undermine young children's emerging social and emotional skills.

How can parents be supported to promote early learning?

137. Parenting can be changed through intervention efforts and many strategies exist to support parents and promote early learning. And, a broad array of studies find that parenting is amenable to interventions (Bogenschneider, 2002[205]; Moran, Ghate and Van

Der Merwe, 2004[206]). However, the specific programmes that work well for individual families are likely highly dependent on the family's specific needs, for instance ensuring families are stably housed before focusing on aspects of the home learning environment (National Research Council and Institute of Medicine, 2000[4]).

138. Home visiting programmes are one way to support parents that have been shown to be effective. Tailoring services to individual families is a core feature of home visiting programmes, which typically involve assessing family needs, providing education and supports to parents and connecting families to other resources in their communities (Michalopoulos et al., 2017[207]). Research demonstrates that home visiting can be a cost-effective way to support parents that contributes to positive outcomes in parenting and children's early learning and longer-term outcomes (Michalopoulos et al., 2017[207]; Sama-Miller et al., 2017[208]).

139. Targeting home learning activities specifically around early language and literacy skills is another area where parenting programmes proliferate. Research generally supports these programmes as meaningful ways to shape parenting behaviours and boost children's skills, including in social and behavioural domains. Yet, methodologically strong studies are scarce and attention to programme implementation is needed as not all interventions appear to work equally well (Moran, Ghate and Van Der Merwe, 2004[206]).

140. Programmes with a "two-generation" approach target both parents and children. These types of programmes appear to be effective in supporting early learning, although the mechanisms are not always clear and programmes vary in their emphasis on children versus parents (Love et al., 2005[209]; Moran, Ghate and Van Der Merwe, 2004[206]; Reynolds and Robertson, 2003[210]; St Pierre, Layzer and Barnes, 1998[211]). Many such programmes, including the Perry Preschool programme, are discussed further in the next section because of their ECEC components.

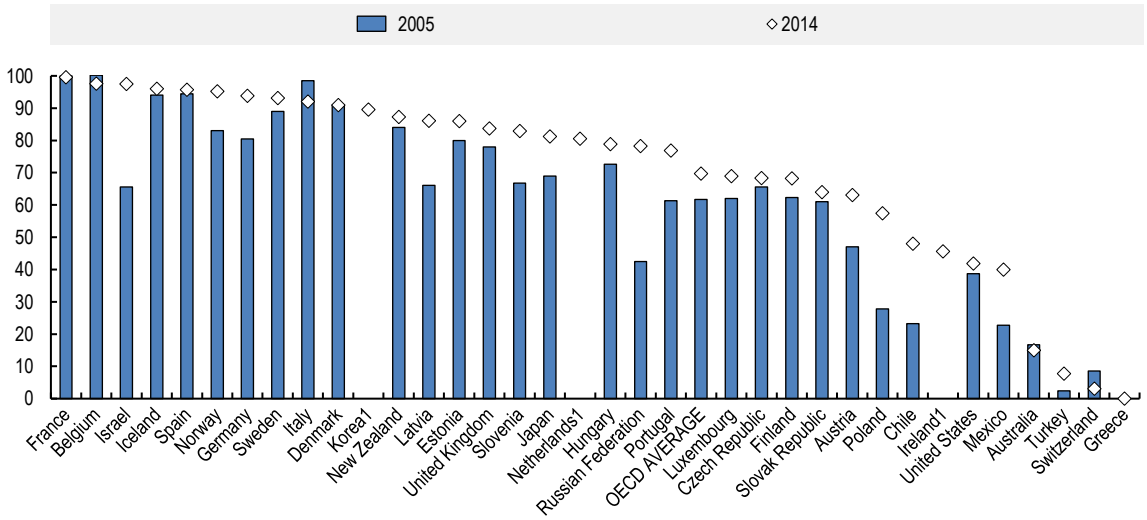
141. Consistent with the power of early childhood to meaningfully impact outcomes throughout the life course, when parents receive early supports the results are more positive and more persistent (Moran, Ghate and Van Der Merwe, 2004[206]). Many programmes to support parents of older children have been adapted for use with parents of younger children; however, given the very different developmental needs of young children, parenting programmes explicitly developed for this age group have more promising results for children's early learning (Eyberg et al., 1998[212]; Moran, Ghate and Van Der Merwe, 2004[206]; Richardson and Joughin, 2002[213]).

Early childhood education and care services have the potential to support early learning

142. Although families have the strongest influence in shaping children's early learning, ECEC services also have incredible potential to support young children. From a policy perspective, ECEC is often divided by two competing purposes: Either to promote early learning or to support parents' participation in the workforce. In the former case, child development is the focus, whereas in the latter case ECEC services are perceived as mainly providing necessary supervision, rather than enrichment, when parents are at work. This dual purpose is even noted in the terminology of ECEC, which includes both care and education. Governments increasingly recognise that supporting children and supporting the labour force need not be at odds and as such have increased efforts to lift children's participation in quality ECEC.

143. Participation rates in ECEC have increased recently in OECD countries, particularly among children aged 3 and younger (Figure 17). These increases reflect growing participation of women in the labour force, as well as greater awareness of the benefits that high-quality ECEC can provide to young children. However, despite this growth in participation rates across countries, demand still outstrips supply in some jurisdictions (OECD, 2017[214]) and the quality of ECEC services is often uneven. Thus, whether or not children have access to high-quality ECEC creates another way in which early learning experiences vary greatly for individual children.

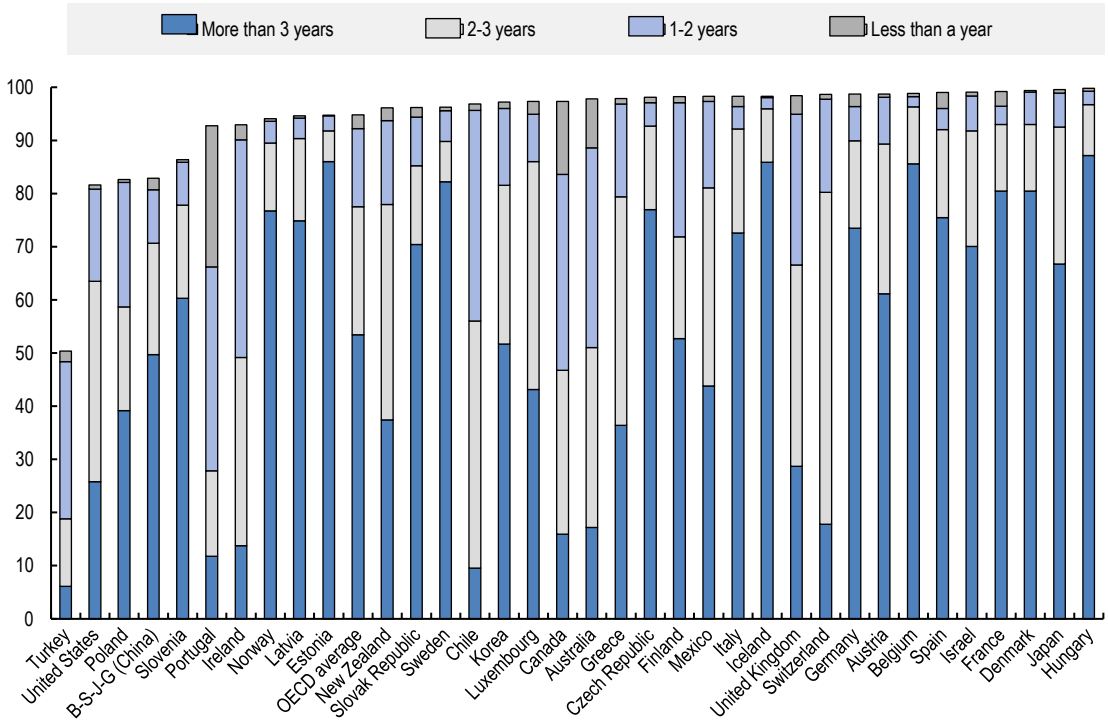
Figure 17. Enrolment rates at age 3 in pre-primary education (2005 and 2014)



Note: Countries are ranked in descending order of the enrolment rates of 3-year-olds in pre-primary education (ISCED 02). [1]Data for reference year 2005 are missing.
Source: OECD (2016[215]), *Education at a Glance 2016: OECD Indicators*, http://dx.doi.org/10.1787/eag-2016-en.

144. Further, although the overall rates of participation in ECEC are high for OECD countries (92% of children attend ECEC for at least one year before entering primary school), the duration of participation in ECEC can vary substantially (Figure 18). In addition, these country-level data mask great variation within countries in terms of the specific populations who access various types of ECEC services.

Figure 18. Early childhood education attendance rates



Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

145. High-quality ECEC is associated with positive outcomes for children, but identifying causal impacts of ECEC programmes on early and later outcomes is challenging. Part of the variation in ECEC experiences is related to variation in the family and home learning contexts: Families with higher incomes and more educated parents tend to use ECEC at higher rates than those with lower incomes and less-educated parents. These differences in participation arise, at least in part, because in many countries families must pay for ECEC programmes and higher-income families are able to invest more in ECEC participation. Higher-income families also tend to provide more stimulating and responsive interactions in the home learning environment (Burchinal et al., 2015[217]; Sylva et al., 2004[218]). Although these associations generally suggested that children with more advantages in the home environment will have more advantages in ECEC as well, evidence from Germany suggests that this association can work in the other direction: In areas with greater access to ECEC following a national reform, parents engaged in more cognitively stimulating and less passive activities with their children (Felfe and Lalive, 2010[219]).

146. Thus, it can be very difficult to know whether ECEC itself is associated with positive early learning outcomes, or whether it is the family and home environments of young children who attend ECEC that contribute to these outcomes. In reality, it is most likely to be a combination of both the home and ECEC environments (as well as other settings) that matters most for children; however, in this section we focus on the effects of ECEC in particular, highlighting the research designs that make this focus possible. We also give particular attention to questions about ECEC quality as well as children's

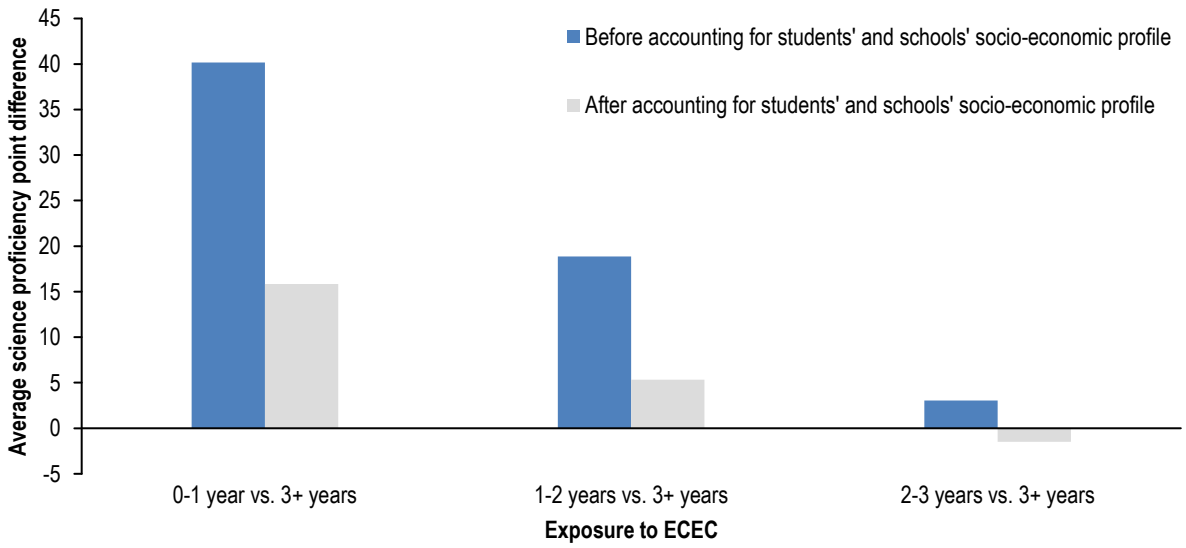
exposure to ECEC programmes, in terms of duration and intensity, to elucidate ways in which ECEC matters for early learning.

147. Although there are many studies of ECEC participation, there are no international data on ECEC and early learning outcomes. However, the Programme for International Student Assessment (PISA) assesses students at age 15 and also asks the students and their parents about participation in ECEC (both duration and intensity) as young children. We include analyses of the PISA 2015 data throughout this section to provide some context for how ECEC is associated with later academic achievement in an international context. In these analyses we largely rely on students' science proficiency scores, which was the academic domain of focus in PISA 2015.

