Australian Government
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Literature review of the impact of early childhood education and care on learning and development

Working paper

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Authoritative information and statistics to promote better health and wellbeing

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Contents

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
AEDI	Australian Early Development Index
AEDC	Australian Early Development Census
COAG	Council of Australian Governments
ECEC	Early Childhood Education and Care
EPPE	Effective Provision of Pre-School Education
GDP	Gross Domestic Product
LDC	Long day care (Long Day Care)
LSAC	Longitudinal Study of Australian Children
NPV	Net Present Value
PISA	Program for International Student Assessment
PwC	Pricewaterhouse Cooper
SEIFA	Socio-Economic Indexes for Areas
UK	United Kingdom
USA	United States of America

Summary

During the past three decades, extensive literature has accumulated on the early years of life for children. Research findings unequivocally agree that these years are a critical period of intense learning for children which provides the foundation for later academic and social success. This review explores the literature on the complex relationship between developmental outcomes and attendance at early childhood education and care programs.

0–3 years: within a child care setting

- Attendance at child care in the first 3 years of life has no strong effects on cognitive and language development for children who are not disadvantaged at home, provided child care is of a high quality (CCCH 2007).
- Quality is key: poor quality child care was found to produce deficits in language and cognitive function for young children (Productivity Commission 2014).
- Studies on the impact of quantity of child care for 0–3 year olds were inconclusive. Some studies reported better intellectual development, improved independence and improved concentration and sociability at school entry; other studies reported lower-rated learning abilities and an elevated risk of developing antisocial behaviour in the future (Sammons et al. 2012; Sylva et al. 2010).
- Other reported benefits of attendance at high-quality child care include less impulsivity, more advanced expressive vocabulary, and greater reported social competence (Belsky et al. 2007).
- Children from disadvantaged backgrounds show the greatest gains from attending high-quality child care (Elliott 2006; Moore 2006).

3–5 years: within a preschool setting

- Stand-alone preschools and day care with preschool programs were both reported to promote cognitive and social development benefits, with evidence of improved performance in standardised tests in the early years of primary school (Warren & Haisken-DeNew 2013).
- Number of months of attendance at preschool is related to better intellectual development and improved independence, concentration and sociability (Sammons et al. 2012).
- Full-time attendance at preschool led to no more significant gains than part-time attendance (Sammons et al. 2012).
- Longitudinal studies have demonstrated the effectiveness of high-quality, focused preschool programs in reducing the effects of social disadvantage, developing children's social competency and emotional health, and preparing children for a successful transition to school. Benefits were optimised when children from different social backgrounds attended the same preschool program (Sylva et al. 2004).
- Children living in disadvantaged communities, those not proficient in English, and Indigenous children were identified as particularly vulnerable and most likely to benefit from high-quality preschool programs (Baxter & Hand 2013; Hewitt & Walter 2014).
- Programs aimed at increasing the attendance of these vulnerable children at preschool programs need to be culturally sensitive (Harrison et al. 2012; Mann et al. 2011).

1 Introduction

Research findings from the past decade unequivocally agree that the first years of life are a critical period of intense learning for children; these years provide the foundation for later academic and social success. It is clear that, although early experiences do not determine children's ongoing development, the patterns laid down early tend to be persistent, and some experiences have lifelong consequences. The value of investing to ensure that all children get the best start in life is increasingly evident to governments around the world. Key to this focus has been the acknowledgement that investment in the early years, in both time and money, has been shown to be far more cost-effective than investments made at any other time (AIHW 2011a, 2011b, 2012; Heckman & Masterov 2004; Keatsdale 2003; Moore 2006; Productivity Commission 2015; Silburn et al. 2011).

In particular, the experiences of children in early childhood education and care (ECEC) have received considerable focus, partly as a result of the increased uptake and also as a result of policy initiatives and investment in this area. Many of these policy initiatives were due to the desire to improve labour participation rates, particularly those of mothers, but the positive developmental and broader societal impacts of increased ECEC exposure have become increasingly apparent (PwC 2011, 2014; Productivity Commission 2015). The current desire for evidence-based policy and practice, as well as the ability to measure the effects of recent reforms in child care quality in Australia, have both provided impetus for this paper.

Priority areas for government

In Australia, the need to invest in early childhood was formally recognised in 2009 by the Council of Australian Governments with its endorsement of *Investing in the Early Years – A National Early Childhood Development Strategy* (COAG 2009). This strategy articulated a vision that, by 2020, 'all children have the best start in life to create a better future for themselves and for the nation'. This initiative is supported by a large body of research demonstrating that investing to support and strengthen all aspects of early childhood development brings long-term benefits to children over the course of their lives and to the whole community. It placed a high priority on developing an ECEC system that best meets the needs of key stakeholders, including children, parents, communities and employers.

All Australian governments have committed in recent years, under a series of national partnership agreements and reform initiatives, to increase children's participation in high-quality ECEC in the year prior to full-time schooling, with a specific focus on increasing participation of Indigenous and disadvantaged children.

As a result there have been a range of early childhood program and policy changes in Australia. Specifically targeted areas include universal access to high-quality ECEC, the implementation of quality standards for child care and its workforce, paid parental leave, and broader availability of family support and early intervention programs. The funding by successive governments of up to 15 hours of preschool a year under the National Partnership Agreement on Universal Access to Early Childhood Education to 2015 is one example of this recognition.

The National Quality Framework is being implemented in a way that is consistent with the National Partnership Agreement on the National Quality Agenda for Early Childhood Education and Care. The Australian Government has allocated $61.1 million over the 3

financial years to 30 June 2018 to support the regulation of child care and early learning services (ACECQA 2013, 2014; COAG 2009; COAG 2013; DPM&C 2015).

Other Australian Government reviews of and changes to the ECEC system during the past 5 years include:

- a review of the National Partnership Agreement on the National Quality Agenda for Early Childhood Education and Care, which is due to report in 2015
- a public inquiry by the Productivity Commission into child care and early childhood learning (Productivity Commission 2013, 2014, 2015)
- national service improvement initiatives, agreements and frameworks for measuring outcomes that have also been designed and implemented in the sector (COAG 2009, 2013).

The Australian Government's 2014 Commission of Audit report included recommendations to replace the child care rebate and child care benefit with a single, simpler, means-tested payment to families to help meet the costs of child care (National Commission of Audit 2014). These recommendations were implemented with child care payment reforms that were announced in the 2015 Budget: a new single means-tested Child Care Subsidy is set to begin on 1 July, 2017, which will replace the Child Care Benefit, Child Care Rebate, Special Child Care Benefit, and the Jobs, Education and Training Child Care Fee Assistance programs. A new subsidy to help pay for nannies and changes to the Paid Parental Leave Scheme were also announced (DSS 2015a).

The key rationales for government assistance to ECEC rely on the existence of community-wide benefits. Various studies (Bennett 2008; CCCH 2000; Hewitt & Walter 2014; Melhuish 2004; OECD 2006; PwC 2011, 2014; Zubrick et al. 2008) suggest these benefits stem from:

- the contribution to enhanced, healthy child development
- increased workforce participation of parents, with the potential to boost economic output and tax revenue, reduce long-term unemployment and reliance on welfare support, and promote social engagement
- equity of access to developmental opportunities during early childhood, which helps overcome disadvantage and its longer-term social consequences
- better transitioning of children into the formal education system
- reduced risk of harm to vulnerable children in the community.

Growth in child care: Government assistance and workforce participation

Child care is now an established part of Australian society: almost all of Australia's 3.8 million children aged 12 or under have experienced some form of ECEC (Productivity Commission 2015):

- From 2006 to 2011, there was an increase in the proportion of children using approved care in all ages from 0 to 12 (23.4% to 27.5%), with almost 6 in 10 (59.1%) 3 year olds attending child care in 2011 (DEEWR 2013).
- In 2012, around 19,400 child care and early learning services enrolled more than 1.3 million children in at least 1 child care or preschool program (comprising around 15,100 approved child care services and 4,300 preschools) (ABS 2011, 2013; Productivity Commission 2013, 2014).

