

DEPARTMENT OF EDUCATION

A review of the effects of early childhood education

Centre for Education Statistics and Evaluation



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Introduction

There is a growing international focus on early childhood education (ECE) as knowledge accumulates about the importance of early childhood development for long-term outcomes¹. The consistent finding that children who attend ECE tend to perform better on later outcomes in attainment, crime, health and productivity (Heckman, Stixrud & Urzua 2006; Sylva et al. 2012) has prompted significant enthusiasm about the positive effects of ECE attendance (Berlinski, Galiani & Gertler 2009; Deming 2009; Taggart et al. 2015).

There is a large body of longitudinal and cross-sectional research spanning several decades that illustrates the associations between ECE attendance and both cognitive and non-cognitive outcomes for children. A number of randomised controlled trials (RCTs), which are better able to account for systematic differences between children who do and do not attend ECE, also report positive cognitive and non-cognitive outcomes for participants. These predominantly small-scale, intensive interventions that combine ECE with other components (such as parenting and healthcare programs) tend to find substantially larger effects than scaled-up equivalents, which in turn tend to find smaller effects than cross-sectional and longitudinal studies. There are a number of consistent findings of the literature:

- High quality ECE can improve children's cognitive and non-cognitive outcomes
- Disadvantaged children stand to gain the most from high quality ECE
- The positive effects of ECE programs are contingent upon, and proportionate to, their quality.

The importance of the early years

Evidence of the need for a concerted focus on early childhood development comes from neuro- and developmental psychology, education, economics, and from a number of other disciplines with a core focus on equity and improving social outcomes. The argument for greater investment in early childhood education is largely based on the simple fact that 'later attainments build on foundations that are laid down earlier' (Heckman 2006, p. 1900). In the language of developmental psychologists, since 'children rapidly develop foundational capabilities on which subsequent development builds' (Shonkoff & Phillips 2000, p. 5), ECE has the potential to play a crucial role in setting children's academic and broader developmental trajectories.

It is well established that there is substantial variation between students by the time they enter the first year of primary education, and that these differences are strong predictors of future outcomes (Duncan et al. 2007; Entwisle 1997). Particular attention has been paid to socioeconomic differences in school readiness and their association with 'an achievement gap that grows over time and contributes to large, long-term disparities in educational attainment, employment, and earnings' (Bierman et al. 2014, p. 140). In an often-cited study, Hart and Risley (1995) found that low-SES children had heard 30 million fewer words by age three than high-SES children. These conditions are made worse by the tendency for 'these same disadvantaged children to be placed in low-resource schools, magnifying the initial inequality' (Lee & Burkam 2002, p. 1). In Australia, this achievement gap is as large as one full year of schooling per socioeconomic quartile by the age of 15 (OECD 2016b).

Heckman (2008, p. 290; Currie 2001) argues that the longer a society waits to intervene in the lives of disadvantaged children, the greater the overall cost of measures to improve equity by the same amount. From this perspective, since 'learning begets learning' (Heckman & Masterov 2007, p. 3), investments in ECE 'will effectively compound over time' (List, Samek & Suskind 2017, p. 5). Following the logic that 'achievement at older ages is the product of a sequential process of skill acquisition', ECE programs that improve children's cognitive and non-cognitive outcomes before they begin school 'might lead children to master more advanced skills at an earlier age and perhaps even increase their ultimate level of achievement' (Duncan et al. 2007, p. 1429). Similarly, failure to adequately equip children with the capability to take full advantage of early primary school may prevent them from reaching their potential.

Since inequalities between students tend to grow when they are not in formal education – such as over long holiday periods (Downey, von Hippel & Broh 2004) – it is possible that earlier entry into the school system may reduce inequalities in education (OECD 2016c). For students from disadvantaged backgrounds, who may experience a 'lack of positive cognitive and non-cognitive stimulation' in the home learning environment (Heckman 2006, p. 1900), the relative value of attending high quality ECE is particularly strong. The economic returns of investment in high quality ECE are estimated to be between 7% and 10% per annum (Heckman 2011), which Heckman argues substantially outperforms interventions later in the educational life-cycle. Consequently, the dominant view of the literature is that for a range of developmental, social, and economic reasons, the earliest years of life are a particularly promising time to intervene in the lives of low-income children (Ludwig & Phillips 2008, Currie 2001).

¹ Early childhood education refers to efforts to teach children younger than school age valuable (cognitive and non-cognitive) skills within a formal setting, such as a preschool or long day care service.

Australian evidence of effects of ECE

There is a large body of literature of cross-sectional findings demonstrating that children who attend ECE do better on a range of cognitive and non-cognitive measures than children who do not attend ECE. In the Australian context, for instance, the first annual report of the Longitudinal Study of Australian Children (LSAC) (Australian Institute of Family Studies 2005) highlights substantial differences in cognitive outcomes between children in educational care, non-preschool day care, and children who did not attend either of these forms of non-parental care. Children aged 4-5 who attended formal care with an educational program had scores from an assessment of infant learning that were 0.2 standard deviations more than children who attended day care centres without preschool programs, and 0.45 standard deviations more than children who did not attend any form of formal care (see Figure 1).

Figure 1: Learning outcomes by type of care attended



Source: Australian Institute of Family Studies, 2005, Figure 9

Note: The learning outcome index is a derived variable that is scaled to have a mean of 100 and a standard deviation of 10 across the whole LSAC sample.

While most studies conducted within Australia have been relatively short-term (Siraj et al. 2016), some longitudinal analysis has been conducted, allowing for analysis of learning *growth* rather than the snapshot provided by cross-sectional studies. Two Australian longitudinal studies predate the National Quality Framework, which has introduced progressively higher standards for early childhood services since 2012, and a third spans the transition to the National Quality Framework. A fourth longitudinal study (the E4Kids research program) has not yet reported its findings on the associations between early childhood attendance and later outcomes.

Biddle and Seth-Purdie’s initial analysis of LSAC data shows the same ‘strong positive relationship between [ECE] attendance and better outcomes’ in the first year of school seen in Figure 1, but after controlling for relevant background characteristics ‘this relationship all but disappeared’ (2013, p. 3). They conclude that their analysis ‘indicates that the standards of ECE that applied prior to the introduction of the National Quality Standards for ECE were not adequate to mitigate developmental vulnerability and that Long Day Care, at the time, may have been harmful’ (Biddle & Seth-Purdie 2013, p. i). The authors acknowledge that their analysis is hampered by the lack of available data on ECE quality, which is crucial since ‘only high-quality ECE promotes learning and development’ (Biddle & Seth-Purdie 2013, pp. 2-3).

In contrast, Warren and Haisken-DeNew (2013) use the same dataset and track outcomes to Year 3. They find that after controlling for a range of background characteristics, as well as prior cognitive ability and home learning environment, ECE attendance is estimated to be associated with an additional 10-15 NAPLAN points on Reading, Numeracy and Spelling (ECE was not associated with statistically significantly higher scores in other domains). This translates to an effect size of between 0.11 and 0.21. Investigating the effect of teacher qualifications, they find that ECE is associated with a significantly higher scores only when the educator held a teaching degree or diploma (see Table 1).

Table 1: Additional NAPLAN points associated with preschool enrolment, by teacher qualification

	Reading	Numeracy	Spelling	Writing	Grammar
Early childhood teaching degree	12.5*	17.1**	15.0**	6.3	4.5
Other teaching degree	15.5	19.3	16.3	16.6	11.9
Adv. diploma/diploma	16.5***	18.6*	15.4*	6.4	10.6
Certificate	12.4	17.3	18.7	8.5	1.0
Other qualification	14.2	13.9	17.5*	8.8	10.8

Source: Warren & Haisken-DeNew (2013), Table 8.

Note: ***, **, and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively. Estimates include controls for background characteristics and prior ability of the child. Diploma and Certificate qualifications are only included if they are in child care or early childhood teaching.

A more recent analysis of LSAC data exploits a ‘natural experiment’ in Queensland – the elimination of public pre-kindergarten for four-year-olds in 2007 – that occurred as part of the alignment of Australian states with the National Quality Standard. Chor, Andresen and Kalil (2016) find statistically significant effects of ECE attendance for both boys and girls on school readiness (effect size² of 0.14 standard deviations), using the Who Am I school readiness assessment, and receptive vocabulary (effect size: 0.23), using the Peabody Picture Vocabulary Test. However, the results of the Strengths and Difficulties Questionnaire showed statistically significant behavioural improvements for girls only. They conclude that the ‘[t]he positive effects of universal prekindergarten provision appear to be driven by the use of higher-quality formal early education and care’ (Chor, Andresen & Kalil 2016, p. 169), further supporting the central importance of quality in determining the effects of ECE attendance.

The other major longitudinal dataset from Australia is the Child Care Choices Longitudinal Extension study (CCC), a longitudinal study of children initially recruited from long day care and family day care, conducted in New South Wales³. Analysis of the relationships between children’s socio-emotional strengths and difficulties in the year before school found no significant association between attendance of ECE and either prosociality or the experience of ‘difficulties’⁴. However, they found that ‘children who were rated by their teachers as more prosocial in Kindergarten were more likely... to have attended fewer hours of formal child care in their early years and longer hours of formal care/education in the year before school’ (Bowes et al. 2009, p. 97). Regression analyses to predict children’s achievement in early literacy and numeracy in the year before school revealed only two statistically significant relationships, both for literacy: a negative relationship with the number of child care arrangements and a negative relationship with weekly hours of formal care/preschool in the year before school. CCC concludes that ‘children who had received longer hours of formal child care in the early years were found to be less well able to meet the academic demands of their first year of school’ (Bowes et al. 2009, p. 93). The authors noted the implications of their findings about the impact of a child’s child care history on their transition to school for reforms to the Australian quality assurance system (Bowes et al. 2009); reforms that eventually led to the introduction of the National Quality Framework.

Further research is required to establish whether the stronger standards in the National Quality Framework have had their intended effect of substantially improving the effect of ECE on child development by improving provider quality. A preliminary analysis of school enrolment form data collected by the NSW Department of Education after the introduction of the National Quality Framework indicates a statistically significant positive relationship between ECE attendance and outcomes at school. Reported attendance at preschool for at least six hours per week in the year before school was associated with higher scores on the Best Start Kindergarten assessment (with effect sizes of between 0.15 and 0.2 standard deviations), and about 10 additional NAPLAN points in Year 3. Attendance in long day care services was associated with slightly lower advantage – 0.1 to 0.15 standard deviations in Kindergarten, and about five additional NAPLAN points in Year 3. While this analysis adjusted for the effects of Aboriginality and parental education and occupation, it could not adjust for other differences between children likely to be relevant, such as the home learning environment and the abilities of the child prior to ECE attendance. The Department’s Centre for Education Statistics and Evaluation (CESE) is continuing to collect additional data to refine this analysis and produce a more accurate estimate.

One more recent study that collected data after the introduction of the National Quality Framework and was able to better control for selection effects is the longitudinal E4Kids study. This study – conducted by Melbourne University in partnership with the Victorian Department of Education and Early Childhood Development and the Queensland Department of Education and Training – was designed to answer the following questions: ‘Are Australian ECEC programs effective? Which are most effective? In what ways are these programs effective? For whom are they effective? And for how long do the effects endure?’ (Tayler et al. 2016, p. 353)⁵. Consequently, this study included a range of quality measures that provided crucial data on the relationships between ECE attendance, ECE quality, and outcomes. While the study has completed its data collection and analysis and has produced articles on a range of subjects, research that links ECE experiences to outcomes at school (e.g. NAPLAN) has not been undertaken⁶. The study provides evidence that the quality of the interactions between educators and children including emotional support, room organisation and instructional support, make a difference to children’s outcomes (see a further discussion on the findings related to quality from the E4Kids study later in this report).

2 Effect size is an often-used measure of the magnitude of a relationship. Effect sizes convert estimates using different measurement tools into a common unit – standard deviations. Because of this, they are useful for comparing or aggregating the results from different research studies.

3 It is important to note that because of the sampling strategy, this study is likely to have excluded many children who attended preschool but not long day care, as well as children not attending any formal education or care.

4 One reason for this finding could be that the study included 11 different variables related to ECE attendance. Including many variables that measure the same concept can often result in multicollinearity, a statistical phenomenon that decreases the likelihood of researchers finding statistically significant results.

5 The focus of this study groups early childhood education with other aspects of formal early childhood care, and did not distinguish between education and care settings. While the focus of this paper is on ECE, ‘ECEC’ is used to refer to studies or data collection that looked at aspects of both education and care.

6 As per personal communication with the director of the study.

International longitudinal findings

The international literature contains much richer data, and shows more consistently positive associations than Australian studies, although these tend to be reduced by the addition of rigorous statistical controls. A number of longitudinal studies that specifically focus on ECE quality provide important insights into the relationships between ECE attendance and cognitive and non-cognitive outcomes that can reasonably be applied in the Australian context.

Effective Preschool, Primary and Secondary Education (UK)

The Effective Preschool, Primary and Secondary Education project (EPPSE), beginning in 1997, is a longitudinal study funded by the UK government. EPPSE was designed to evaluate the influence of preschool on children's academic and social-behavioural outcomes. The study compared nearly 3,000 children attending English preschools to 380 children that attended no, or very little, preschool. Two recent major evaluations, EPPSE 3-14 (Sylva et al. 2012) and EPPSE 3-16+ (Taggart et al. 2015), find positive associations between preschool attendance and a range of cognitive and non-cognitive outcomes after controlling for relevant background characteristics. For instance, preschool attendance was associated with a 41 point score difference in the General Certificate of Secondary Education (GCSE) exams (effect size: 0.31); attendance for two or more years was associated with a 51 point score difference (effect size: 0.38); and attendance at a high quality preschool was associated with a 49 point score difference (effect size: 0.37). These results lead Taggart et al. to conclude that ECE attendance 'influences both attainment and progress in early school careers and set[s] children on particularly beneficial learning trajectories' (2015, p. 29).

