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RESTACKING THE ODDS

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TECHNICAL REPORT

Early childhood education and care: An evidence based review of indicators to assess quality, quantity and participation.

Carly Molloy
Phoebe Quinn
Christopher Harrop
Nicholas Perini
Sharon Goldfeld

RESTACKING THE ODDS

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List of abbreviations

ACECQA	Australian Children's Education and Care Quality Authority
AECD	Australian Early Development Census
CCC	Child Care Choices
CC-HOME	Child-care HOME
CIS	Caregiver Interaction Scale
CLASS	Classroom Assessment Scoring System
CLASS PreK	Classroom Assessment Scoring System PreK
COAG	Council of Australian Governments
ECEC	Early Childhood Education and Care
ECERS	Early Childhood Environment Rating Scale
ECERS-E	Early Childhood Environment Rating Scale Extension
ECERS-R	Early Childhood Environment Rating Scale – Revised
EYLF	Early Years Learning Framework
EPPE	Effective Provision of Pre-School Education (EPPE) Study
EPPNI	Effective Pre-school Provision in Northern Ireland
EPPSE	Effective Provision of Pre-School Education, Primary, and Secondary (EPPSE) Study
ES	Effect Size
IEA	International Association for Evaluation of Educational Achievement (IEA) Pre-Primary project
LSAC	Longitudinal Study of Australian Children
NAPLAN	National Assessment Program – Literacy and Numeracy
NCAC	National Childhood Accreditation Council
NCEDL	National Center for Early Development and Learning
NICHD	National Institute of Child Health and Human Development
NICHD SECCYD	National Institute of Child Health and Human Development Study of Early Child Care Youth Development
NHMRC	National Health and Medical Research Council
NQF	National Quality Framework
NQS	National Quality Standards
OECD	Organisation for Economic Co-Operation and Development
ORCE	Observational Record of Caregiving Environment
PIRLS	Progress in International Reading Literacy Study
QA	Quality Area
RCT	Randomised Controlled Trial
REA	Restricted Evidence Assessment
TIMSS	Trends in International Mathematics and Science Study

EXECUTIVE SUMMARY: EARLY CHILDHOOD EDUCATION & CARE

Restacking the Odds: Project Background

Too many children are born into circumstances that do not provide them with a reasonable opportunity to make a good start in life. Disadvantaged circumstances for children lead to developmental inequities in physical health, social-emotional wellbeing, and academic learning. These inequities emerge in early childhood and often continue into adulthood, contributing to unequal rates of low educational attainment, poor mental and physical health and low income. In some cases, this experience is part of a persistent cycle of intergenerational disadvantage. Inequities constitute a significant and ongoing social problem, and along with substantial economic costs have major implications for public policy.

To redress developmental inequities, research has shown that efforts should be delivered during early childhood (pregnancy to 8 years of age) to have the greatest benefits. Thus, *Restacking the Odds* focuses on five key evidence-based interventions/platforms in early childhood (*see Figure 1: Five Fundamental Strategies)*:

- Antenatal care;
- Sustained nurse home visiting;
- Early childhood education and care;
- Parenting programs; and
- The early years of school.

These five strategies are only a subset of the possible interventions available, but have been selected carefully. They are notably *longitudinal* (across early childhood), *ecological* (targeting child and parent), *evidence-based*, and able to be *targeted* to benefit the 'bottom 25 per cent' (i.e., those most disadvantaged). The premise is that by 'stacking' these fundamental interventions (i.e., ensuring they are all applied for a given individual) there will be a cumulative effect - amplifying the impact and sustaining the benefit.

For each of the five strategies, the intent is to use a combination of data-driven, evidence-based and expert-informed approaches to develop measurable, best practice indicators of quality, quantity (access) and participation (reach):

Quality: Are the strategies *delivered effectively*, relative to evidence-based performance standards? A strategy with "quality" is one for which there is robust evidence showing it delivers the desired outcomes. A large number of research studies have explored aspects of this question (i.e., "what works?"). Therefore, *particular attention is paid to the quality dimension in this report*.

Participation: Do the *appropriately targeted* children and families *participate* at the right dosage levels? "Participation" shows what portion of the relevant groups are exposed to the strategy at the level required to generate the desired benefit. (For example, what portion of the group are attending the number of hours of early education required for positive

outcomes). Participation levels can be calculated whether the strategy is universal (for everyone), or targeted (intended to benefit a certain part of the population).

Quantity: Are the strategies *available locally* in sufficient quantity to meet the needs and size of the target population? "Quantity" helps determine the quantum of effort and the infrastructure needed to adequately deliver the strategy for a given population.

In this project, indicators of quality, participation and quantity will be used to help identify gaps and priorities in Australian communities. This will include testing preliminary indicators in 10 communities over the next 3 years to determine which are pragmatic to collect, resonate with communities, and provide robust measures to stimulate community and government action. The findings summarised in this report - *Early Childhood Education and Care* - will provide essential inputs to guide subsequent work for the *Restacking the Odds* project. There is a similar report for each of the five strategies.

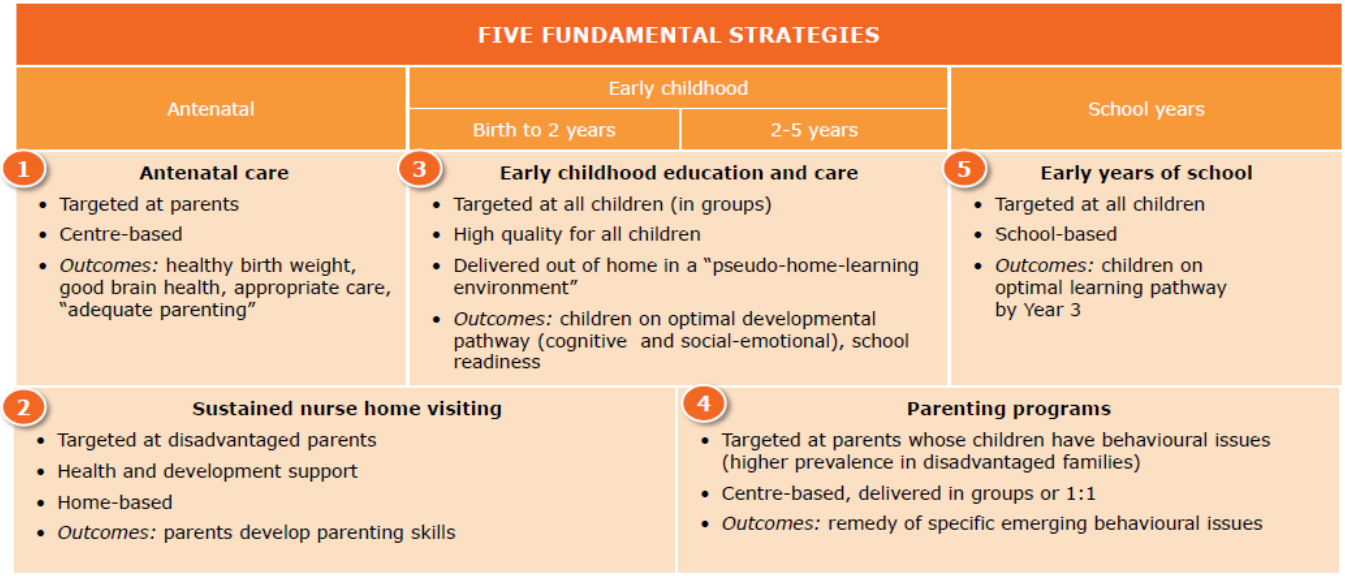

Figure 1: Five fundamental strategies

Introduction: Early Childhood Education and Care

Early Childhood Education and Care (ECEC) is a potential way to reduce inequities in child health and developmental outcomes. Extensive research indicates that the education and care of young children (birth to eight years of age) can have an immense influence on long-term outcomes related to cognition, language, health, and wellbeing [1, 2]. For example, the Australian Early Development Census (AEDC) data suggest that children who attend preschool are less likely to be developmentally vulnerable, even when considering level of relative disadvantage [3]. Much of the research originally used to support ECEC originated from the USA and focused largely on the positive effect of ECEC on disadvantaged children [4]. However, there has been a more recent shift to optimise ECEC programs for all children (e.g. [5, 6]) and these studies suggest that participation in high quality ECEC has the potential to provide all preschool-aged children with an opportunity to develop life-long skills for learning and wellbeing.

The benefits of attending ECEC are related the quality of ECEC programs. Rating scales assessing quality include aspects of structural quality (i.e. how the ECEC system is designed and organised, such as the number of professionally trained staff) and process quality (i.e. practices within an ECEC setting, such as relationships and interactions between staff and children). Research has shown that ECEC programs for children aged 3 to 5 years with an emphasis on literacy, maths, science, environment and using a diversity of cultural and theoretical approaches result in better academic and social-behavioural outcomes [7]. Children have been shown to make more progress in preschools where staff have higher qualifications, and international research has reported that objective measures of quality (e.g. the Classroom Assessment Scoring System PreK and Early Childhood Environment Rating Scale - Revised) are related to better outcomes for children (e.g. [5, 7-9]). Several studies have also reported that the relationship between ECEC quality and benefits to child development is stronger for children from disadvantaged backgrounds (e.g. [10-12]). However, others have found no support for this 'compensatory hypothesis' suggesting that even high-quality ECEC is insufficient to totally compensate for environmental disadvantage (e.g. [13, 14]). It nevertheless remains important to increase participation for disadvantaged children.

In 2016, 43% of all Australian children aged 0-5 years were enrolled in ECEC services, and 92% of 4-year-old children were enrolled in a preschool program [15]. To be considered enrolled, the child must have attended the ECEC program for at least one hour during the reference period, or be absent due to illness or extended holiday leave and expected to return. The enrolment rate for 4-year-old children is on par with other OECD nations (average 84%) [16], but some large subgroups of Australian children are substantially less likely to participate in ECEC programs. These subgroups include children from low socio-economic backgrounds, remote communities, Indigenous backgrounds, non-English speaking backgrounds, and those with a disability or special health care needs [17, 18]. Inadequate reach of high quality ECEC programs to the most vulnerable/disadvantaged is likely to result in widening the child development inequity gap.

Aim

This restricted targeted review addresses four key questions:

1. Within an existing national quality system for ECEC, which quality areas and/or standards have the most significant effect on child developmental outcomes (i.e., cognition, language, academic, and social and emotional development)?

2. What does the evidence indicate is the most effective (universal) starting age, dosage (i.e. number of hours per week), and attendance duration (i.e. number of months/years) as it relates to improving child developmental outcomes (cognition, language, academic, and social emotional development)?

3. Given the evidence determined from Question 2, in what quantity should a given community deliver ECEC?

4. Do the answers to these questions differ for targeted provision to disadvantaged populations?

Method

This literature review utilised a targeted restricted evidence assessment (REA) research methodology. REA uses similar methods and principles to a systematic review but makes concessions to the breadth and depth of the process, to enable faster completion. Rigorous methods for locating, appraising and synthesising the evidence related to a specific topic are utilised, but the methodology places some limitations on the search criteria and on how the evidence is assessed. For this review we sought data from primarily large longitudinal national/international cohort studies (peer-reviewed and grey literature – i.e. unpublished or not commercially published written material), although there are some advantages (i.e. large samples, multiple outcomes, unselected population "real-world"), there are also several limitations (i.e. no causal effects, selective follow-up loss).