The use of approved child care in Australia has increased substantially since the Australian Government first introduced financial assistance in 1972. In recent years, there has been a shift from informal care towards formal care (17% in 1999 to 22% in 2008) (ABS 2010; IBISWorld 2011), with the number of children using approved long day care (LDC) increasing by 39.5% from 2004 to 2012 (DEEWR 2013).

Government financial assistance has continued to fuel the uptake in child care in recent years, particularly in formal care. Since 2008, the Australian Government has subsidised 50% of out-of-pocket expenses up to a maximum limit for approved care. This increase is mainly due to an increasing proportion of children younger than 5 years attending LDC. This can, in part, be attributed to an increased labour force participation rate of women with young children. Given their typically greater role in caring for children (particularly younger children), access to affordable quality child care can be a more significant factor in workforce participation for women than men (ABS 2010, 2012; Baxter 2013, 2015; PwC 2011).

Measuring developmental outcomes: The Australian Early Development Census (AEDC)

The Australian Early Development Census (AEDC) is a national indicator of children's development as assessed by their teachers in their initial year of formal schooling (median age 5). The AEDC covers 5 developmental domains: physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communications skills and general knowledge.

The AEDC was developed in response to the need to measure how children are faring with respect to developmental outcomes as they enter the range of initiatives, services and systems being developed. It is based on the 2002 Australian Early Development Index (AEDI) that was, itself, based on the Canadian Early development Index (Brinkman 2010; Brinkman et al. 2014; Brinkman et al. 2013; Brinkman et al. 2010; Sayers 2008).

The first AEDI (now known as the AEDC) was conducted in 2009, and collected data on 261,147 children. In 2012, data were collected on 289,973 children. These figures represented 97.5% and 96.5% of the estimated eligible population respectively.

Overall, most Australian children are doing well developmentally: the prevalence of developmental vulnerability was 23.6% in 2009, and it reduced to 22.0% in 2012. While concentrated in the most disadvantaged group, these developmentally vulnerable children are found in all socioeconomic groups, and by number, apart from the top socioeconomic group, they are evenly spread across the other socioeconomic groups (AEDI 2013).

Cost benefit of ECEC

The Australian Government is the largest provider of child care fee assistance to support families, with outlays exceeding $5.5 billion a year and growing. It is therefore important that this expenditure achieves the best possible impact in terms of benefits to families and children as well as the wider economy (Productivity Commission 2015; PwC 2014). The stage-by-stage way in which a child's early capabilities lay the foundation for later capabilities in education and other domains of development has been well informed by the research of Nobel economics prize winner James Heckman (Heckman et al. 2012, Heckman 2006; Heckman & Masterov 2004). His human capital modelling based on the United States of Amercia's (USA) population data has been a major influence on the reappraisal of early childhood education policy that has occurred in most developed countries during the past decade. Heckman's findings indicate that programs that deliver on the key principles of

human growth and development in the early years of childhood offer the best returns on dollars spent on program development and implementation.

International cost–benefit research

Most of the international cost–benefit analysis literature on child care and on ECEC generally tends to focus on disadvantaged children. This is understandable given the greater impact on developmental and social outcomes this group tends to exhibit. Investing in disadvantaged young children promotes fairness and social justice and, at the same time, promotes productivity in the economy and in society at large. Early interventions targeted toward disadvantaged children have much higher returns than later interventions such as reduced pupil-teacher ratios, public job training, prisoner rehabilitation programs, tuition subsidies, or expenditure on police. Later interventions, although important, are considerably less effective if these early foundations are lacking (Heckman 2006; Silburn et al. 2011).

The majority of cost–benefit analyses have been applied where high-quality child care has been used as a form of intervention for disadvantaged families. A striking feature of these results is that the size of the accrued benefit far outweighs the cost of interventions, even considering a substantial margin for error. The applicability of these indicative savings to the general population is open to considerable doubt since much of the benefit in these studies of disadvantaged populations derives from reductions of negative outcomes such as crime, the need for remedial education, and unemployment. The incidence of these negative outcomes is significantly lower in the general population, and therefore the scope for savings is similarly dramatically reduced (Melhuish 2004; PwC 2014).

Australian cost–benefit research

There has been limited use of cost–benefit analysis to evaluate ECEC intervention programs in Australia. Recent work published by PricewaterhouseCoopers (PwC), has used economic modelling to address a significant gap in ECEC research in Australia on the value of ECEC investment to the economy (PwC 2014) in 3 key areas:

- the impact of an increase in mothers' labour force participation
- productivity impacts of children's attendance at quality ECEC
- the impact of increasing vulnerable children's attendance at ECEC.

The PwC modelling indicates that a total combined benefit for all 3 impacts would be an estimated $7.0–9.3 billion increase in Australia's gross domestic product (GDP) in net present value (NPV) terms (PwC 2014). The range is driven by two scenarios of productivity outcomes (low and high) that could be achieved from improving ECEC quality. Total GDP impacts by 2050 have been modelled and are summarised below:

- benefits of increased female workforce participation: $6.0 billion cumulative to 2050, or $3.7 billion in NPV terms
- benefits for children receiving a quality ECEC program: up to $10.3 billion cumulative to 2050 to $3.0 billion in NPV terms
- benefits of increased participation of vulnerable children: $13.3 billion cumulative to 2050 or $2.7 billion in NPV terms.

The authors note that there will also be costs to government in providing more ECEC services but that this will be offset by a number of financial benefits including:

- changes to taxes received from an increasing ECEC sector and the associated participation and productivity impacts
- a reduction in expenditure on unemployment and other government payments to parents once they enter the labour market
- a decrease in expenditure associated with remedial education, justice and health services as a result of improved education and life outcomes for vulnerable children.

Costs incurred will relate to increased use of child care by currently non-working mothers and by vulnerable children who do not currently attend child care. There will also be costs associated with increased regulatory activity to ensure that the child care that is provided is of high quality.

In considering both the costs and benefits to the economy, the net fiscal benefits for the 3 impacts discussed above is estimated to deliver an accrued cost saving of between $1.6 billion (low scenario) and $1.9 billion (high scenario) in NPV terms (PwC 2014). The modelling work highlights the long-term nature of the returns to society: the upfront costs to the taxpayer are far outweighed by the fiscal savings and revenue gains in the long term.

The PwC modelling drew on the benefits to costs ratios found in the highly intensive, highly targeted intervention programs such as the Perry Preschool programs and the Abecedarian project conducted in the USA in the 1960s and 1970s. PwC acknowledged that the contexts of these studies were different to contemporary Australia and that there were problems in applying these benefit to cost ratios to the overall modelling results (PwC 2014; Productivity Commission 2015).

The Productivity Commission's 2015 report on child care and early childhood learning also included consideration of the costs and benefits of ECEC. Key recommendations included changing the complex government assistance scheme into a single means- and activity-tested payment (or subsidy) to parents. They noted that the current complex tax and transfer system creates a strong disincentive for some parents to enter the workforce or increase their hours of work; the processes to assess quality of ECEC services were recognised as cumbersome, inconsistent, and costly to governments and providers.

The Productivity Commission (2015) estimated that more parents who are currently not working could be encouraged to enter the workforce. The report noted that enhanced workforce participation has many benefits to government, including increased economic output and tax revenue, reduced reliance on welfare support, and promotion of social engagement. These costs and benefits were not modelled or explored in further detail. The first-round GDP impacts (that is, ignoring any flow-on impacts on wages or ECEC fees) associated with the work force participation effects of the new child care subsidy were estimated to be around 0.1 per cent, or an additional $1.3 billion in 2013–14 (Productivity Commission 2015).