The positive associations of preschool attendance for social-behavioural outcomes were found to be particularly strong for boys, the reverse of the findings of Chor, Andresen & Kalil (2016) in the Australian context. Consistent with the broader theoretical and empirical literature, disadvantaged students, and particularly those with poor quality home learning environments, stood to gain the most from ECE attendance. These associations were strongest for disadvantaged children who attended high quality ECE. The EPPSE team investigated the conditions conducive to positive effects for disadvantaged students following ECE attendance in the *Performing against the odds: developmental trajectories of children in the EPPSE 3 to 16 study* report through in-depth qualitative case studies (Siraj-Blatchford et al. 2011). The combination of the associations demonstrated in the longitudinal data and the qualitative case studies led those researchers to the conclusion that 'preschool education of average or better quality or effectiveness can help to alleviate the effects of social disadvantage' (Siraj-Blatchford et al. 2011, p. 5).

As a follow-up to the EPPSE study, the UK government has commissioned another longitudinal study with a similar focus. The Study of Early Education and Development (SEED) will track 7,000 UK children from the age of 2 to Year 3 in school (approximately age 7). With twice as many children participating compared to EPPSE, this may provide more information on the experiences of children in small subgroups of the population. Results from this study may also give some indication of the effects of recent ECE reforms undertaken in the UK (such as providing universal ECE to a younger age group). This study is currently in its initial stages – only outcomes up to age 3 are available (Melhuish, Gardiner & Morris 2017).



Dosage effects

An important policy question that is examined by many studies is whether the 'dosage', or amount of ECE a child receives, is an important driver of later outcomes. Dosage effects are generally examined in two different ways: the duration (that is, is two or more years of ECE better than one year); and the intensity (is full-time participation better than part-time participation, either in terms of the number of days per week or the number of hours per day).

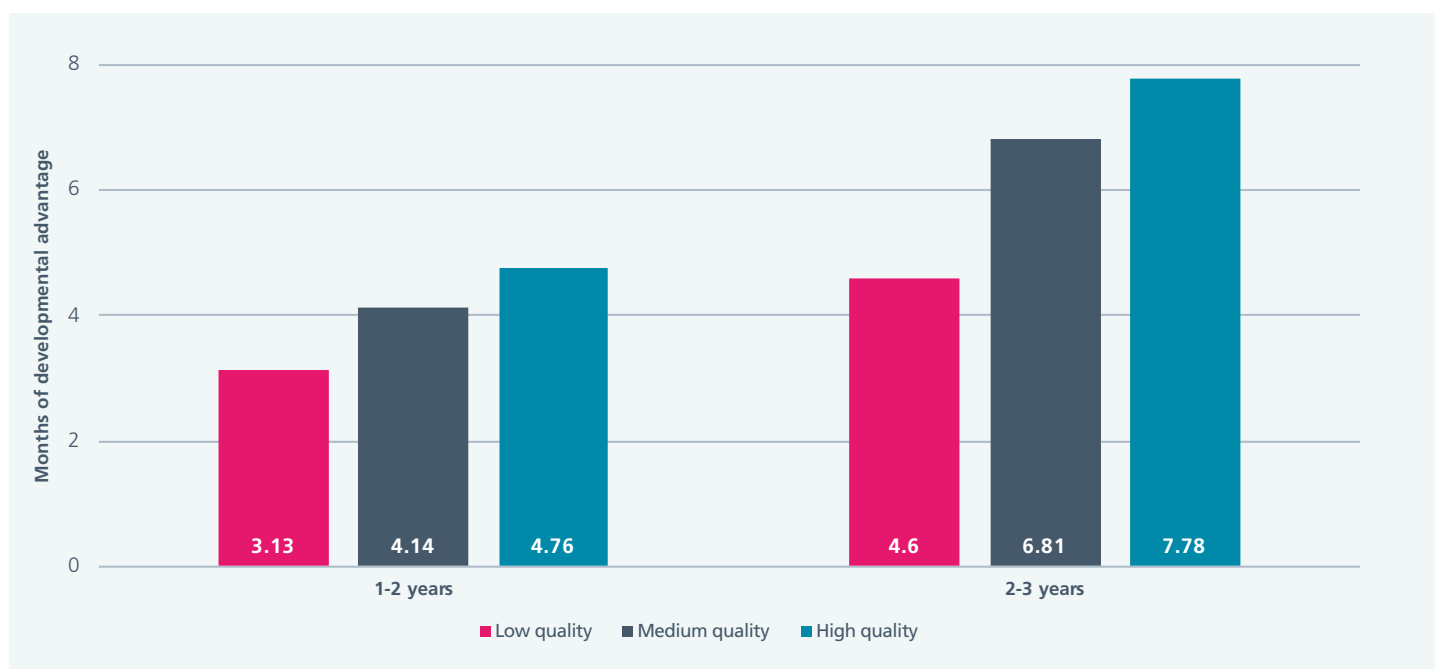
Analyses from the UK find consistently strong associations for longer duration of attendance, as well as attendance at higher quality centres, with children who attended high quality preschool for more than two years found to have a nearly 8 month developmental advantage in literacy at school entry over students who did not attend preschool (Figure 2; Melhuish 2016; Taggart et al. 2015). Contrary to some other findings in the literature, there was no significant difference between the associations of full and half day attendance and school entry outcomes for UK pre-schoolers (Taggart et al. 2015, p. 7).

In New Zealand, children who had attended ECE for more than 48 months performed statistically significantly better at age 16 than those who had attended ECE for less than 36 months in numeracy and cognitive composite scores, as well as logical problem solving. However, these differences relating to duration of attendance were no longer statistically significant after controlling for maternal qualifications and prior ability at age five, leading Hodgen

to conclude that 'the benefits of longer ECE experience make most of their visible contribution to age-5 scores, with a separate contribution still visible at age 14, but no longer visible by age 16' (2007, pp. 10-11). Since ability at age five (the start of school) was included as a control, this does not necessarily indicate that ECE did not have an effect on these students – rather, it indicates that students exposed to more ECE did not differ in their learning *trajectories* when they got to school.

Many US studies have focused on the relationship between intensity and later outcomes. Cooper et al. reviewed studies investigating the effects of half-day and full-day ECE and found similarly overall positive associations with achievement; full-day ECE attendees scored 'about one fifth to one third of a standard deviation higher on academic tests' than half-day ECE attendees even after controlling for relevant background characteristics (2010, p. 60). However, in these studies it is found that the effect 'dissipates over time and appears to vanish for all subgroups of students by the end of the third grade' (Cooper et al. 2010, p. 60)⁷. The effects of more intensive attendance appear to be contingent upon quality, consistent with the UK experience discussed above, as well as the findings of the wider literature (Barnett 1995, p. 28). As Cooper et al. note: '[a]lthough added time may create the opportunity for increased learning, it is how that time is used that will determine the [ECE program's] ultimate effectiveness' (2010, p. 62).

Figure 2: Estimated developmental advantage by duration and quality of preschool



Source: Taggart et al. 2015, Figure 1.

7 For more on the tendency for many positive results to diminish over time, see the section on 'fade out' later in this report.

Competent Children, Competent Learners study (NZ)

New Zealand's Competent Children, Competent Learners (CCCL) longitudinal study had a core focus on ECE and its relationship to later cognitive and attitudinal competencies (Hodgen 2007). CCCL 'did not include children who have no ECE experience' (Hodgen 2007, p. 1), and was primarily interested in the effects of the duration of ECE attendance. Importantly, this study included ratings of centre quality gathered through observation as well as information on structural quality factors such as child-educator ratios. Follow-ups at age 12 (Wylie et al. 2004) and 14 (Wylie et al. 2006) found moderate positive associations with mathematics and reading comprehension, although these were diminished when background characteristics were accounted for. Low-SES children who attended high quality ECE saw the largest benefits (Hodgen 2007), as with the EPPSE study, supporting the view of the relative value of ECE attendance as directly proportionate to what it replaces. Hence, disadvantaged children stand to gain the most from high quality ECE since they tend to 'otherwise experience impoverished and relatively unstimulating home environments' (Lamb 1998, p. 14; Scarr, 1997). There are also clear selection effects in quality of care that support Shonkoff and Phillips' finding that 'children who enjoy high-quality care are likely to have other advantages' (2000, p. 72). In the CCCL sample, only 14% of children whose mothers did not have any qualifications attended an ECE centre in the top quartile in staff responsiveness, whereas children whose mothers had university qualifications attended these centres at nearly three times that rate (39%) (Hodgen 2007).

In a follow-up at age 16, there continued to be a detectable relationship between ECE quality and later outcomes. Although associations with ECE quality were weaker when measured at age 16 than at age 14, a number of quality measures remained significant after controlling for maternal qualifications and income (Hodgen 2007). Of the 21 process quality measures examined, five remained significant at age 16:

- Staff are responsive to children
- Staff guide children in centre activities
- Staff ask children open-ended questions
- Staff join children in their play
- The centre is print-saturated.

PISA (cross-country)

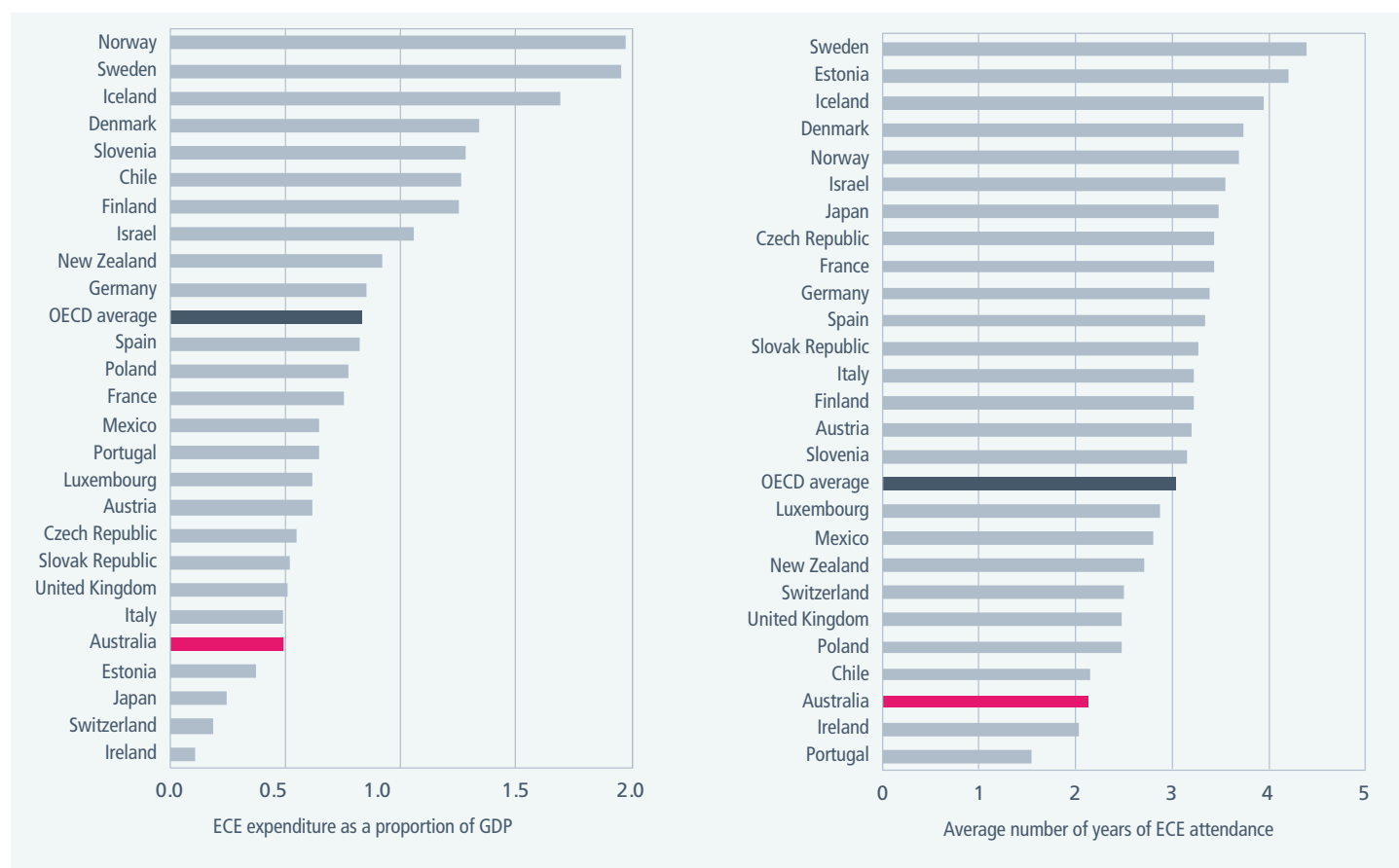
The OECD's Programme for International Student Assessment (PISA) data has 'consistently shown that students who had attended pre-primary school for more than one year score higher than students who had attended for less time' (OECD 2016c, p. 44). The authors note that '[i]t is not possible to ascertain, though, whether this is an effect of the learning opportunities provided in early childhood education or simply mirrors selection' (p. 233). Their analysis of 2015 PISA data found that every additional year of pre-primary attendance was associated with a four point advantage in test scores, although this association was not statistically significant after controlling for socioeconomic status of students and schools⁸. Further analysis of this data suggested that the minimum duration of early childhood education that is required to improve the likelihood of good performance at age 15 is two years (OECD 2017, p. 146).

OECD data on ECE expenditure as a percentage of GDP shows that Australia has the fifth lowest per capita expenditure on ECE of the countries for which there is available data and the third lowest average duration of ECE attendance (Figures 3-4). Expressed this way, Australia's ECE expenditure is less than half that of each of the Nordic countries, and less than one quarter that of Sweden and Norway.



⁸ It should be noted that, at least in the case of NSW students, data from PISA on ECE attendance has serious quality issues. The question regarding ECE attendance on the Australian PISA survey reads 'How old were you when you started *kindergarten* or preschool?' (emphasis added). This wording was used to accommodate students in other states where the ECE year is known as kindergarten. However, in NSW, where this term refers to the first year of primary school, the wording is likely to have caused substantial confusion.

Figure 3 & 4: ECE expenditure as a proportion of GDP and average number of years of ECE attendance, selected countries



Source: OECD 2016a, Table C2.3; OECD 2016c, Table II.6.51.

Note: See footnote 8 for a caveat relating to the ECE duration data

Early Childhood Longitudinal Study (US)

The Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) follows a nationally representative (US) sample initially comprising more than twenty thousand children who were in kindergarten in 1998-1999 (National Center for Education Statistics 2001; Claessens, Duncan & Engel 2009). Magnuson, Ruhm and Waldfogel's analysis of ECLS-K data shows that children who attended preschool had higher levels of academic achievement at school entry than those who did not, but also that attendees' families were more advantaged (2007, pp. 24-25). After controlling for these relevant background characteristics (such as socioeconomic status), the preschool effect size is reduced from around 0.4 to around 0.14 (Magnuson, Ruhm & Waldfogel 2007).