148. The findings from PISA are valuable to inform multi-national conversations and learning on this topic, but as with many other studies these findings cannot address causal links between ECEC and later academic achievement. In addition, students participating in PISA in 2015 attended ECEC settings between 2000 and 2005: The landscape of ECEC services has shifted to varying degrees across participating countries in the intervening time. For this reason, the PISA data cannot be assumed to generalise to current ECEC contexts. Further, PISA relies on student and parent recall of ECEC experiences that occurred a decade (or more) before the time of the survey. Thus, although the PISA data currently represent the only international information available on individuals' ECEC experiences and later learning outcomes, the results from these analyses must be interpreted cautiously.

149. Nonetheless, the PISA data contain unique information about ECEC experiences and later learning outcomes from representative samples of students from 72 countries/economies. As such, the PISA data represent an important source of information about potential associations between ECEC and later academic achievement. Results from PISA underscore the importance of accounting for children's family and home environments, notably family socioeconomic status, to understand potential implications of ECEC attendance. For example, Figure 19 shows that the association between length of exposure to ECEC and children's science proficiency looks quite impressive when family socioeconomic status is not included in the model. However, this association drops substantially once family socioeconomic status is taken into account. These results indicate that family socioeconomic status and participation in ECEC are not independent: That is, the association between duration of ECEC experiences and students' academic performance is largely moderated by family background.

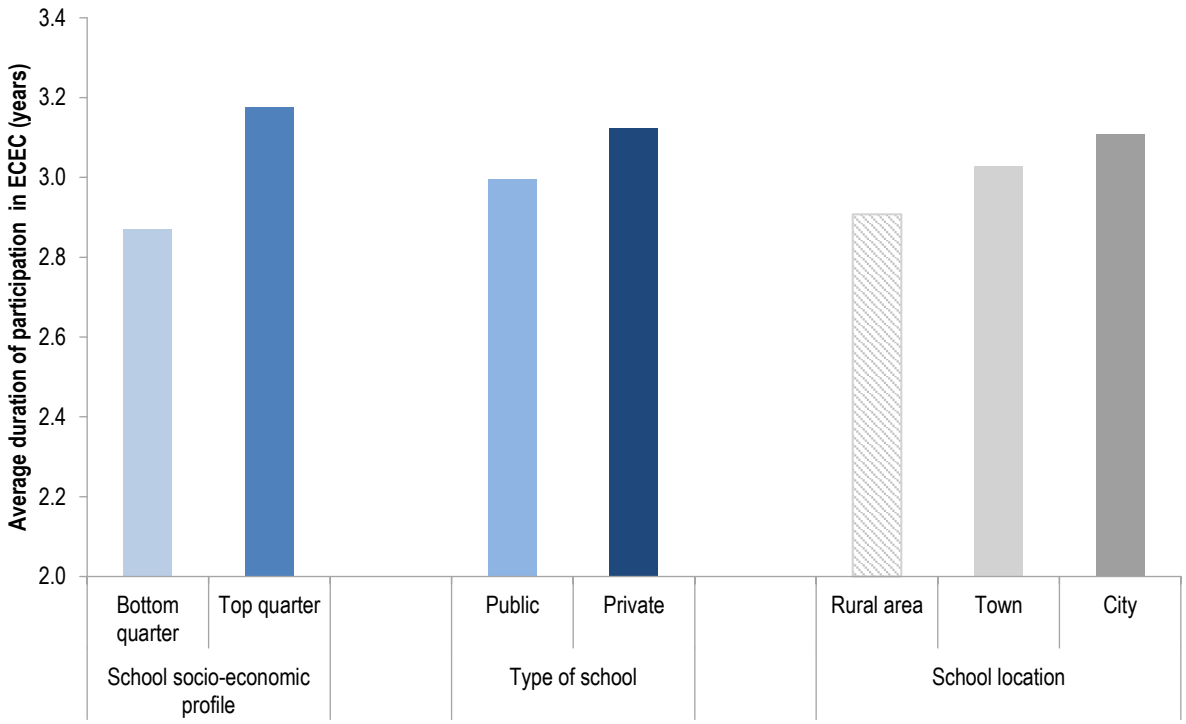
Figure 19. Association between ECEC attendance and science proficiency before and after accounting for socioeconomic background



Source: OECD (2017[214]), *Starting Strong 2017: Key OECD Indicators on Early Childhood Education and Care*, http://dx.doi.org/10.1787/9789264276116-en.

150. Along these same lines, across OECD countries, the average duration of ECEC attendance is associated with characteristics of students' schools at age 15. Specifically, schools that serve a greater proportion of high socioeconomic status students, private schools and schools in urban areas tend to have students who participated in ECEC for more time than schools that serve fewer high socioeconomic status students, public schools and schools in rural areas, respectively (Figure 20). This demonstrates that participation in ECEC is associated with a number of factors - including characteristics of secondary schools - that can also contribute to students' outcomes. Findings from England further support this idea of the importance of schooling contexts: Disadvantaged children who attended schools with more able peers were more likely to escape poverty as adults (Blanden, 2006[134]). Further, being part of a class with strong learning outcomes in the first year of primary schooling was associated with individual achievement at age 16 (Tymms, Merrell and Bailey, 2017[90]). In addition, family socioeconomic status may account for both the average duration of ECEC attendance and the types of schools that students attend.

Figure 20. Differences in duration of ECEC participation by school characteristics



Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

High-quality ECEC programmes can have enduring, positive effects

151. Despite the difficulties of understanding the impacts of ECEC on children's outcomes due to the overlap with family background and characteristics of later schooling, there is a large body of research that addresses these challenges to identify the role of ECEC for early learning and beyond. Much policy interest in ECEC has stemmed from impressive results from just two long-term, experimental studies of ECEC programmes in the United States. The programmes are the Perry Preschool Project and the Abecedarian Project. The Perry Preschool Project was implemented in Michigan in the 1960s and involved 123 low-income African-American children. Of these children, 58 were randomly assigned to receive a high-quality pre-school programme as well as home visits. The Abecedarian Project was conducted in North Carolina in the 1970s with 111 predominantly African-American children in poverty. Fifty-seven of these children were assigned to receive high-quality childcare beginning in infancy and continuing through entry to primary school.

152. Although each of these two projects involved a small number of children, they are notable to policymakers for two reasons. First, the programme interventions were completed in early childhood, but the children have been followed into adulthood: the Perry Preschool study participants were assessed at age 40 and the Abecedarian study participants were assessed in their mid-30s. Both programmes continued to show positive effects of participation decades after the interventions ended. Second, the programmes were studied using an experimental design, with random assignment of children to the treatment and control groups. This research design allows strong conclusions about the

causal effects of these early childhood programmes on outcomes later in life—although the study participants had many additional experiences between early childhood and the assessments in adulthood, the one factor that systematically distinguishes them is their status in the treatment versus control groups.

153. The Perry Preschool and Abecedarian programmes provided high-quality, intensive services to families, and had impacts across a range of domains, including better physical health, stronger social and emotional skills, reduced joblessness and criminal offences, as well as higher educational attainment and earnings. Cost-benefit analyses across these myriad outcomes suggest that, despite the fact these two programmes were expensive to implement, the returns on those investments are substantial—around USD 7 in societal returns for each USD 1 invested (García et al., 2016[38]; Heckman et al., 2010[7]; Karoly, 2017[220]). The range of impacts across domains of adult outcomes in combination with the economic benefits of these programmes frames the promise of ECEC.

154. Yet, despite the many strengths of the Perry Preschool and Abecedarian programmes (e.g. high-quality ECEC and strong intensity of exposure to the programmes) and the advantages of the research designs (e.g. experimental, long-term), these programmes involved a very small number of children in very specific geographic, cultural and historical contexts. Do more recent investments in different contexts live up to the promise of ECEC?

What do recent studies of ECEC tell us?

155. In 1998 the United States Congress mandated an impact study of Head Start, a programme that serves more than 800 000 low-income 3- and 4-year-olds and their families throughout the United States. Head Start is a two-generation programme, serving both children and their parents, with a focus on health and general well-being. Although the programme continues to take a comprehensive, whole-child approach, the 1998 legislation requiring an impact study also designated "school readiness" as the primary goal of Head Start. On average, Head Start centres are of higher quality than privately-run ECEC centres (Currie, 2007[221]).

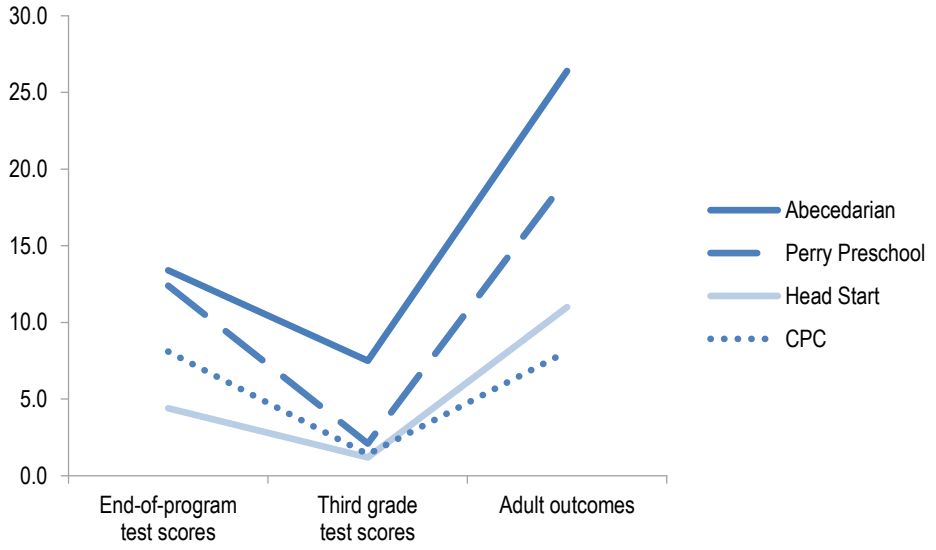
156. In response to the Congressional mandate, the Head Start Impact Study (HSIS) began in 2002 and included 4 667 children who were randomly assigned to participate in Head Start or to be in the control group. Thus, although the HSIS cannot yet provide the type of long-term follow-up that makes the Perry Preschool and Abecedarian programmes findings so exciting, it can offer insight into the power of ECEC for a broader range of children in more recent historical context. Children generally attended Head Start centres for half-days, on average 25 to 28 hours per week. By the end of 1st grade, children who attended Head Start showed stronger language skills than their peers in the control group; however, additional positive effects that were evident at kindergarten entry did not persist through the end of 1st grade (U.S. Department of Health and Human Services, 2010[222]).

157. Even more recently, the United States state of Tennessee used random assignment for its pre-kindergarten programme in 2009 to 2011 when more families wanted to enrol in the programme than the state could accommodate. Using a subset of these children, researchers found significant benefits of participation at the end of the programme, but by the end of 3rd grade these advantages were no longer evident. In fact, maths skills were lower at the end of 3rd grade among children who had participated in the pre-kindergarten programme (Lipsey, Farran and Hofer, 2016[223]). These findings, along with the HSIS results at first grade, suggest potential "fadeout" for the effects of ECEC

programmes. Notably, however, the Perry Preschool findings suggest standardised tests did not detect benefits of programme participation in primary school, but nonetheless the programme improved outcomes in adulthood (Schweinhart, 2003[224]).

158. It is too soon to say if recent, larger-scale ECEC programmes like Head Start and Tennessee pre-kindergarten might have similar long-term effects; however, correlational studies that look at Head Start participation, as well as participation in another high-quality ECEC programme in the United States (Chicago Child-Parent Center Program; CPC) suggest that fadeout of the association between ECEC participation and elementary school test scores may not be meaningful for adult outcomes. In fact, it appears that adult earnings are better predicted by test scores at the conclusion of these ECEC programmes than by test scores in elementary school (Figure 21). Findings from EPPSE show a similar pattern of results, with strong educational and economic outcomes for children who attended ECEC programmes (compared to those who did not attend) despite fadeout in elementary school test scores; advantages were even more pronounced for individuals who attended very high-quality ECEC programmes (Cattan, Crawford and Dearden, 2014[225]). Further, as Figure 20 demonstrates, the schools children attend after ECEC are not all the same, and these schools undoubtedly contribute to student performance on achievements tests.

Figure 21. Predicted percentage effects on adult earnings of early childhood programmes, based on test scores versus adult outcomes



Note: Adult earnings effects are shown as predicted average percentage increase in earnings due to the programme, compared to expected earnings if the person had not participated in the programme. Tests used at the end of preschool (or beginning of kindergarten) and third grade were the same within programmes and reflect general cognitive skills. Adult outcomes represent a range of well-being indicators based on availability in each sample. CPC refers to Chicago Child-Parent Center Program.
Source: Reproduced from Bartik (2014[226]), *From Preschool to Prosperity: The Economic Payoff to Early Childhood Education*, http://research.upjohn.org/up_press/228/.