2 Methodology

Context

This review explores the complex relationship between attendance at ECEC and developmental outcomes for children. Current literature is evaluated for best practice with respect to both the impact of quality and quantity of ECEC on Australian children. The relationship between exposure to ECEC both in terms of length of time attending (in months) and intensity of exposure (in terms of hours attended per week) on school readiness and developmental outcomes in general is the main focus of this paper. Both Australian and international research are examined for lessons learnt and optimal levels of exposure to ECEC.

The effect of attendance at ECEC on children from socially disadvantaged backgrounds, Indigenous children, and children from non-English speaking backgrounds was investigated. These specific groups were identified for inclusion because the AEDC (and its precursor, the AEDI) indicates their vulnerability as does the volume of studies and published literature that examined these groups in particular.

Scope

ECEC covers the different models of care currently available in Australia. The most common models currently provided are formal services delivered outside of the home, including long day care (LDC), family day care, occasional care, outside school-hours care, and preschool. Given that most research and literature in this area is focussed on LDC and preschool, these are the models we focus on for the purpose of this review.

In considering the extensive research literature on ECEC, findings have been grouped according to the age of the children of interest. Given the differences in both the nature of provision of care and the nature of the findings, it is useful to distinguish between evidence involving the age range 0–3 years (predominantly in a child care setting) and the age range 3 years to school age (predominantly in a preschool setting).

Conceptual approach and criteria for including studies

The intent of this literature review is to summarise the existing literature on the relationship between attendance at ECEC and developmental outcomes for children. The review is limited to summarising the major findings and conclusions of the identified publications. Neither the method nor the design of each of the studies was evaluated for this report. A comprehensive evaluation of the studies identified is beyond the scope of this report; however, we acknowledge the need for future investigations to more comprehensively assess the reliability and validity of the results of the studies identified and summarised here.

The framework for the review consisted of identifying relevant studies in online databases and a range of relevant organisations websites (such as the Australian Bureau of Statistics (ABS), the Australian Institute of Family Studies, the Australian Research Alliance for Children and Youth, FLoSse Research, the Department of Social Services and the United Nations International Children's Emergency Fund). The Cochrane Database of Systematic Reviews, Google Scholar, Informit and PubMed were searched using terms relating to child care, preschool, developmental outcomes and school readiness. This search resulted in a list of 123 references, which were further reviewed for relevance to the research questions. The

final literature review list contained 105 articles published in English, with 4 publication dates from 1990s, and the rest published between 2000 and 2015. The criteria for inclusion of studies in the review are outlined below:

- The ECEC intervention must have begun during preschool years, that is, before compulsory schooling.
- The intervention was centre-based, as opposed to in-home, and focused on the promotion of child wellbeing and outcomes (centre-based care included child care centres, preschools, play schools and play groups).
- The evidence assessed linkages between participation in a program and outcomes (mainly developmental, cognitive, social outcomes).

Key research questions

The review provides a structured response to 3 key research questions:

- Does quality of ECEC affect developmental outcomes?
- Does quantity of ECEC affect developmental outcomes?
- Which groups of children benefit most from exposure to ECEC?

3 Does the quality of ECEC affect developmental outcomes?

Attendance at ECEC programs has been inextricably linked to developmental outcomes for children, both positive and negative. The literature demonstrates that the quality of the program can predict children's performance in cognitive and social assessments; indeed, quality has universal consequences for the child's development (NICHD 2003, 2008). Quality in ECEC is more significant than the expected influence on developmental outcomes of the amount of ECEC that a child experiences, stability of the arrangements (including staffing, hours and providers), and the types of care in which a child is enrolled.

The research is clear cut as to the importance of family characteristics for childhood learning and development. Household income, parental and particularly maternal education and the home learning environment are the strongest predictors of children's developmental outcomes. Most studies account for this in their design and analysis (see, for example Productivity Commission 2015).

What is quality in ECEC?

Quality in ECEC has been established by extensive research as including the following elements: group size, staff to child ratio, supervision level, teacher sensitivity, richness or quality of staff interactions, learning and emotional climate, curriculum content, and teacher or caregiver qualifications. There is little reliable evidence on the relative contribution that each of these makes to a child's developmental outcomes (Burchinal et al. 2009; CCCH 2006, 2013; Elliott 2006; Huntsman 2008; Productivity Commission 2014, 2015; PwC 2011; Schweinhart et al. 2005; Silburn et al. 2011).

The focus towards quality in ECEC services is also seen in the National Quality Framework that was established in 2012. This framework applies to most LDC, family day care, preschool or kindergarten, and outside schools hours care services. It includes a National Quality Standard, improved staff qualifications and educator-to-child ratios, an assessment and rating system, and a national learning framework. Services are assessed against the 7 quality areas of the National Quality Standard and are given a quality rating. The quality areas include educational program and practice, children's health and safety, physical environment, staffing arrangements, relationships with children, collaborative partnerships with families and communities, and leadership and service management (ACECQA 2013, 2014; CCCH 2013; DEEWR 2013).

Age-related benefits of ECEC

Age is the main factor affecting the type of formal ECEC services children attend. Children younger than 1 are the least likely to attend formal child care. This is supported by recent government policies such as paid parental leave and the baby bonus. Attendance rates at child care increase after the first year, peak at 4, and drop significantly once children reach school age. The vast majority of children aged 4–5 attend a preschool program, either at a stand-alone preschool or a preschool program in a LDC centre (Baxter 2013; Productivity Commission 2014).

For children aged 0–3 years

The evidence on child care in the first 3 years indicates that, for children who are not disadvantaged in their home environment, high-quality child care has no strong effects on cognitive and language development. In contrast, poor quality child care can produce deficits in language or cognitive development. Having nurturing, warm and attentive carers is the most critical attribute of quality in any child care setting, especially for younger children (CCCH 2007; Productivity Commission 2014).

There is also evidence that high levels of attendance at child care, particularly group care in the first 2 years, could elevate the risk for developing antisocial behaviour (Melhuish 2004). In the United Kingdom (UK) it was reported, however, that informal child care by relatives at a young age is associated with improved social development. There is some evidence that maternal employment and child care in the first year of life could also have negative effects on cognitive and social development (Melhuish 2004; Melhuish et al. 2006; Sammons et al. 2012; Sylva et al. 2004, 2010).

For children younger than 1, those from homes where the quality of care and the learning environment is below that available in child care are most likely to benefit from participation in child care (To et al. 2000). Although there may be some developmental benefits for other very young children from time spent in formal child care settings, there is also a potential for negative effects such as the emergence of behavioural problems later in childhood (Houng et al. 2011). These effects appear to be related to the age of the child at commencement of child care and the length of time the child spends in formal care (Kalb et al. 2014; Productivity Commission 2014).

There is some evidence of developmental benefits for children attending quality child care from about 1–3 years; although the evidence of long-term benefits from universal access (except for children from disadvantaged backgrounds or with additional needs) to such learning is equivocal: some studies find negative effects, some find no effects, and some find positive effects. Discrepant results may relate to age of starting and also probably at least partly to differences in the quality of child care received by children. In addition, child care effects are mediated by family background: negative, neutral and positive effects depend on the relative balance of quality of care at home and in child care (Melhuish 2004).

Generally, though, children who have participated in high-quality child care perform better academically than their peers, and children who are socially disadvantaged show the most benefit. ECEC therefore has great potential to close academic performance and attainment gaps between children from different socioeconomic backgrounds (Elliott 2006; Moore et al. 2012; Moore 2006). However, quality is critical, as low-quality services may have the effect of increasing developmental vulnerability (CCCH 2006). In Australia, some researchers who used a biological measure of child stress (cortisol) to assess the impact of child care quality, reported that in settings achieving higher levels of quality, children's cortisol levels dropped during the day, whereas cortisol levels remained high in poorer quality centres (Sims et al. 2005).