Quality, participation and quantity

The REA considered the three drivers of quality, quantity, and participation as related to ECEC and child outcomes, as follows:

1. Quality

To determine the indicators of quality, Australia's existing quality rating system was utilised: the National Quality Standard (NQS) implemented by the Australian Children's Education and Care Quality Authority (ACECQA). An initial mapping exercise was undertaken to determine how closely Australia's Quality Areas matched the key principles identified from the European Commission Quality Framework and on domains from standardised, objective measures of ECEC quality [the Classroom Assessment Scoring System PreK (CLASS PreK) and Early Childhood Environment Rating Scale – Revised (ECERS-R)]. This initial scoping work provided confidence that important areas were not being missed when using the seven Quality Areas from the ACECQA National Quality Framework to direct the targeted literature search. A combination of literature reviews (peer-reviewed and web-based reports) and interviews with experts were then performed, to determine which ACECQA Quality Areas had the most robust evidence related to child outcomes. This determined the Quality Areas used for the recommended indicators for ECEC quality.

2. Participation

To determine participation indicators we focused on national and international longitudinal studies and utilised systematic reviews and meta-analyses, where available, with good quality and low bias. Study quality includes an assessment of *internal validity* (the degree to which the design and conduct of the study avoid bias, e.g. through randomisation, allocation concealment and blinding), and *external validity* (the extent to which the results of the study can be generalised to the population outside the study).

The evidence was then examined to determine any differential effect related to universal or targeted program participation in children from 0 to 5 years (e.g. targeted according to housing vulnerability or poverty, culturally and linguistically diversity, or low IQ). We used the evidence to develop indicators for the key dimensions of participation that relate to improved child outcomes, including optimal starting age, duration and dosage.

3. Quantity

Quantity indicators require agreed indicators for both the numerator (participation data) and denominator (population data). Quantity indicators were developed using the best indicators of participation level (for universal and targeted provision), and community-level population data. Again, the domain experts were consulted for their perspectives.

Ranking the Evidence

Individual studies were assessed for effectiveness across the three domains of functioning (cognitive/language, academic, and social-emotional) based on the following criteria:

- *Supported*: clear evidence of benefit, with sustained benefits of at least 1 year, and without evidence of harm or risk to participants. Populations examined are similar to, and results are clinically sensible to apply to, the Australian context.
- *Promising*: evidence suggestive of benefit of at least 6 months and without evidence of harm or risk to participants. Populations examined may be somewhat different to the Australian population, affecting generalisability and applicability to the Australian context. Meta-analyses and systematic reviews of moderate quality will be ranked as promising due to increased risk of bias.
- *Not supported*: There is evidence of harm or risk to participants.
- *Null*: no difference found between comparison groups.

Once each study was evaluated for effectiveness, an overall ranking of the evidence was determined using the following classifications (adapted from [19]). See Appendix D for full details.

- *Supported*. Clear, consistent evidence of benefit.
- *Promising*. Evidence suggestive of benefit but more evidence needed.
- *Mixed*. Data is mixed and could show evidence of harm or risk.
- *Not adequately addressed*. Insufficient evidence in the target research-base.
- *Not supported*. There is evidence of harm or risk to participants.

Findings

Quality Indicators

The ACECQA framework for national quality standards defines seven Quality Areas (QA) (see Appendix A for full detail of related elements), which were divided into two categories:

TEACHING-RELATED FACTORS	ENVIRONMENT-RELATED FACTORS
QA1 – Educational program and practice	*QA2 - Children's health and safety*
QA4 – Staffing arrangements	*QA3 - Physical environment*

QA5 – Relationships with children

QA6 – Collaborative partnerships with families and communities

QA7 - Leadership and service management

The research review provided evidence that the three teaching-related factors are associated with improved child outcomes (cognitive/academic and social-emotional). Conversely, we did not find clear evidence that the environment-related factors directly improve child developmental outcomes. Table 1 provides an overview of the evidence-base by Quality Area (QA). Appendix E provides a detailed list of the evidence separated into Quality Areas.

Table 1: Summary of the overall evidence base

QUALITY AREA	COGNITIVE & ACADEMIC	SOCIAL-EMOTIONAL
TEACHING-RELATED FACTORS		
Educational program and practice	• Supported	• Supported
Staffing arrangements	• Supported	• Supported
Relationships with children	• Supported	• Supported
ENVIRONMENT-RELATED FACTORS		
Children's health and safety	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence base
Physical environment	• Promising	• Not adequately addressed in target evidence base
Collaborative partnerships with families and communities	• Promising	• Promising
Leadership and service management	• Promising	• Not adequately addressed in target evidence base

Quality Areas rated as Supported (1, 4 and 5)

Quality Area 1 – Educational program and practice.

Two systematic reviews of moderate to high quality were identified [20, 21], which provided evidence that educational programs and practice were related to positive child outcomes (cognitive/academic and social emotional). These findings were further supported by a meta-analysis of low-to-moderate quality [22] and three major international trials:

- Effective Provision of Pre-School Education (EPPE) Study (e.g. [7])
- The National Institute of Child Health and Human Development Study of Early Child Care Youth Development (NICHD SECCYD) Studies (e.g. [4, 23, 24], and
- The International Association for Evaluation of Educational Achievement (IEA) Pre-Primary project [25].

Quality Area 4 – Staffing arrangements. There is strong evidence that certain aspects of staffing arrangements in ECEC settings – including staff-child ratios, group size, staff experience and qualifications – affect cognitive and social-emotional child outcomes. The evidence base for this included:

- Three systematic reviews/meta-analyses (high quality/low bias), examining outcomes across a range of study types (e.g. cross-sectional, longitudinal, correlational, experimental, and quasi-experimental studies) [26-28].

- One systematic review [29] and one meta-analysis [22] (both moderate quality, some risk of bias) examining outcomes from experimental and quasi-experimental studies and several national and international trials.
- The Longitudinal Study of Australian Children (LSAC) [30].
- Data from several major longitudinal studies: the EPPE study [31], NICHD SECCYD study [8], National Center for Early Development and Learning's (NCEDL) Multi-State Study of Pre-Kindergarten [32, 33].

Quality Area 5 – Relationships with children. Our search strategy did not yield any high quality systematic reviews or meta-analyses relevant to Quality Area 5. However, a substantive and frequently cited literature review was identified, which reported that there was some support for an association between staff relationships with children and both behavioural and cognitive child development. The findings of the review are also supported by a second review and international trials, EPPE, NICHD SECCYD, IEA Pre-primary longitudinal, cross-national study, Dutch pre-COOL study, and local Australian data strengthening the generalisability and applicability of the findings. In addition, the evidence base related to Quality Area 1 (specifically Standard 1.2 - Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child) and Quality Area 4 (specifically Educators, co-ordinators and staff members are respectful and ethical) are also relevant to Quality Area 5. Thus, overall the evidence was rated as "supported".

Other Quality Areas (2, 3, 6, and 7)

The other four Quality Areas of the NQS (QA2, QA3, QA6 and QA7) were rated as "Promising" or "Not adequately addressed in target evidence-base".

Quality Area 2 – Children's health and safety.

Quality Area 3 – Physical environment.

Quality Area 6 – Collaborative partnerships with families and communities.

Quality Area 7 – Leadership and service management.

Recalibrating the quality rating system

Today, an ECEC service can receive an overall "Exceeds" rating under Australia's National Quality Standard if it *meets* the quality standards in all seven Quality Areas (QA), and e*xceeds* the standard in at least four of the seven areas, including at least two of:

- QA1 - Educational program and practice
- QA5 - Relationships with children
- QA6 - Collaborative partnerships with families and communities
- QA7 - Leadership and service management

This means that an ECEC service can receive an overall "Exceeds" rating while not exceeding the standard in *any* of the three evidence-based areas (i.e., QA1, QA4, QA5). Furthermore, data from publicly available ACECQA ratings show that ECEC services are *least likely* to meet elements related to

Quality Area 1, which is one of the three evidence-supported domains. This suggests a significant quality gap in ECEC services nationally[1].

If the scoring system were recalibrated to give greater weight to the three Quality Areas that the evidence shows have a significant effect on child outcomes this is how it could look:
To receive an overall 'Exceeds' rating a service would need to meet the quality standards in all seven areas, and exceed the standard in all three evidence-based areas:

- QA1 – Educational program and practice
- QA4 – Staffing arrangements
- QA5 – Relationships with children

The National Quality Standards are presented in Appendix A, including a detailed set of practices associated with each Quality Area.

Quality indicator

The proportion of ECEC services rated 'exceeding' the standard in quality areas 1, 4 and 5 and at least 'meeting' the standard in all other quality areas according to the ACECQA assessment.

Participation Indicators

There were three main factors identified that related to Participation: i) starting age, ii) program duration, and iii) program intensity. The key findings for universal and targeted participation are detailed below, and an overview of the evidence ranking is presented in *Table 2* for universal provision and *Table 3* for targeted provision of ECEC. See Appendix F (universal) and Appendix G (targeted) for a detailed list of the evidence.

[1] National Quality Framework Snapshot Q4 2017, Australian Children's Education & Care Quality Authority.

Table 2: Summary of the overall evidence base; starting age, program duration, program dose (for universal provision)

STARTING AGE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
0-2 years	• Supported	• Promising	• Mixed
2-3 years	• Supported	• Promising	• Mixed
3-4 years	• Promising	• Promising	• Not adequately addressed in target evidence-base
4-5 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base

PROGRAM DURATION	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Less than 1 year	• Not adequately addressed in target evidence-base	• Supported	• Not adequately addressed in target evidence-base
1-2 years	• Promising	• Supported	• Not adequately addressed in target evidence-base
2-3 years	• Supported	• Supported	• Not supported
More than 3 years	• Supported	• Supported	• Not supported

PROGRAM DOSE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Part time	• Supported	• Supported	• Not adequately addressed in target evidence-base
Full time (> 15 hours)	• Mixed	• Not adequately addressed in target evidence-base	• Not supported

Table 3: Summary of the overall evidence base; starting age, program duration, program dose (for targeted provision)

STARTING AGE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
0-2 years	• Supported	• Supported	• Supported
2-3 years	• Not adequately addressed in target evidence-base	• Supported	• Not supported
3-4 years	• Supported	• Supported	• Supported
4-5 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base

PROGRAM DURATION	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Less than 1 year	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base
1-2 years	• Supported	• Supported	• Supported
2-3 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base
More than 3 years	• Supported	• Supported	• Supported

PROGRAM DOSE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Part time	• Supported	• Supported	• Supported
Full time (> 15 hours)	• Supported	• Supported	• Supported

Universal ECEC Participation

Starting Age

The evidence is not clear-cut across domains of functioning (cognition and language, academic, and social-emotional), however a starting age between 3 and 4 years provides the best balance of outcomes with no "risk or harm" documented in the studies reviewed.