What is most notable about this analysis, however, is that the authors found that the positive association between preschool and some cognitive outcomes actually grew between Years 1 and 3, 'raising the possibility of 'sleepers effects' that increase in size in later grades' (Magnuson, Ruhm & Waldfogel 2007, p. 26). However, they note that overall, while the reported associations between preschool and students' skills are statistically significant, the magnitude of these effects is relatively small at school entry (effect size: 0.14) and the ongoing impact in later grades is variable.

Hence if there are increasingly positive long term associations with ECE attendance they are, at the least, hard to detect (Magnuson, Ruhm & Waldfogel 2007, and discussed in more detail below.

Evidence from randomised controlled trials

In both cross-sectional and longitudinal analyses it is difficult to rule out that differences in outcomes between children who attend ECE and those who do not may be driven by observable or unobservable differences between the groups (such as SES, prior childhood experiences, or the value parents assign to education). Since the children who attend ECE are likely to be systematically different from those who do not in ways that cannot be entirely accounted for through statistical methods, the best way to identify causal effects is through randomised controlled trials (RCTs). As Blau and Currie put it: 'The importance of random assignment is that researchers can be reasonably certain that there are no pre-existing, unobserved, and uncontrolled differences between the treatments and controls on average' (2006, p. 1222). The major RCT studies that examine the effects of interventions incorporating ECE are summarised in Table 2, and discussed in more detail below.

Table 2: Summary of randomised controlled trials examining effects of interventions including ECE programs

Program name	Ran in	Intervention	Target population	Results
High/Scope Perry Preschool	1960s	ECE + home visits from teachers	Small group of low-SES children in the US	Large effects on educational attainment and various adult outcomes
Milwaukee Project	1960s	ECE + childcare + parenting program + nutrition from birth to age 6	Small group of low-SES children in the US	Large effects on IQ, no difference on educational performance by 14
Abecedarian	1970s	ECE + childcare + intensive parenting program from birth to age 8	Small group of low-SES children in the US	Large effects on IQ, educational performance and attainment to age 21
Houston Parent Child Development Centre	1970s	Childcare + parenting program + home visits	Small group of low-SES children in the US	Some significantly positive effects on educational performance
Early Training Project	1970s	ECE over the summer + home visits for 4-5 year olds	Small group of low-SES children in the US	Reduction in special education enrolment; no other significant effects
Infant Health and Development	1980s	ECE + parenting program + home visits from birth to age 3	Moderate group of premature, low birthweight infants in the US	Significantly positive effects on development at age 3; no effect on education at age 8
Even Start	1990s	ECE + adult education + parenting program from birth to age 7	Large group of low SES children in the US (lower SES than Head Start)	No significant effects
National Head Start Impact Study	2000s	ECE + parenting program for 4 year olds	Large group of low SES children in the US	Moderate effects at the end of preschool; no significant effects at school
Tennessee Voluntary Pre-K	2010s	ECE in year before school	Large group of low SES children in the US	Moderate effects at the end of preschool; children were less likely to repeat Kindergarten; no significant positive effects on cognitive or non-cognitive outcomes at end of Year 1 (significantly negative effect on one subscale)



High/Scope Perry Preschool

The High/Scope Perry Preschool program, conducted between 1962 and 1967, randomly assigned 58 low-income African-American children identified as at high risk of failing in school into the Perry Preschool program and 65 to a control group (Schweinhart et al. 1993). Treated participants met for 2.5 hours a day, 5 days a week, over the course of a 30-week school year, with most children participating for two years. Teacher-child ratios were kept at 5-6:1, and all teachers held Bachelor's degrees in education and were licensed public school teachers (Barnett 2011). In addition, from October to May for each year of the program, teachers conducted 1.5 hour weekly visits to each mother and child (Schweinhart 2003).

The Perry Preschool program had substantial and statistically significant effects. By age 27, the treated participants had significantly higher levels of schooling, being 17 percentage points more likely to graduate from high school, as well as having significantly higher earnings and lower rates of arrest (Schweinhart 2003). While such 'well-designed studies of intensive educational interventions show that it is possible for intervention to make a positive difference in children's lives', these small sample size programs are 'typically funded at higher levels and run by more highly trained staff than large-scale, publicly-funded programs' (Blau & Currie 2006, pp. 1226,1222; Currie & Almond 2011). Arnett in particular highlights the problem that many, if not most, of these early studies were run in 'well-funded university-run centers, unrepresentative of the quality of care experienced by most children' (1989, p. 541). Further, the simultaneous implementation of multiple treatments presents a challenge for policy recommendation, since 'their program evaluation designs provide no way of isolating which program elements mattered the most' (Claessens, Duncan & Engel 2009, p. 416).



Abecedarian

Abecedarian was a multi-treatment program undertaken in Carolina, US, targeted at disadvantaged children. It was implemented in two phases: the first from birth to 5 years old, and a second from 5 to 8 years old. Children in the treatment group attended centre-based childcare for eight hours a day, five days a week, 50 weeks a year up until the age of 5 (Blau & Currie 2006). Staff were highly qualified teachers and teacher-child ratios were between 3:1 and 6:1 (Garcia et al. 2016). From ages 5-8, treatment group parents also met fortnightly with their children's teachers.

As with Perry Preschool, Abecedarian demonstrated statistically significant long-term treatment effects, including a 0.33 standard deviation (SD) increase in IQ (up to age 21) and a 0.5 SD increase in reading and math (up to age 21), as well as higher levels of educational attainment and fewer symptoms of depression (Schweinhart et al. 2005). At the age of 30, Abecedarian group participants were:

- 42% more likely to have been employed over the past two years than members of the control group;
- 81% less likely to have received welfare for a long period (9+ months) between the ages of 22.5 and 30 years;
- Almost four times as likely to have graduated from college;
- More educated, with 1.2 more years of education; and
- 1.8 years older when their first child was born (an average of 21.8 years of age for the Abecedarian group compared to 20.0 years of age for the control group).

The study found no statistically significant effects on high school graduation rates, income, type of employment, mental or physical health, criminal activity, or substance use.

Despite its relatively small size, with 54 students in the treatment group and 51 students in the control group, these substantial and long-lasting effects demonstrate that interventions incorporating ECE can work. However, given the much more intensive nature of the intervention provided, this study does not illustrate the effects of universal ECE alone. Notably, since 68% of the control group attended relatively high quality, full-time childcare centres for more than a year (Barnett 2011), this study was perhaps less of an evaluation of the effects of universal ECE and more of a demonstration of what can be achieved when intensive intervention in the lives of disadvantaged children occurs in *addition* to participation in high quality formal education and care.

Other small randomised control trials

Blau and Currie's (2006) extensive review of the literature documents the findings of a number of other high profile ECE studies, finding five with randomised designs other than Abecedarian and Perry Preschool. Three of these were primarily childcare programs:

- the Milwaukee Project (Garber 1988) – finding positive effects on IQ in a later measurement in Year 8;
- the Infant Health and Development Project (McCarton et al. 1997; Hill, Waldfogel & Brooks-Gunn 2002) – finding positive effects on IQ at ages 3, 5 and 8, fewer behavioural problems at ages 3 and 5, though these were not significant at age 8, and greater achievement in maths at age 8;
- the Houston Parent Child Development Center program (Johnson & Walker 1991) – finding no significant positive effects.

Of the two remaining randomised designs, the evaluation of the Early Training Project (Gray, Ramsay & Klaus 1983) found statistically significantly lower rates of participants' enrolment in special education by year 12, while the evaluation of the Institute for Developmental Studies program (Deutsch et al. 1983) found no significant effects. However, even the significant findings are complicated by the fact that all of the above studies included either home visits or parental job and academic training as part of the treatment, limiting the capacity to isolate the causal effects of the ECE component by itself.

Head Start

Generally speaking, the smaller the size of the ECE study, the larger the effects ECE is found to have. This raises the concern that 'the quality of small-scale interventions cannot be maintained by large public programs' (Barnett 2011, p. 976). Head Start is the largest and longest running study for which longitudinal data is available. While not a randomised controlled trial in and of itself, there are a number of evaluations of Head Start programs that do employ RCT designs.

Head Start began in 1965 and is still running today. It has expanded significantly since its beginnings as a summer school program designed to help low-income students prepare for school, providing millions of children with health, nutrition, and social services (Washington & Bailey 1995). Notably, like other early childhood interventions, Head Start also provides parent education, which is both widely acknowledged as a key component of improving children's outcomes and as a confound that limits how much of the effect can be attributed to ECE on its own (Claessens, Duncan & Engel 2009). Further, the fact that Head Start is specifically designed to serve economically disadvantaged children (Lee & Loeb 1995), for whom the relative benefits are likely to be substantially larger than for the average child in the population, makes it challenging to apply conclusions from Head Start studies to

universal ECE. As a large, longitudinal study with the capacity to facilitate RCTs, Head Start may feasibly provide insights into the causal impact of ECE programs, although the evidence, as with the wider literature, is mixed.

The National Head Start Impact Study (NHSIS), a 2010 evaluation employing random assignment (with a sample size of 4,667) found that the provision of one year of Head Start resulted in a statistically significant increase relative to the control group in 13 of 22 language, literacy and maths measures, with an average effect size of 0.18 SD (Barnett 2011). This is consistent with other studies that have found short-term cognitive, emotional, and social benefits of Head Start (Lee, Brooks-Gunn & Schnur 1988; US Department of Health and Human Services 1985). However, NHSIS also found that these effects quickly faded out, and that 'the benefits of access to Head Start at age four are largely absent by 1st grade' (US Department of Health and Human Services 2010, p. xxxviii). This is also consistent with the wider literature, as Copple, Cline and Smith (1987, p. 4; Lee & Loeb 1995, p. 62) assert, 'the consensus of past Head Start and other intervention studies' is that they demonstrate 'little or no lasting effects of early childhood programs on achievement scores'.

Despite the prevalence of 'fade out', opinions on the relative value of the Head Start program remain mixed. Gibbs, Ludwig and Miller are optimistic, stating that '[a]ssessments that Head Start is ineffective based on NHSIS results are in our view premature, given our currently limited understanding of how and why early childhood education improves long-term life chances' (2011, p. 2). Ludwig and Phillips are even more positive, arguing that there is now a body of evidence that at least suggests that Head Start generates long-term benefits and passes a benefit-cost test' (2008, pp. 266-267).

In part, this optimism is stimulated by the work of Garces, Thomas and Currie (2002) and Deming (2009). Garces, Thomas and Currie (2002) use a (non-experimental) comparison of children in Head Start to their siblings who did not participate in Head Start to evaluate longer-term effects. They note the limitations of this approach, but state that – writing well before the NHSIS study – since 'experimental evaluations of the program do not exist' this approach is the next best thing. They find that rates of high school completion are about 20 percentage points higher for Head Start attendees than their non-Head Start siblings. However, this effect was only significant for white participants. Deming (2009) provides more compelling sample-wide evidence, though it is similarly non-experimental and employs the non-Head Start sibling approach. He finds that Head Start participants 'gain 0.23 standard deviations on a summary index of young adult outcomes' (high school graduation, college attendance, 'idleness', crime, teen parenthood, and health status), although here too there is evidence of some fade out (Deming 2009, p. 111).

Fade out

The phenomenon of ‘fade out’, that is, that rather than setting positive trajectories that compound over time (List, Samek & Suskind 2017), the effects of ECE programs tend to grow *weaker* over time, is a significant concern for policy makers. Many studies indicate that initially positive effects associated with ECE tend to fade out between 1 and 3 years after the intervention. This limits the usefulness of non-longitudinal studies for informing policy, since they are likely to exaggerate effects by focusing on short-term results that are likely to fade out.

What causes fade out and what policies would most appropriately address the issue are matters of considerable debate. Garces, Thomas and Currie argue that the fade out phenomenon does not necessarily indicate that the ECE attendees ‘do not benefit from starting school ‘on the right foot’ (2002, p. 1000). As with ECE programs, school quality varies substantially, and it is widely acknowledged that ‘the impact of early educational experiences may [rely on] the ongoing quality of school learning experiences in kindergarten and first grade’ (Bierman et al. 2014, p.155; see also Magnuson, Ruhm & Waldfogel 2007). Similarly, Lee et al. argue that efforts need to be directed towards ‘inducing sustained and successful academic experiences... rather than focusing on efforts to ‘fix’ the problem’ (1990, p. 505) with single-shot ECE programs. From the perspective of many ECE specialists, it is not the responsibility of ECE to ensure high school or lifelong success, but rather to give children the best

possible foundation from which to take full advantage of the first year of school. It is then the responsibility of the first year of school to prepare children for the second, and so on.

The potential for ECE to ‘enable children to establish a more positive academic *trajectory* for their future school careers’ (Peisner-Feinberg et al. 2001, p. 1550; emphasis added) is a powerful possibility that warrants further exploration, but empirically, the benefits of ECE are better characterised as an arc. It is not reasonable to apply the trajectory concept to ECE and not each year of primary school, high school and beyond. A child’s future success is the sum of multiple trajectory-setting factors. However, a recent US-based study suggested that the effect of fade out is mitigated when a community is sufficiently saturated with an early childhood program (Dodge et al. 2017), which has implications for the importance of universal access to ECE.

It may be that more effective early years schooling could turn a short-term advantage of ECE into a positive lasting trajectory, but the compelling economic case that ‘an optimal investment strategy should focus investments in the early years compared to the later years’ (Heckman & Masterov 2007, p. 24) is challenged by the prevalence of fade out. There is much research to be done in this area, and there is a particularly strong imperative to conduct medium- and long-term evaluations of the causal effects of ECE in Australia.