Many benefits of high-quality ECEC have been reported in the literature. Not only do children in high-quality care perform better in cognitive tests, but they were also found to less impulsive, had more advanced expressive vocabulary and greater reported social competence according to their caregivers and even when a wide range of child, family and child care factors were statistically controlled. Children were also rated as more cooperative and compliant, having fewer behavioural problems (Belsky et al. 2007). The quality of care

influences child performance, independent of family factors, particularly in the cognitive domain (Huntsman 2008; NICHD 2003, 2008; To et al. 2000).

Existing and previous research has repeatedly shown that children who attended early education interventions or programs showed better performance and progress in their early school years in almost all intellectual, cognitive, and school domains, and in many socialisation domains. These benefits help improve school readiness, school transitions and student motivation. This is reinforced by recent research showing that the attendance at preschool in Australia is associated with higher Year 3 NAPLAN scores in the domains of numeracy, reading and spelling (Brinkman et al. 2013; Kalb et al. 2014; Warren & Haisken-DeNew 2013). The association is equally as strong at predicting scores at Years 3, 5 and 7 (ages 8, 10 and 12). Studies have also shown improvements, sometimes of smaller magnitude, for socio-emotional/social adjustment outcomes such as self-esteem and social behaviour (Belsky et al. 2007; Biddle 2007; Brinkman et al. 2013; Burchinal et al. 2009; Kalb et al. 2014, O'Connor et al. 2014).

Longitudinal research

There is little longitudinal research on child care for the general population that traces outcomes for older children: the only exception is the National Institute of Child and Human Development's study. The study's authors consider that determination of links between early child care and children's development by third grade is particularly important because levels of achievement and social adjustment formed by this stage are highly stable thereafter (NICHD 2005; Rutter & Maughan 2002). They found that high-quality child care continued to be linked to higher scores in maths, reading and memory. They also noted the relative independence of quality, quantity and type of child care in relation to child developmental outcomes.

A longitudinal Swedish study also showed that high structural quality predicted higher-level math ability at age 8, an effect not evident in analyses at 40 months, which was postulated to be due to a 'sleeper' effect (Broberg et al. 1997). NICHD (2005) also found evidence of potential sleeper effects in their 9-year analysis, but these related to quantity rather than quality of care.

While the size of the effect of child care quality is generally modest, it is significant (Burchinal et al. 2002; NICHD 2002, 2005). NICHD (2002) concluded that effect sizes for quality were as large as the effect size for parenting quality and poverty, and others found that effects were larger for children from low-income families (Loeb et al. 2004; NICHD 2002). Generally, the weight of evidence supports the widely-held belief that, for ECEC, 'quality matters' (Huntsman 2008).

Children 3 years and older

There is an unequivocal effect of exposure to the quality of early learning and development programs provided through preschool programs for older children (generally 3 to 5 years). In particular, the evidence supports improved performance in standardised tests in the early years of primary school as a result of participation in these programs. Research has found that preschool programs are beneficial to the development of the general population. There are greater benefits to those children from disadvantaged backgrounds, including early identification of, and intervention for, children with developmental vulnerabilities (Melhuish 2004; Productivity Commission 2014).

In recognition of this evidence, the Australian Government committed that 'by the end of 2013, every child should have access to a preschool program in the year prior to full time schooling – for 15 hours a week, for 40 weeks a year and at a cost that does not restrict access to these services'. This commitment may also have a significant impact on the usage of and demand for services, though the size and exact nature of the effect is not known at this early stage (COAG 2009, 2013).

In 2013, there were 288,052 children aged 4–5 enrolled in a preschool program in Australia. Of all enrolled children, 83.2% were aged 4 and 16.8% were aged 5. Of the total number of enrolled children, 55.0% were enrolled in a preschool service provider, 41.7% were enrolled in a preschool program within a LDC centre, and 3.3% of children were enrolled in programs across more than 1 provider type (ABS 2013). Attendance rates were higher in more socioeconomically prosperous areas and for children from English-speaking backgrounds (Goldfeld et al. 2013; Harrison et al. 2009; O'Connor et al. 2014).

Both standalone preschools and day care with preschool are thought to provide substantial benefits to children's development. Day care without preschool is generally considered to be of lower quality, and it is thought to provide fewer developmental benefits. Early entry into lower-quality child care was associated with reduced social competence for 5-year-old children, but early entry combined with both high-quality child care and favourable family circumstances was associated with higher social competence (Melhuish 2004; O'Connor et al. 2014).

Longitudinal research

The majority of longitudinal studies published to date tend to focus on children from disadvantaged backgrounds. Major studies, including the Effective Provision of Pre-School Education (EPPE) Study in the UK and the High/Scope Perry Preschool Program in the USA, have reported positive lifelong effects of early intervention programs, not just on educational attainment, but also on income and interaction with the criminal justice system (Barnett 2011; Melhuish 2004; Melhuish et al. 2006; Sammons et al. 2012; Sylva et al. 2004, 2010). Several studies have demonstrated the effectiveness of high-quality, focused preschool programs in reducing the effects of social disadvantage, developing children's social competency and emotional health, and preparing children for a successful transition to formal schooling. These effects have been demonstrated to have significant economic and social benefits for the lifetime of participants (Schweinhart et al. 2005).

Disadvantaged children benefited significantly from high-quality preschool, especially where they were with a group of children from different social backgrounds (Sylva et al. 2004). In following up these children at age 14, it was evident that attending high-quality preschool programs predicted better outcomes for maths and science, but not for English, with the benefits of the programs being less evident than at younger ages. The effects of attending preschool programs on promoting improved socio-behavioural outcomes were, however, found to have faded somewhat by the age of 14 (Sammons et al. 2012).

A further study in the UK drawing on the Longitudinal Study of Young People in England, found that preschool education improved test scores for children aged 11, 14 and 16 and was particularly beneficial for children from disadvantaged socioeconomic backgrounds. The effect of preschool on non-cognitive outcomes was more mixed, with positive effects on socialisation and attitudes towards education, but no significant effect on mental wellbeing and problematic behaviours (Apps et al. 2012).

The Longitudinal Study of Australian Children (LSAC) reports on more than 8,000 children, and it is a key cornerstone of research on children in Australia today. Research using data from LSAC found that, after controlling for socio-demographic characteristics, there was a significant positive association between attendance at preschool programs and year-3 NAPLAN results (Warren & Haisken-DeNew 2013).

The Organisation for Economic Co-operation and Development found that the Program for International Student Assessment (PISA) reading assessment results of 15-year-old students in most countries who had attended pre-primary or preschool for more than a year outperformed those who had not attended, even after accounting for their socioeconomic background. In other countries, such as the USA, Finland, South Korea and Estonia, attending preschool had little or no relationship to the PISA results achieved by students from similar socioeconomic backgrounds (OECD 2014).

There is less research available on the longer-term benefits (into adulthood) for the general population from attending preschool programs. A Norwegian study measured the effects, on those aged in their early 30s from the introduction of universal access to ECEC for children aged 3–6 in Norway in the mid-1970s. It compared the differences in adult outcomes for children from Norwegian local government authorities where the program was extensively implemented in the second half of the 1970s and those in which it was not. Drawing on a sample of nearly 500,000 children, the study found that the introduction of this program increased the chance of completing high school and attending college. This in turn strengthened labour market attachment and delayed child bearing and family formation as adults. The benefits of education mostly accrued to those children with less-educated mothers. Most of the increases in earnings accrued to females, particularly those who were exposed to child care, as a result of delaying child bearing and family formation as adults (Havnes & Mogstad 2009).

4 Does the quantity of ECEC affect developmental outcomes?

The relationship between quantity of ECEC and developmental outcomes is complex. While the majority of research suggests a strong link with the quality of ECEC, the evidence relating to quantity of care is less clear cut: positive, negative and no effects are all reported. Research on the influence of quantity can be considered in relation to the time spent in ECEC relative to age at entry (duration), and the amount of ECEC on a weekly basis (intensity of exposure).