159. Experimental studies are quite expensive to conduct and can raise questions about equity given that some children are assigned to *not* receive an intervention viewed as beneficial. Natural experiments provide a strong alternative and have been used in many countries. One example of a natural experiment is to examine variation in timing of

implementing public ECEC programmes across geographic regions. This approach was used in Norway, where some municipalities expanded ECEC coverage more quickly than others following a national reform. Research comparing children in areas with expanded access to ECEC to those in areas with limited access to ECEC found that access to ECEC had positive effects on educational attainment and earnings (Havnes and Mogstad, 2011[227])[3]. Using similar methodology, ECEC has been found to have positive effects in various domains in the United States, England and Argentina (Berlinski, Galiani and Manacorda, 2008[228]; Cascio, 2009[229]; Dodge et al., 2017[230]; Fitzpatrick, 2008[231]; Blanden et al., 2014[232]). Nonetheless, follow-ups at age 11 in England are consistent with the experimental findings that academic benefits of access to ECEC may dissipate as children move through the educational system (Blanden et al., 2014[232]).

160. Findings from the expansion of universal ECEC in Québec, Canada paint a somewhat different picture. In this case, other Canadian provinces were used as a control group, because the ECEC expansion occurred only in Québec. Results suggest that expanded access to ECEC in Québec led to greater maternal involvement in the labour force, but children's early outcomes were adversely affected relative to their peers in other provinces (Baker, Gruber and Milligan, 2008[233]; Lefebvre, Merrigan and Roy-Desrosiers, 2011[234]). A meta-analysis which included these findings from Canada as well as natural experiments in six other countries underscores the complexity of interpreting these results: Taken together, evidence on the impacts of universal ECEC for children's outcomes is mixed. However, the meta-analysis concludes that universal access to ECEC is beneficial to socioeconomically disadvantaged children and that the quality of ECEC programmes is of paramount importance (van Huizen and Plantenga, 2015[235]).

161. Further, understanding the process of scaling-up ECEC programmes is important. Sure Start is an English initiative intended to serve all families with young children in specific, disadvantaged communities and aims to support children's health and development. Initial evaluations of Sure Start compared communities where the programme had been implemented with communities awaiting implementation: Results were mixed but suggested negative effects of programme availability for the most disadvantaged families (Belsky et al., 2006[236]). However, a study on the implementation of Sure Start revealed that variation in the services provided by programmes was associated with outcomes for children and programmes were not always fully operational within their first three years (Melhuish et al., 2007[237]). Importantly, subsequent evaluations of Sure Start, after the programme was better established in communities, suggest it is positively associated with outcomes for young children (Melhuish et al., 2008[238]). This carefully documented example of large-scale programme implementation demonstrates that policies and programmes can take time to reach their intended targets and evaluation efforts must account for this.

162. Another alternative to experimental study designs is the use of regression discontinuity designs (RDD). This research approach takes advantage of age-based eligibility restrictions for participation in ECEC programmes. For example, in the United States, children in the state of New Mexico are eligible to attend pre-kindergarten

[3] Analyses conducted for this study controlled for a wide range of family characteristics, including parents' birth cohort, their education, their age at first birth, the number of older siblings, relocation between municipalities, children's sex and immigrant status and municipality-specific fixed effects.

beginning in September if they are 4-years-old as of August 31 (Hustedt et al., 2010[239]). The principle underlying RDD is that a child who turns 4 on August 31 and a child who turns 4 on September 1 are very similar in terms of developmental stage, but the first child will have the chance to attend pre-kindergarten a year earlier than the second. Using this approach, several studies in the United States find positive effects of pre-kindergarten on children's cognitive skills (Gormley, Phillips and Gayer, 2008[240]; Hustedt et al., 2010[239]; Wong et al., 2008[241]).

163. Alternative approaches to evaluating ECEC that are not experimental but are nonetheless more rigorous than correlational research (e.g. using instrumental variables) find positive effects of ECEC in the United States, Germany and Uruguay (Berlinski, Galiani and Manacorda, 2008[228]; Felfe and Lalive, 2010[219]; Figlio and Roth, 2009[242]). Findings from Denmark suggest, however, that the role of ECEC may depend on the type of programme in which children participate, and that overall ECEC in this country is not closely linked with outcomes during primary school (Datta Gupta and Simonsen, 2010[243]; Datta Gupta and Simonsen, 2011[244]). This type of finding suggests that the quality of programmes and the intensity of children's exposure to the programmes may contribute to the pattern of results; however, outside the contexts of randomised control trials, it can be very difficult to fully understand or account for variation in programme quality or intensity.

164. Studies using observational data and conventional multivariate regression analysis tend to show that ECEC enrolment generally yields positive effects on cognitive development (Kaspar, 2010[245]). A large volume of studies from the NICHD SECCYD, show positive effects of ECEC participation on different measures of cognitive achievement that persist into elementary school (NICHD Early Child Care Research Network and Duncan, 2003[246]; NICHD Early Child Care Research Network, 2006[247]; NICHD Early Child Care Research Network, 2005[248]). Further, findings from the EPPSE Project reveal that experience in ECEC has positive effects on students' academic success through age 16, and having attended a high-quality ECEC programme was especially meaningful for social and emotional skills at age 16 (Cattan, Crawford and Dearden, 2014[225]; Sylva et al., 2014[189]).

165. Yet, findings from large-scale studies also reveal that despite improvements in school readiness, ECEC attendance is linked with increases in externalising behaviours and lower self-regulation in primary school (Belsky et al., 2007[249]; Magnuson, Ruhm and Waldfogel, 2007[250]; Sammons et al., 2003[251]). Although the cognitive gains may fade in elementary school, the behavioural problems seem to persist. While concerning, it must be noted that academic gains were better sustained among children from disadvantaged families, suggesting that even if these students are not catching up with their more advantaged peers, ECEC may be important for ensuring the gaps between more and less affluent students do not increase across elementary school. Further, the EPPSE findings reveal that the negative link between ECEC and behaviour problems was reduced when accounting for ECEC programme quality and duration, suggesting that ECEC need not lead to adverse behavioural outcomes.

166. There is a great deal of variation in the findings linking ECEC participation and children's outcomes. Given this variation, additional attention is needed to understand when ECEC is most valuable, what types of programming provide high-quality ECEC and for whom—we address these questions in more detail in the next section. Following that discussion we address myriad factors that may contribute to variation in results

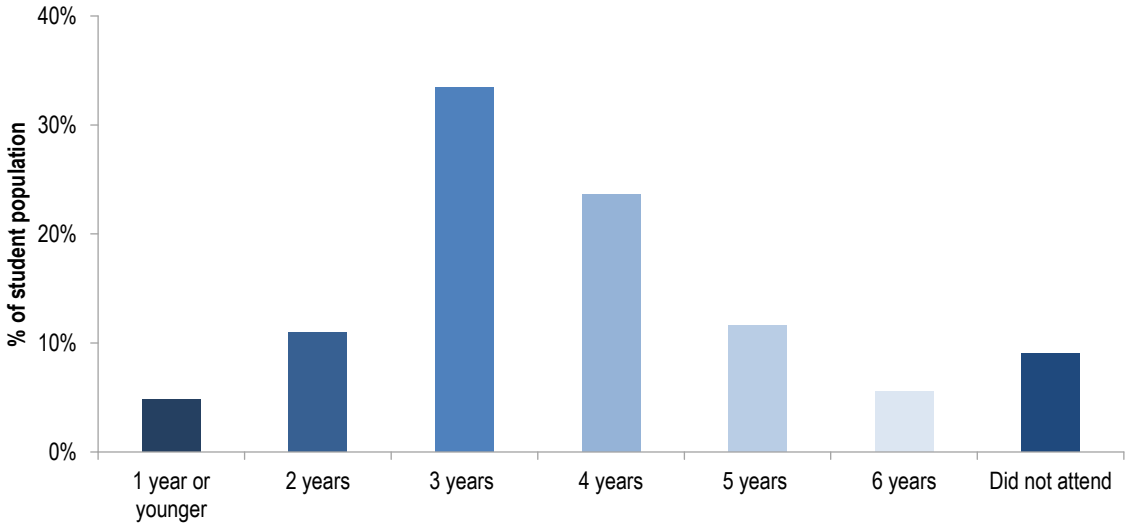
across studies, most notably the quality of ECEC available to families and the intensity of children's exposure to ECEC programmes.

Is ECEC more effective for some children than for others?

167. Given that ECEC participation is often viewed by policymakers as a means of increasing educational and social equity across groups of children, understanding whether ECEC is more effective for some children than for others is very important. Research has examined whether the age at which children begin participation in ECEC is associated with their early learning and subsequent outcomes, as well as whether family socioeconomic status, children's migration status, language background and gender make a difference.

168. Infants and toddlers (from birth through age 2) have very different developmental needs than 3- and 4-year-olds (who in turn have different developmental needs than older children). Accordingly, ECEC programmes must provide different supports for children of different ages. Across OECD countries, a minority of children begin ECEC before the age of 3 (Figure 22) (OECD, 2017[214]).

Figure 22. Age at which students started ECEC

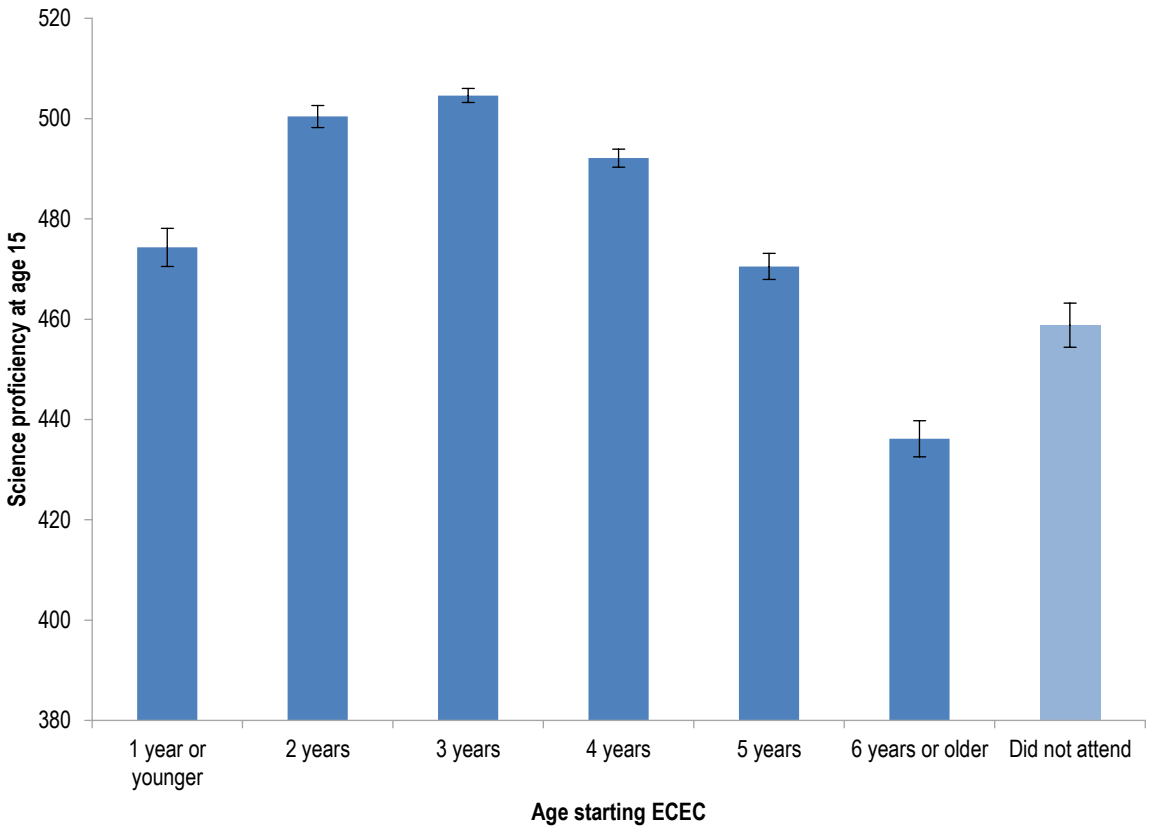


Note: Students represented in this figure were born in 2000, meaning that ECEC participation occurred between 2000 and 2006. As noted in Figure 17, participation rates of young children in ECEC have increased in the intervening years.
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

169. The clearest evidence that ECEC is beneficial for children comes from studies of 3- and 4-year-olds. For younger children, there is some indication that ECEC may not be uniformly positive, particularly related to the emergence of behaviour problems (NICHD Early Child Care Research Network and Duncan, 2003[246]; NICHD Early Child Care Research Network, 2005[248]; NICHD Early Child Care Research Network, 2006[247]). Based on data from PISA, age of entry into ECEC appears to be associated with students' academic achievement at age 15: Children who begin attending ECEC at age 3 demonstrate stronger skills in science compared with children who begin ECEC much

earlier or much later (Figure 23). The pattern of findings is the same when considering reading and maths skills at age 15 as well.