Even Start

Even Start is a large-scale US intervention targeted at very disadvantaged families – more disadvantaged than the typical family enrolled in Head Start. The program consists of parenting education, adult education, parent-child activities, and an ECE program. The Third National Even Start evaluation dealt with a portion of participants that were randomly assigned into either an Even Start program or a control group, reporting on a range of cognitive and non-cognitive outcomes. However, of the 41 measures reported, there were zero statistically significant effects (US Department of Education, Planning and Evaluation Service 2003). The finding of this program is in contrast with broader trends in the literature, where programs targeting more disadvantaged children tend to exhibit greater effects. The evaluation team notes that there were a number of implementation issues, such as relatively low uptake of provided services and insufficient emphasis on language acquisition and reasoning (US Department of Education, Planning and Evaluation Service 2003), which may potentially explain the failure to achieve significant results.



Tennessee Voluntary Prekindergarten

The Tennessee Voluntary Prekindergarten program (TN-VPK) is the most methodologically informative recent study on large-scale ECE provision available. TN-VPK dealt with the issue of the scarcity of available full-day prekindergarten places by randomising admission, such that ‘no differences are expected on average between the characteristics of the children of those admitted and those not admitted’ (Lipsey et al. 2013, p. 9). The evaluation of this program included longitudinal follow-ups on a range of cognitive and non-cognitive outcome measures. This design allowed for evaluation of the effects of ECE attendance on these outcomes independent of confounding factors.

At the end of the program, the TN-VPK students performed statistically significantly better on both cognitive (effect size: 0.32) and school readiness (effect size: 0.22) assessments. However, depending on the measure, these effects either went away or turned negative in later grades, prompting the evaluation team to state that ‘[t]he longitudinal effects found for TN-VPK so far are decidedly mixed.’ (Lipsey et al. 2013, p. 15, Lipsey, Farran & Hofer 2015). These findings broadly reflect the wider literature on large-scale ECE programs. It is clear that short-term gains can be achieved, especially for disadvantaged students attending high quality centres. However, there is far more mixed evidence for long-term effects of ECE programs that do not include more intensive interventions.

Upcoming experimental research

There is a particularly promising Harvard/Chicago longitudinal study that began in 2010 employing random assignment into *either* preschool, a parenting program, or a control group (Cappelen et al. 2016; Fryer, Levitt & List 2015). This will allow the researchers to isolate the impact of providing ECE on its own, without a corresponding parenting program (in contrast to most other interventions). However, while the researchers have reported on outcomes for the parenting program – finding effect sizes of 0.131 for cognitive outcomes and 0.221 for non-cognitive outcomes (Fryer, Levitt & List 2015) – this study has not yet reported on these for the preschool program at this stage.

The limits of existing randomised controlled trials of ECE

While randomised controlled trials are typically the most reliable type of study design for assessing causal impacts of ECE, there are some features of the currently published RCT literature that may make it challenging to apply to ECE policy in NSW. The relevant RCT studies CESE was able to locate were extremely similar to one another in a number of key ways: all were located in the US; all targeted low-SES children; almost all incorporated other interventions such as parenting programs as well as ECE provision; and most were relatively small scale. Because all participants in an RCT are exposed to the same treatment, it is not possible to disentangle the effects of ECE from other components of these programs, or to assess whether these programs would produce the same effects in a different context or targeting different participants. The effects of ECE programs in the existing literature of RCTs therefore might not be representative of the effects of preschools and long day care services currently operating in NSW.

It should be noted that some of these limitations have potential to over-estimate the impact of ECE provision. Programs that combine ECE with complementary interventions, for example, are likely to be more effective than ECE by itself. In addition, the literature as a whole has repeatedly demonstrated that small scale programs targeting disadvantaged children elicit more benefits than larger scale programs that are not targeted. Similarly, estimates of ECE program quality appear to indicate that US centres have higher average quality than those in Australia (see the section on quality later in this report), possibly introducing an additional bias when attempting to extrapolate to NSW children. The most effective way of overcoming these limitations and resolving any inconsistency between findings from RCT and non-RCT literature would be to implement an RCT that assesses the provision of ECE in a context similar to NSW. At the time of writing, none appear to be planned.

Effects of ECE quality

One of the most consistent findings of both the longitudinal and experimental literature is that the effects of ECE programs are proportionate to their quality (Barnett 1995; Duncan 2003; Vandell 1996). The strongest endorsements of investments in ECE refer explicitly to the types of high-quality institutions and programs that have been the focus of ECE intervention studies such as Abecedarian and Perry Preschool (Heckman 2011). Siraj et al. note that there is widespread acknowledgement that ‘the developmental, learning and social benefits associated with ECEC cannot be assumed to entail unless the service provision is of sufficient quality’ (2016, p. 4).

One explanation as to the causal mechanism underpinning the positive association between ECE and superior outcomes through the early years of primary school is the finding that ‘children in high-quality settings engage in more complex activities with peers and materials and score higher on standardized measures of school readiness’ (La Paro, Pianta & Stuhlman 2004, p. 410). In findings that echo patterns in the broader ECE literature, quality appears to be particularly important for low-SES children (Peisner-Feinberg et al. 2001).

However, there is little agreement about how much quality (and of what type) is required to ensure positive outcomes. Quality in educational settings can be ‘a relative and sometimes politically contested term’ (Sylva et al. 2012, p. 9). In ECE specifically, Hwang, Broberg, and Lamb describe it as a ‘slippery and multifaceted construct that requires careful measurement and interpretation’ (1991, p. 117).

A number of established international indicators of ECE quality (Table 3), as well as national indicators, such as Australia’s National Quality Framework, provide objective measures for evaluation. Quality is typically divided into the *structural* domain (characteristics of the institutional setting, such as educator-child ratios) and the *process* domain (characteristics of the interactions between staff and children and between the children themselves). In practice, the division may be less distinct as the characteristics of structural quality are likely to support the achievement of process quality.

Table 3: Measures of ECE Quality

Name	Key Constructs		Source
Child Caregiver Interaction Scale (CIS)	Emotional domain Cognitive/Physical domain Social domain		Arnett (1989)
Early Childhood Environmental Rating Scale – Revised Edition (ECERS-R)	Space and furnishings Personal care routines Language-reasoning	Activities and interaction Program structure Parents and staff	Harms, Clifford & Cryer (1998)
Early Childhood Environment Rating Scale – Extension (ECERS-E)	Literacy Mathematics	Science Diversity	Sylva, Siraj-Blatchford & Taggart (2003)
Infant/Toddler Environment Rating Scale (ITERS-R)	Space and furnishings Personal care routines Listening and talking	Activities and interaction Program structure Parents and staff	Harms, Cryer & Clifford (2003)
Observational Record of the Caregiving Environment (ORCE)	Positive and negative affect Language focused interaction Stimulation	Behaviour management Child’s activity Child’s interaction with other children	Vandell (1996)
Child/Home Early Language & Learning Literacy Observation Tool (CHELLO)	Literacy environment Group/family observation		Neuman, Koh & Dwyer (2008)
Classroom Assessment Scoring System (CLASS)	Emotional and instructional support Classroom organisation		Pianta et al. (2008)
Early Language & Literacy Classroom Observation Pre-K Tool (ELLCO Pre-K)	Classroom structure Curriculum Language environment	Books and book reading Print and early writing	Smith, Brady & Anastasopoulos (2008)

Source: Halle, Vick Whittaker & Anderson 2010

Structural quality

Structural quality comprises characteristics of an ECE provider such as educator-child ratios and teacher qualifications (Blau & Currie 2006). These factors are easily quantified, and so it is comparatively straightforward to link them to child outcomes, and can provide an easily measurable proxy for broader ECE quality. Lower educator-child ratios, for instance, are often found to be associated with ECE quality (Blau 2000; Shonkoff & Phillips 2000), higher process quality (Ghazvini & Mullis 2002; McCartney et al. 1997), and child outcomes (Sylvia et al. 2004; Sylvia et al. 2010; Howes 1997). Many studies find that this relationship remains after adjusting for factors such as socioeconomic status.

Jha's (2014) analysis of Australian studies investigating educator-child ratios describes statistically significant, if small, positive associations between smaller ratios and socio-emotional outcomes (see Houg, Jeon & Kalb 2011; Department of Families, Housing, Community Services and Indigenous Affairs 2010). Internationally, longitudinal research found that 'classrooms that met professional standards regarding child:adult ratios tended to have children with better language skills' (Burchinal et al. 2000, p. 339). Burchinal et al. (1996) similarly found that educator-child ratios are related to infants' communication skills after controlling for differences in care quality in the home environment.

NSW Department of Community Services' (2008) review of the research evidence on quality in child care identifies five studies on the impact of ratio changes. Of these, three were natural experiments, with one finding improvements in global quality of care after a reduction from 8:1 to 6:1 and 6:1 to 4:1 (Howes & Smith 1995); a second finding that child-initiated verbal interactions with caregivers decreased when the ratio was increased from 2.2:1 to 4.2:1 (Palmerus 1996); and one finding no significant effects on process quality after reducing the staff-child ratio (Smith et al. 1988). Of the two other studies, in which ratios were manipulated and effects inferred from pre- and post- measurements, one found that caregivers were more supportive and the children were more cooperative with a ratio of 3:1 than 5:1 (De Schipper, Riksen-Walraven & Geurts 2006); while the other found no significant effects from a moderate reduction in ratios (Love, Ryer & Faddis 1992).

The findings of the literature on the relationship between caregiver qualifications and child outcomes are more consistent (Arnett, 1989; de Kruif et al. 2000; Howes, 1997; Loeb et al. 2004; McWilliam 2000; Vandell 1996; Scarr, Eisenberg & Deater-Deckard 1994; Vandell & Powers 1983). Higher levels of ECE-specific training are associated with better classroom quality (Hamre & Bridges 2004), however Burchinal et al. (2000) found that the association between teachers meeting recommended standards of education and better cognitive and language performance was only statistically significant for girls.

Howes, Whitebook and Phillips' analysis of the National Child Care Staffing Study found that 'formal education was a better predictor than specialized training' (1992, p. 399).

The more recent analysis of Pianta et al. found that 'quality was lower in classrooms... when teachers lacked formal training (or a degree) in early childhood education' (2005, p. 144), underscoring the importance of both education and training.

Barnett's influential review of the literature asserts firmly that 'young children's learning and development clearly depend on the educational qualifications of their teachers' (2003, pp. 1-2). While he is strongly supportive of the effects that high-quality preschool education can have on short and long-term outcomes, he concludes that 'many preschools are educationally ineffective' because they lack adequately paid teachers who hold professional qualifications (Barnett 2003, p. 3). Specifically, he asserts that 'only teachers with at least a four-year college degree consistently provide the good-to-excellent quality linked to future school success' (Barnett 2011, p. 10).

However, Early et al. demonstrate that 'structural standards are not sufficient to ensure quality in programs and improvements in child outcomes' (2006, p. 193; 2007) by themselves, finding no significant relationships between teachers' years of education or possession of a Bachelor's degree and ECE classroom quality measures. These findings appear to support Hayes, Palmer and Zaslow's contention that while structural quality 'appear[s] to support and facilitate more optimal interactions' they 'do not guarantee it' (Lamb 1998, p. 13 in Blau & Currie 2006). These findings underscore the crucial importance of process quality.

Process quality

Process quality is more difficult to define and measure, characterising 'the interactions between children and their caregivers, their environment and other children', up to and including such measures as the frequency of smiling, responding to questions, asking open-ending questions, and encouraging independence (Blau & Currie 2006, p. 1184). There has been a great deal of research into the construct validity of measures of process quality (Colwell et al. 2013), which is increasingly 'measured with systematic observational rating scales' (Melhuish et al. 2015, p. 7).

There are at least fifty different quality scales available (Halle, Whittaker & Anderson 2010), although the most widely used scales have much in common. One of the most influential classification systems for analysing process quality, reproduced in Table 4, comes from the 'Teaching Through Interactions' framework (Hamre & Pianta 2007).