Questions about the possible associations between young children's attendance at child care and their socio-emotional development have intrigued researchers, parents and policymakers for more than 3 decades. The resulting research is inconclusive, in part because 'findings may hinge on the context in which those results were obtained' (Hausfather et al. 1997; Love et al. 2003). Discrepant results could relate to age of commencement at child care, intensity of exposure, and also to differences in the quality of child care received by children.

In addition, child care effects are mediated by family background: negative, neutral and positive effects are all observed, varying with the relative balance of quality of care at home and in child care (Burger 2010; Melhuish 2004). Analysis of the LSAC data showed that LDC was more likely to be used by mothers who had a university education, were employed full-time rather than part-time, and whose family income was higher. Many different factors contribute to longer hours of attendance for infants at day care, including maternal age, education level and employment status (whether full-time or part-time). Family factors were also found to have a significant influence, including household income, number of siblings, and speaking a language other than English at home (Harrison 2008).

For children aged 0–3 years

Findings from Australian and overseas research on the impact of ECEC on the learning and developmental outcomes of younger children are inconclusive. Early research on child care in the 1970s and 1980s tended to focus on the relationship between non-parental care in the first year and insecure attachment. Some studies failed to find an association, and others suggested that, within very specific criteria (at least 20 hours of LDC per week for a large part of their life), there was an over-representation of insecure avoidant attachment patterns. These variations in infant attachment were later found to be predictive of various aspects of future socio-emotional development, and thus effects of child care on attachment are anticipated to have longer term consequences for development (Belsky et al. 2007; Melhuish 2004; Sylva et al. 2010). Gialamas and others (2014) also found that more time spent in centre-based child care (but not other types of care) in a child's first 3 years was associated with a higher incidence of externalising problem behaviours and lower levels of internalising problem behaviours (as reported both by parents and teachers) but not with children's receptive vocabulary ability at school entry.

Duration: effect of age at entry to child care

Children's socio-emotional development can also be affected by the number of hours per week of attendance at child care and the age of commencement, though again, mixed results have been reported. In Australia, some studies reported that children's learning abilities in the first year of school were rated lower by teachers for children who had spent long hours

in care before 3 years of age. Others found that sustained and regular ECEC (that is, the more months a child attends) provides greater benefits for children's learning (Sammons et al. 2012; Sylva et al. 2010). Every month of preschool attendance after age 2 has also been linked to better intellectual development, improved independence, and improved concentration and sociability in the first years of school (Sylva et al. 2004). Studies from Sweden also reported that children commencing child care aged between 6 and 12 months achieved significantly higher scores on cognitive ability and academic tests at age 8 and 13 (Harrison 2008; Harrison et al. 2009). In contrast, the Canadian National Longitudinal Study of Children and Youth found no correlation between school readiness and the number of hours spent in child care (Gagne 2003).

Intensity of exposure: effect of number of hours per week of attendance at child care

Australian and overseas research indicate that long hours of care (more than 30 hours per week) for very young children (generally children younger than 12 months old) and multiple care arrangements were associated with behavioural problems later in childhood (Bowes et al. 2009; NICHD 2008). However, Love et al. (2003), drawing on evidence from 3 internationally diverse studies, noted that quality of care was a more important predictor of child outcomes in very young children than quantity of care was. They proposed that the differences between their findings and those reported in the USA's National Institute of Child and Human Development study of time in child care and socio-emotional adjustment in kindergarten were likely to be explained, at least in part, by the country or state in which the study is located and the external regulatory system that is applied to child care services. High-quality care has also been reported to predict higher vocabulary scores and more exposure to centre-based care predicted more teacher-reported externalising problems (Belsky et al. 2007; Love et al. 2003).

Love et al. concluded that when the quality of care achieves higher standards, as occurs under government-supported and monitored systems of quality assurance (such as the National Quality Framework in Australia or Early Head Start in the US), the negative effects of quantity of care may be diminished, 'In a context in which standards for good-quality care are enforced through government regulatory mechanisms, the risk for behavioural problems may be explained by factors other than time in care' (Love et al. 2003; NICHD 2002, 2005, 2008).

In Australia, only a limited number of studies have examined the relationship between quantity of care and children's socio-emotional development. Harrison and Ungerer, in their study of 145 first-born infants, found no association between weekly hours of care and parent ratings of child behavioural problems at 30 months and 5 years, or between hours of care and teacher ratings of socio-emotional adjustment in the first year of school. In their sample, stability rather than quantity of care was a key factor in explaining problem behaviours (Harrison & Ungerer 2005). Longer hours of child care per week might have risks for children's social/behavioural development, language competence and school learning (Kalb et al. 2014). Results from the LSAC indicated that behavioural problems in children aged 2–3 were higher for those receiving 30 or more hours of non-parental child care per week (Harrison 2008).

These findings agree with those of Houng and others (2011), who investigated the effect of the quantity of child care on children in the LSAC study, finding that the optimum number of hours in non-parental child care was up to 28 hours per week. They also found that there were no negative effects from using any quantity of child care compared to not using child care.

At age 4–5, a total of 30 or more hours of non-parental care per week was associated with lower language skills regardless of the type of ECEC attended (Harrison et al. 2009). In the USA, the long-term effects of more hours of child care were reported to include increased problem behaviour (Belsky et al. 2007; NICHD 2005). Research from Canada, Australia, Israel and the USA has shown that negative effects are exacerbated in situations of poorer quality programs (Lefebvre et al. 2011; Love et al. 2003) caring for larger numbers of children (Harrison et al. 2012; Harrison 2008).

For children 3 years and older

From the 2012 AEDI results, nearly 85% of children in Australia attended a preschool program either in a standalone facility or in a LDC centre in the year before school. For those children who attended a preschool program, around 19% were found to be developmentally vulnerable on 1 or more of the domains. This compares with 30% of children who were found to be vulnerable but did not attend a preschool program (AEDI 2013; DEEWR 2013).

It is universally accepted that some preschool experience (compared to none) enhances children's development. Children who did not attend any form of child care show poorer cognitive and social/behavioural outcomes at entry to school and at the end of Year 1 compared with those who attended a preschool program. They are also more likely to be identified as having some form of special educational needs. Children who did not attend a formal early learning program also had lower scores for receptive vocabulary than children attending preschool programs and comparable scores to children in LDC. Children who attended LDC plus other additional care had the lowest scores, although this may be due to differences in quality and stability of care rather than being exclusively due to exposure to LDC (Melhuish et al. 2006; Sylva et al. 2004, 2010).

A simple comparison of child outcomes in the first few years of full-time schooling and previous participation in preschool showed that those who participated in preschool had a lower probability of being rated by their teachers as doing poorly in school, having low maths or literacy levels, and being rated by their carer as having poor social and emotional development (Biddle & Seth-Purdie 2013).

Is there an optimal number of hours of preschool?

There is a dearth of literature on the optimal number of hours of attendance at a preschool program. There are principally 2 issues investigated in the literature: length of attendance at a preschool program in number of months, and number of hours per week of attendance at preschool programs. The EPPE Study conducted in the UK presented the strongest evidence to extend universal access to preschool to younger children. The study reported a significant link between the duration of months in preschool and progress in cognitive process: every month of preschool experience after age 2 was linked to better intellectual development and improved independence, concentration and sociability. An early start at preschool (aged between 2 and 3) was also linked to better cognitive outcomes on entering primary school and an improved ability to socialise with others. However, they concluded that it was not possible to draw firm conclusions about the optimal starting age for individual children in preschool from the EPPE research (Sammons et al. 2012; Sylva et al. 2004).