Program Duration

On balance, the evidence related to duration *Supports* programs of two years. Although there was good evidence for programs between two and three years' duration for cognitive and academic achievement, there was also some evidence (local data) that suggests programs longer than two years have detrimental effects on social-emotional outcomes.

Program Dose (intensity)

Due to the potential detrimental effect of full time provision of ECEC on child outcomes, the evidence best *Supports* part-time provision for universal access.

Universal participation indicator

Proportion of all children attending ECEC for 15 hours or more per week for the two years before starting formal school.

Targeted ECEC Participation

Starting Age

Most of the population samples in the research were from the US and may differ in ways that affect the generalisability to the Australian context. For example, most of the targeted samples drew from predominantly African-America populations and from the 1960s and 1970s. On balance, the evidence suggests that children from at-risk backgrounds would likely benefit from an earlier start to ECEC compared with the general population. The evidence *Supports* a starting age of 0 to 2 years.

Program Duration

Unlike for the universal provision of ECEC, there was no evidence of an increased risk of social-emotional difficulties associated with programs of longer duration. The limitations noted above regarding generalisability and applicability to the Australian context are also relevant here, but given the quantity and relative strength of the Abecedarian findings, the evidence *Supports* programs of at least three years' duration.

Program Dose

The research regarding program dose for children from disadvantaged backgrounds *Supports* full time provision of ECEC. There are some potential issues with generalisability of the research to the Australian context (US-based research, selective samples of low IQ, African-American people).

Targeted participation indicator

Proportion of all children experiencing disadvantage who attend ECEC for 15 hours or more per week, for at least the three years before starting formal school

Quantity Indicators

The determination of the required quantity of ECEC services in a given community is a function of the size of the population, the portion of the population participating, and the effort required to provide the right standard of care. This is largely a practical consideration, and the literature reviewed did not provide any specific data related to this driver. However, two relevant measures of quantity were considered:

- Is there sufficient ECEC infrastructure? i.e., number of ECEC places per defined population (per 15 hours).
- Is there a sufficient workforce? i.e., number of ECEC workers or teachers.

Quantity indicator

The number of ECEC places for 15 hours per week available to 2-5 year olds

CONCLUSIONS

ECEC quality indicators

Restacking the Odds proposes using the evidence related to the Quality Areas to recalibrate how a service is rated for overall quality, by emphasising the three Quality Areas that have a significant effect on child outcomes.

The current Quality Rating System

A service can receive an overall "Exceeds" the National Quality Standard if:
The service meets *all* standards and receives an Exceeds National Quality Standard rating in at least four Quality Areas, including at least two of the following areas:

- QA1 - Educational program and practice
- QA5 - Relationships with children
- QA6 - Collaborative partnerships with families and communities
- QA7 - Leadership and service management

Restacking the Odds Quality Rating System

To receive an exceeding rating, a service would need to attain an *Exceeds* National Quality Standard rating in all three evidence-based Quality Areas:

- QA1 – Educational program and practice
- QA4 – Staffing arrangements
- QA5 – Relationships with children

And must at least "Meet" the National Quality Standard in the remaining four Quality Areas.

Quality indicator

The proportion of ECEC services rated 'exceeding' the standard in quality areas 1, 4 and 5 and at least 'meeting' the standard in all other quality areas according to the ACECQA assessment.

ECEC participation indicators

Two indicators were selected that encapsulated the three factors related to participation; one pertained to universal participation whilst the other related to targeted participation, as follows:

- The proportion of all children, aged 3 to 5 years in a given area, who attend ECEC for at least 15 hours per week.

- The proportion of children, aged 2 to 5 years in a given area, from disadvantaged backgrounds and/or with special needs (children residing in an area with a Socio-Economic Index for Areas [SEIFA] Index of Relative Socio-economic Disadvantage [IRSD] quintile of 1, non-English speaking background, Aboriginal and Torres Strait Islander children, children with disability) who attend ECEC for at least (more than) 15 hours per week

Universal participation indicator

Proportion of all children attending ECEC for 15 hours or more per week, for the two years before starting formal school

Targeted participation indicator

Proportion of all children experiencing disadvantage who attend ECEC for 15 hours or more per week, for at least three years before starting formal school

ECEC quantity indicators

The determination of the required quantity of ECEC services in a given community is a function of the size of the population, the portion of the population participating, and the effort required to provide the right standard of care. This is largely a practical consideration, and the literature reviewed did not provide any specific data related to this driver. There are however two measures that are related to quantity:

- Is there sufficient ECEC infrastructure? i.e., number of ECEC places per defined population (per 15 hours).
- Is there sufficient workforce? i.e., number of ECEC workers/teachers.

Quantity indicator

The number of ECEC places for 15 hours per week available to 2-5 year olds

BACKGROUND: RESTACKING THE ODDS

Too many children are born into circumstances that do not provide them with a reasonable opportunity to make a good start in life. Disadvantaged circumstances for children lead to developmental inequities in physical health, social-emotional wellbeing, and academic learning – that is, differential outcomes that are preventable. Inequities emerging in early childhood often continue into adulthood, contributing to unequal rates of low educational attainment, poor mental and physical health and low income. In some cases, this experience is part of a persistent cycle of intergenerational disadvantage. Inequities constitute a significant and ongoing social problem and – along with the substantial economic costs – have major implications for public policy.

The importance of early childhood and the impact of this period on long-term developmental outcomes has been well documented. Research has demonstrated that this period is crucial for brain development across all domains, and that both risk and protective factors encountered by the child during this time can have life-long impacts [35]. In particular, exposure to multiple risk factors predicts more severe, adverse developmental consequences compared with a singular risk factor (e.g. [36, 37]). Furthermore, research has shown that developmental interventions that isolate only one risk factor are less likely to work than those that are multi-faceted (e.g. [38-40]). The premise behind the latter approach to intervention is that resources/assets accumulate and the benefits of multiple assets accrue, leading to more positive outcomes. In line with this premise and with evidence on cumulative risk, it is the hypothesis of *Restacking the Odds* that inequities can be reduced by using existing, evidence-based interventions and approaches from service providers of the following five strategies: antenatal care; sustained nurse home visiting; early childhood education and care; parenting programs; and the first 3 years of school. These strategies are notably longitudinal (across early childhood), ecological (targeting child and parent), evidence-based, and able to be targeted (aimed at benefiting the 'bottom 25 per cent', namely the most disadvantaged). By 'stacking' these fundamental interventions (i.e., ensuring they are all applied), it is predicted that there will be a cumulative effect, amplifying the effect and resulting in sustained benefits.

In order to achieve this, the *Restacking the Odds* project seeks to use the existing evidence within the five fundamental strategies of early childhood, to develop best practice benchmark frameworks that better define indicators of quality, access (quantity), and reach (participation).

This report focuses on the strategy of *Early Childhood Education and Care*. There is a similar report for each of the five strategies.

INTRODUCTION: EARLY CHILDHOOD EDUCATION AND CARE

The early years are a time of rapid brain development, and a secure and nurturing environment provides a solid base for learning. An extensive research base indicates that the education and care of young children (birth to eight years of age) has an immense influence on long-term outcomes related to resilience, health, and wellbeing. Specifically, early childhood education and care (ECEC) programs offered during the first five years strengthen social and cognitive development [1, 2]. ECEC has been associated with positive short- and long-term outcomes in literacy, cognition, social-emotional development, and future academic success. Participation in high quality ECEC has the potential to provide all preschool children with an opportunity to develop life-long skills for learning and wellbeing [41]. Previous research (predominately US-based) has focused largely on the impact of ECEC on disadvantaged children, demonstrating benefits across a broad spectrum of outcomes [4]; however, there has been a more recent shift to optimise ECEC programs for all children (e.g. [5, 6]).

Universal access to ECEC services is therefore a way improve developmental outcomes for Australian children. There is a clear need for this in Australia, with 15 per cent of children from the lowest socio-economic quintile (around 60,000 children in total) entering school as "developmentally vulnerable", as measured by the Australian Early Development Census (AEDC) [42]. The AEDC is a teacher-report measure of the development of all children starting school and is completed every 3 years. Children are classified as "developmentally vulnerable" if they demonstrate a much lower (lowest 10%) than average ability in the developmental competencies in a domain. The five AECD domains include language and cognitive skills, communication skills and general knowledge, physical health and wellbeing, social competence and emotional maturity. While overall levels of developmental vulnerability have not shifted significantly, the gap between the poorest and wealthiest communities, and between remote/rural and metropolitan areas, has increased. This finding is significant given the evidence that many children who enter school developmentally vulnerable fail to catch up to their peers (e.g. [43, 44]). National studies show ECEC as a potential way to impact child outcomes. For example, AEDC data suggest that children who attend preschool are less likely to be developmentally vulnerable, even when considering level of relative disadvantage. Furthermore, research from the Longitudinal Study of Australian Children (LSAC) demonstrates that children who attend preschool score higher on year 3 National Assessment Program – Literacy and Numeracy (NAPLAN) tests, with a reduced probability of being rated by their carer as having poor social and emotional development [30].

The benefits of attending ECEC are related, in particular, to the quality of ECEC programs, with quality having been shown to have a significant influence on child outcomes. Rating scales assessing quality include aspects of structural quality (i.e. how the ECEC system is designed and organised, such as the number of professionally trained staff) and process quality (i.e. practices within an ECEC setting, such as relationships and interactions between staff and children). ECEC programs for children aged 3 to 5 years with an emphasis on literacy, maths, science, environment and using a diversity of cultural and theoretical approaches result in better academic and social-behavioural outcomes [7]. Staff qualifications and ratings of quality are also related. Children have been shown to make more progress in preschools where staff have higher qualifications, and objective measures of quality (e.g. the Classroom Assessment Scoring System PreK and Early Childhood Environment Rating Scale – Revised) are also related to better outcomes for children (e.g. [5, 7-9]).

Whilst the research shows that high quality ECEC services can improve child outcomes, the data shows that those children at greatest risk of poor outcomes may not be accessing these services. In 2014, 43% of all Australian children aged 0-5 years were enrolled in ECEC services, and 95% of 4-year-old children were enrolled in a preschool program in the year before school [15]. To be considered enrolled, the child must have attended the ECEC program for at least one hour during the reference period, or be absent due to illness or extended holiday leave and expected to return. The enrolment rate for 4-year-old children are on par with other OEDC nations (average 84%) [16], but some large subgroups of Australian children are substantially less likely to participate in ECEC programs. This includes children from low socio-economic backgrounds, remote communities, Indigenous backgrounds, non-English speaking backgrounds, and those with a disability or special health care needs [17, 18]. Inadequate reach of high quality ECEC programs to the most vulnerable/disadvantaged is likely to result in widening the child development intergenerational disadvantage gap further.

AIM

This restricted targeted review addresses 4 key questions:

1. Utilising an existing ECEC national quality system, which quality areas and/or standards have the most significant effect on child outcomes (i.e., cognition, language, academic, and social emotional development)?

2. What does the evidence indicate is the most effective (universal) starting age, dosage (i.e. number of hours per week), and duration (i.e. number of months/years) as it relates to improving child developmental outcomes (cognition, language, academic, and social emotional development)?