Figure 23. Age starting ECEC and science proficiency at age 15



Note: Black bracketed lines represent the standard error of the proficiency estimates. The standard errors are smaller when the proficiency estimates are based on a larger sample of 15-year-olds, such as among those who started ECEC at 2, 3 or 4 years of age. The standard errors are larger when the proficiency estimates are based on a smaller sample of 15-year-olds, such as among those who did not attend ECEC or started at 1 year or younger or at 5 years or at 6 years or older.
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

170. Along these lines, children in the EPPSE study showed stronger cognitive skills at school entry if they started ECEC before age 3, although no additional benefit was found for children starting ECEC before age 2 (Sylva et al., 2004[252]). The benefits of these levels of exposure to ECEC programmes extended through the end of compulsory schooling (Sammons et al., 2014[253]). Similar results were found in France (Filatriau, Fougère and Tô, 2013[254]). However, a meta-analysis of the effects of duration of ECEC attendance across countries suggests duration of participation is not a key determinant of children's outcomes (van Huizen and Plantenga, 2015[235]). Aggregate-level data, such as those in the meta-analysis and those presented in Figure 23, may conceal important differences across countries. Specifically, the typical starting age of ECEC is likely important to consider: In countries where ECEC systems are designed to support the needs of very young children, early participation in ECEC may be beneficial. Given that

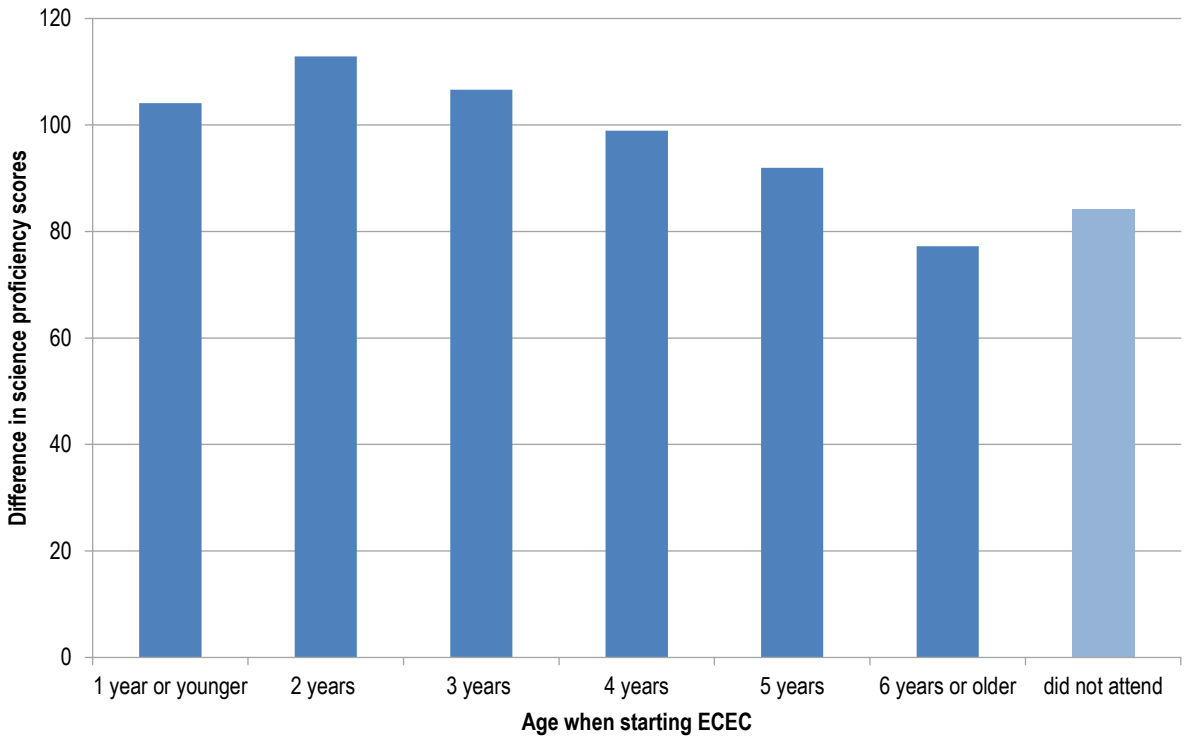
across countries it is most common for children to begin ECEC at age 3, it is possible that many systems are not equipped to provide ECEC services for younger children, contributing to the non-linear trend in Figure 23.

171. In addition to age of entry to ECEC, family socioeconomic status can shape how ECEC participation contributes to early learning and later outcomes. A number of correlational studies suggest that children from lower socioeconomic status families experience particular benefits from participation in ECEC programmes, relative to their peers from higher socioeconomic status families (Kaspar, 2010[245]; Ladd, 2017[255]; Sylva et al., 2004[218]). Notably, these findings often suggest that ECEC participation is especially beneficial for children from disadvantaged families, but that it does not necessarily close the gap in later outcomes between children from low and high socioeconomic status families (Schoon, Cheng and Jones, 2013[256]).

172. Most of the randomised control trials of ECEC participation targeted only disadvantaged children and families, making it hard to assess the importance of family socioeconomic status in the causal link between ECEC participation and children's outcomes. However, one study that attempted to estimate the causal influence of ECEC participation on educational attainment in Uruguay found initially small positive effects, which grew over time, increasing years of completed schooling by 0.8 years by age 15. These effects were stronger for children from disadvantaged contexts (Berlinski, Galiani and Manacorda, 2008[228]).

173. Results from PISA 2015 across OECD countries suggest the association between age of entry to ECEC and science proficiency at age 15 is fairly similar for students from different levels of socioeconomic status (Figure 24). Importantly, findings from PISA highlight the stratification of academic achievement by socioeconomic status regardless of length of exposure to ECEC programmes. Figure 24 reveals that participation in ECEC does not close the academic performance gap between advantaged and disadvantaged students, even when accounting for the duration of exposure to ECEC (i.e. age of entry to ECEC): Students from higher socioeconomic status households outperform their peers from lower socioeconomic status households. The reasons for these performance gaps are not evident in the PISA data, but likely include aspects of home learning environments as well as aspects of the ECEC environments, such as the quality of ECEC programmes, that also vary with families' socioeconomic status. Differences in the quality of later schooling and community experiences of these youth from different socioeconomic backgrounds could also play a role in keeping or intensifying early gaps between these groups.

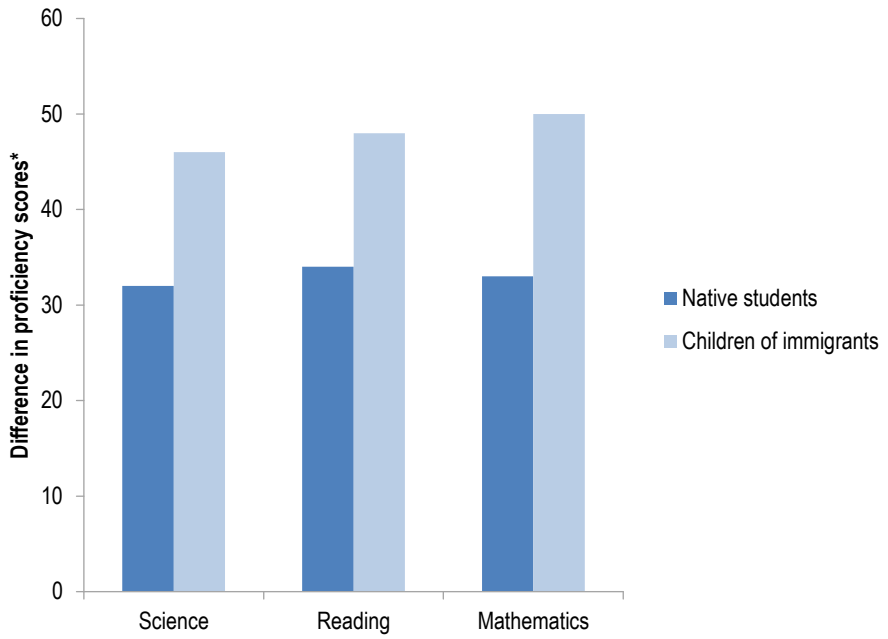
Figure 24. Difference in science proficiency for students from high versus low socioeconomic status households, by age starting ECEC



Note: High and low socioeconomic status households represent those in the top and bottom quarter, respectively, based on their socioeconomic profiles.
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

174. Children from families where the language spoken at home is different from the language of schooling may incur particular benefits from ECEC participation (Burchinal et al., 2015[217]). Migration status may be an indicator of children's status as dual language learners, and immigrant families also are less likely to access ECEC programmes than are native families (European Commission/EACEA/Eurydice/Eurostat, 2014[11]). PISA results show that the gains in science proficiency at age 15 from beginning ECEC at age 3 versus age 5 are greater for children of immigrants compared with children of non-immigrants (Figure 25).

Figure 25. Differences in proficiency scores among students that started attending ECEC at ages 3 and 5, by immigration status



Note: *Difference in proficiency scores among students that started attending ECEC programmes at age 3 in comparison with those that started attending at age 5.
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)*(database), http://www.oecd.org/pisa/data/2015database/.

175. Gender also may have implications for how children experience ECEC. During infancy, on average, boys tend to display greater negative emotionality and have somewhat more difficulty regulating emotions than girls (Leaper, 2002[257]). Datta Gupta and Simonsen (2011[244]; 2010[243]) find that publicly financed, home-based day-care in Denmark has negative effects, at least in the short term, on non-cognitive skills among boys (but not girls) of less-educated mothers. However, findings from PISA show that the association between science proficiency at age 15 and age of entry to ECEC is similar for boys and girls.

Why is there so much variation in the results of studies on ECEC and children's outcomes?

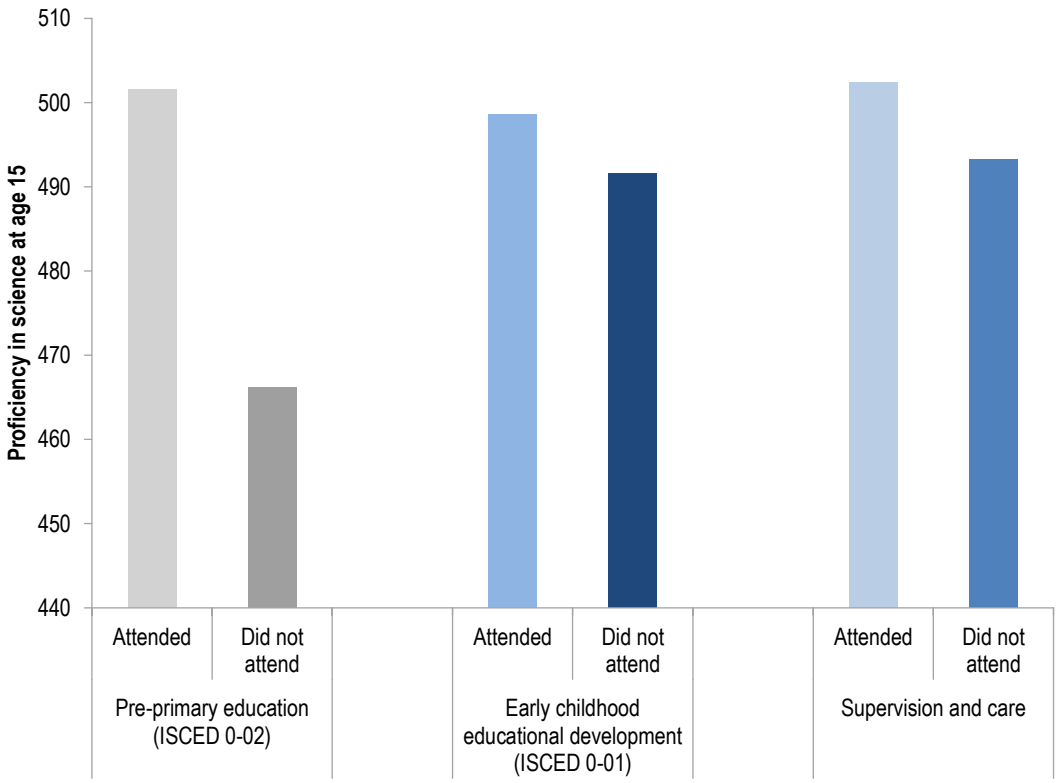
176. Overall, research findings show that participation in ECEC can be beneficial for children's early learning and later outcomes. Yet, some studies show more promising results than others, and questions about the type of ECEC programmes, when children attend these programmes and for whom ECEC is most important are not fully resolved. Differences in study methodology can explain some, but not all, of the varying results in the literature. Many differences in outcomes of ECEC participation may hinge on the type of ECEC programme, children's exposure to these programmes, the quality of the programmes, as well as the cultural and policy contexts in which the programmes operate.