These results seem to be consistent irrespective of country. A recent Chinese study found that entering preschools at a younger age, and remaining there for a longer time, benefited children's academic development, but longer attendance was also linked to slightly more behavioural problems (Li et al. 2014). A study by Sammons et al. also demonstrated the positive effects of the duration of attendance at preschool on children's development. The

main findings were that the number of months of attendance is related to better intellectual development and improved independence, concentration and sociability, and full-time attendance led to no better gains than part-time attendance (Sammons et al. 2012).

When comparing number of hours of preschool attended, most studies compare part-time to full-time attendance, with few differences in school readiness achievement (that is, pre-reading and early number concepts) reported (Melhuish et al. 2006; Sammons et al. 2012; Sylva et al. 2004, 2010; Walston & West 2004).

LSAC children's early literacy and numeracy scores did not differ by weekly hours of child care, preschool or school (Harrison et al. 2009). Research also indicated that 2 years of high-quality ECEC of 15 hours per week gave the same protective effect as having a tertiary-educated mother (Sylva et al. 2010). Taken together, the findings of the EPPE Study suggested that extended periods of preschool provision on a part-time basis are likely to provide more advantages than a shorter time period in full-time provision (Sylva et al. 2004). However, given that many parents use preschool programs as a child care option for their children, shorter hours of care are unlikely to be popular with parents and could limit uptake given the discrepancy between part-time preschool program hours and standard working hours.

While preschool programs are beneficial to the general population and particularly to disadvantaged children, it is not clear that the current provision of 15 hours per week is optimal from a child developmental perspective. For example, prior to the National Partnership Agreement on the Universal Access to Early Childhood Education, the New South Wales Government provided 30 hours per week of preschool in public preschools. In New Zealand, there is 20 hours per week of publicly provided early childhood education for all 3- and 4-year olds (New Zealand children start school on or shortly after their fifth birthday). In England all 3- and 4-year olds are entitled to 15 hours per week of free early education or child care, and in Northern Ireland, at least 2.5 hours per day, 5 days per week (12.5 hours per week) of free preschool is provided (Gov.uk 2014).

In 2008, the United Nations Children's Fund established a global benchmark to achieve a minimum of 15 hours per week of preschool for children aged 4–5. Given the complexity of determining the optimum number of hours of preschool, the range of hours provided across countries is not surprising and has been identified in the recent Productivity Commission's Inquiry Report: Childcare and Early Childhood Learning as an issue for further investigation (Productivity Commission 2015).

5 Which groups of children benefit most from exposure to ECEC?

Extensive research has demonstrated that the children most likely to benefit from exposure to ECEC are those from socially disadvantaged backgrounds. These benefits accrue in the form of short-term developmental improvements as well as longer-term improvements in vulnerabilities.

Research on brain development has shown that the period from birth to school age includes uniquely sensitive periods in which the foundations for cognitive learning, self-regulation and social interaction are laid (AIHW 2012; Silburn et al. 2011). Children from backgrounds that fail to provide them with the warm, responsive care and the stimulation they need during this period, are less likely to meet developmental milestones—they become 'developmentally vulnerable' (COAG 2009, 2013; Harrison et al. 2012; Kalb et al. 2014; Robinson et al. 2012; Silburn et al. 2011).

Literature reports that children who bear the greatest burden of risk factors (conditions in the individual, family and social environments that predict developmental vulnerability) face the highest lifetime chances of poor educational attainment, poor physical and mental health, behavioural and relationship problems, and low social and economic participation. The greater the degree of vulnerability, the more urgent the need for early intervention becomes. Vulnerability that is not addressed during periods of peak developmental sensitivity becomes more difficult and more costly to reverse as a child ages and falls further behind his or her peers (Biddle 2007, 2010; Biddle & Seth-Purdie 2013; Feinstein 2003).

It is widely recognised that high-quality ECEC (including preschool) is beneficial to the general population and delivers significant benefits to disadvantaged children including the promotion of early learning and development and reduced vulnerability.

However, there is evidence that children from 'special needs' groups—Indigenous, low Socio-Economic Indexes for Areas (SEIFA), language background other than English, children living in remote and very remote areas, and children with a disability—are simultaneously more likely to be developmentally vulnerable and less likely to participate in ECEC (Baxter & Hand 2013). Preschool-aged children from a disadvantaged background represented just over 20% of all preschool-aged children nationally and accounted for just under 18% of enrolments (Anderson et al. 2003; Elliott 2006; Kalb et al. 2014; Productivity Commission 2014; RoGS 2013).

The evidence on child care in the first 3 years for disadvantaged children indicates that high-quality child care can produce benefits for cognitive, language and social development. Low-quality child care produces either no benefit or negative effects (Baxter & Hand 2013; Melhuish 2004).

For those 3 years and older, disadvantaged children benefit particularly from high-quality preschool provision; specifically, they benefit more in socially mixed groups (AIHW 2009; CCCH 2007; Melhuish et al. 2006; Sylva et al. 2004, 2010). Early childhood intervention boosts children's confidence and social skills, which provides a better foundation for success at school. Reviews of the research infer that it is the social skills and improved motivation that lead to lower levels of special education and school failure and higher educational achievement in children. Studies into adulthood indicate that this educational success is

followed by increased success in employment, social integration and, sometimes, reduced criminality. The findings on disadvantage are seen elsewhere and are the basis of policy initiatives all over the world (Melhuish 2004; Young & Richardson 2007).

The AEDC data for 2012 show that Indigenous children, children living in disadvantaged communities, and children not proficient in English are the most likely to be developmentally vulnerable (Harrison et al. 2012), thus it is these groups we will focus on for the rest of this section.

The AEDC data also highlight gender differences in development. Boys were more likely to be developmentally vulnerable than girls across all the domains. Nearly 15% of boys were found to be developmentally vulnerable on 2 or more of the domains compared to just under 7% of girls (AEDI 2013). Gender issues cut across all of the following groups identified and thus are explored here rather than in a separate section.

In agreement with the AEDC report, Wake and others (2008) also found that girls in the child cohort of the LSAC study consistently had more positive outcomes than boys (except in the physical domain).This well-replicated finding is thought to involve both biological dispositions and differences in parenting practices and societal expectations for boys and girls.

There is considerable evidence that boys are more vulnerable to developmental difficulties and develop more slowly, especially in language and social-emotional domains, than girls in the early years (see, for example, Ruble & Martin 1998). This is thought to reflect principally biological dispositions, although differential parenting practices and expectations for boys and girls also appear to have some influence (Prior et al. 1993). Wake and others (2008) noted that these latter factors may be in part responsible for the greater gender difference in outcomes in the child, as compared to infant, cohort when analysing the LSAC data. Also analysing the LSAC data, Kalb and others (2014) found that boys tended to benefit most in terms of learning outcomes from formal child care when its usage is not too intense and it is mixed with other forms of child care such as informal grandparent care. It was also postulated that overall differences will lessen as the LSAC children move towards adolescence, but with continuing male vulnerability to difficulties such as learning problems and 'acting-out' behavioural disorders (Prior et al. 2000). While such gender differences are well established in previous research, they need more recognition in policy and service provision contexts.

Indigenous children

According to the AEDC data for 2012, Indigenous children are more than twice as likely to be developmentally vulnerable than non-Indigenous children (43% versus 22%). This has decreased since 2009 (47%). The difference between Indigenous and non-Indigenous children in AEDC results was particularly marked in the domain of language and cognitive skills. Just under 6% of non-Indigenous children were found to be developmentally vulnerable in language and cognitive skills compared to more than 22% of Indigenous children (DEEWR 2013).

In response to these and previous findings on this issue, the Australian Government has identified the preschool needs of Indigenous children, particularly those living in remote communities, as a key priority. The Closing the Gap Indigenous policy framework adopts a specific target, that all Indigenous children younger than 5 years will have access to ECEC within a decade (by 2018) (COAG 2009; DSS 2015b). Since 2008, consecutive Closing the Gap Prime Minister's reports have noted substantial enrolment growth, with the 2015 report

estimating that 85% of Indigenous children in remote areas are enrolled in preschool, up from 55% in 2006 (PM&C 2015).