3. Given the evidence determined from question 2, in what quantity should a given community deliver ECEC?

4. Do the answers to these questions differ for targeted provision to disadvantaged populations?

DEFINITIONS

ECEC Quality

Although there is no internationally recognised definition of ECEC quality, measures used to assess quality typically include both structural and process elements. *Structural quality* refers to the way the ECEC system is designed and organised (e.g. the number of professionally trained staff, the design of the curriculum). *Process quality* relates to the practices within an ECEC setting (e.g. relationships and interactions between staff and children, day-to-day pedagogic practices of staff) [45].

ECEC Participation

Refers to the dosage (hours) and duration (years/months) of ECEC services available to the targeted population.

ECEC Quantity

Refers to the capacity of ECEC services within a defined (local) area, relative to the size of the target population.

THE AUSTRALIAN ECEC CONTEXT

Australian families are offered a diverse range of options for the education and care of their young children. ECEC services provide one or more of the following service types:

- Child care – refers to formal child care services provided to children aged 0-12 years, including:
    - Long day care,
    - Family day care,
    - Outside school hours care (OSHC), and
    - Occasional care.
- Preschool (kindergarten) – refers to services delivering a preschool program by a qualified teacher to children, mainly in the year or two before they begin full time schooling.

Whilst these are the *types* of services available, in practice, there is significant variation in the actual services provided to the public. The is because the ECEC arrangements in Australia are complex and differ between the states and territories in terms of the range of services offered, the extent of those services, and the model of service integration. Furthermore, the Australian ECEC system is managed by a range of different organisations including:

- local government-managed services,
- school-managed services,
- community-based organisations, for-profit providers, and
- not-for-profit providers with government subsidies available to families.

(Services outside the scope of this review of ECEC services include primary schools and in-home care).

The situation of multiple service types and providers is further complicated by the diverse ECEC funding arrangements (all levels of government and families contribute).

National Quality Framework

Australia has an established quality rating system with associated quality indicators, the National Quality Framework (NQF). The overarching objective of the NQF is to improve educational and developmental outcomes for children attending ECEC services, through driving quality improvement in service delivery [46].This system was implemented in 2013, however, development of the NQF began in 2007 when the Australian ECEC system underwent major reform following a change of government.

The decision to introduce a National Quality Framework came from the recognition that consistent quality standards across jurisdictions and across services was required to ensure Australia had a world-class ECEC system. Historically, there was a gap in the quality of 'child care' services and 'preschools/kindergartens' services, due to the view that childcare existed primarily to provide support to working families [47]. Furthermore, as each state and territory ran their own ECEC regulatory system, there was significant administrative and regulatory duplication of services between the Commonwealth and states and territories.

A central part of this reform was the formation of the Council of Australian Governments (COAG), a cross jurisdiction council which includes representatives from all three tiers of government (federal, state and local). COAG was commissioned to consider ways of creating a national approach to ECEC that was consistent with Australian and international research, but in practice, mainly relied upon recommendations provided by the Organisation for Economic Co-Operation and Development [48]. The OECD is an intergovernmental economic organisation with 35 member countries, which was founded in 1961. The OECD provides a foundation to identify good practices, including aspects of quality that are critical to the provision of ECEC services and contribute to positive outcomes for children.

Under COAG, the core of the Australian Government's reform agenda for ECEC focused on three key aspects of early childhood services:

1. National Quality Standards and enhanced regulatory arrangements;
2. A quality rating system, and;
3. A national early years learning framework.

[49].

These three aspects of ECEC were developed by COAG, and are described in more detail below.

National Quality Standards

In 2009, COAG produced the *National Quality Framework for Early Childhood Education and Care and School Age Care* (National Quality Framework; NQF). The NQF was designed to provide national minimum standards to drive improvements in quality across Australia, and includes the National Quality

Standards (NQS). The NQS were developed following an "extensive and targeted consultation process with and between a panel of experts" and also involved field testing [49]. Seven quality standards were developed, based upon research and/or consensus from panel experts. The standards are also consistent with quality indicators identified by the OECD (educational concept and practice, structural quality, interactions between educators and children and targeting services to meet the needs of families and local communities) [50]. The NQS sets a national benchmark in 7 quality areas (QA) for 18 standards (see Appendix A for full detail of related elements):

1. Educational program and practice (QA1);
2. Children's health and safety (QA2);
3. Physical environment (QA3);
4. Staffing arrangements (QA4);
5. Relationships with children (QA5);
6. Collaborative partnerships with families and communities, (QA6) and;
7. Leadership and service management (QA7)

[50].

Quality Rating System

The NQS is accompanied by a national assessment and rating process, reporting the quality of each service against five rating levels:

i) Significant Improvement Required,

ii) Working Towards NQS,

iii) Meeting NQS,

iv) Exceeding NQS, and

v) Excellent.

Each of the seven quality areas consist of two to three quality standards; high-level outcome statements. There are *also* two to three elements under each of the quality standards – these are specific outcome sentences that describe how the standard should be achieved (see Appendix A for detail).

The NQS includes a total of 58 elements, which are assessed as being met or not. A service is required to meet all the elements within a standard to be rated as "Meeting" that standard. A service must meet all seven standards to attain an overall rating of "Meeting" the National Quality Standards. In addition, a service can receive an "Exceeding" rating (as determined by the assessor) for each standard and can receive an overall "exceeds" the National Quality Standard *if* the service meets *all* standards and

receives an Exceeds National Quality Standard rating in at least four quality areas, including at least two of the following areas:

- Educational program and practice (QA1)
- Relationships with children (QA5)
- Collaborative partnerships with families and communities (QA6)
- Leadership and service management (QA7)

The "Excellent" rating can only be awarded by the national body, the Australian Children's Education and Care Quality Authority (ACECQA), upon application from the approved service provider.

The quality rating system was developed following a consultation process with stakeholders. ACECQA is the national body that guides and reports on the NQF (including the NQS), while regulatory authorities in each state and territory are responsible for its implementation (see Table 4).

Table 4: National Quality Rating System

Rating Level	How the overall rating is determined
Significant improvement required	• Service does not meet 1 of the 7 quality areas or a section of the legislation and there is a significant risk to the safety, health and wellbeing of children. • The regulatory authority will take immediate action.
Working towards National Quality Standard	• Services provides a safe education and care program. • There are 1 or more areas identified for improvement.
Meets National Quality Standard	• Service meets the National Quality Standard. • Service provides quality education and care in all 7 quality areas.
Exceeds National Quality Standard	• Service goes beyond the requirements of the National Quality Standard in at least 4 of the 7 quality areas, with at least two of these being quality areas 1, 5, 6, or 7.
Excellent	• Service promotes exceptional education and care, demonstrates sector leadership and is committed to continually improving. • Awarded by ACECQA. • Services rated Exceeding National Quality Standard in all quality areas may choose to apply for this rating.

Early Years Learning Framework

The NQS also supports the implementation of an early years curriculum, titled *Belonging, Being and Becoming: The Early Years Learning Framework* (EYLF). This framework guides early childhood educators in the provision of quality early childhood educational programs and practice, through curriculum and pedagogy. The EYLF was designed to bring together the multiple perspectives of the Australian community about how best to support children's learning from birth to five years and their transition to school. The EYLF considers diversity of cultural, spiritual, and theoretical approaches to ECEC across Australia, and it is intended to be a resource for educators, parents, and the broader community who have an interest in child development [51].

METHOD

The literature review utilised a targeted Restricted Evidence Assessment (REA) methodology. REA is a research methodology that uses similar methods and principles to a systematic review, but makes concessions to the breadth and depth of the process in order to be completed within a short timeframe. Rigorous methods for locating, appraising and synthesising the evidence related to a specific topic are utilised; however the methodology places a number of limitations in the search criteria and in how the evidence is assessed.

ECEC Quality, Participation and Quantity

Australia has an established quality rating system (the National Quality Standards) with associated quality indicators. So, as a matter of pragmatics the existing national system was used, with robust evidence mapped against this rating system to either endorse or adapt the current scoring methodology and system indicators related to quality. The *Restacking the Odds* methodology for the ECEC strategic area involved seven key steps, which are described in detail below. The first three steps are unique to the methodology employed to the quality driver.

1. Interview – ACECQA representative

An informal interview with Rhonda Livingstone, National Education Leader and General Manager Educational Leadership from ACECQA was conducted, in order to seek (a) her expertise about the relative importance of different aspects of quality on child outcomes, and (b) any official documentation outlining the evidence-base underpinning the NQS. Ms Livingstone was involved in the development of the ACECQA National Quality Standards (NQS). The major objective of the interview was to seek any official documentation outlining the evidence-base underpinning the NQS.

2. Mapped the European Commission Key Principles of a Quality Framework against the National Quality Standards (refer to Appendix B)

The *European Commission Key Principles of a Quality Framework* is a benchmark, which is part of the Education and Training 2020 Strategy. It addresses the challenge of (a) providing access to child care and education for all, and (b) raising the quality of ECEC provision.

The development of this framework was a process that included ECEC experts and policy-makers from across Europe, who reviewed the existing evidence from policy and practice as well as cross-national research findings. The "*Proposal for Key Principles for a Quality Framework for Early Childhood Education and Care*" outlines the attributes identified as crucial for enhancing the quality of service provision [33].

Increasing access to high quality ECEC is a major focus of the European benchmark. The European benchmark, emphasises the importance of improving access for children from disadvantaged backgrounds and for improving the quality of provision and support for ECEC teachers. In 2011, the European Commission launched a process of cooperation to address these two major challenges (access and quality). The process included the establishment (in 2012) of a Thematic Working Group as part of the Education and Training 2020 work programme.

The focus of the Thematic Working Group was to identify and review key policy actions which had led to improvements in ECEC quality and access. The Group, which was comprised of ECEC experts and policy makers from across Europe, reviewed the existing evidence from policy and practice in Member States, as well as cross-national research findings. The Group highlighted five areas where action has led to clear improvements in the quality of provision:

1. access;
2. workforce;
3. the curriculum;
4. evaluation and monitoring; and
5. governance and funding.

Within these five areas, there were ten broad actions (Quality Statements – see Appendix B), which were designed so that they could be used by Member States to improve the quality of ECEC provision and support all children, their families and the community [33].

These ten quality statements were mapped against the NQF. The purpose of this mapping exercise was to determine if there were any important areas not covered by the seven Quality Areas of the NQF.

3. CLASS PreK and ECERS-R mapped against NQS (refer to Appendix B)

The Classroom Assessment Scoring System PreK (CLASS PreK) and Early Childhood Environment Rating Scale – Revised (ECERS-R) are valid and reliable tools used to assess ECEC quality. The measurement domains from CLASS PreK and ECERS-R were mapped against the existing National Quality Standards, to determine which areas were best supported by existing measures of quality shown to relate to child outcomes. As with the mapping exercise above, these standardised measures of ECEC quality were examined, to ensure that important areas were not missed by only focusing the literature search on the seven Quality Areas of the NQF.

4. Targeted literature research

The following steps (a to d) were applied across the 3 key drivers (quality, participation, and quantity).