177. ECEC programmes differ from one another along a variety of dimensions, with the age of children served being one key distinction. The different needs of young children at different ages are recognised in the International Standard Classification of

Education (ISCED) levels to some extent: ISCED Level 0-01 programmes ("early childhood educational development") are for children younger than 3 and ISCED Level 0-02 programmes ("pre-primary education") are targeted to children at age 3 until entry to primary school (ISCED Level 1). ISCED does not classify programmes that provide only supervision and care, without an explicit educational component, although many young children in both age groups participate in such programmes.

178. Looking at data from PISA, participation in any type of ECEC provided a boost to students' science achievement a decade later, but students who did not experience pre-primary education (ISCED 0-02) appeared to have a relative disadvantage (Figure 26). ISCED 0-02 programmes have clear educational components that are likely to align more closely with the academic outcomes measured in PISA than ISCED 0-01 or supervision and care programmes. Thus, it is not surprising that participation in ISCED 0-02 programmes is most strongly associated with students' science proficiency at age 15.

Figure 26. Science proficiency scores by attendance in different types of ECEC settings



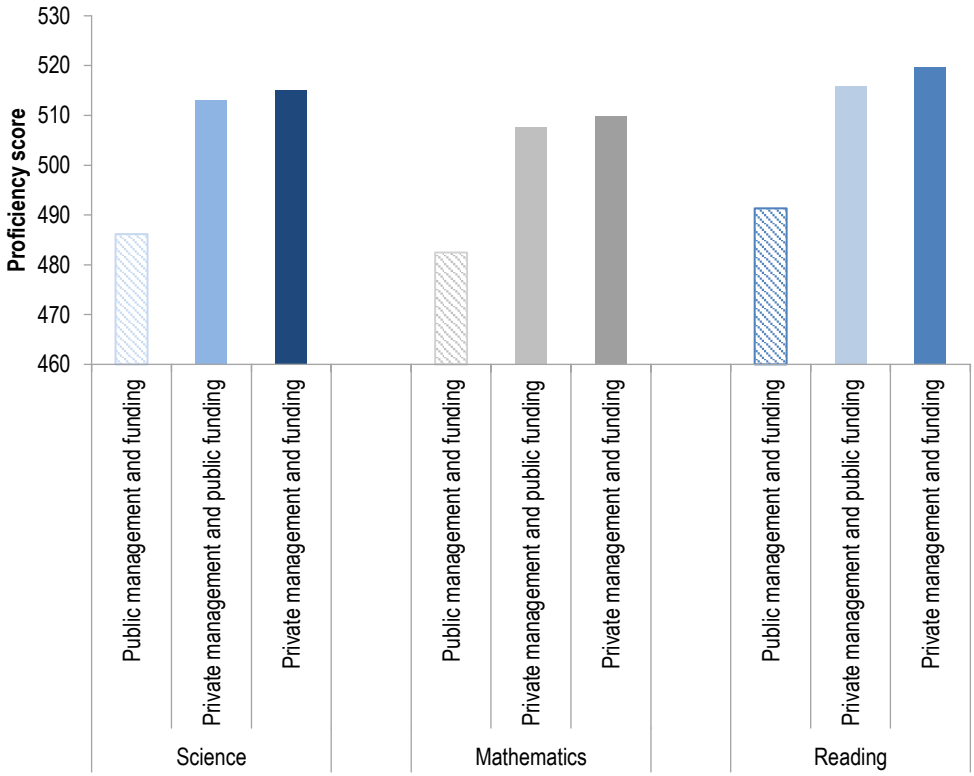
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

179. In most OECD countries, ECEC programmes are more commonly provided by public than by private institutions, especially in the case of kindergartens or preschools (OECD, 2017[214]). Public institutions often charge lower fees than private institutions and are therefore of special importance for low-income families, who cannot afford to make large private contributions. However, private institutions can also receive—and may rely heavily on—public funding; in this case, the ECEC programmes provide private

management of public funds. These different funding and management models create different types of programmes.

180. Data from some countries suggest that publically funded programmes may have higher quality and produce better outcomes for children (Japel, Tremblay and Côté, 2005[258]; Magnuson, Ruhm and Waldfogel, 2007[250]; Melhuish and Gardiner, 2017[259]; NICHD Early Child Care Research Network, 2002[260]; Baker, Gruber and Milligan, 2008[233]). In contrast, findings from PISA reveal that, on average across OECD countries, children who attended publicly-funded and managed ECEC programmes demonstrated lower science proficiency at age 15 than their peers who attended privately managed programmes, regardless of funding source (Figure 27). It is important to remember that these data from PISA are drawn from student and parent reports of ECEC attendance, and as such are perceptions of the programme type rather than administrative data on the funding and management of ECEC programmes. Again, the PISA data cannot identify why publically funded and managed programmes might be less optimal for children than other settings, but these results from PISA may reflect that rapidly growing public systems can struggle to provide adequate quality, or that these programs may be disproportionately located in particular regions or serve particular segments of the population (e.g. highly disadvantaged families).

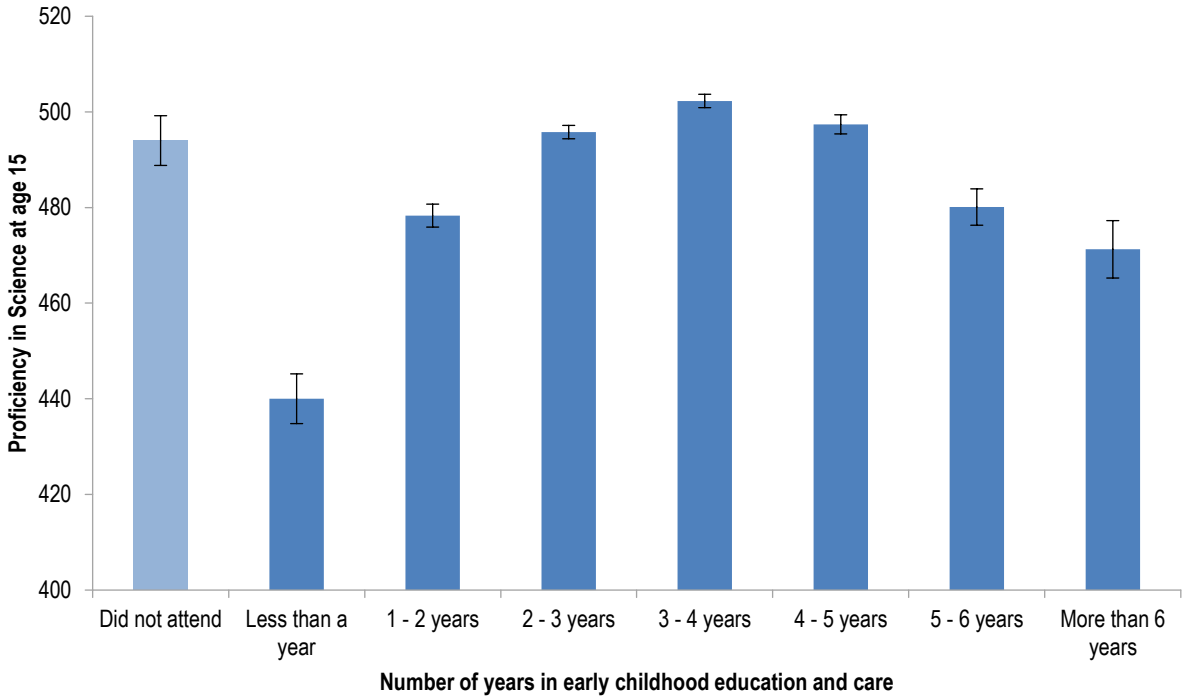
Figure 27. Differences in students' academic proficiency and type of funding of their pre-school institutions



Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

181. Another factor that can contribute to variation in findings is the duration of exposure children have to ECEC. PISA data suggest that the association between the duration of students' ECEC experiences (i.e. the number of years children spend in ECEC) and later academic performance is curvilinear: 15-year-olds who attended three to four years of ECEC show the strongest performance in PISA relative to students who attended ECEC for a shorter or longer duration (Figure 28).

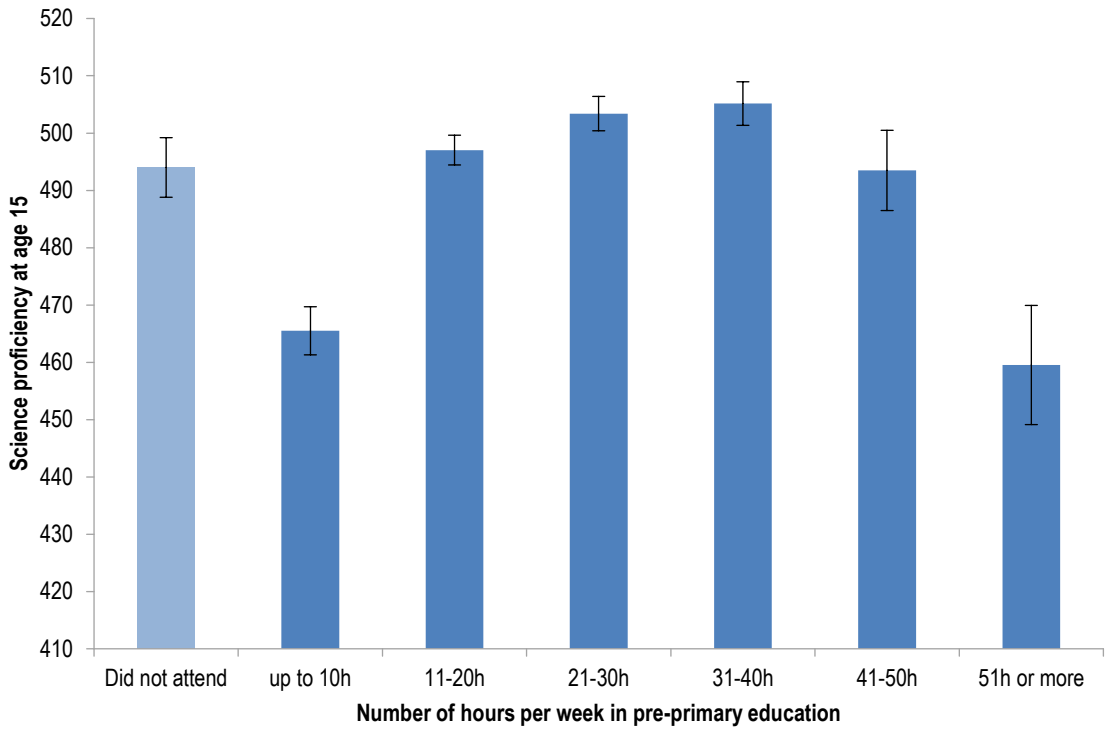
Figure 28. Relationship between duration of ECEC attendance and proficiencies at age 15



Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

182. In addition to variation in duration of exposure to ECEC in terms of years, frequency or intensity of children's ECEC attendance during any given week also varies —some children spend only a few hours per week in ECEC whereas others are in ECEC while their parents work full-time. Across OECD countries, the association between the intensity of ECEC participation, expressed in hours per week children spent in ECEC, and their science proficiency at age 15 is also curvilinear (Figure 29). For ECEC programmes to matter for academic achievement in adolescence, it appears that children need to participate fairly regularly. Yet, spending large quantities of time in ECEC each week may be less optimal for children—in other words, just like in the case of duration of ECEC experience, more is not always better (NICHD Early Child Care Research Network and Duncan, 2003[246]).The ECEC reform in Québec may have incentivised placing young children into care for long hours (Lefebvre, Merrigan and Roy-Desrosiers, 2011[234]), potentially contributing to suboptimal outcomes for children discussed earlier.

Figure 29. Relationship between intensity of ECEC attendance and science proficiency at age 15



Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

183. Together, results from PISA show that larger quantities of ECEC experiences, in terms of both duration and intensity, do not straightforwardly translate into better academic achievement for students. The quality of ECEC programmes that children experience may matter most (OECD, 2018[261]).