Table 4: Outline of the Teaching Through Interactions framework

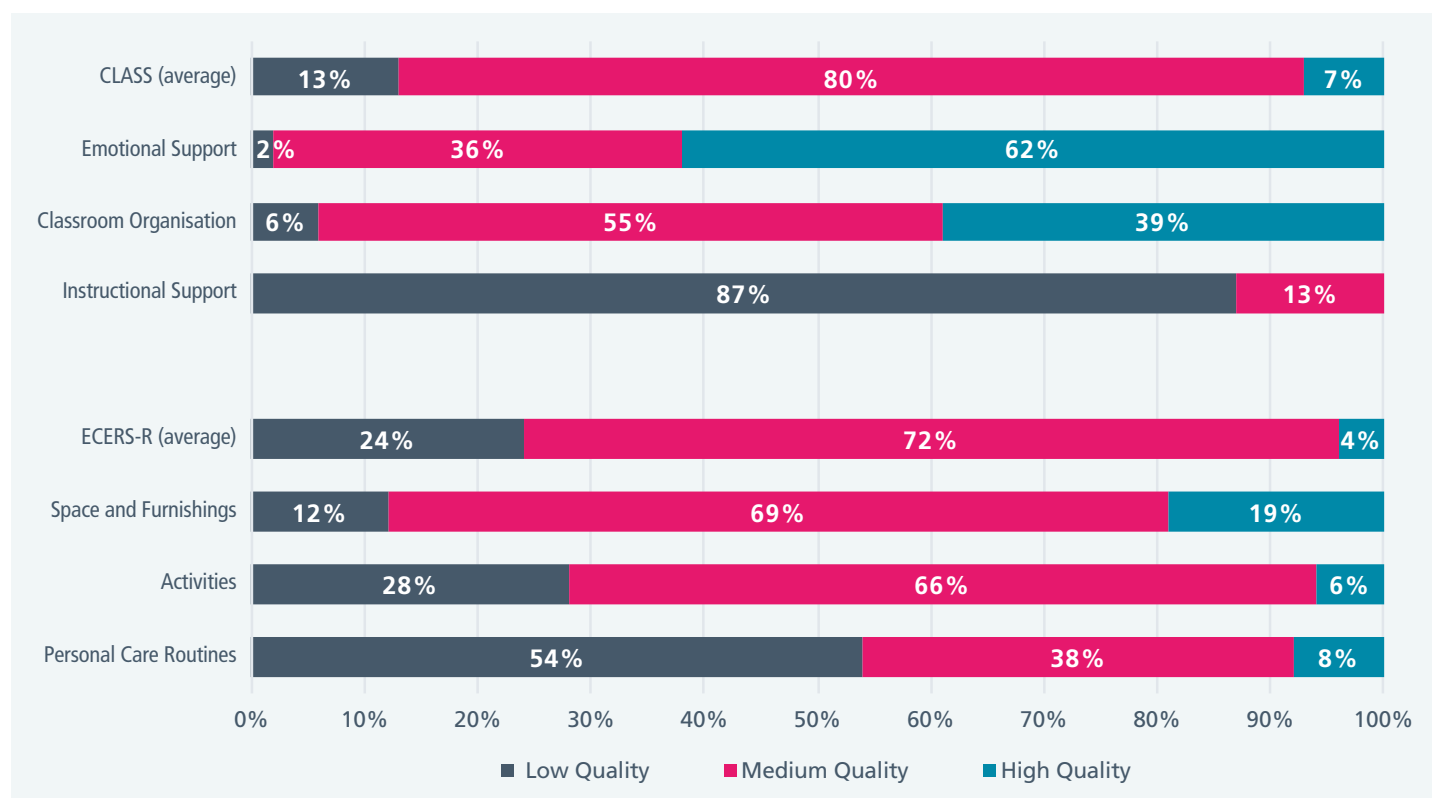
Domain	Dimension	Low quality	High quality
Emotional support	Positive climate	Teachers and children are emotionally distant from one another and do not appear to enjoy their time together.	Teachers and children have positive relationships, enjoy spending time together, and are respectful in their interactions.
	Negative climate	Teachers are often frustrated and angry in interactions with children and/or frequent arguing or fighting among children occurs and goes unresolved.	Teachers and children rarely display negativity (e.g. anger, aggression, irritability) in interactions with each other and when they do, it is quickly alleviated.
	Teacher sensitivity	Teachers do not attend to children's cues for additional support – socially or academically.	Teachers are aware of and responsive to the needs of children in their classroom.
	Regard for student perspectives	The classroom is teacher driven and features few opportunities for children to express their ideas or take initiative in activities.	Assess the degree to which teachers' interactions with students and classroom activities place an emphasis on students' interests, motivations, and points of view, rather than being very teacher driven.
Classroom organisation	Behaviour management	Teachers spend much time reacting to behaviour problems in the classroom or little time managing behaviour, and children are observed to engage in frequent misbehaviour.	Expectations for behaviour are clear and consistent, and teachers are proactive in their approach to managing behaviour.
	Productivity	Clear classroom routines do not exist and children spend much time wandering, unengaged, or unclear about what they should be doing.	Teachers set up clear classroom routines in ways that help children spend most of their time engaged in meaningful activities.
	Instructional learning formats	Teachers do not engage with children and/ or fail to provide activities and instruction of interest to children.	Teachers actively promote children's engagement through their interactions and by providing interesting activities, instruction, centres, and materials.
Instructional support – General	Concept development	Learning opportunities are either not provided or focus on rote and fact-based learning.	Teachers' interactions with children promote higher order thinking skills and make learning meaningful by connecting it to children's lives
	Quality of feedback	Teachers provide children with little or no feedback or the feedback provided is focused primarily on correctness rather than on expanding children's learning.	Children are given frequent feedback that expands their understanding of ideas and encourages their continued participation.
	Language modelling	The classroom has little or no conversation. Teachers do most of the talking and/or children are expected to remain quiet.	Teachers and children engage in frequent conversation with one another in ways that help children extend their language and communication skills.

Source: Hamre 2014, Table 1

The ECERS (1980), its revised form – the ECERS-R (1998) – and its supplement/extension – the ECERS-E (2003) – have been widely employed to document the associations between ECE quality and children’s development outcomes (Sylva et al. 2006; Peisner-Feinberg et al. 2000) and described as ‘the standard measure in the field of early education for more than 25 years’ (Mashburn et al. 2008, p. 735). These instruments measure quality on a range of items, ranging from staff’s encouragement of children’s use of books, learning activities, peer interaction, discipline, and individualised teaching and learning (Harms, Clifford & Cryer 1998). These items are able to be computed into a single overall measure of quality or broken up into subscales: space and furnishing, personal care routines, language-reasoning, activities, interaction, program structure, and parents and staff. Similarly, the Classroom Assessment Scoring System (CLASS) is able to be broken up into a number of subscales: positive climate, negative climate, teacher sensitivity, over-control, behaviour management, productivity, concept development, learning formats, and quality of feedback (La Paro, Pianta & Stuhlman 2004). These measures have been widely used to evaluate the associations between elements of process quality and children’s cognitive and non-cognitive outcomes (Howes, Phillipsen & Peisner-Feinberg 2000). A European case study of ECEC comparing cultural differences in process quality found that ‘what was thought good practice in one country was by-and-large also considered good practice in another country’, affirming the international suitability of the CLASS scale (Slot et al. 2017, p. 4).

Both the ECERS-R and CLASS scales were employed in Melbourne University’s E4Kids longitudinal study, although there is not yet published research linking these measures to children’s longer-term outcomes. However, E4Kids’ initial evaluations of 250 Queensland and Victorian ECE services are the most thorough recent investigation of ECE quality in Australia. NSW services are not included in this study, although there is reason to think that NSW services would be comparable (see break-out box on the next page). The E4Kids research notes that in previous studies, Australian ECEC services were reported to have higher average quality than in some larger English-speaking countries such as the United Kingdom and the United States (Fenech, Sweller & Harrison 2010; Harrison et al. 2006; Love et al. 2003), but their study ‘presents contrary evidence’ (Tayler et al. 2013, p. 14). As reported in Figure 5, Australian ECE is overwhelmingly medium quality, with 80% of ECE classrooms rated as such on the CLASS scale and 72% on the ECERS-R. Seven per cent were rated as high quality on CLASS, (compared to 13% as low quality), and only 4% were rated as high quality on ECERS-R, (compared to 24% as low quality). Tayler et al. conclude: ‘If high-quality services are desired for promoting child development, these results are troubling’ (2013, p. 16).

Figure 5: Queensland and Victorian ECE service ratings using ECERS-R and CLASS scales



Source: Tayler et al. 2013, p. 17

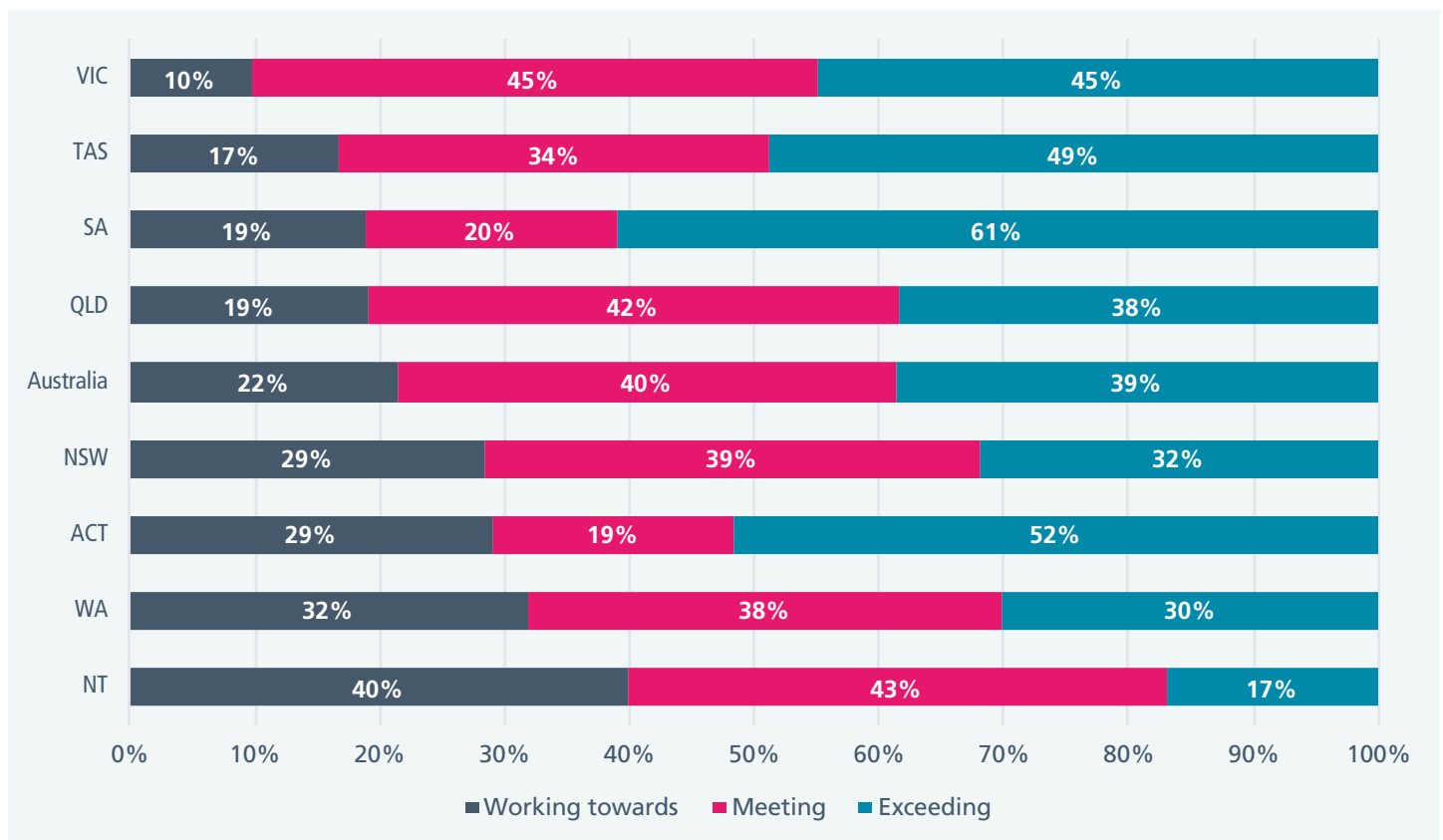
ECE quality in NSW

While there is a lack of recent estimates of ECE quality in NSW that can be compared internationally, the implementation of the National Quality Framework provides an ongoing comparison of ECE quality in NSW to other Australian jurisdictions. Based on the most recent data for assessed services¹⁰, assuming services are rated consistently across states, there is little reason to think that ECE quality in NSW is substantially higher than the rest of Australia.

Three results from the NQF data are particularly troubling. The first is that a greater proportion of ECEC centres in NSW are working towards (that is, not meeting) the national quality standards and a smaller proportion of NSW centres are exceeding the standards, compared to most other states (including Victoria and Queensland), as well as the national average (Figure 6).

The second is that the same pattern is evident in the key quality area of educational program and practice, which is most directly related to the quality of educational provision (Figure 7). The third is that quality ratings for long day care services in Australia are substantially below those for other types of services (Figure 8). This is relevant because NSW is particularly reliant on long day care services to provide ECE programs in the year before school – 65% of four and five year olds receive their preschool program through a long day care service in NSW, compared to 51% for Australia as a whole (Australian Bureau of Statistics, 2016).

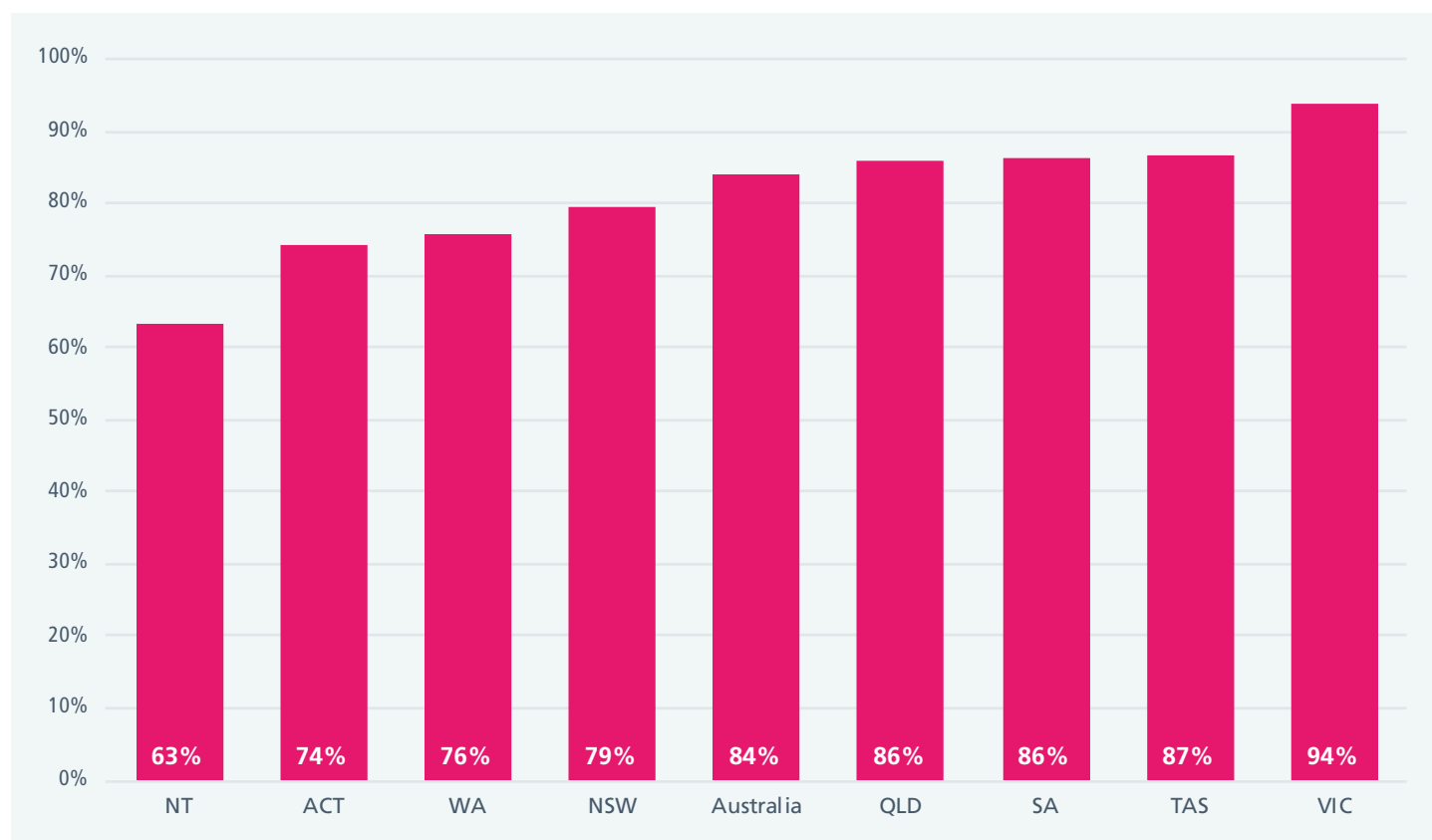
Figure 6: Distribution of national quality ratings for preschools and long day care services, by state