(a) Systematic reviews and meta-analyses

Search Strategy

A targeted search of the academic literature was conducted, and sought to identify systematic reviews, meta-analyses, randomised controlled trials, and other relevant primary research by searching standard academic and clinical databases. This process was directed by information from major national and international studies, and included grey literature where necessary.

The following databases were used to identify relevant primary literature related to this topic: Ovid MEDLINE, SCOPUS, ERIC, PsychINFO, Cochrane library, and PubMed.

The quality of the systematic reviews and/or meta-analyses was assessed using the PRISMA checklist [52] (see Appendix C).

Search Terms

The search terms were kept broad at this first step, in order to cover relevant papers across the three key drivers (quality, quantity, participation). The Title/s, Abstract/s, MeSH terms, and Keywords lists were:

- *early childhood education, preschool, kindergarten.*
- *systematic review, meta-analysis, review.*

Paper Selection

Systematic reviews or meta-analyses were included if they were evaluating any aspect of ECEC related to any of the three key drivers (quality, quantity, participation).

(b) Targeted search strategy

For each of the drivers, there was a focus on the key studies identified either by experts or within the systematic reviews/meta-analyses. The studies included did not undergo a quality and bias check.

Search Terms: Quality

The NQS provided the context from which a targeted search strategy was developed, to determine which factors within the seven quality standards have the greatest impact on child outcomes.

The following studies were identified as key projects with data related to quality:

- *The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) studies*
- *The Effective Provision of Pre-School Education (EPPE) study*
- *The International Association for Evaluation of Educational Achievement (IEA) Pre-Primary Project*

Search Terms: Participation

A targeted search of government reports and reviews - particularly those reporting on large scale randomised controlled trials (RCTs) and/or nation-wide projects with longitudinal data – was conducted. This process was directed by information from major national and international studies and included grey literature where necessary. The following studies were identified as key projects reporting on participation-related parameters:

- *The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) studies*
- *The Effective Provision of Pre-School Education (EPPE) study*
- *Longitudinal Study of Australian Children*

- *Abecedarian project*
- *Early Head Start*
- *Perry Preschool Project*
- *Milwaukee Project*
- *Project Care*

Search Terms: Quantity

The following search terms specific to the research questions were included in searching the Title/s, Abstract/s, MeSH terms, and Keywords lists:

- *early childhood education, preschool, kindergarten*
- *availability, access, quantity, transport, distance travelled, neighbourhood/s, community/ies*

Paper Selection

Key papers examining aspects of quality, quantity, or participation were included in this restricted review.

(c) Ranking the Evidence

Individual studies were assessed for effectiveness across the three domains of functioning (cognitive/language, academic, and social-emotional) based on the following criteria:

- *Supported*: clear evidence of benefit, with sustained benefits of at least 1 year and without evidence of harm or risk to participants. Populations examined are similar to, and results are clinically sensible to apply to, the Australian context.
- *Promising*: evidence suggestive of benefit of at least 6 months and without evidence of harm or risk to participants. Populations examined may be somewhat different to the Australian population, affecting generalisability and applicability to the Australian context. Meta-analyses and systematic reviews of moderate quality will be ranked as promising due to increased risk of bias.
- *Not supported*: There is evidence of harm or risk to participants.
- *Null*: no difference found between comparison groups.

Once each study was evaluated for effectiveness, an overall ranking of the evidence was determined using the following classifications (adapted from [19]). See Appendix D for full details.

- *Supported*. Clear, consistent evidence of benefit.
- *Promising*. Evidence suggestive of benefit but more evidence needed.
- *Mixed*. Data is mixed and could show evidence of harm or risk.

- *Not adequately addressed*. Insufficient evidence in the target research-base.
- *Not supported*. There is evidence of harm or risk to participants.

5. Development of Draft Indicators

Indicators were developed, based on those which were determined by the evidence to be the best indicators of quality, participation, and quantity.

6. Expert Evaluation of Draft Indicators

The distilled list of indicators was vetted by an Australian and two international ECEC experts:

- *Professor Iram Siraj* PhD, OBE. Professor of Child Development and Education University of Oxford.
- *Professor Edward Melhuish* CSci, CPsychol, FBPsS, FAcSS, OBE. Professor of Human Development, Birkbeck, University of London and Professor of Human Development, and Academic Research Leader, University of Oxford.

These experts were asked to independently comment on the developed list of ECEC quality, quantity, and participation indicators.

RESULTS

ECEC Quality

1. Interview with the ACECQA representative: NQS development

The interview with Rhonda Livingstone, National Education Leader, General Manager Educational Leadership from ACECQA provided the context to the development of the NQS.

Overall, the development of the NQS (detailed below) involved drawing upon:

- The standards that were previously included in the National Childhood Accreditation Council (NCAC),
- National and international research and practice, and
- Quality indicators of the Classroom Assessment Scoring System (CLASS).

The development of the NQS drew upon standards that were previously included in the NCAC, and also utilised the quality indicators of the Classroom Assessment Scoring System PreK (CLASS PreK); [53] and the Early Childhood Environment Rating Scale – Revised (ECERS-R) [54]. Based on Ms Livingstone's account, the experts had initially tried to "*cherry pick the best and throw it into a big melting pot*" – however they then realised that there was a need to consider outcomes for children and look at the research evidence that supported better developmental outcomes. Consequently, the experts then looked more broadly at the research and practices regarding quality outcomes for children which was occurring in the UK, New Zealand, and the US. In addition, the experts considered the context of learning from experience in regulating for minimum quality (NCAC Quality Assurance). The Australian context was also considered, in terms of culture and the guiding principles that underpin the whole regulatory standards. This included the recognition and value of Aboriginal and Torres Strait Islander (ATSI) culture as well as the role of parents as child's first educator (which are embedded in the guiding principles of the NQF. The development of the NQS also drew upon quality indicators used in the Classroom Assessment Scoring System (CLASS), particularly with regard to what is considered to be 'exceeding practice' (there are several versions of CLASS that target different ages groups). The Australian Council for Education Research was also consulted with regard to the description of 'exceeding' for the NQS rating system.

As a result of these processes, quality areas were developed based on evidence linking these domains with positive child outcomes, as follows:

- Quality Area 1- Educational program and practice,
- Quality Area 4 - Staffing arrangements, and
- Quality Area 5 - Relationships with children.

Four other quality areas and standards were also developed, based largely on legislation/regulation requirement

- Quality Area 2 - Children's health and safety,
- Quality Area 3 - Physical environment,
- Quality Area 6 - Collaborative partnerships with families and communities, and
- Quality Area 7 - Leadership and service management.

2. NQS Mapping: the European Commission Key Principles of a Quality Framework

The ten Quality Statements from the European Commission Key Principles of a Quality Framework were mapped against Australia's NQS. There were several points of overlap between these two documents (see Appendix B for details). Specifically, the following quality areas and standards were addressed in both frameworks: Quality Area 1 (standard 1 & 2); Quality Area 4 (Standard 4.1); Quality Area 5 (Standard 5.1); Quality Area 6 (standard 6.1 & 6.2); Quality Area 7 (Standard 7.1). The two domains not covered by the European Commission Key Principles of a Quality Framework were Quality Area 2 (Children's health and safety) and Quality Area 3 (Physical environment).

This initial scoping work provided confidence that any important areas were not being missed when using the seven Quality Areas from the National Quality Framework to direct the targeted literature search.

3. NQS mapping against objective measures of quality: ECERS-R AND CLASS

Similar to the mapping exercise above, valid and reliable measures of ECEC quality (ECERS-R and CLASS) were compared with the NQS (see Appendix B), to ensure that important areas were not missed [53, 54].

The CLASS incorporates items to measure both structural and process aspects of ECEC quality. Areas demonstrating the most substantial overlap were *Quality Areas 1 and 5. Quality Area 1* (Educational programs and practice) included items such as productivity, concept development, language modelling, literacy focus, and teacher sensitivity, and *Quality Area 5* (Relationships with children) included the following domains; positive climate, negative climate, and regard for student perspectives. *Quality Area 4* overlapped with the entire emotional support domain; and included elements such as positive climate, negative climate, teacher sensitivity, regard for child perspectives, and behaviour guidance. *Quality Area 3* overlapped with just one item; instructional learning formats.

ECERS-E also measures structural and process aspects of quality ECEC, and showed a higher number of overlapping themes with the NQS compared with the CLASS, including *Quality Areas 1, 4, and 5* noted above. In addition, the ECERS- E also includes at least two items in the other four NQS areas (details are provided in Appendix B).

In summary, the overlapping themes identified, with quality measures and the European Commission Key Principles compared with the NQS, highlight the relative importance of Quality Areas 1, 4, and 5. As mentioned above, this initial scoping work provided confidence that no important areas were being missed, when using the seven Quality Areas from the National Quality Framework to direct the targeted literature search.

4. Targeted literature research

A targeted search of the academic literature sought to identify systematic reviews, meta-analyses, randomised controlled trials, and other relevant primary research, by searching standard academic and clinical databases. Few relevant systematic reviews and meta-analyses of acceptable quality were identified, and those that were found are described in relation to the appropriate *Quality Area (QA 1-7 listed below)*.

Three major national and international trials were identified as providing evidence relevant to a number of the quality areas of interest in this report. These studies are described in brief below. These studies are only referred to thereafter where they are relevant and applicable to the Australian context.

1. The Effective Provision of Pre-School Education (EPPE) study was the first major longitudinal, mixed-methods study to investigate the effects of ECEC provision on children's cognitive, social, and behavioural development. This study used a national sample of over 3,000 UK children between the ages of 3 and 11 years, who were recruited between 1997 and 1999 [7]. The EPPE project covered a range of different types of ECEC provision, and included a comparison group of children who had minimal or no ECEC experience. Data was collected on child and family background characteristics; child cognitive, social and emotional developmental measures; and preschool characteristics. Preschool characteristics included 'structural' features (such as child/staff ratios, staff training, policies, curriculum, and parental involvement) and 'process' features (such as interactions between children and between staff and children, and the structuring of activities). The EPPE study used the following measures of ECEC quality and child outcomes:

    - ECERS-R: a revised version of the Early Childhood Environment Rating Scale which covers space and furnishings, personal care routines, language reasoning, activities, interaction, programme structure, and parents and staffing [55].
    - ECERS-E: an extension of the ECERS focused on the English curriculum, which covers literacy, mathematics, science and environment, and 'diversity' [7].
    - CIS: Caregiver Interaction Scale, which assesses positive relationships, permissiveness, detachment, and punitiveness of staff [56].

    The EPPE study also conducted in-depth case studies of 12 ECEC centres rated as 'good' or 'excellent' in terms of effectiveness (producing better than expected outcomes based on child and

home characteristics). The case studies were conducted retrospectively using document analysis, interviews and observation; in order to give further detail about good practice.