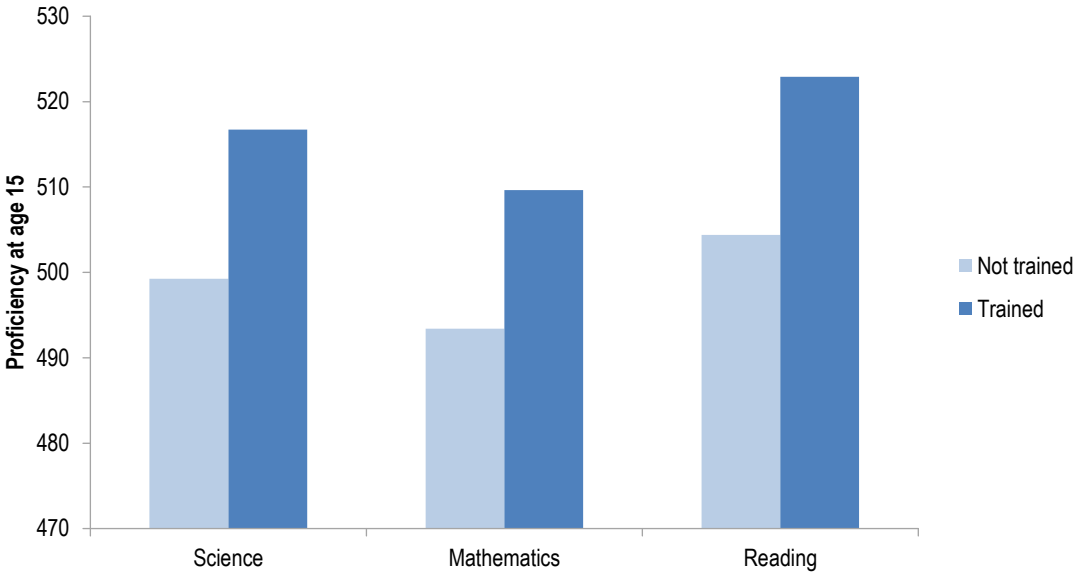
The quality of ECEC programmes makes a difference for early learning outcomes

184. Quality of ECEC programmes is multi-faceted. On the one hand, structural quality, comprising programme elements such as physical, human and material resources, are relatively straight-forward to regulate through policy and monitor through regular administrative data collections. On the other hand, process quality, comprising children's interactions with people, space and materials, can be more difficult to regulate and monitor but likely better reflects children's experiences in ECEC settings (OECD, 2018[261]). Structural quality is often considered a precondition for process quality. For example, in ECEC programmes with more educated teachers or with lower adult-to-child ratios (i.e. good structural quality), children may be more likely to have opportunities for warm and responsiveness interactions with their children (i.e. good process quality).

185. Perry Preschool and the Abecedarian Project provided very high-quality ECEC—both in terms of structural quality and process quality—and the project teams were able to closely monitor ECEC quality given the small number of participants. As ECEC programmes expand to serve more and more children, ensuring quality becomes more

challenging. One way that countries try to address quality in ECEC settings is by regulating structural quality, including the ratio of staff to children: Ensuring that teachers are responsible for a smaller number of children is considered one way to support teachers to provide individualised attention and relationship-based learning activities for young children (Pianta, Downer and Hamre, 2016[262]). Another facet of ECEC structural quality may be the education of ECEC programme staff. Staff with more training, education and experience may be better equipped to meet the demands of supporting early learning for a group of young children (Pianta, Downer and Hamre, 2016[262]). As Figure 30 shows, when parents reported that their children were cared for by trained staff, children demonstrated better science proficiency at age 15 as part of PISA.

Figure 30. Differences in proficiency scores at age 15 depending on staff training

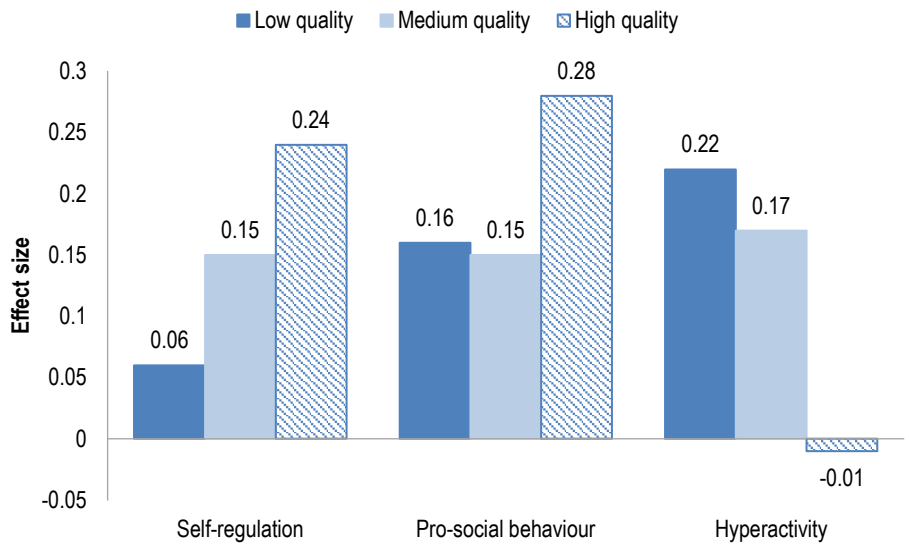


Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

186. Consistent with broad indicators of quality available in PISA, meta-analytical findings suggest that these indicators of structural quality are associated with stronger outcomes for children (van Huizen and Plantenga, 2015[235]). Moreover, a separate meta-analysis confirms that these aspects of structural quality are indeed associated with greater process quality in ECEC settings (OECD, 2018[261]). However, although some aspects of structural quality appear to be associated with children's outcomes, structural quality alone is generally not enough to ensure good process quality and strong outcomes for children (OECD, 2018[261]).

187. Although process quality data are generally not collected in routine or ongoing ways by governments, many studies examine this aspect of ECEC quality. For example, EPPSE found short-term effects indicating that ECEC attendance was beneficial for both cognitive and socio-emotional development, especially for children from disadvantaged backgrounds. However, the benefits persisted at age 11 only for those children who attended high-quality ECEC programmes—and associations between ECEC attendance and behaviour problems were not evident among children who attended high-quality ECEC programmes (Figure 31).

Figure 31. ECEC quality and outcomes at age 11 relative to children who did not attend ECEC



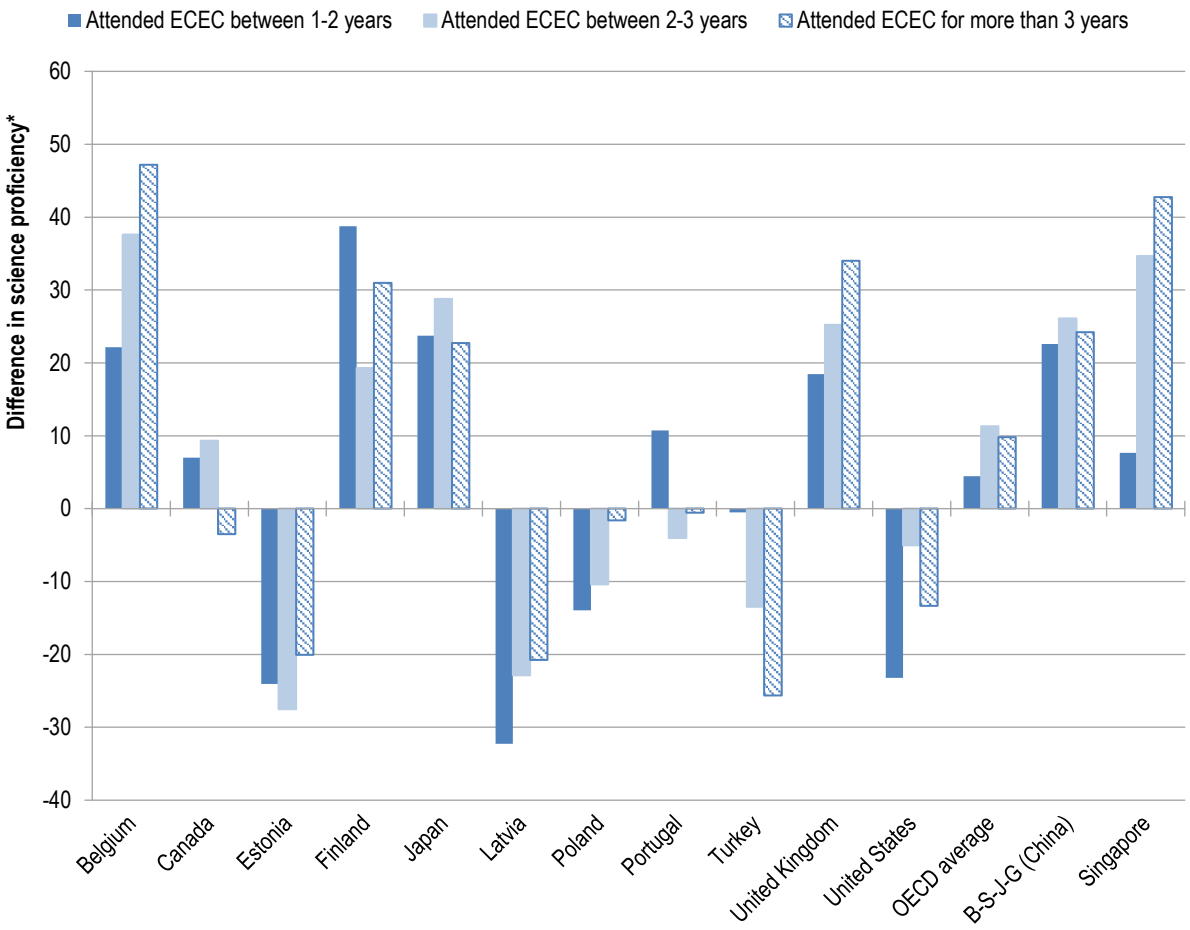
Note: Effect size compares the relative strength of different factors that influence children's literacy proficiency at age 5. It is expressed in the units of standard deviations where an effect of 0.1 is relatively weak, one of 0.40 is moderately strong, and an effect of 0.70 is strong.
Source: Data from Sammons et al. (2008[263]), *Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11): Influences on Children's Development and Progress in Key Stage 2: Social/behavioural Outcomes in Year 6*, Department for Children, Schools and Families.

188. In addition to general measures of quality that are typically used for regulation and for research, ECEC programmes—even those of high quality—can be very different from one another. Reynolds (2012[264]) suggests five mechanisms through which ECEC programmes may contribute to later outcomes: cognitive-scholastic advantage, family support behaviour, school quality and support, motivational advantage and social adjustment. High-quality ECEC programmes likely set children and families on a path to experience all of these advantages, but the relative emphasis placed on any one area can lead to variability in the advantages incurred from participation in one programme versus another. For instance, Perry Preschool and the Abecedarian Programme analyses show that the cognitive-scholastic advantage is a driving force for outcomes later in life, whereas analyses with cohorts from the Child-Parent Centres show that family support and school quality and support were key drivers of later outcomes (Reynolds et al., 2017[265]).

189. Finally, given that countries generally regulate many structural aspects of quality for ECEC, it is not surprising that national contexts also appear to matter for interpreting the effects of ECEC. Each country has a custom constellation of ECEC policies and institutions that offer distinct content and quality for young children and their families. To date, the bulk of the research on ECEC and outcomes is from England and the United States; however, results from PISA that control for family-level and school-level socioeconomic status suggest that the links between ECEC and science proficiency in these two countries differ, and that there is extensive variation across other countries as well (Figure 32). In addition to ECEC regulations, some of the variation across countries likely relates to differences in the average age of entry to ECEC, and whether national systems are sufficiently equipped to support very young children (i.e. infants and

toddlers) who participate in ECEC. As such, more research is needed to understand how the existing research base may or may not apply in international contexts, including how quality of programmes and duration and intensity of participation may differ across countries.

Figure 32. Relationship between ECEC attendance and science proficiency at age 15 across countries



Note: *Differences in comparison with students that did not attend ECEC.
Source: OECD (2016[216]), "2015 Reading, Mathematics and Science Assessments," *Programme for International Student Assessment (PISA)* (database), http://www.oecd.org/pisa/data/2015database/.

Community context matters for young children, parents and ECEC programmes

190. Children, families and ECEC programmes are all situated in a broader community context. Despite the increasing importance of virtual connections to work, school and family, local contexts continue to have a central role in individuals' everyday lives, including in early childhood.

191. Community characteristics contribute to children's well-being, although the exact mechanisms through which this occurs are not always clear, neighbourhood associations with parenting and with ECEC services are both meaningful (Leventhal, Dupéré and

Shuey, 2015[266]). Once again, the interrelatedness of all of these experiences for individual children makes it difficult to identify the causes of individual outcomes. Nonetheless, growing up in poor communities appears to have multigenerational ramifications beyond the role of individual family socioeconomic status: Parents' exposure to neighbourhood poverty as children is associated with their children's cognitive development (Sharkey and Elwert, 2011[267]).

192. Findings from one of the few experimental studies to examine neighbourhood effects on children and families indicate that neighbourhood poverty is particularly important during early childhood (Chetty, Hendren and Katz, 2016[268]). The Moving to Opportunity for Fair Housing Demonstration (MTO) began in five urban areas in the United States in the 1990s by randomly assigning low-income families who were living in social housing in high-poverty neighbourhoods to one of three groups: (1) receive housing vouchers to move to lower poverty neighbourhoods; (2) receive traditional housing vouchers to move to any neighbourhood of their choice; or, (3) serve as an in-place control group.