Source: Australian Children's Education and Care Quality Authority 2017

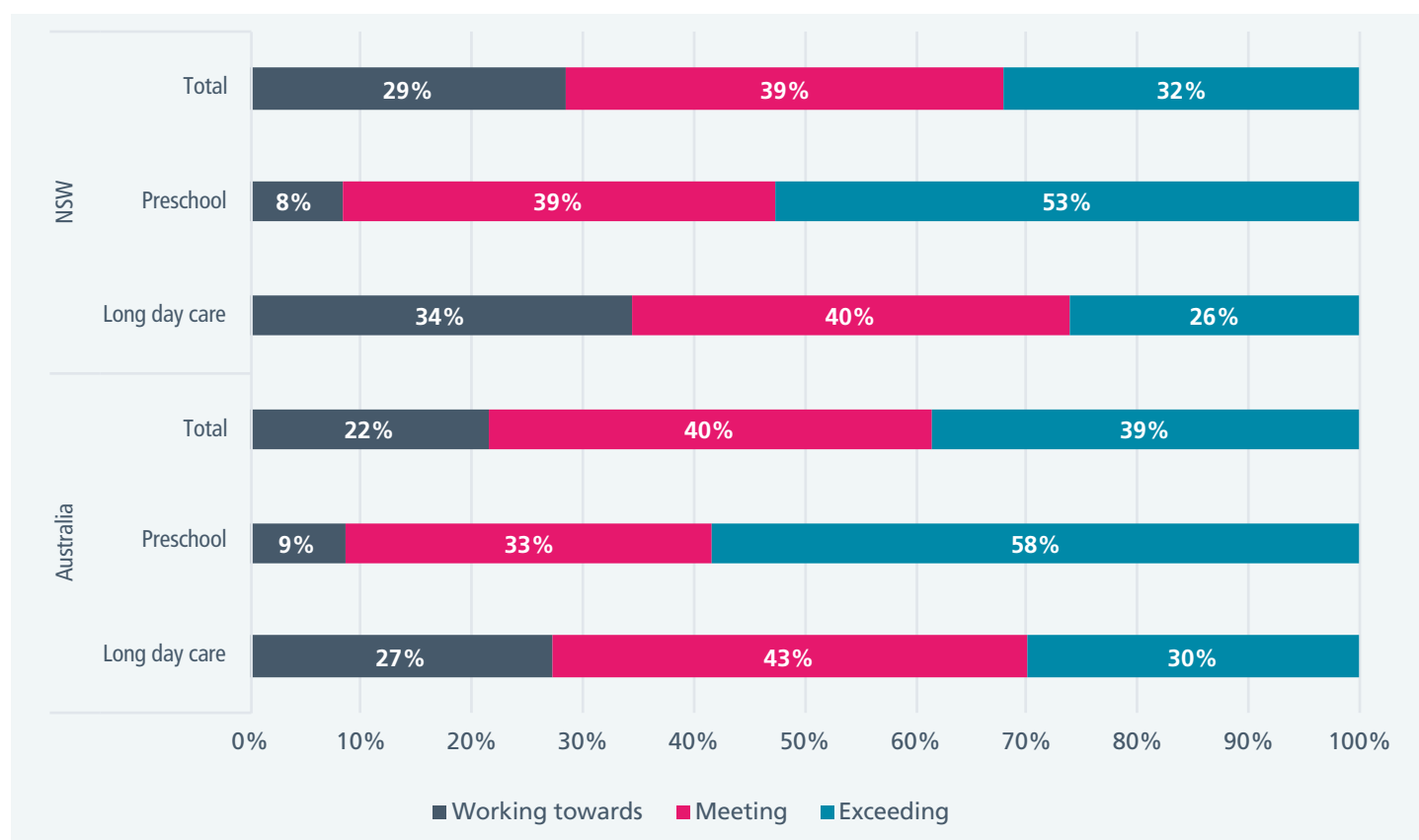
¹⁰ As of March 2017, 13% of ECEC services in NSW did not have a quality rating (Australian Children's Education and Care Quality Authority 2017).

Figure 7: Proportion of preschool and long day care services meeting or exceeding national quality standards in educational program and practice



Source: Australian Children's Education and Care Quality Authority 2017

Figure 8: Distribution of national quality ratings, by service type, NSW and Australia



Source: Australian Children's Education and Care Quality Authority 2017

Clearly, the most problematic finding from the analysis of Tayler et al. (2013) is the finding that none of the sampled ECE providers had high quality instructional support, while 87% were of low quality. Also using E4Kids data, Cloney et al. (2016) find that low-SES children are substantially more likely to be enrolled in lower quality services, with a one standard deviation increase in SES associated with a 0.21 standard deviation increase in the quality of instructional support. This measure is constructed from four subdomains: 1) concept development; 2) quality of feedback; 3) language modelling; and 4) literacy focus. Given the widespread use of CLASS, international comparisons to this measure are available. The program office of Head Start, for instance, produces an annual 'national statistics by domain' fact sheet (Table 5). A comparison indicates that the average Australian ECE classroom, according to E4Kids data, is 1.5 standard deviations (SDs) lower than the US Head Start national classroom average on instructional support, 3.2 SDs lower on emotional support, and 3.33 SDs lower on classroom organisation.

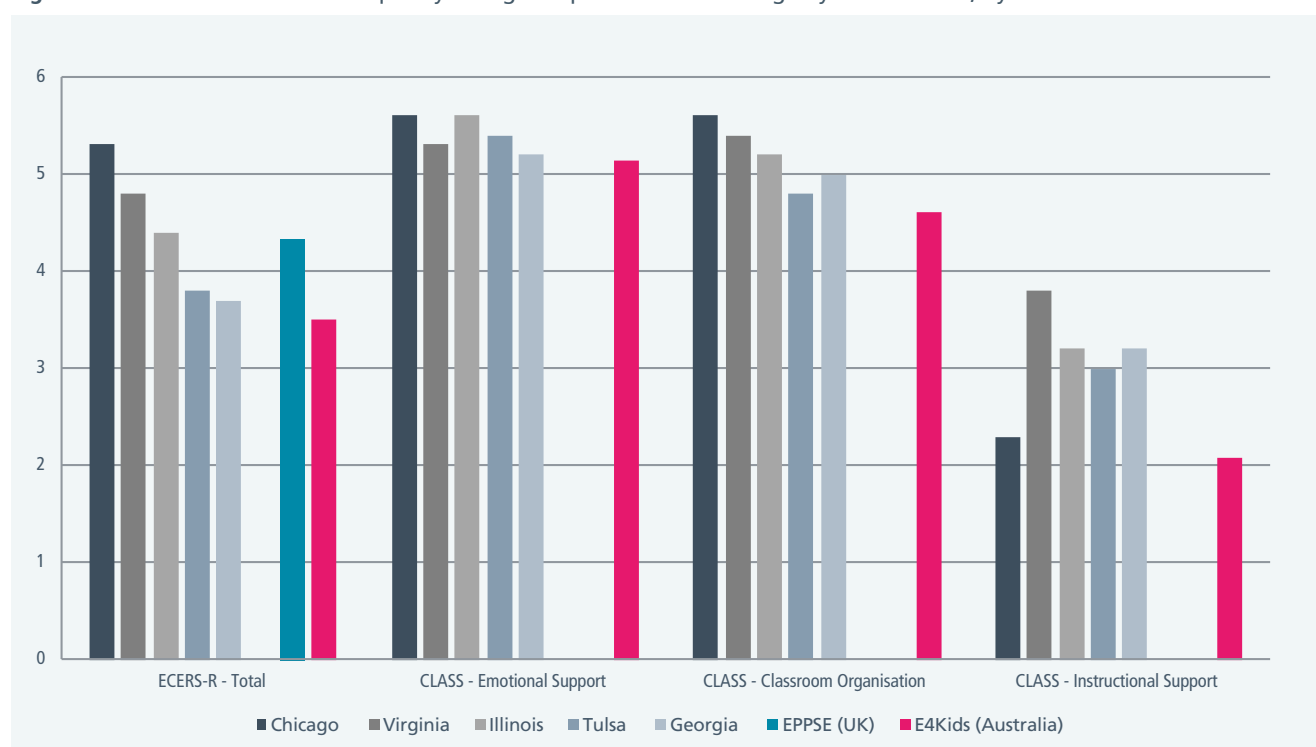
These Head Start CLASS scores are on average higher than those found for non-Head Start publicly funded ECE programs in the United States (Figure 9). However, even among large-scale ECE programs, Queensland and Victoria perform comparatively poorly. This is particularly concerning in light of the 'threshold' analysis of Burchinal et al. (2010), conducted using CLASS on 671 low-SES ECE classrooms in the United States. They found that 'children acquire academic skills only when the minimal standards represented by our cut-off point of above a 3.25 on the CLASS Instructional Quality Dimension are met... It is likely that below that point, there is too little explicit instruction or guided child-centered teaching for academic learning to occur' (Burchinal et al. 2010, p. 174). For comparison, the mean instructional quality score for ECE services in E4Kids was 2.07 (Tayler et al. 2013). Importantly, many scholars, such as Weiland et al. assert that instructional quality is 'the dimension of quality that may matter most in supporting growth in children's academic outcomes' (2013, pp. 199-200).

Table 5: Outline of the Teaching Through Interactions framework

Domain	Mean	Standard Deviation	Minimum	Maximum
Emotional support	6.03	0.28	4.96	6.91
Classroom organisation	5.80	0.36	4.69	6.65
Instructional Support	2.88	0.54	1.59	5.17

Source: Halle, Vick Whittaker & Anderson 2010

Figure 9: Distribution of national quality ratings for preschools and long day care services, by state



Source: Australian Children's Education and Care Quality Authority 2017

One model for what high quality instruction could look like is 'sustained shared thinking'. This is when 'two or more individuals work together in an intellectual way to solve a problem, clarify a concept, evaluate an activity, or extend a narrative' (Sylva et al. 2003, p.3). Sustained shared thinking includes the successful support of children's communication, language, thinking and learning. It requires skilled staff who are 'knowledgeable in children's learning and who can assess, monitor and support their socio-emotional, linguistic and cognitive development; and ensuring children are safe, stimulated, and ready to learn and think deeply' (Siraj et al. 2016, pp.17-18). The EPPSE study found that the most effective ECE settings encouraged sustained shared thinking to occur between two children or between a child and an educator. That study concluded that 'periods of sustained shared thinking are a necessary pre-requisite for the most effective early years practice' (Sylva et al. 2003, p.3).



Conclusion

High quality early childhood education is robustly associated with positive outcomes, particularly at higher levels of duration (years) and intensity (hours), and particularly for students from disadvantaged backgrounds. There is a strong empirical basis for the importance of the early years of development and a theoretical literature that asserts that ECE attendance sets positive developmental trajectories. This trajectory model is the foundation of economic arguments for the relative value of investing in the expansion of ECE access.

However, empirical evidence of the impact of actual ECE programs tends to be mixed. While attendance at most forms of ECE is generally associated with improved cognitive and non-cognitive outcomes at the point of school entry, a longer-term picture is more complicated. Sustained effects have been demonstrated in small-scale, targeted, resource intensive interventions, but the best evidence from randomised controlled trials of larger-scale programs typically show that effects 'fade out' by the early years of primary school.

This picture is also complicated by the fact that all published RCTs have taken place in the US. Other longitudinal research in the UK and New Zealand – which may be more comparable contexts – show more positive findings, but these studies also employ less strong research methods, and cannot rule out bias relating to selection effects. Exactly what impact ECE has (or is likely to have) in Australia is difficult to determine, given the relative lack of domestic research examining this question using strong research designs, and the conflicting findings from the research that has been conducted.

One policy lever that the literature agrees will unambiguously increase the positive effects of ECE participation is an increase in educational quality. Analyses examining early childhood services prior to the introduction of the National Quality Framework were far from encouraging. While analyses undertaken since the introduction of the Framework indicate more positive results, according to the most recent data using the most common measures of ECE quality, there remains substantial room for quality improvement in Australian jurisdictions, including NSW.