2. The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) was a longitudinal study of the development of a demographically and ethnically diverse sample of over 1000 children in the USA. Children were recruited at 1 month of age in 1991, and followed through to adolescence [23]. Quality of ECEC was measured using (a) the Observational Record of Caregiving Environment (ORCE), which involves observing and recording child behaviour, activities, and interactions with adults and other children [24], and (b) the Child-care HOME (CC-HOME) a global rating of quality which is focused on the quality of the caregiving environment more broadly, including ratings for responsivity, modelling and acceptance [4]; and measures of structural features including staff-child ratio, group size and staff education level [23]. The researchers also measured child development and family characteristics, including the quality of maternal care.

3. The International Association for Evaluation of Educational Achievement (IEA) Pre-Primary Project was a longitudinal, cross-national study of ECEC. The project examined the association between the structural and process characteristics of ECEC settings of children who attended ECEC at age 4 years and their cognitive and language performance at age 7 years. The sample of 1,897 children came from 10 countries (developed and developing), and while Australia was not included, findings which were consistent across these 10 countries can reasonably be generalised to the Australian setting (i.e., similar demographics, healthcare systems). Observations of ECEC centre quality were made using instruments specifically developed for this study through collaboration between researchers across countries; and these instruments covered child behaviour, adult behaviour, structural features, family characteristics, and child development [25].

Where appropriate, studies that were based in Australia were included, in order to assist with the interpretation of the evidence and the extent to which is the information is generalisable and applicable to the population of interest (i.e. Australian children).

Data was also extracted from the European Commission *Key Principles of a Quality Framework for Early Childhood Education and Care* (described above), which used the research literature to determine the key priority areas [33].

The results below consider the research as related to each quality area (QA1-7). This is not an exhaustive summary of the evidence related to the *National Quality Standards*. Rather, it is a summary of a targeted search, focused on well-known high quality longitudinal studies, systematic reviews and meta-analyses, and evidence identified by experts in the European Commission *Key Principles of a Quality Framework for Early Childhood Education and Care*. See Appendix E for a list of the evidence-base related to each of the quality areas.

Table 5 provides a summary of the overall evidence base.

Table 5: Summary of the overall evidence base

UNIVERSAL		
QUALITY AREA	**COGNITIVE & ACADEMIC**	**SOCIAL-EMOTIONAL**
TEACHING-RELATED FACTORS		
Educational program and practice	• Supported	• Supported
Staffing arrangements	• Supported	• Supported
Relationships with children	• Supported	• Supported
ENVIRONMENT-RELATED FACTORS		
Children's health and safety	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence base
Physical environment	• Promising	• Not adequately addressed in target evidence base
Collaborative partnerships with families and communities	• Promising	• Promising
Leadership and service management	• Promising	• Not adequately addressed in target evidence base

Quality Area 1: Educational program and practice

Standard 1.1 - An approved learning framework informs the development of a curriculum that enhances each child's learning and development

There are two major factors contained within *Standard 1.1*. Firstly, it stipulates that ECEC programs should have a structured, explicit curriculum that is embedded within practice. Secondly, it specifies via the Quality Elements that child learning and development outcomes emphasised by the curriculum should include "identity, connection with community, wellbeing, confidence as learners and effectiveness as communicators" (see Appendix A for a full list of Quality Standards and associated Elements). An approach targeting these quality elements is referred to in this report as 'holistic' but there are a number of synonymous terms used in the literature such as 'cognitive developmental', 'balanced', 'global', 'comprehensive' and 'constructivist'. Holistic curricula aim to foster academic progress alongside other aspects of child development, and balance structure with flexibility. This is in contrast to programs which focus more exclusively on school readiness in terms of numeracy and literacy, referred to henceforth as 'academic' curricula [33]. This project sought to determine the strength of evidence underlying both of these aspects of *Standard 1.1*:

1) An explicit curriculum embedded in practice, and

2) A holistic approach to the curriculum.

Below is the research gathered which relates to this area of the Standard.

A systematic review, synthesising 38 randomised-controlled trials and matched-control studies on the effects of 27 specific ECEC programs in the US, investigated the effect of these programs on cognitive outcomes of children aged 3-5 [20]. ECEC programs were categorised as either 'academic' or 'cognitive-developmental' (holistic). Analyses revealed that compared with control conditions (e.g., standard practice or an alternative program(s)), programs in both the 'academic' and 'cognitive-developmental' categories were associated with greater child developmental progress in the areas targeted by the particular program (whether it be language, literacy, phonological awareness, mathematics or cognition). Notably, the average effect sizes were small. Holistic programs were found to have better

long-term effects on social adjustment (such as reduced delinquency, teenage pregnancy, and welfare dependency and increased educational and employment levels), based on a small subset of studies which continued to adolescence or adulthood. This review was of moderate quality, with detail lacking in the description of the search strategy and the results of individual studies. No risk of bias assessment across the studies was presented. In addition, comparison conditions of the included studies were highly variable and not always described in sufficient detail. The authors also noted that in most of the studies, teachers received a higher degree of support in implementing the curriculum than would be typical when a new program is implemented at scale. This suggests that the broad implementation of such programs outside of the context of a study may not produce effects of the same magnitude.

A more recent systematic review by the same lead authors drew upon 32 randomised-controlled trials and matched control studies, to examine the effects of 22 ECEC programs on the cognitive development of children aged 3-5 years [21]. In contrast to the previous review, programs were either categorised as 'comprehensive approaches' with a balance of skill-focused and child-initiated activities (holistic), or 'developmental-constructivist approaches' which include little direct teaching of literacy skills and focus upon child-initiated activities [21]. Control conditions varied across studies, either representing standard practice or an alternative program to the 'intervention' program. Notably, the control group programs all used developmental-constructivist models. The review reported significant evidence of positive language and literacy outcomes at the completion of preschool and kindergarten follow-up for comprehensive ECEC programs which balanced skill-focused and child-initiated activities. The review also found that developmental-constructionist programs had a smaller effect, which was not statistically significant.

This review was generally of high quality, with the exceptions that some detail was lacking in the description of the search strategy, and that there was no risk of bias assessment across the studies presented. This review provided evidence that structured holistic curricula which balance direction from ECEC staff and children are associated with greater gains in child cognitive developmental outcomes, as compared with ECEC settings lacking in structured curricular guidance. It should be noted that neither of the systematic reviews described above investigated short-term social and emotional outcomes, due to a lack of objective measures in the included studies.

A third systematic review was identified that aimed to assess aspects of ECEC quality amongst low-income and ethnic minority populations in the Unites States. However, the available data was insufficient to draw any meaningful conclusions about the relative importance of different aspects of quality which were being studied [57].

One longitudinal trial had information related to *Standard 1.1,* the EPPE study. Neither the NICHD SECCYD nor the IEA specifically addressed questions related to the presence or nature of curricula. In the EPPE study, researchers devised the ECERS-E assessment of process quality, which consisted of the subscales: Literacy, Mathematics, Science and Environment, and Diversity [7]. There was a significant positive correlation between scores on the ECERS-E (representing the quality of curriculum delivery) and child cognitive development, in terms of pre-reading, non-verbal reasoning and early number concepts [7]. Case studies of 'good' and 'excellent' ECEC centres revealed that curriculum leadership from managers, and curriculum knowledge amongst ECEC workers, were key attributes related to

effectiveness in producing better child outcomes than expected - based on child and home characteristics. It was also observed that teachers in effective ECEC settings provided traditional "teaching" in addition to providing play environments and routines conducive to learning, with a balance between staff-initiated and child-initiated activities [5, 7]. This last finding provides support for holistic approaches to curriculum development.

The European Commission *Proposal for key principles of a Quality Framework* also considered curricula. In the summary of the evidence regarding ECEC curricula, the authors of this paper stated that curricula were powerful tools to improve the effectiveness of ECEC [33]. Based on research, including work from the field of developmental psychology [58], the conclusion was reached that holistic approaches are understood to be more appropriate than those that only emphasise subject-specific, sequential academic learning. The authors caution that in order to have this positive effect, curricula must be aligned with principles of good practice, including:

- Explicit yet broad learning goals as opposed to age-specific standards, due to variability in child development,
- An emphasis on reflective practice,
- A balance in focus between learning and wellbeing, and
- Curricular guidance on how staff may provide a diverse range of play and learning environments for children.

Standard 1.2 - Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child

A meta-analysis of 123 studies, which included US studies between 1960 and 2010, reported that 'individualised instruction' (a focus on each child's individual progress and needs) had a positive effect on cognitive development [22]. The reputed reason behind this was that when teachers had the opportunity to match content to children's particular needs, children were better able to learn new concepts [22]. However, there is potential flaw in this interpretation. The category termed 'individualised instruction' is a combined category, constructed by the researchers based upon a number of factors assumed to be conducive to 'a focus on each child's individual progress and needs'. These factors were: the program had a formal curriculum; class size of fewer than 10 children; 5 or less children per staff member; or the program used primarily small group or individual instruction. Thus, the finding relates to the umbrella term 'individualised instruction', rather than reflecting a specific association between child outcomes and the pedagogical behaviour of ECEC staff. This meta-analysis was rated as moderate-to-low quality and a number of risks of bias were identified. Issues included a lack of information on individual studies, high rates of missing data in included studies, the inclusion of low quality studies, and the inclusion of studies which were many decades old. As such, this meta-analysis only provides weak, indirect evidence for *Standard 1.2*. This finding could be interpreted as supporting the importance of a formal curriculum, small class sizes and generous staff-child ratios; however due to the non-specific and weak nature of this finding, it is not discussed in relation to *Standard 1.1* or *Quality Area 4*.

The EPPE study findings provided support for a positive link between *Standard 1.2* and child developmental outcomes. As mentioned previously, one subscale of the ECERS-E used to assess quality in the EPPE study was 'diversity'. This subscale includes items related to curriculum differentiation, individual record keeping, observation and ability grouping, and as such is highly relevant to *Standard 1.2*. ECEC centres scores on this subscale were significantly correlated with child progress in pre-reading, non-verbal reasoning and early number concepts [7]. Findings from the case studies further support the importance of delivering the teaching program in a way that thoughtfully considers the individual needs of each child. Observations of teachers suggested that in effective centres, the following practices were common: formative assessment (although detailed feedback was rarely provided to children during tasks); record keeping of child progress shared with parents regularly; selection of activities to appropriately challenge the child; curriculum differentiation; open-ended questioning; and the practice of 'sustained shared thinking' (in which an adult and a child work together intellectually to address an issue or extend a train of thought)[5, 7, 59]. Importantly, it was also observed that the most effective staff demonstrated comprehensive understanding of the curriculum, in a way that allowed them to apply the most relevant aspects of the curriculum to the children in any given context [7].

An analysis from the NICHD SECCYD investigated the associations between child outcomes and several measures of ECEC quality, including 'language stimulation'. This variable encompassed a number of caregiver behaviours including directing questions or other talk to a child, reading aloud to a child, responding to a child's vocalisations, and teaching a child an academic skill. This variable is therefore linked to the kind of individual attention assessed by *Standard 1.2*. In the study, language stimulation was found to be positively associated with children's performance on 5 out of 6 measures of cognition and language skills, at ages 15, 24, and 36 months. There was no association with any measures of social-emotional development [60].