193. Results from follow-ups with these families 10 to 15 years later found that adults who moved to lower poverty neighbourhoods had better health outcomes than those who remained in high-poverty neighbourhoods; however, positive outcomes for children were not uniformly observed in the survey data (Ludwig et al., 2012[269]; Sanbonmatsu et al., 2011[270]). Yet, research using linked administrative data (e.g. tax records) shows that children who were young when their families moved to lower poverty neighbourhoods benefitted from the moves in terms of educational attainment and income. In contrast, moving neighbourhoods was not beneficial for teenagers' longer-term outcomes, highlighting the importance of community contexts for young children (Chetty, Hendren and Katz, 2016[268]).

194. The community context also matters for families and the home learning environment. Consistent with research on the associations between family economic hardship and parental well-being and behaviours (Conger and Donnellan, 2007[197]), neighbourhood poverty is associated with adults' well-being and parenting, with implications for young children (Ludwig et al., 2012[269]; Shuey and Leventhal, 2019[271]). For example, in a nationally representative Canadian sample, a pathway was identified from neighbourhood disadvantage to young children's behaviour problems via maternal depression and punitive parenting behaviours (Kohen et al., 2008[272]).

195. Further, resources available in the community can support early learning in multiple domains. For example, access to parks and playground equipment is associated with children's levels of physical activity (Bradley, 2015[273]), although mothers' concerns about neighbourhood safety can limit the extent to which they allow their young children to spend time in these outdoor settings (Kimbro and Schachter, 2011[274]). Along these lines, access to community resources like museums, libraries and other cultural opportunities is associated with early learning, but participating in these out-of-home activities is also highly correlated with having more stimulating materials at home (Bradley, 2015[273]).

196. The community context also is associated with aspects of ECEC. Ideally, the location of ECEC programmes will correspond to the location of young child populations, but as demographics shift across communities and countries the available supply of ECEC may not adequately meet families' needs (Goerge et al., 2007[275]). In addition, government funding for ECEC programmes is not distributed evenly across geographies, meaning that some communities have greater or lesser access to publicly-funded ECEC

(National Survey of Early Care and Education Project Team, 2016[276]; Vandenbroeck, 2015[277]). Publicly-funded programmes often are targeted to areas with concentrations of poor children, and public investments in ECEC may have the greatest benefits for children in disadvantaged neighbourhoods (Figlio and Roth, 2009[242]). On the other hand, market forces may lead to a greater availability of private ECEC in more affluent communities. Indeed, high-quality ECEC appears to be more prevalent in more advantaged neighbourhoods (Hatfield et al., 2015[278]). Thus, children's neighbourhood context is likely to shape their families' access to desirable ECEC programmes.

197. Beyond these immediate contexts that are of importance for young children and early learning, communities transmit broader societal and cultural norms and experiences. These include norms around maternal employment and the types of ECEC that are valued for young children, and also extend to stereotypes and biases among individuals in the community as well as at an institutional-level. Mass-trauma experiences such as war, political conflict, terrorism and natural disasters also are influential in young children's broader community context (Masten et al., 2015[279]). Although these aspects of the community may not be of primary interest when considering the contexts of early learning, it must be noted that these contexts matter for young children, their families and their ECEC settings.

Towards better information on early learning

198. The research reviewed throughout this paper is clear: Early learning matters. Moreover, early learning can be supported and strengthened through contexts where children spend much of their time, specifically the home and ECEC programmes. The importance of early learning, as well as inequalities in children's access to high-quality early learning environments, make data on early childhood experiences essential. By understanding children's early learning outcomes at the start of primary school, parents, teachers and policymakers will be better positioned to identify best practices and policies to support learning and well-being in early childhood and beyond.

199. To be informative to policy and practice, data on young children's experiences need to be comprehensive, in-depth, informed by multiple perspectives and timely. Data from PISA provide a unique opportunity to examine the implications of early learning for students in adolescence with an international sample; however, these data are retrospective and as such can only provide rough approximations of early childhood experiences. Moreover, students participating in PISA in 2015 were 5-years-old in 2005, meaning that the international context of ECEC participation has shifted substantially since the time these students were early learners (see Figure 17).

200. Ideally, data on early childhood would be collected in early childhood, both to include direct assessments of children and also to reduce the bias of students' and parents' retrospective reports. This approach would allow for better quality data and for more comprehensive information to be collected from children, parents and teachers. Although PISA has limited information on the role of participation in ECEC programmes for students' later achievement, there are currently no international assessments of the early learning home environment. Thus, even with numerous studies from multiple countries suggesting the importance of the home learning environment during early childhood, no international metrics exist to identify how families engage in early learning or how policies can best support families and ECEC settings to strengthen early learning.

201. IELS addresses this gap in the field by collecting internationally comparable information on young children's early learning outcomes, as well as information on key contexts of early learning. By developing a shared language to learn about the diversity and complexities of early learning experiences across countries, IELS aims to create opportunities for countries to learn from one another. Although specific goals of early childhood will vary across cultures, countries share common goals of supporting young children's well-being in the present and helping them to be engaged citizens in the future. IELS collects information directly from 5-year-olds, their parents and teachers to generate a broad picture of early learning within and across countries.

Assessment for learning

202. In recent years, curricular and learning standards have been embedded within a life-cycle or lifelong learning approach and a growing number of countries and regions

have started to frame learning as a continuum from early childhood through the final year of schooling. At these later stages of schooling, assessment of skills is generally evaluative of the students; however, student achievement is also used to reflect on the quality of teaching and the schools that students attend. Again, these assessments are often framed as evaluative and can have high-stakes for students, teachers and school administrators. One concern around conducting assessments in early childhood is the potential for this downward extension of high-stakes evaluation.

203. ECEC practitioners, however, do commonly conduct assessments of children's learning and development as an integral part of their teaching (Barnett, Ayers and Francis, 2014[280]). These types of ongoing assessment do not resemble the standardised tests that are common for older students (e.g. PISA), but rather are part of ongoing interactions between children and teachers with educational materials. Similarly, primary school entry assessments are generally viewed as helping to tailor educational experiences to individual children, not as an evaluation of the child, the family or prior educational experiences (Barnett, Ayers and Francis, 2014[280]; European Commission/EACEA/Eurydice/Eurostat, 2014[11]). Thus, a rich array of information on the outcomes of early learning exists, but it is not in a format that allows compilation across jurisdictions.

204. Just as the goal of ongoing assessment of early learning is for staff to reflect on their practices and consider what supports individual children may need, compilation of data at a systems level can serve a parallel function. That is, by conducting international assessments of early learning, countries will have an opportunity to reflect on their own strategies to strengthen early learning, identify goals for ongoing systems improvements and learn from policies and practices in other countries. The variation across countries in policies can provide important opportunities for understanding what pieces of a system are working and what pieces may need improvement.

205. For example, findings from the United States sometimes fail to show an association between the child-adult ratio in ECEC settings and measures of process quality or children's outcomes. These null findings are generally hypothesised to be associated with the relatively low variability in child-adult ratios across settings within the United States. This assumption is supported by international PISA data, which shows greater variability in this structural dimension of ECEC quality across countries (OECD, 2018[281]). This demonstrates the importance of comparable international data to inform individual country policies and to give needed context to research studies coming from a single country.

206. An additional benefit of early learning assessments at an international level is to build confidence in the quality of definitions and monitoring regimes to contribute to ongoing improvements in the quality and effectiveness of policies aimed at strengthening early learning. As the use of ECEC programmes by families and related policy interest in them has grown, a number of countries have expanded the type of monitoring and data collection undertaken. As in the schooling sector, some of this expansion is related to a trend towards increasing devolution of responsibilities to regional, state and local levels (Morris, 2011). Further, national ministries have increased the requirements on local governments to actively manage ECEC provision and have provided a greater array of frameworks and tools to assist in this. Yet, questions remain about which of these strategies are most effective and whether the data collection efforts can adequately inform directions for ongoing improvements.

207. Early learning assessments offer opportunities for system changes to happen more quickly, rather than waiting until later in the schooling process to understand how students are faring. The rapid pace of change in ECEC systems also requires regular assessments to ensure effective, high-quality services are reaching all children, and particularly children from the most vulnerable families.

Robust, developmentally-appropriate assessments of early learning are possible

208. The array of research linking early learning with outcomes later in life demonstrates that valid and reliable assessments of early learning are possible. Moreover, assessments of early learning can be conducted responsibly, using developmentally-appropriate strategies. Just as early learning is not simply a downward extension of later learning, measurement of early learning is not simply a downward extension of measurement at later stages of life. Because early behaviours and skills do not have a one-to-one correspondence with later stages of development, it is necessary to understand which early outcomes serve as building blocks or precursors for later outcomes.

209. The case of literacy is a clear example of change and continuity across development: As described in the longitudinal literature review, early language skills predict literacy skills in primary school and beyond. Even before birth, a developing foetus can recognise familiar voices and specific speech sounds (Decasper et al., 1994[282]). Throughout infancy, children's comprehension of language grows and their own production of speech (through babbling) begins to acquire the sounds of their native language even before they are producing recognisable words (Campbell, 2006[283]).

210. Although distinct from literacy, these early language abilities form the foundation on which literacy develops (National Early Literacy Panel, 2008[284]). Students must learn to identify letters and decode text, but children who know the meaning of a word are more likely to be able to read it and understand it in context, once decoding skills are in place (Snow et al., 1995[285]). Early childhood is a time of rapid growth in language skills, occurring both through a combination of innate human tendencies to acquire language and through exposure to language in the environment (Rogoff, 2003[18]). Thus, although literacy per se may not be a goal of early childhood in most societies, measuring children's language skills in early childhood is a strong predictor of later literacy (Parsons et al., 2011[37]; Schoon et al., 2015[36]).

211. Development in other domains follows similar trajectories, with early learning forming requisite foundations for developing more specific competencies later in life. Some aspects of early learning are further challenging to measure because of young children's emerging abilities to report on their own feelings, experiences and behaviours. For instance, older children and adults can report relatively reliably on their life satisfaction or general well-being, among other domains, with easily administered survey items. In contrast, for young children these types of outcomes are generally captured, albeit less specifically, by observations of children and reports from adults on behaviours across situations. Further, as the developmental trajectory of language and literacy described above suggests, young children can be limited by their expressive vocabularies if presented with the types of questions about well-being asked of older individuals.

212. These circumstances generally lead to larger measurement error and lower reliability and validity for any single measure of early learning outcomes, compared to similar measures for older children and adults. As such, measuring early learning typically depends on a blended approach to assessment that draws on information obtained directly from children, in addition to observations and reports from

knowledgeable adults. The exact blend of different types of measurements from different reporters depends on the goals of assessment and also on practical constraints, such as the amount of time required from any participant. Young children, who are still developing different aspects of their self-regulatory abilities, have shorter attention spans than older individuals: To obtain valid information from young children, assessments must be shorter than those that older children and adults may be willing to complete.

213. Finally, skills across domains can be thought of as either constrained or unconstrained. Constrained skills are those like knowledge of the alphabet that are finite and are typically easily assessed. In contrast, unconstrained skills are those such as reading comprehension that require broad applications of knowledge and are more limitless than constrained skills (Paris and Paris, 2007[286]). Unconstrained skills can be more difficult to measure than constrained skills, although the former are generally more closely associated with longer-term outcomes than the latter (Snow and Matthews, 2016[287]). Further, unconstrained skills are acquired gradually over time, drawing on learning in multiple areas, including constrained skills. For this reason, assessment of young children requires drawing on a range of constrained skills as well as unconstrained skills to understand the foundational knowledge young children have acquired.

What early learning outcomes are included in IELS?

214. Given the importance of unconstrained skills, like knowledge of vocabulary, IELS focuses heavily (although not exclusively) on these types of skills, rather than on skills that are typically taught in early schooling. In addition, a focus on concepts rather than rote knowledge more broadly reflects early learning across cultures: In many countries, young children are not expected to acquire early academic knowledge (e.g. knowledge of the alphabet) but foundational early learning is occurring. The general principle of focusing assessment on unconstrained, conceptual skills is applied across four domains in IELS: Emergent literacy skills, emergent numeracy skills, self-regulation and social and emotional skills. These early learning outcomes reflect domains that are consistently measured in existing research as well as specific aspects of social and emotional skills (i.e. empathy and trust) that are of noted importance but that are less often assessed with young children.