References

- Arnett, J 1989, *Caregiver interaction scale*, Educational Testing Service, Princeton, NJ.
- Australian Bureau of Statistics 2016, *Preschool education Australia*, cat. no. 4240.0, ABS, Canberra.
- Australian Children's Education and Care Quality Authority 2017, *NQF snapshot Q1 2017*, ACECQA, Sydney.
- Australian Institute of Family Studies, 2005. Growing up in Australia: *The Longitudinal Study of Australian Children: 2004 Annual Report*, Australian Institute of Family Studies, Melbourne.
- Barnett, WS 1995, 'Long-term effects of early childhood programs on cognitive and school outcomes', *The Future of Children*, vol. 5, no. 3, pp. 25-50.
- Barnett, WS 2003, 'Better teachers, better preschools: student achievement linked to teacher qualifications', *Preschool Policy Matters*, no. 2, National Institute for Early Education Research, New Brunswick, NJ.
- Barnett, WS 2011, 'Effectiveness of early educational intervention', *Science*, vol. 333, no.6045, pp.975-978.
- Berk, LE 1985, 'Relationship of caregiver education to child-oriented attitudes, job satisfaction, and behaviors toward children', *Child Care Quarterly*, vol. 14, no. 2, pp. 103-129.
- Berlinski, S, Galiani, S & Gertler, P 2009, 'The effect of pre- primary education on primary school performance', *Journal of Public Economics*, vol. 93, no. 1, pp. 219-234.
- Biddle, N & Seth-Purdie, R 2013, Development Risk Exposure and Participation in Early Childhood Education: How Can We Reach the *Most Vulnerable Children?* HC Coombs Policy Forum & Social Policy Institute, Australian National University, Canberra.
- Bierman, KL, Nix, RL, Heinrichs, BS, Domitrovich, CE, Gest, SD, Welsh, JA & Gill, S 2014, 'Effects of Head Start REDI on children's outcomes 1 year later in different kindergarten contexts', *Child Development*, vol. 85, no. 1, pp. 140-159.
- Blau, D & Currie, J 2006, 'Pre-school, day care, and after-school care: who's minding the kids?' *Handbook of the Economics of Education*, vol. 2, pp. 1163-1278.
- Blau, DM 2000, 'The production of quality in child-care centers: Another look', *Applied Developmental Science*, vol. 4, no. 3, pp. 136-148.
- Bowes, J, Harrison, L, Sweller, N, Taylor, A & Neilsen-Hewett, C 2009, *From child care to school: Influences on children's adjustment and achievement in the year before school and the first year of school*, report to the NSW Department of Community Services, Sydney.
- Burchinal, MR, Roberts, JE, Nabors, LA & Bryant, DM 1996, 'Quality of center child care and infant cognitive and language development', *Child Development*, vol. 67, no. 2, pp.606-620.
- Burchinal, MR, Roberts, JE, Riggins Jr, R, Zeisel, SA, Neebe, E & Bryant, D 2000, 'Relating quality of center-based child care to early cognitive and language development longitudinally', *Child development*, vol. 71, no. 2, pp. 339-357.
- Burchinal, M, Vandergrift, N, Pianta, R & Mashburn, A 2010, 'Threshold analysis of association between child care quality and child outcomes for low-income children in pre-kindergarten programs', *Early Childhood Research Quarterly*, vol. 25, no. 2, pp. 166-176.
- Cappelen, AW, List, JA, Samek, A & Tungodden, B 2016, *The Effect of Early Education on Social Preferences*, no. 22898, NBER Working Papers, National Bureau of Economic Research, Cambridge, MA.
- Chor, E, Andresen, ME & Kalil, A 2016 'The impact of universal prekindergarten on family behavior and child outcomes', *Economics of Education Review*, vol. 55, pp. 168-181.
- Claessens, A, Duncan, G & Engel, M 2009, 'Kindergarten skills and fifth-grade achievement: Evidence from the ECLS-K', *Economics of Education Review*, vol. 28, no. 4, pp. 415-427.
- Cloney, D, Tayler, C, Hattie, J, Cleveland, G & Adams, R 2016, 'The selection of ECEC programs by Australian families: Quality, availability, usage and family demographics', *Australasian Journal of Early Childhood*, vol. 41, no. 4, pp. 16-27.
- Colwell, N, Gordon, RA, Fujimoto, K, Kaestner, R & Korenman, S 2013, 'New evidence on the validity of the Arnett Caregiver Interaction Scale: Results from the early childhood longitudinal study-birth cohort', *Early Childhood Research Quarterly*, vol. 28, no. 2, pp. 218-233.
- Cooper, H, Allen, AB, Patall, EA & Dent, AL 2010, 'Effects of full-day kindergarten on academic achievement and social development', *Review of Educational Research*, vol. 80, no. 1, pp. 34-70.
- Copple, CE, Cline, MG & Smith, AN 1987, *Path to the Future: Long-Term Effects of Head Start in the Philadelphia School District*, US Department of Health and Human Services, Washington DC.
- Currie, J & Almond, D 2011, 'Human capital development before age five', *Handbook of Labor Economics*, 4, vol. 4, pp. 1315- 1486.
- Currie, J 2001, 'Early childhood education programs', *The Journal of Economic Perspectives*, vol. 15, no. 2, pp. 213-238.
- de Kruif, RE, McWilliam, RA, Ridley, SM & Wakely, MB 2000, 'Classification of teachers' interaction behaviors in early childhood classrooms', *Early Childhood Research Quarterly*, vol. 15, no. 2, pp. 247-268.
- De Schipper, EJ, Riksen-Walraven, JM & Geurts, SAE 2006, 'Effects of child-caregiver ratio on the interactions between caregivers and children in child-care centers: an experimental study', *Child Development*, vol. 77, no. 4, pp. 861-874.
- Deming, D 2009, 'Early childhood intervention and life-cycle skill development: Evidence from Head Start', *American Economic Journal: Applied Economics*, vol. 1, no. 3, pp. 111-134.
- Department of Families, Housing, Community Services and Indigenous Affairs 2010, *Child care and early education in Australia: The longitudinal study of Australian children*, Social Policy Research Paper no. 40, report prepared by LJ Harrison, J Ungerer, GJ Smith, SR Zubrick, S Wise, F Press, M Waniganayake & the LSAC Research Consortium, FaHCSIA, Canberra. Deutsch, M, Deutsch, CP, Jordan, TJ & Grallow, R 1983, 'The IDS program: An experiment in early and sustained enrichment', in *The Consortium for Longitudinal Studies (ed.) As the Twig is Bent: Lasting Effects of Preschool Programs*, Lawrence Erlbaum Associates Inc, Hillsdale, NJ, pp. 33-69.

- Dodge, KA, Bai, Y, Ladd, HF and Muschkin, CG 2017, 'Impact of North Carolina's early childhood programs and policies on educational outcomes in elementary school', *Child Development*, vol. 88, no. 3, pp 996-1014.
- Downey, DB, von Hippel, PT & Broh, BA 2004, 'Are schools the great equalizer? Cognitive inequality during the summer months and the school year', *American Sociological Review*, vol. 69, no. 5, pp. 613-635.
- Duncan, GJ 2003, 'Modeling the impacts of child care quality on children's preschool cognitive development', *Child Development*, vol. 74, no. 5, pp. 1454-1475.
- Duncan, GJ, Dowsett, CJ, Claessens, A, Magnuson, K, Huston, AC, Klebanov, P, Pagani, LS, Feinstein, L, Engel, M, Brooks-Gunn, J & Sexton, H 2007, 'School readiness and later achievement', *Developmental Psychology*, vol. 43, no. 6, pp. 1428-1446.
- Dunn, L 1993, 'Proximal and distal features of day care quality and children's development', *Early Childhood Research Quarterly*, vol. 8, no. 2, pp. 167-192.
- Early, DM, Bryant, DM, Pianta, RC, Clifford, RM, Burchinal, MR, Ritchie, S, Howes, C & Barbarin, O 2006, 'Are teachers' education, major, and credentials related to classroom quality and children's academic gains in pre-kindergarten?' *Early Childhood Research Quarterly*, vol. 21, no. 2, pp. 174-195.
- Early, DM, Maxwell, KL, Burchinal, M, Alva, S, Bender, RH, Bryant, D, Cai, K, Clifford, RM, Ebanks, C, Griffin, JA & Henry, GT 2007, 'Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs', *Child Development*, vol. 78, no. 2, pp. 558-580.
- Entwisle, DR 1997, *Children, Schools, & Inequality: Social Inequality Series*. Westview Press, Boulder, CO.
- Fenech, M, Sweller, N & Harrison, L 2010, 'Identifying high- quality centre-based childcare using quantitative data-sets: what the numbers do and don't tell us', *International Journal of Early Years Education*, vol 18, no. 4, pp. 283-296.
- Fryer, RG, Levitt, SD & List, JA 2015, Parental incentives and early childhood achievement: a field experiment in Chicago heights, no. 21477, NBER Working Papers, *National Bureau of Economic Research*, Cambridge, MA.
- Garber, HL 1988, *The Milwaukee Project: Prevention of mental retardation in children at risk*, American Association on Mental Retardation, Washington, DC.
- Garces, E, Thomas, D & Currie, J 2002, 'Longer-term effects of Head Start', *The American Economic Review*, vol. 92, no. 4, pp. 999-1012.
- García, JL, Heckman, JJ, Leaf, DE & Prados, MJ 2016, The life- cycle benefits of an influential early childhood program, no. 22993, NBER Working Papers, *National Bureau of Economic Research*, Cambridge, MA.
- Ghazvini, A & Mullis, RL 2002, 'Center-based care for young children: Examining predictors of quality', *The Journal of Genetic Psychology*, vol. 163, no. 1, pp. 112-125.
- Gibbs, C, Ludwig, J & Miller, DL 2011, *Does Head Start do any lasting good?* no. 17452, NBER Working Papers, *National Bureau of Economic Research*, Cambridge, MA.
- Gray, SW, Ramsey, BK & Klaus, RA 1983, 'The Early Training Project, 1962-1980', in The Consortium for Longitudinal Studies (ed.) *As the Twig is Bent: Lasting Effects of Preschool Programs*, Lawrence Erlbaum Associates Inc, Hillsdale, NJ, pp. 33-69.
- Halle, T, Vick Whittaker, JE & Anderson, R 2010, *Quality in early childhood care and education settings: A compendium of measures*, report prepared by Child Trends for the US Department of Health and Human Services, Washington DC.
- Hamre, BK 2014, 'Teachers' daily interactions with children: An essential ingredient in effective early childhood programs', *Child Development Perspectives*, vol. 8, no. 4, pp. 223-230.
- Hamre, BK & Bridges, M 2004, 'Early care and education staff preparation, quality, and child development: A review of the literature', Unpublished manuscript, University of California at Berkeley.
- Hamre, BK & Pianta, RC 2007, 'Learning opportunities in preschool and early elementary classrooms', in RC Pianta, MH Cox & K Snow (eds), *School readiness and the transition to school*, Brookes, Baltimore, MD, pp. 49-84.
- Harms, T, Clifford, RM & Cryer, D 1998, *Early Childhood Environment Rating Scale – Revised Edition*. Teachers College Press, New York, NY.
- Harms, T, Cryer, D & Clifford, RM 2003, *Infant/Toddler Environment Rating Scale - Revised Edition*. Teachers College Press, New York, NY.
- Harrison, LJ, Skouteris, H, Watson, J & Ungerer, JA 2006, 'Government policy contributes to quality infant-toddler child care: Longitudinal trends in Australia' Paper presented at *Quality in centre-based childcare: Links between external structures and internal processes*, World Association for Mental Health, 10th World Congress, Paris, July.
- Hart, B & Risley, TR 1995, *Meaningful differences in the everyday experience of young American children*, Paul H Brookes Publishing, Baltimore, MD.
- Hayes, CD, Palmer, JL & Zaslow, MJ 1990, *Who Cares for America's Children? Child Care Policy for the 1990s*, Panel on Child Care Policy, Committee on Child Development Research and Public Policy, Commission on Behavioral and Social Sciences and Education, National Research Council, National Academy Press, Washington, DC.
- Heckman, JJ & Masterov, DV 2007, *The productivity argument for investing in young children*, no. 13016,, NBER Working Papers, *National Bureau of Economic Research*, Cambridge, MA.
- Heckman, JJ 2006, 'Skill formation and the economics of investing in disadvantaged children', *Science*, vol. 312, no. 5782, pp. 1900-1902.
- Heckman, JJ 2008, 'Schools, skills, and synapses', *Economic inquiry*, vol. 46, no. 3, pp. 289-324.
- Heckman, JJ 2011, 'The economics of inequality: the value of early childhood education', *American Educator*, vol. 35, no. 1, p. 31-35.
- Heckman, JJ, Stixrud, J & Urzua, S 2006, 'The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior', *Journal of Labor Economics*, vol. 24, no. 3, pp. 411- 482.