The IEA Pre-Primary project provided further support for a positive link between *Standard 1.2* and child developmental outcomes. This project found that children's language scores at age 7 tended to be higher amongst those who had attended ECEC centres where they were allowed to freely choose activities, and where less time was spent on whole group activities [25]. The authors proposed several factors which may explain this benefit. Firstly, when children propose an activity, it is more likely to interest them than an activity that a teacher might propose, especially to a whole group. Teachers are then able to introduce vocabulary which is interesting to the child, facilitating learning. Secondly, a child is more likely to be able to select an activity that is of an appropriate level of difficulty. Thirdly, free choice activities often require children to interact verbally with one another, developing their linguistic and social skills [25].

The importance of focused, reflective practice was also supported in the European Commission report. The report underlined the importance of building flexibility into the curriculum, so that ECEC staff could work with children's interests and allow the child to be the protagonist of their own learning [33]. Based on the reviewed evidence, the report recommended that effective ECEC staff are able to link children's interests and questions with appropriate aspects of the curriculum. This was considered essential to the development of shared meaning and understanding, with such flexibility being crucial so that curriculum adherence did not become rigid or narrow. Furthermore, research reviewed in the report

indicated that the ability to work collegially, pedagogical experimentation, regular planning, practice-based research, and professional development were effective elements of reflective practice and continuous improvement. Many of these practices are consistent with those observed in the EPPE case studies of effective ECEC settings. More on the linkages between professionalism and quality of pedagogical practices will be discussed in relation to *Quality Area 4 – Staffing Arrangements*.

Cultural diversity was another key reason identified in the in the European Commission report for the importance of tailoring curriculum delivery to each child [33]. Mono-cultural approaches to ECEC are identified as barriers to participation in ECEC for minority ethnic groups, with implications for child development and for families and societies as a whole [33]. This assertion is largely based on findings from The Roma Early Childhood Inclusion (RECI) Overview Report (a qualitative research project across 4 countries in Eastern and Central Europe focusing on children from a disadvantaged ethnic community) and other policy-related reports. The European Commission report proposed that along with structural and system-level steps to diminish barriers to marginalised groups, flexible and culturally sensitive curriculum delivery was crucial to ensuring that children of all social and cultural backgrounds receive effective education. It also highlighted the importance of partnerships with parents, which will be discussed in detail in relation to *Quality Area 6 – Relationships with families*.

In summary, there were two systematic reviews and one meta-analysis that examined the relationship between positive child developmental outcomes and the presence and implementation of an explicit, structured curriculum. One of these was of high quality, and reported that comprehensive early childhood programs that have a balance of skill-focused and child-initiated activities had significant evidence of positive literacy and language outcomes at the end of preschool and on follow-up measures at kindergarten. Although the included studies were all US programs and focused on high poverty communities, the review was rated as Supported since the included studies were all of high quality and the results are generally applicable and generalisable to the Australian context [21]. Although the remaining systematic review and meta-analysis also provide evidence that educational program and practice is related to positive child outcomes (cognitive/academic and social emotional), these were of low-to-moderate quality, thus were rated as Promising.

There were three longitudinal international trials (EPPE, NICHD SECCYD, and IEA Pre-primary longitudinal, cross-national study) that provided Support for Quality Area 1 in terms of cognitive/academic functioning. However, only the EPPE study found a positive relationship between structured curricula and social-emotional outcomes.

Overall, the evidence Supports Quality Area 1. See Appendix E for a list of the evidence-base related to this quality area.

Quality Area 2: Child's health and safety

Standard 2.1 - Each child's health is promoted

Standard 2.2 – Healthy eating and physical activity are embedded in the program for children

Standard 2.3 – Each child is protected

Child health and safety is an important right and is a legal requirement under the Education and Care Services National Law and the Education and Care Services National Regulations. ECEC centres have a duty of care to ensure that some standards are met (e.g. *Standard 2.3 – Each child is protected*).

There is very little evidence in the literature of an association between any of the components of *Quality Area 2* and positive cognitive, academic, or social-emotional development of children attending ECEC. The EPPE study included an assessment of 'personal care routines' in ECEC centres, which is one of the ECERS subscales. Analysis using complex value-added models revealed no association between personal care routine scores and any measures of child development at age 7 [61]. The NICHD SECCYD study investigated the relationship between hygiene and child cognitive, social, and health outcomes and found no evidence of an association. However, it may be that ECEC centres in the sample consistently reached adequate levels of hygiene due to state and local standards. While it is possible that failing to meet such standards may be problematic, this data suggests that once thresholds are met, hygiene practices are unlikely to be an area easily manipulated to improve child outcomes [23]. The IEA Pre-Primary Project did not include any measures of the features of health and safety covered by *Quality Area 2*.

The absence of research data does not mean that the aims of promoting child safety, health eating, and exercise are unimportant, or that efforts to ensure these standards are met should be in any way diminished. Rather, the purpose of this review is to highlight quality areas most related to developmental outcomes - as these areas hold the most potential to improve child outcomes.

> Given the paucity of research in this area and the findings from the EPPE and NICHD SECCYD study that show no association between specific aspects of "health safety" and child outcomes, Quality Area 2 was rated as Not adequately addressed in the target evidence-base.

Quality Area 3: Physical environment

Standard 3.1 - The design and location of the premises is appropriate for the operation of a service

Standard 3.2 - The environment is inclusive, promotes competence, independent exploration and learning through play

Standard 3.3 - The service takes an active role in caring for its environment and contributes to a sustainable future

A systematic review of 18 experimental and quasi-experimental studies was conducted, to investigate the evidence regarding writing interventions which target preschool literacy skills. This review

suggested that the provision of additional literacy-related materials led to increases in length and complexity of literacy-related play [62]. Overall, the systematic review was rated as being of moderate risk of bias due to missing information on methodology, inadequate detail regarding individual studies and a lack of assessment of risk of bias (within or across studies). However, one study in the review was of particular relevance to *Quality Area 3*; the study considering the impact of literacy-related materials in the physical environment. The finding concerning literacy-related materials was based on only one experimental study, with a sample size of 91 children aged 3 – 5 years. The study compared the play behaviour of children a control group (who had access to typical play objects, books and paper) to those in an intervention group (who were provided with many additional literacy-related objects such as cookbooks, play money, grocery packages and maps) [63]. The study found that children in the intervention group showed significant differences in the frequency, duration and complexity of literacy exhibitions in play. The children from the intervention group also included literacy objects in more varied and practical ways in their play and showed with more explicit language use, as compared with the non-intervention group. No other systematic reviews or meta-analyses addressing an association between any of the topics related to *Quality Area 3* and child developmental outcomes were identified, indicating a lack of research in this area.

The EPPE study included an assessment of 'space and furnishings' in ECEC centres, which is one of the ECERS subscales. Analysis using complex value-added models revealed no association between space and furnishing scores and any measures of child development at age 7 [61]. The space and furnishings quality score was correlated with high positive relationship scores and low detachment scores between the child and ECEC educator, as measured using the Caregiver Interaction Scale. However, this association between the physical environment and some aspects of process quality is a correlation only and does not provide evidence of a causal link. Observations from the EPPE case studies were that "good" and "excellent" ECEC centres had a welcoming appearance, acceptable or good resources and space, and displayed children's work in the setting. However, there was great variation in the quality of outdoor play environments, suggesting that a high quality outdoor environment is not necessarily required in order to produce good child developmental outcomes [7].

The NICHD SECCYD study found evidence that the physical environment can positively affect memory and language development: young children with access to more stimulating, varied and well organised materials (including materials to stimulate maths, movement, music, language, art, and play) received higher scores on tests of language comprehension and short-term memory at age 4.5 years [60]. The authors claimed that this finding was particularly rigorous, since the children themselves were unlikely to influence the physical environment at all (in contrast to, as an example, conversations with staff, which some children may pursue more than others). However, this study had some limitations including high rates of attrition, affecting generalisability. There is a need, therefore, for the replication of these findings, particularly in the Australian context.

The IEA Pre-Primary Project reported that children's cognitive performance at age 7 was associated with the availability of a wide variety of equipment and materials in ECEC settings [25]. Results showed that every standard deviation increase in the variety of materials (based on a list of 112 types of materials) resulted in a 0.09 point increase in children's age-7 cognitive scores.

An Australian study of 48 children aged 17-31 months attending long-day childcare, reported that unsatisfactory play materials (materials not appropriate to the child's stage of development) had a negative effect on the complexity of pretend play, which may have implications for cognitive development. This study has been included here, since the Australian sample speaks to the applicability of the findings to the Australian context. However, this was an observational study with no comparison group, and the sample size was small [64].

Quality Areas 2 and *3, (Child's health and safety* and *Physical environment* respectively), are interrelated, with the physical environment impacting upon the ability of ECEC staff to ensure and promote child health and safety. For example, it has been claimed in some literature reviews of ECEC quality that it is important for environments to be designed in order to the reduce risk of disease, and to be calm and quiet enough to allow uninterrupted sleep [65, 66]. However, robust evidence linking these factors to child developmental outcomes is lacking.

In summary, there is some evidence that the physical environment of ECEC settings is associated with child developmental outcomes. The physical environment is an aspect of the structural quality of ECEC settings, and it may be that rather than directly impacting developmental outcomes, it moderates the effect of other factors - such as teaching practices - on child outcomes [8]. Yet such models remain largely speculative based on the currently available evidence. In any case, ECEC centres must meet many of the standards under Quality Area 3 for reasons of safety, law, or accreditation.
Although one relevant systematic review was identified (moderate quality, moderate risk of bias), it only included one experimental study that reported on a specific aspect of Quality Area 3 (i.e. additional literacy-related materials). Several other studies suggested an association between the physical environment and specific aspects of process quality, but each had limitations affecting their generalisability (i.e. small sample size, high attrition), and the topics covered did not provide sufficient information to adequately critique the entirety of this Quality Area. Therefore, the overall rating of the evidence was Promising for cognitive/academic outcomes and not adequately addressed in the target evidence-based for social-emotional outcomes.

Quality Area 4—Staffing arrangements

Standard 4.1 - Staffing arrangements enhance children's learning and development and ensure their safety and wellbeing

There is strong evidence that cognitive, social and emotional child outcomes are affected by various aspects of staffing arrangements in ECEC settings, including staff-child ratios, group size, staff experience and qualifications.

It is important to note that whereas many of the quality elements discussed under Quality Area 1 – Educational Program and Practice are 'process features' of quality (i.e. pedagogy), most aspects of

staffing arrangements are best understood as 'structural features' of quality. As previously mentioned, rating scales assessing quality include aspects of structural quality (e.g., the design and organisation of the ECEC system, including the number of professionally trained staff) and process quality (e.g., the practices within an ECEC setting, such as relationships and interactions between staff and children). It has been hypothesised that structural quality affects child outcomes indirectly by influencing process quality, which in turn effects child developmental outcomes [8, 9]. Therefore, rather than investigating only direct effects of staffing arrangements on child development, this evaluation of the evidence also focused on the effect staffing arrangements have on process quality features - which are understood to directly impact on child outcomes.