However, Indigenous children and economically disadvantaged families are still less likely to attend an ECEC program than their non-Indigenous and more advantaged peers. Kalb and others (2014) noted that the patterns of child care usage by Indigenous families seem to differ depending on the gender of the child. They observed that, for girls, the proportion of Indigenous families using formal child care was very high, well above the percentage for non-Indigenous families, with the opposite found for informal child care arrangements. Indigenous girls also benefit significantly in terms of both cognitive and non-cognitive skills from attendance at child care. It should be noted, however, that this finding was based on a relatively small number of Indigenous families within the LSAC study.

Very young Indigenous children are also considerably less likely to attend formal ECEC services compared with all children of the same age. Around 21% of Indigenous children aged 0–3 attended formal child care compared to 38% of all children in the same age group (ABS 2009a). Interestingly, research has noted that the enrolment of Indigenous children is not a significant problem but that retention and regular attendance are.

Researchers have postulated that this low level of attendance is due to Indigenous families preferring a culturally safe environment for their children in the years before school. This is reinforced by an increased uptake of early learning programs by Indigenous families when in a context of community partnerships, culturally relevant practices that value local Indigenous knowledge, and appropriate teacher training and support. Early learning programs that do not reflect the culture and knowledge of the Indigenous community are not seen as culturally safe and tend not to be used by families in that community (Biddle 2007, 2010; Biddle & Seth-Purdie 2013; Harrison et al. 2012; Hewitt & Walter 2014; Mann et al. 2011; Robinson et al. 2012). Issues raised as barriers to attendance by Indigenous parents include lack of access to transport, financial stress, and perceived attitudes and behaviours (Mann et al. 2011).

Biddle (2007) also found that Aboriginal and Torres Strait Islander children's preschool attendance declined with the increase in distance from capital cities, and this was at a greater rate than that of non-Indigenous children. Children who reside in very remote Australia are more likely to be developmentally vulnerable, and they are least likely to attend preschool. This is evident in higher absentee rates for Indigenous children compared to non-Indigenous children in preschools (ABS 2009b), with the biggest variation between enrolment and attendance rates of Indigenous 4-year olds seen in *Remote/Very Remote* communities when compared with *Inner/Outer regional* areas and *Major cities* (AIHW 2015). Close to half (44.5%) of children in very remote communities are developmentally vulnerable, compared to around one fifth of children (21.1%) from major cities (Biddle 2007; Productivity Commission 2014).

Irrespective of the Indigenous status of the child, risk factors such as household income, educational attainment of parents and health circumstances of families have significant impact, both on levels of attendance at ECEC and subsequently on children's developmental outcomes.

Recent studies reviewing targeted early intervention programs for Indigenous children emphasised the need to develop and implement high-quality, professionally structured and managed programs for Indigenous families that take culture, family process and community

setting systematically into account in order to optimise uptake of and benefit from these programs (Hewitt & Walter 2014; Mann et al. 2011; Robinson et al. 2012).

Socially disadvantaged children

Children from socially disadvantaged backgrounds who are exposed to risk factors such as a low family income, a single parent, low maternal age, low parental education, and overcrowded households have also been shown to be at risk for poorer cognitive abilities and school outcomes (Hewitt & Walter 2014). It has long been recognised that family characteristics (such as level of income, education, and emotional support provided) can be stronger determinants of childhood developmental outcomes than any specific features of child care. Ethnicity may also play a role in determining risk for poor school performance, due to associated communication problems for both child and parent. Focused early education interventions have been shown to be effective at overcoming many of these risks (Anderson et al. 2003; Biedinger 2009; Burchinal et al. 2009; Burger 2010; CCCH 2008).

Unsurprisingly, children living in the most socio-economically disadvantaged Australian communities are more likely to be developmentally vulnerable on each of the AEDC domains. However, a recent study by Biddle and Seth-Purdie (2013) noted that they were more likely to participate in preschool. This could mean that state policies designed to promote preschool attendance in low-SEIFA communities have had some success, even though these policies did not ensure the highest participation rates amongst children bearing the highest risk burdens (conditions in the individual, family and social environments that predict developmental vulnerability). Preschool enrolment is still substantially lower for children from families with neither parent working or from a single parent family in which the parent is not working (68%) (ABS 2013).

High-quality programs provide important benefits for children's social, emotional, and learning outcomes, particularly for children from disadvantaged backgrounds. Studies from the USA, the UK and Northern Ireland have reported that children who attended high-quality early learning programs (as assessed by trained observers) achieved better cognitive and social/behavioural outcomes at school entry with benefits lasting into the primary school years (Melhuish 2004; Melhuish et al. 2006; NICHD 2003, 2008; Sammons et al. 2012; Sylva et al. 2004, 2010). These benefits are most evident for children at greater risk of poorer outcomes due to low family income, low parental education levels, or special education needs. 'Larger benefits accrue when quality is in the good to high range' (Harrison et al. 2012; Burchinal et al. 2009).

Studies in the USA have shown that, by the third grade, gaps in test scores across socioeconomic groups are stable by age, suggesting that later schooling and variations in schooling quality have little effect in reducing or widening the gaps that appear before students enter school (Heckman 2006).

The AEDC results indicate that, while developmentally vulnerable children are over-represented in the most disadvantaged group, they are spread across all socioeconomic groups. However, children from higher socioeconomic backgrounds may not remain developmentally vulnerable. Research in both Australia and the UK found that children from high socioeconomic backgrounds who performed poorly in early tests (UK) or commenced school with poor development as assessed by the AEDC (Australia) had a tendency to improve academically during primary school and 'catch up', whereas similar children from low socioeconomic backgrounds were unlikely to 'catch up' and would continue through school on a low educational trajectory (Feinstein 2003; Silburn et al. 2011).

Children from non-English speaking backgrounds

Students in Australia with limited proficiency in the language of instruction at school (English) may face additional challenges in negotiating the school context, whereas bilingual children who enter school with well-developed English language skills may have a range of developmental advantages. Beyond these academic difficulties, recent research suggests that emerging bilingual children may also show poorer outcomes across broad health and psychosocial domains including physical health and wellbeing, social competence, emotional maturity, and language and cognitive development (Goldfeld et al. 2013). Hence, it is critical to identify factors that provide opportunities for bilingual children to develop English language skills before they enter the school system. Houng and others (2011) found that children living in households where the main language is not English benefit significantly from attending formal child care.

Despite the potential benefit of ECEC for children from non-English speaking backgrounds, these children are less likely to attend formal ECEC. In 2013, 17% of children whose main language spoken at home was not English usually attended ECEC services compared with the 20% of the rest of the child population (RoGS 2015). Differences appear to be the largest for LDC and before or after school care. It should be noted that these rates have improved since 2011, when 15% of children from non-English speaking backgrounds usually attended ECEC services compared to 24% of the rest of the child population (Harrison et al. 2009; Productivity Commission 2014; RoGS 2013).

In addition to language barriers, children from non-English speaking backgrounds may also have cultural barriers to participating in ECEC. These can relate to parental attitudes and beliefs, such as parents preferring to have young children at home or parents having different ways of approaching everyday tasks. Any targeted ECEC policy or program for this group will need to appreciate the cultural sensitivities of such a diverse group of children (Baxter & Hand 2013; Sims et al. 2008).

The link between entering school with limited English proficiency and reduced early academic performance (in English) has been well documented (Brinkman et al. 2009; O'Connor et al. 2014). The AEDC results for 2012 showed that the most developmentally vulnerable group comprised children who were not proficient in English because they spoke another language at home or because English was their second language. Nearly 94% of these children were found to be developmentally vulnerable in 1 or more domains, and around 58% were developmentally vulnerable in 2 or more domains. In contrast, only around 20% of children from non-English speaking backgrounds, but who were proficient in English, were assessed as being developmentally vulnerable in 1 or more domains and 8% in 2 or more of the domains, which is only slightly below that of the broader Australian population (Biddle & Seth-Purdie 2013).