215. Emergent literacy and emergent numeracy, which have a long history of measurement in early childhood, are nonetheless assessed in IELS using innovative, play-based methods. The emergent literacy assessment of IELS includes phonological awareness (a constrained skill) and vocabulary and listening comprehension (unconstrained skills). IELS does not address children's knowledge of print but rather focuses on pre-literacy skills that lay the foundation for acquiring literacy skills throughout schooling. Similarly, IELS emphasises simple problem solving and the processes of applying concepts and reasoning in the assessment of emergent numeracy. For instance, by having children move objects between plates to apportion them evenly, the assessment addresses children's reasoning with numbers. Parents and teachers also respond to survey questions assessing children's emergent literacy and numeracy skills.

216. Self-regulation is a complex construct that blends many skills. Inhibition (or inhibitory control), mental flexibility (or ability to shift attention) and working memory appear to play a fundamental role in shaping children's abilities to engage successfully in both cognitive and non-cognitive tasks. As such, all three of these aspects of self-regulation are included in IELS as part of the direct assessment with children. Raver and Blair (2016[17]) use the example of learning to play a new game to illustrate the

importance of these skills: to learn the rules of the game, children need to hold new information in mind (working memory), flexibly focus attention on important aspects of the game (e.g. strategies used by other players) and inhibit responses (e.g. waiting for one's own turn). This array of behaviours becomes integrated as children get older, but each of these smaller components plays a fundamental role in how young children experience and engage with their environments. As with emergent literacy and numeracy, children participate in play-based assessments whereas parents and teachers also provide insight on children's self-regulation skills via questionnaires.

217. Social and emotional competence, including co-operation, independence and connection, is one behavioural result of the integration of more specific self-regulatory skills. Children who display greater social and emotional competence early in elementary school have an easier time building relationships with teachers and peers and also perform better academically relative to children with weaker social and emotional skills (McClelland et al., 2007[288]). Parents and teachers participating in IELS provide reports of children's prosocial behaviours as well as their co-operation and connection with peers. These specific behaviours suggest general social well-being and can be considered a measure of how well children apply self-regulatory skills across contexts.

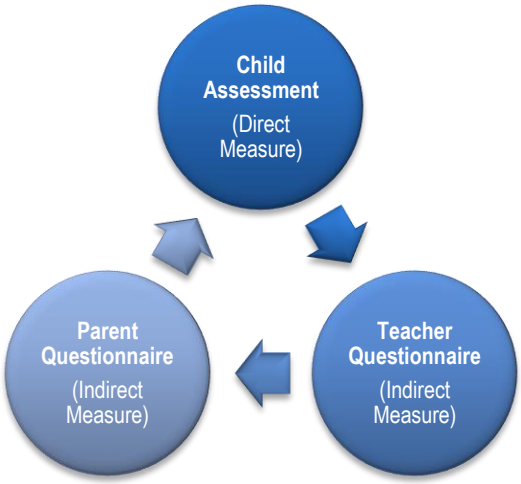
218. Social and emotional skills may look very different from the cognitive skills traditionally assessed in educational settings (e.g. literacy and numeracy), but these skills involve cognitive components. For instance, empathy can be considered to comprise three components: sharing of another person's emotional state, explicit understanding of another person's emotional state and prosocial behaviours that follow (Dadds et al., 2008[289]). Affective empathy involves the emotional response children have in response to someone else's situation; that is, one's own experience of the feeling another person is experiencing. In contrast, cognitive empathy refers to children's ability to take the perspective of someone else, thereby understanding another person's feelings. Affective empathy emerges very early in life—it is even observable in infancy—whereas cognitive empathy relies on perspective-taking skills that develop throughout early childhood. Both affective and cognitive empathy are necessary to engage in prosocial behaviour in response to another person's emotional state.

219. Like empathy, trust is multi-faceted and comprises both emotional and cognitive components. Trust in early childhood weaves together children's early experiences and opportunities to develop consistent and predictable relationships (e.g. attachment to caregivers) and their ability to extend these experiences into new relationships. Trust in others is connected to children's emotional health and experience of social relationships (Rotenberg, Macdonald and King, 2004[290]) and is also connected to learning: Children have selective trust in informants and prefer to learn new information from trusted sources (Harris, 2007[291]). Once again, perspective-taking skills are critical for children to understand and interpret social behaviours in order to assess and feel trust in others.

220. Children participating in IELS respond to hypothetical (story) scenarios about empathy. Empathy represents a central aspect of children's emotional health and social well-being but has not previously been assessed in large-scale studies like IELS, mainly related to the challenges of assessing these early skills in a valid and reliable manner. IELS aims to expand the focus of children's well-being beyond early academic skills by developing innovative measures to assess empathy in early childhood. In addition, parent and teacher reports regarding children's prosocial behaviours contribute to a broad picture of early learning on social and emotional well-being in both home and school environments.

221. By collecting data from children, parents and teachers, IELS aims to triangulate across these measurement sources to provide a rich assessment of early learning (Figure 33). Parents and teachers respond to survey questions whereas children participate in an interactive tablet-based assessment in a one-on-one setting with a trained study administrator. The study administrator provides observations of children's focus and engagement during their time together (approximately 45 minutes on each of the two days). These various approaches capitalise on the strengths of different types of data and allow children the opportunity to be active participants in helping countries understand how to support early learning.

Figure 33. IELS triangulation across measurement sources



A holistic approach to assessing early learning

222. The robust associations among home environments, ECEC experiences and broader community contexts described throughout this paper suggest that no single context can or should be solely accountable for early learning outcomes. Yet, together these contexts have an obligation to help children develop their interests and skills to optimise their experiences as young children and to set them on a path towards well-being and success in the future. Unfortunately, data collection efforts often focus on evaluating particular programmes for cost-effectiveness, rather than benchmarking the system of supporting early learning as a whole. International data collection focused on assessing early learning provides an opportunity to take a system-wide perspective, recognising the many contexts that, in combination, contribute to early learning.

223. ECEC is a notable context of early learning for policy purposes because, as recent government investments show, it is a context that is particularly amenable to policy intervention. That is, governments have clear authority to provide educational experiences to its youngest citizens and to implement programmes to encourage labour force involvement, such as childcare for parents of young children. In contrast, the home learning environment has received somewhat less policy attention in recent years, perhaps because the policy levers are less distinct when it comes to answering questions like: What helps or hinders families to provide a rich early learning environment?

224. The success of ECEC programmes that foster parents' participation (see Love et al., (2005[209]); Reynolds and Robertson, (2003[210]); St Pierre, Layzer, and Barnes, (1998[211]); Moran, Ghate and Van Der Merwe, (2004[206])), as well as home visiting and other programmes to support parents, demonstrate that programmes and policies targeting the home learning environment are possible and can be effective.

225. Children do not grow up experiencing one environment at a time: They are embedded in families and communities that provide varying supports and access to quality ECEC and other resources to promote children's well-being. Moreover, the interrelated nature of family socioeconomic status, features of the home learning environment, access to high-quality ECEC programmes, community contexts and quality of later schooling mean that children face constellations of risk or protective factors (Schoon, Cheng and Jones, 2013[256]). Thus, multiple policy levers are needed to address early learning at home, in ECEC, and across the two, as well as more broadly in community systems. To be informative and beneficial to countries, any international assessment of early learning must acknowledge the complexity of these overlapping contexts and include assessments that address these contexts.

226. IELS is addressing the multiple contexts in which early learning occurs. Parents are key respondents for much of this information, although teachers provide important details as well. Specifically, parents report on the type and quantity (i.e. hours per week) of ECEC participation their children had during each year of early childhood (birth through age 5). Parents also respond to questions about the home learning environment and the types of activities in which their children engage. In addition, parents answer questions about the resources available in their neighbourhoods as well as their perceptions of safety. Parents also provide information on their household socioeconomic resources. Teachers provide information about themselves, permitting an understanding of some aspects of the schools or programmes where children are enrolled at age 5.

227. Across countries participating in IELS, children are in different school or ECEC settings at age 5. The age-based approach allows countries a common point of comparison for understanding care routines and home learning activities families use at this age, as well as developmental comparisons of children's early learning. However, other studies, notably the International Performance Indicators in Primary Schools (iPIPS), take a stage-based approach, assessing children at entry to primary school across countries, regardless of their age. Both approaches offer different advantages. The age-based approach of IELS is intended to provide countries with information on children's learning and well-being that is internationally comparable despite the great diversity and complexity of early childhood systems.

228. In sum, the goal of IELS is to provide a comprehensive, multi-method, holistic snapshot of early learning and child well-being across countries. The Study involves multiple respondents and investigates multiple contexts in pursuit of this goal. Countries set learning objectives for early childhood, consistent with children's right to education and nurturance (European Commission/EACEA/Eurydice/Eurostat, 2014[11]; Working Group on Early Childhood Education and Care under the auspices of the European Commission, 2012[14]). Assessment of early learning provides an essential opportunity to reflect on whether governments, communities, schools and families are supporting early childhood learning objectives as intended. Early childhood is a time of rapid growth, a life stage full of power and promise. As such, understanding how young children are faring is imperative to promote well-being in the present as well as in the future.

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Annex A. Longitudinal Studies

Europe

- Estonian Longitudinal Study: Intellectual Development of Children

  This study began in 1996 with 551 children (ages 0-1, 3, 4, 5 and 6) from Estonia.

- Individual Development and Adaptation Study

  This study began in 1965 with three cohorts (ages 10, 13 and 15) from the Swedish town of Örebro. Each cohort included approximately 1 100 students.

- Jyväskylä Longitudinal Study of Personality and Social Development (JYLS)

  This study follows nearly 400 members of grade 2 classrooms from a town in Central Finland. Participants were mostly born in 1959.

- Swiss Survey of Children and Youth, COCON (Competence and Context)

  This study includes 3 111 children from three cohorts (ages 6, 15 and 21) and is representative of the German- and French-speaking parts of Switzerland.

New Zealand and Australia

- Christchurch Health and Development Study

  This study follows 1 265 individuals born in mid-1977 in the Christchurch urban region.

- Dunedin Multidisciplinary Health and Development Study

  This study follows 1 037 individuals born in 1972-1973 in Dunedin.

- Mater-University of Queensland Study of Pregnancy

  This study began with 8 556 pregnant women at their first clinic visits in 1981.

United Kingdom

- Avon Longitudinal Study of Parents and Children (ALSPAC)

  This study began with more than 14 000 pregnant women and their partners in the Bristol area who were recruited in 1991-1992.

- British Cohort Study (BCS), 1970 Cohort

  This study follows more than 17 000 individuals born in a single week in 1970 in England, Scotland and Wales.

- Medical Research Council (MRC) National Survey of Health and Development (NSHD)

This study began with 5 362 individuals born in a single week in 1946 in England, Scotland and Wales.

- Millennium Cohort Study

  This study follows approximately 19 000 children born in the United Kingdom in 2000-2001.

- National Child Development Study (NCDS), 1958 Cohort

  This study follows more than 17 000 individuals born in a single week in 1958 in England, Scotland and Wales.

- Twins Early Development Study

  This study used birth records of twins born in the United Kingdom between 1994 and 1996 to recruit more than 15 000 pairs of twins for assessment, beginning at age two. The sample is representative of the United Kingdom population of twins.

United States

- Colorado Adoption Project

  This study began in 1975 with pregnant mothers who planned to place their children for adoption. The project collected data from these birth families and on 245 adoptive families, as well as a matched control group of parents raising their biological children.

- Early Childhood Longitudinal Study – Birth Cohort (ECLS-B)

  This study is of a nationally representative sample of approximately 14 000 children born in the United States in 2001.

- Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K)

  This study is of a nationally representative sample of approximately 22 000 children attending kindergarten in the United States in the fall of 1998.

- Fragile Families and Child Wellbeing Study

  This study follows a cohort of nearly 5 000 children born in large United States cities between 1998 and 2000. Approximately three-quarters of these children were born to unmarried parents.

- Fullerton Longitudinal Study

  This study was launched in 1979 and recruited 130 one-year-old children and their families from birth announcements in the Fullerton, California area.

- Hawaii Personality and Health Cohort

  This study originally collected data from 2 404 elementary school students in Hawaii between 1959 and 1967.

- Kauai Longitudinal Study

  This study began in 1955 with 660 pregnant women in Kauai, Hawaii.

- The Minnesota Study of Risk and Adaptation from Birth to Adulthood

  This study began in 1975 with 267 first-time mothers in their third trimester of pregnancy.

- National Longitudinal Survey of Youth (NLSY) – 1979

  This study follows over 9 000 individuals who were originally interviewed in 1979, when they were between the ages of 14 and 22.

- Panel Study of Income Dynamics (PSID)

  This study began in 1968 with a nationally representative sample of over 18 000 individuals. The study continues to follow these individuals and their descendants: In 1997, data were collected from over 3 500 children ages 0 to 12.

- Project Competence Longitudinal Study

  This study followed 205 children and their families recruited from urban school districts in the United States in the late 1970s.

- Study of Early Child Care and Youth Development (SECCYD)

  This study began in 1991 with more than 1 300 infants and their families from 10 locations across the United States.