- Hill, J, Waldfogel, J & Brooks-Gunn, J 2002, 'Differential effects of high-quality child care', *Journal of Policy Analysis and Management*, vol. 21, no. 4, pp. 601-627.
- Hodgen, E 2007, *Early childhood education and young adult competencies at age 16*. Report for the Ministry of Education, New Zealand.
- Houng, B, Jeon, SH & Kalb, G 2011, *The effects of childcare on child development*. Report for the Department of Education, Employment and Workplace Relations, Melbourne Institute of Applied Economic and Social Research, University of Melbourne.
- Howes, C & Brown, J 2000, 'Improving Child Care Quality: A Guide for Proposition 10 Commissions', in N Halfon, E Shulman, M Shannon & M Hochstein (eds), *Building Community Systems for Young Children*, UCLA Center for Healthier Children, Families and Communities, Los Angeles, CA.
- Howes, C & Smith, EW 1995, 'Relations among child care quality, teacher behavior, children's play activities, emotional security, and cognitive activity in child care', *Early Childhood Research Quarterly*, vol. 10, no. 4, pp. 381-404.
- Howes, C 1997, 'Children's experiences in center-based child care as a function of teacher background and adult: child ratio', *Merrill-Palmer Quarterly*, vol. 43, no. 3, pp. 404-425.
- Howes, C, Phillipsen, LC & Peisner-Feinberg, E 2000, 'The consistency of perceived teacher-child relationships between preschool and kindergarten', *Journal of School Psychology*, vol. 38, no. 2, pp. 113-132.
- Howes, C, Whitebook, M & Phillips, D 1992, 'Teacher characteristics and effective teaching in child care: Findings from the National Child Care Staffing Study', *Child and Youth Care Forum*, vol. 21, no. 6, pp. 399-414.
- Hwang, P, Broberg, A & Lamb, M 1991. 'Swedish day care research', in E C Melhuish & P Moss (eds), *Day care for young children: International perspectives*, Routledge, London.
- Jha, T 2014, *Regulating for Quality in Childcare: The Evidence Base*, policy monograph 142, The Centre for Independent Studies.
- Johnson, DL & Walker, T 1991, 'A follow-up evaluation of the Houston Parent-Child Development Center school performance', *Journal of Early Intervention*, vol. 15, no. 3, pp. 226-236.
- La Paro, KM, Pianta, RC & Stuhlman, M 2004, 'The classroom assessment scoring system: Findings from the prekindergarten year', *The Elementary School Journal*, vol. 104, no. 5, pp. 409-426.
- Lamb, M 1998, 'Nonparental child care: Context, quality, correlates, and consequences', in W Damon, IE Sigel & KA Renninger (eds), *Handbook of child psychology: Child psychology in practice*: Vol. 4, Wiley, New York, NY.
- Lee, VE & Burkam, DT 2002, *Inequality at the starting gate: Social background differences in achievement as children begin school*, Economic Policy Institute, Washington DC.
- Lee, VE & Loeb, S 1995, 'Where do Head Start attendees end up? One reason why preschool effects fade out', *Educational evaluation and policy analysis*, vol. 17, no. 1, pp. 62-82.
- Lee, VE, Brooks-Gunn, J & Schnur, E 1988, 'Does Head Start work? A 1-year follow-up comparison of disadvantaged children attending Head Start, no preschool, and other preschool programs', *Developmental Psychology*, vol. 24, no. 2, pp. 210-222.
- Lee, VE, Brooks-Gunn, J, Schnur, E & Liaw, FR 1990, 'Are Head Start effects sustained? A longitudinal follow-up comparison of disadvantaged children attending Head Start, no preschool, and other preschool programs', *Child Development*, vol. 61, no. 2, pp. 495-507.
- Lipsey, MW, Hofer, KG, Dong, N, Farran, DC & Bilbrey, C 2013, *Evaluation of the Tennessee Voluntary Prekindergarten Program: Kindergarten and First Grade Follow-Up Results from the Randomized Control Design*, Research Report, Peabody Research Institute, Nashville, TN.
- Lipsey, MW, Farran, DC & Hofer, KG 2015, *A Randomized Control Trial of a Statewide Voluntary Prekindergarten Program on Children's Skills and Behaviors through Third Grade*, Research Report, Peabody Research Institute, Nashville, TN.
- List, J, Samek, A & Suskind, D 2017, 'Combining behavioral economics and field experiments to reimagine early childhood education', *Artefactual Field Experiments*, no. 00595, The Field Experiments Website.
- Loeb, S, Fuller, B, Kagan, SL & Carrol, B 2004, 'Child care in poor communities: Early learning effects of type, quality, and stability', *Child Development*, vol. 75, no. 1, pp. 47-65.
- Love, JM, Ryer, P & Faddis, B 1992, *Caring Environments: Program Quality in California's Publicly Funded Child Development Programs: Report on the Legislatively Mandated 1990-91 Staff/child Ratio Study*, RMC Research Corporation, Portsmouth, NH.
- Love, JM, Harrison, L, Sagi-Schwartz, A, Van IJzendoorn, MH, Ross, C, Ungerer, JA, Raikes, H, Brady-Smith, C, Boller, K, Brooks-Gunn, J & Constantine, J 2003, 'Child care quality matters: How conclusions may vary with context', *Child Development*, vol. 74, no. 4, pp. 1021-1033.
- Ludwig, J & Phillips, DA 2008, 'Long-term effects of Head Start on low-income children', *Annals of the New York Academy of Sciences*, vol. 1136, no. 1, pp. 257-268.
- Magnuson, KA, Ruhm, C & Waldfogel, J 2007, 'The persistence of preschool effects: Do subsequent classroom experiences matter?' *Early Childhood Research Quarterly*, vol. 22, no. 1, pp. 18-38.
- Mashburn, AJ, Pianta, RC, Hamre, BK, Downer, JT, Barbarin, OA, Bryant, D, Burchinal, M, Early, DM & Howes, C 2008, 'Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills', *Child Development*, vol. 79, no. 3, pp. 732-749.
- McCartney, K, Scarr, S, Rocheleau, A, Phillips, D, Abbott-Shim, M, Eisenberg, M, Keefe, N, Rosenthal, S & Ruh, J 1997, 'Teacher-Child Interaction and Child-Care Auspices as Predictors of Social Outcomes in Infants, Toddlers, and Preschoolers', *Merrill-Palmer Quarterly*, vol. 43, no.3, pp. 426-450.
- McCarton, CM, Brooks-Gunn, J, Wallace, IF, Bauer, CR, Bennett, FC, Bernbaum, JC, Broyles, RS, Casey, PH, McCormick, MC, Scott, DT & Tyson, J 1997, 'Results at age 8 years of early intervention for low-birth-weight premature infants: The Infant Health and Development Program', *Jama*, vol. 277, no. 2, pp. 126-132.

- McWilliam, RA, 2000, 'Recommended practices in interdisciplinary models', in S Sandall, ME McLean & BJ Smith (eds) *DEC Recommended Practices in Early Intervention/Early Childhood Special Education*, Sopris West, Longmont, CO, pp. 47-54.
- Melhuish, E 2016, 'Longitudinal research and early years policy development in the UK,' *International Journal of Child Care and Education Policy*, vol. 10, no. 3.
- Melhuish, E, Ereky-Stevens, K, Petrogiannis, K, Ariescu, A, Penderi, E, Rentzou, K, Tawell, A, Leseman, P & Broekhuizen, M 2015. *A review of research on the effects of early childhood education and care (ECEC) on child development*, CARE project: Curriculum Quality Analysis and Impact Review of Early Childhood Education and Care (ECEC), Technical Report, European Commission.
- Melhuish, E, Gardiner, J & Morris, S 2017, *Study of Early Education and Development (SEED): Impact Study on Early Education Use and Child Outcomes up to Age Three*, research report, Department of Education, London, UK.
- Neuman, SB, Koh, S & Dwyer, J 2008, 'CHELLO: The child/ home environmental language and literacy observation', *Early Childhood Research Quarterly*, vol. 23, no. 2, pp. 159-172.
- NSW Department of Community Services 2008, *Determinants of quality in child care: A review of the research evidence*, report prepared by L Huntsman, Centre for Parenting & Research, Ashfield, NSW.
- OECD 2016a, *Education at a glance 2016: OECD Indicators*, OECD Publishing, Paris.
- OECD 2016b, *PISA 2015 Results (Volume I): Excellence and Equity in Education*, OECD Publishing, Paris.
- OECD 2016c, *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, OECD Publishing, Paris.
- OECD 2017, *Starting Strong 2017: Key OECD Indicators on Early Childhood Education and Care*, OECD Publishing, Paris.
- Office of Head Start 2016, *A national overview of grantee CLASS scores in 2015*, available online at <https://eclkc.ohs.acf.hhs.gov/hslc/data/class-reports/class-data-2015.html>.
- Palmérus, K 1996, 'Child-Caregiver Ratios in Day Care Center Groups: Impact on Verbal Interactions', *Early Child Development and Care*, vol. 118, no. 1, pp. 45-57.
- Peisner-Feinberg, ES, Burchinal, MR, Clifford, RM, Culkin, ML, Howes, C, Kagan, SL & Yazejian, N 2001, 'The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade', *Child Development*, vol. 72, no. 5, pp. 1534-1553.
- Peisner-Feinberg, ES, Burchinal, MR, Clifford, RM, Yazejian, N, Culkin, ML, Zelazo, J, Howes, C, Byler, P, Kagan, SL & Rustici, J 2000, *The Children of the Cost, Quality, and Outcomes Study Go to School: Technical Report*, Frank Porter Graham Child Development Center, University of North Carolina at Chapel Hill, Chapel Hill, NC.
- Pianta, R, Howes, C, Burchinal, M, Bryant, D, Clifford, R, Early, D & Barbarin, O 2005, 'Features of pre-kindergarten programs, classrooms, and teachers: Do they predict observed classroom quality and child-teacher interactions?' *Applied Developmental Science*, vol. 9, no. 3, pp. 144-159.
- Pianta, RC, Karen, M, Paro, L & Hamre, BK 2008, *Classroom assessment scoring system (CLASS) manual, pre-K*, Paul H. Brookes Publishing Company, Baltimore, MD.
- Scarr, S 1997, 'Why child care has little impact on most children's development,' *Current Directions in Psychological Science*, vol. 6, no. 5, pp. 143-148.
- Scarr, S, Eisenberg, M & Deater-Deckard, K 1994, 'Measurement of quality in child care centers', *Early Childhood Research Quarterly*, vol. 9, no. 2, pp. 131-151.
- Schweinhart, LJ 2003, 'Benefits, Costs, and Explanation of the High/Scope Perry Preschool Program', paper presented at the *Meeting of the Society for Research in Child Development*, Tampa, Florida, 26 April.
- Schweinhart, LJ, Barnes, HV, Weikart, DP, Barnett, W & Epstein, A 1993, *Significant benefits: the High/Scope Perry Preschool study through age 27 (Monographs of the High/ Scope Educational Research Foundation, 10)*, HighScope Press, Ypsilanti, MI.
- Schweinhart, LJ, Montie, J, Xiang, Z, Barnett, WS, Belfield, CR & Nores, M 2005, *Lifetime effects: the High/Scope Perry Preschool study through age 40 (Monographs of the High/ Scope Educational Research Foundation, 14)*, HighScope Press, Ypsilanti, MI.
- Shonkoff, JP & Phillips, DA (eds) 2010, *From Neurons to Neighborhoods: The science of early childhood development*, National Academy Press, Washington, DC.
- Siraj, I, Kingston, D, Neilsen-Hewitt, C, Howard, S, Melhuish, E, de Rosnay, M, Duursma, E & Luu, B 2016, 'Fostering Effective Early Learning: A review of the current international evidence considering quality in early childhood education and care programmes – in delivery, pedagogy and child outcomes,' unpublished review funded by the NSW Department of Education.
- Siraj-Blatchford, I, Mayo, A, Melhuish, E, Taggart, B, Sammons, P & Sylva, K 2011, *Performing against the odds: developmental trajectories of children in the EPPSE 3 to 16 study: brief*, Department for Education, London, United Kingdom.
- Slot, P, Cadima, J, Salminen, J, Pastori, G and Lerkkanen, MJ 2017, *D2.3: Multiple case study in seven European countries regarding culture-sensitive classroom quality assessment*, report 613318 CARE, Curriculum and Quality Analysis and Impact Review of European Early Childhood Education and Care.
- Smith, AB, McMillan, BW, Kennedy, S & Ratcliffe, B 1988, 'The effect of improving preschool teacher/child ratios: an 'experiment in nature'', *Early Child Development and Care*, vol. 41, no. 1, pp. 123-138.
- Smith, MW, Brady, JP & Anastasopoulos, L 2008, *User's Guide to the Early Language & Literacy Classroom Observation Pre-K Tool (ELLCO Pre-K)*, Brookes Publishing, Baltimore, MD.
- SRI International 2012, *Fact sheet: Illinois Preschool For All (PFA) Evaluation: PFA Program Quality*, prepared by Erika Gaylor, available online at <https://www.sri.com/sites/default/les/publications/quality-fact-sheet.pdf>.
- Sylva, K, Melhuish, E, Sammons, P, Siraj-Blatchford, I. & Taggart, B (eds) 2010, *Early childhood matters: Evidence from the effective pre-school and primary education project*. Routledge, Abington, United Kingdom.

- Sylva, K, Melhuish, E, Sammons, P, Siraj-Blatchford, I & Taggart, B 2004. *The Effective Provision of Pre-school Education (EPPE) Project: Findings from pre-school to end of key stage 1*, Department for Education and Skills, Nottingham, United Kingdom.
- Sylva, K, Melhuish, E, Sammons, P, Siraj-Blatchford, I & Taggart, B 2012. *Effective pre-school, primary and secondary education 3-14 project (EPPSE 3-14): Final report from the Key Stage 3 phase: influences on students' development from age 11-14*, Department for Education, London, United Kingdom.
- Sylva, K, Siraj-Blatchford, I & Taggart, B 2003, *Assessing quality in the early years: Early childhood environment rating scale: Extension (ECERS-E), four curricular subscales*, Trentham Books, Stoke on Kent, United Kingdom.
- Sylva, K, Siraj-Blatchford, I, Taggart, B, Sammons, P, Melhuish, E, Elliot, K & Totsika, V 2006, 'Capturing quality in early childhood through environmental rating scales', *Early Childhood Research Quarterly*, vol. 21, no. 1, pp. 76-92.
- Taggart, B, Sylva, K, Melhuish, E, Sammons, P & Siraj, I 2015, *Effective pre-school, primary and secondary education project (EPPSE 3-16+): How pre-school influences children and young people's attainment and developmental outcomes over time*, Research Brief, Department for Education, London, United Kingdom.
- Taylor, C, Ishimine, K, Cloney, D, Cleveland, G & Thorpe, K 2013, 'The quality of early childhood education and care services in Australia', *Australasian Journal of Early Childhood*, vol. 38, no. 2, pp. 13-21.
- Taylor, C, Cloney, D, Adams, R, Ishimine, K, Thorpe, K & Nguyen, TKC 2016 'Assessing the effectiveness of Australian early childhood education and care experiences: study protocol', *BMC public health*, vol. 16, no. 352.
- US Department of Education, Planning and Evaluation Service 2003, *Third National Even Start evaluation: Program impacts and implications for improvement*, prepared by R St Pierre, A Ricciuti, F Tao, C Creps, J Swartz, W Lee, A Parsad, Abt Associates Inc & T Rimdzius, Washington DC.
- US Department of Health and Human Services 1985, *The Impact of Head Start on Children, Families and Communities: Final Report of the Head Start Evaluation, Synthesis and Utilization Project*, report prepared by RH McKey, L Condelli, H Ganson, BJ Barrett, C McConkey & MC Plantz, Washington, DC.
- US Department of Health and Human Services 2010, *Head Start Impact Study*, Final Report, Washington DC.
- Vandell, DL & Powers, CP 1983, 'Day care quality and children's free play activities', *American Journal of Orthopsychiatry*, vol. 53, no. 3, pp.493-500.
- Vandell, DL 1996, 'Characteristics of infant child care: Factors contributing to positive caregiving: NICHD early child care research network', *Early Childhood Research Quarterly*, vol. 11, no. 3, pp. 269-306.
- Warren, D & Haisken-DeNew, JP 2013, *Early Bird catches the Worm: The causal impact of pre-school participation and teacher qualifications on year 3 national NAPLAN cognitive tests*, Melbourne Institute Working Paper No. 34/13.
- Washington, V & Bailey, UJO 1995, *Project Head Start: Models and strategies for the twenty-first century*, Garland Publishing Inc, New York, NY.
- Weiland, C, Ulvestad, K, Sachs, J & Yoshikawa, H 2013, 'Associations between classroom quality and children's vocabulary and executive function skills in an urban public prekindergarten program', *Early Childhood Research Quarterly*, vol. 28, no. 2, pp. 199-209.
- Whitebook, M, Howes, C & Phillips, D, 1989. *Who Cares? Child Care Teachers and the Quality of Care in America: Final report of the national child care staffing study*, Child Care Employee Project, Oakland, CA.
- Wylie, C, Ferral, H, Hodgen, E & Thompson, J 2006, *Competencies at age 14 and competency development for the Competent children, Competent Learners study sample*, New Zealand Council for Educational Research, Wellington, New Zealand.
- Wylie, C, Thompson, J, Hodgen, E, Ferral, H, Lythe, C & Fijn, T 2004, *Competent children at 12*, New Zealand Council for Educational Research, Wellington, New Zealand.



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