Recent research from O'Connor and others (2014) investigated the relationship between ECEC and English proficiency at school entry for this group using AEDC data. Their findings revealed that attendance at preschool was associated with increased odds of being proficient in English at school entry for bilingual children, whereas attending day care without a preschool program, or having more informal non-parental care or parental care only, was associated with decreased odds of proficiency in English at school entry. These findings suggest that engagement with preschool programs (and specifically preschool, not in a LDC setting) prior to school entry may present a practical, modifiable approach to improving English proficiency at school entry for bilingual children. This research has important implications for policy and programs that aim to reduce inequality in skills at

school entry. It also highlights the importance of the educational purpose of ECEC settings when considering the impact of ECEC on language development.

6 Research opportunities

Current research areas of interest as defined in the AEDC research program include children with special health care needs, those with a language background other than English, and those with mental health issues in the family (both of the child and the parents). Current projects include the exploration of the relationship between perinatal outcomes, developmental outcomes as measured by the AEDC and the influence on educational outcomes. Researchers are using the AEDC data to answer questions about sub-populations as well as population issues, and many are using the AEDC to link to other health and education data sets. AEDC research is contributing to policy, planning, service delivery and academic debates (AEDC 2014).

What we don't know: key areas for further research

While there are some studies available on enrolment, detailed national data on the attendance rates of children in early learning programs in the years before entering formal schooling have been made publically available only since 2012 (ABS 2013). The datasets will now be published annually and should provide a basis for further research in this area. The availability of data regarding children in remote locations is particularly problematic. There have been no rigorous trials or evaluations of early childhood programs in Australia, particularly programs for Indigenous and at-risk children. There is also limited Australian research on how to address the challenge of low use of early learning programs by Indigenous and disadvantaged families. There is similarly no Australian research that has examined the relative benefits of targeted and universal programs for early learning or the long-term effects of attending an early learning program through a cost–benefit analysis. Moreover, there is still potential to evaluate the success of specific interventions designed to increase the ECEC participation of vulnerable children and to improve the outcomes for children who do participate.

In terms of vulnerable children, there is a paucity of research into the factors contributing to preschool attendance, particularly Indigenous children's attendance. There is also a dearth of research, particularly quantitative research, on the relative applicability and influence of a range of factors on preschool attendance, such as lower maternal education, financial stress, number of co-resident siblings, living in a less advantaged neighbourhood, speaking a language other than English in the home, maternal psychological distress, and poorer parenting behaviour. Also lacking is research on whether these risk factors, if any, rather than the child's Indigenous status, are the major influencing issue for increasing preschool attendance (Hewitt & Walter 2014; Mann et al. 2011).

Longitudinal studies of the impacts of ECEC on outcomes later in life are required in Australia to fully understand the long term costs and benefits (Productivity Commission 2015). One of the major policy changes around ECEC over the last few years was the introduction and implementation of the National Quality Framework. One of the motivations for this policy change was to raise quality and drive continuous improvement and consistency in Australian education and care services to ensure children have the best possible start in life. Even with the ongoing fiscal pressures on all levels of government in Australia, the benefits of recruiting a new birth cohort of children into the LSAC and testing the comparative learning and developmental outcomes for participants and non-participants would shed considerable light on the impact of the National Quality Framework. It would be of great interest to be able to compare the findings of a post-Framework study with the

existing cohorts. A longitudinal study could also provide insight into the durability of benefits of universal preschool for Australian children.

Also, as noted by the brief of this paper itself, there is a lack of research (published and otherwise) focused on the most costly features of early education such as the duration of intervention, length of day, teacher-child ratio, teacher qualifications, and in-service teacher development (Barnett 2011).

The 2015 Productivity Commission inquiry also recommended that the Australian Government establish a program to link information for each child from the National ECEC Collection to information from the Child Care Management System, the AEDI, and NAPLAN testing results to establish a longitudinal database (Productivity Commission 2015).

7 Conclusions

An extensive body of literature is available on the subject of ECEC, both in Australia and across the world. It is well established that family characteristics, such as parent educational attainment and their income levels, as well as home environmental factors, are the strongest predictors of a child's development. However, noting the rapid increase in the numbers of children using more significant amounts of formal care (mainly in LDC, but also family day care settings and preschool) the impact of ECEC is an area of increasing interest for both government and academia. There are 3 key aspects of ECEC that should be considered.

- Quality of ECEC: this is the most comprehensively researched element of the 3 aspects, with very strong support for the notion that positive outcomes relate most directly to the quality of ECEC. Literature on the topic include longitudinal research in both Australian and international contexts. The dimensions of what constitutes a quality ECEC program have been well researched, articulated and implemented in Australian national strategies and frameworks such as the National Quality Framework. Even so, there is little reliable evidence on the relative contribution that each component of quality makes to a child's developmental outcomes.
- Intensity of ECEC: there is less research, and so fewer definitive conclusions can be drawn on the amount of weekly hours a child spends in ECEC, particularly in the preschool environment. This remains a topic suited for further study, cognisant that quality, intensity and duration are all linked by complex relationships and are not independent factors.
- Duration of ECEC: the length of time, in months, spent in ECEC has somewhat been linked to increased benefits relating to developmental outcomes. The limited literature suggests that the optimum period in the preschool environment (aged 3) would be part time, spread across 2 years, rather than full time in a single year. Research on the optimum age at which a child commences ECEC, typically in the 0–3 bracket, is mixed and is a suitable subject for further research.

Early educational intervention has been shown to have a substantial short-term and long-term effect on cognition, social and emotional development, school progress, antisocial behaviour and even crime. Both Australian and international studies have shown that children's literacy and numeracy skills at age 4–5 are a good predictor of academic achievement in primary school. As a result, policies and programs that focus on the early years can only enhance educational outcomes for children.

A broad range of approaches, including large public programs, in a range of countries has demonstrated generally high levels of effectiveness of ECEC. This reflects a unanimous acknowledgement of the importance of engagement during preschool years. This literature review suggests general agreement regarding positive developmental outcomes for all children from around 3 years taking part in ECEC programs, provided the ECEC service is of sufficiently high quality. These benefits are even greater for children from disadvantaged backgrounds and can persist into adulthood.

The impacts of ECEC on younger children are mixed:

- Quality ECEC even at a young age is likely to provide benefits for disadvantaged children from poor caring environments.
- The potential for negative effects is greater the closer to birth a child commences ECEC and the longer the time the child spends in care each week.
- These negative effects could be lessened by higher-quality ECEC and are less evident for older children.

Under the National Partnership Agreement on Universal Access to Early Childhood Education endorsed by COAG in 2008, the Australian Government and the state and territory governments agreed to provide 600 hours of preschool per year, delivered by a qualified early childhood teacher to all children in the year before they commence full-time schooling by 2013.

As these arrangements have been fully implemented only since 2013, their impact on the development of Australian children in the longer term is yet to be assessed. In 2014, the Australian Government decided to extend the current universal access agreement for the 2015 calendar year while it was being reviewed.

Extensive research, both in Australia and overseas, has shown that universal access to preschool education can enhance developmental outcomes for all children (at least in the short term) and particularly for disadvantaged children from preschool attendance. Continuing with these arrangements would enable a more comprehensive assessment of the benefits to the wider Australian population of preschool attendance in the year before school and provide the basis to make any changes to the provision of preschool.

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Early childhood education and care is a key priority for the Australian Government in recognition that ECEC programs play a vital role in the development of Australian children and their preparation for school, and enabling parents to work. This review explores the literature on the complex relationship between attendance at early childhood education and care programs and developmental outcomes for children.