Staff training & qualifications

A systematic review and meta-analysis examined the relationship between the level and type of education of the lead teacher and the quality of ECEC, as measured by the Early Childhood Environment Rating Scale (ECERS) and the Infant Toddler Environment Rating Scale (ITERS) [27]. The review – published by the Campbell Collaboration in 2017 - included 48 comparative and correlational studies with 82 independent samples published between 1980 and 2014. Overall, there was a positive correlation between teacher qualifications and overall quality scores of the Environment Rating Scales (r=0.198, confidence limits 0.133, 0.263). Statistically significant positive correlations were also found between lead teacher qualifications and the following subscales of the ECERS and ITERS: program structure; activities; language and reasoning; parent and staff; interactions. Notably, the "interactions" subscale in ECERS and ITERS covered supervision of general and gross motor activities, discipline and child-staff and staff-staff interactions. The review was rated overall as of high quality and low risk of bias, although because the included studies are correlational rather than experimental, there is no direct evidence of causation. Nonetheless, this review provides strong evidence that the qualifications of the lead teacher in ECEC settings is related to the quality of ECEC.

A systematic review and meta-analysis of experimental and quasi-experimental studies that were published between 1980 – 2005, showed a significant positive association between professional development training of ECEC staff and staff competency (*d*=0.45, S.E.=0.10) [29]. A subset of studies which included child developmental data was analysed, to investigate the effect of staff training levels on child behavioural outcomes. However, the association found was not significant (*d*=0.55, S.E.=0.30). There were only 4 studies in this subset, therefore it is possible that the sample size was too small to detect an association. Importantly, the meta-analysis found that not all of the training interventions delivered to staff were equally effective. Training programs which lacked a fixed curriculum tended to be less effective, as did those which were delivered to large groups of staff. This systematic review was rated as being of moderate quality and a number of risks of bias were identified. Firstly, the results of individual studies are not presented, nor was the full electronic search strategy. Secondly, some of the studies included in the systematic review presented a high risk of bias. For example, three studies employed a pre-post test design and had attrition rates of 35%, 41% and 50%; thus the sample exposed to the intervention condition was likely to be systematically different from the control sample (although it is difficult to predict the degree or direction of resulting bias). Thirdly, no risk of bias assessment across studies was reported. Despite these limitations, this systematic review and meta-analysis provides some support for an association between staff training and staff competency. Below, the evidence from large prospective cohort studies is discussed, which support the findings from this meta-

analysis and address a wider range of forms of training and qualifications (including generalist education and initial formal qualifications).

The EPPE study identified a positive relationship between manager qualification level and ECEC centre quality, as measured using the ECERS-R tool [7]. Case studies of successful centres revealed that staff with high qualifications (Level 5 e.g. Bachelor of Education or Post Graduate Certificate of Education) were found to (a) provide more instruction, compared with staff without qualifications or with lower level qualifications (such as the National Vocational Qualification or the National Nursing Examination Board qualification), and (b) often provided pedagogical role modelling to less qualified staff. More highly qualified staff also engaged more frequently in the practice of 'sustained shared thinking' and exhibited more effective interactions with children. Evidence regarding the quality of interactions between staff and children will be outlined under *Quality Area 5 – Relationships with children*.

Multilevel analyses in the EPPE study found a significant positive correlation between the percentage of staff-hours with Level 5 qualifications and child progress in pre-reading, social/behavioural measures such as increased co-operation and conformity, and reduced antisocial/worried behaviour [7]. The authors noted that there are complex inter-relationships between qualifications, staff-child ratios, and overall measures of quality, and that that this link between staff qualifications and child outcomes may operate indirectly through one or more of these factors. Research on the characteristics of leaders and managers of ECEC centres will be discussed further under *Quality Area 7 – Leadership and service management*.

Data from the NICHD SECCYD was analysed using structural equation modelling. The researchers reported that staff training positively affected child cognition and social skills in a mediated pathway via process quality of care such as staff behaviour, as measured using the ORCE [8]. In another study, NICHD SECCYD data were analysed in relation to whether or not the child's ECEC centre had met child care standards (in terms of staff-child ratio, group size, staff general education, and staff training in child development), as set by the American Public Health Association and the American Academy of Pediatrics [67]. Meeting standards for general staff education (some College in any field) was associated with higher mean language comprehension scores, higher school readiness scores, and lower behavioural problems scores at 36 months, as compared with children attending ECEC centres not meeting the education standards. The same associations were observed for children attending ECEC centres meeting specific staff training standards (some post-high school training in child development, early childhood education, or a related field) compared to children attending services not meeting these standards [67]. The IEA Pre-Primary Project found a series of factors that were related to children's cognitive performance at age 7, including the number of staff years of experience [25].

In the Australian context, national assessment results of Year 3 children (NAPLAN) were used in a large-scale Longitudinal Study of Australian Children (LSAC). The researchers found that children whose 3-year-old preschool teachers had a degree or diploma qualification (as opposed to a certificate) had significantly higher numeracy and literacy scores at Year 3 [30]. This effect was even stronger when staff had specialised in early childhood education as opposed to education of older children (which tends to focus more on academic instruction), and the authors speculated that this may be due to

greater awareness of developmentally appropriate practices [30]. These results provide strong support for this quality standard.

In addition to formal staff qualifications, there is evidence that ongoing professional training and teacher coaching contribute to better child outcomes. In a study of 533 ECEC classrooms in the USA, the quality of child care was associated not only with the highest level of formal education (baccalaureate degree), but also, with staff-reported attendance at professional training workshops. Moderate effect sizes were reported, even after controlling for staff-child ratio and staff experience [68]. Further supporting evidence comes from a comparison of the EPPE study [7] with its Northern Irish counterpart, the Effective Pre-school Provision in Northern Ireland (EPPNI) project [69]. Both studies evaluated the quality of ECEC settings using the same tool (ECERS-R), and across most types of ECEC settings the quality was found to be equivalent between England and Northern Ireland. The exception was that the quality of playgroup settings was significantly higher in Northern Ireland compared with England. Further investigation revealed that staff levels of training correlated with this pattern; with playgroup staff in Northern Ireland having considerably higher levels of training than their English counterparts, due to government investment in in-service professional development for large numbers of playgroup staff [69].

Early and colleagues (2006) analysed data from the National Center for Early Development and Learning's (NCEDL) Multi-State Study of Pre-Kindergarten in the USA. This study involved 237 state funded pre-kindergarten classrooms and over 800 children, and investigated associations between staff education, classroom quality and child academic achievement [32]. Analysis of covariance was conducted across six variables of staff education, four measures of classroom quality, and seven measures of child outcomes. The analysis found an association between staff having a Bachelor and (a) higher scores on the ECERS Teaching and Instruction subscale, and (b) higher child scores on a standardised measure of math achievement.

The European Commission report also endorses the importance of staff training: its third *Statement* is that ECEC services should have "well-qualified staff whose initial and continuing training enables them to fulfil their professional role" [33]. According to the report, this training should include formal qualifications as well as ongoing professional development. This is based on evidence including the meta-analysis described above [29], the EPPE study [7] and the NCEDL study [32]. The report also drew upon policy-related literature, in order to detail recommendations for how professionalisation of ECEC staff may be encouraged by ECEC institutions, government institutions and non-governmental bodies [33].

In summary, there is strong evidence that staff qualifications and experience tend to enhance pedagogy, thereby indirectly enhancing child outcomes across cognitive, social, and emotional domains. The 2017 Campbell Collaboration systematic review and meta-analysis provides strong correlational evidence for a link between staff qualifications and ECEC quality [27]. The 2007 systematic review and meta-analysis of experimental and quasi-experimental evidence [29] suggests that professional development training is related to staff competence. Despite the limitations and risk of bias of the review, this conclusion is supported by evidence from prospective longitudinal studies. In addition, while the association between staff training and child outcomes reported in the meta-analysis

was not found to be significant, this relationship is supported by findings from EPPE, NICHD SECCYD, IEA Pre-Primary, and the Australian LSAC.

Staff-child ratios & group size

Four systematic reviews/meta-analyses were identified as relevant to this topic. Two of these were briefly evaluated in relation to *Quality Area 1* and found to be of insufficient quality and demonstrating several sources of bias, thus were excluded from further analysis [22, 57]. The other two studies were considered. The first, a recent systematic review and meta-analysis, utilised data from a comprehensive database of US-based ECE program evaluations (experimental and quasi-experimental). This review was found to be of high quality and was included [26]. The review examined the association between group size, child-teacher ratio, and program effect sizes on child cognitive, achievement, and social emotional outcomes. The researchers found that group size and child-teacher ratios had a non-linear relationship with cognitive and achievement effect sizes. Specifically, a reduction in child-teacher ratio by one child, for situations with ratios of 7.5:1 and lower, predicted an effect size of 0.22 standard deviations (SD). A similar pattern occurred when there was one less child in classes sizes of 15 children and lower (SD, 0.10). No relationship was identified for larger class sizes and child-teacher ratios. Due to a small sample, it was not possible to draw any inferences related to socio-emotional outcomes. Although analyses revealed a significant association between child-teacher ratios and class size, the effect sizes were small and the authors concluded that utilising this mechanism as a driver for improved ECEC effectiveness is likely to have limited penetration.

The second study was a recent systematic review of 29 cross-sectional or longitudinal studies (and a meta-analysis of three studies), investigated the effect of child-staff ratios on child outcomes. The review did not find any evidence that reducing child-teacher ratios beyond current/recognised thresholds would produce cognitive, academic, or socio-emotional gains [28]. Receptive language (measured by the Peabody Picture Vocabulary Test) was the only outcome for which a meta-analysis could be conducted (since no other measures were used in three or more studies), and this revealed no significant association with staff-child ratios. This systematic review and meta-analysis was rated as being of high quality and low risk of bias, suggesting it represents a reliable synthesis of the available evidence from cross-sectional and longitudinal studies. However, it cannot necessarily be concluded that restrictions on class sizes and child-staff ratios could be relaxed with no impact on child outcomes. All classes included in the Perlman review were in compliance with local regulations (which vary according to age group, and ranged from 5 to 14.5 children per adult). Furthermore, in the studies included by Bowne and colleagues, child-staff ratios ranged from 5:1 to 15:1 and group sizes ranged from 11 to 25 [26]. As such, no conclusions can be drawn regarding the impact of child-staff ratios and class sizes beyond these limited ranges. There are also several other possible explanations for the lack of association, which include: curvilinear associations (as supported by the findings of Bowne and colleagues described above); moderation or mediation effects; potential imprecision caused by a mismatch between the units of measurement of predictors (class level) and child outcomes (individual level); inconsistent measures of child outcomes; and the observational – rather than experimental - nature of the majority of studies on this topic [28]. In addition, the children in the included studies were of pre-school age (30-72 months), and, as will be discussed below, some research suggests that staff-child ratios and group sizes may impact on younger age groups (less than 3 years) more strongly than on pre-school aged children.

By contrast, the EPPE study found a significant link between low child-staff ratios and child progress in early number concepts, although this was the only measure of cognitive development on which an association was found. No associations were observed with social/behavioural developmental measures [7].

In a study using NICHD SECCYD data to investigate the effect of meeting standards relating to structural quality (described above), meeting professionally recommended child-staff ratio standards was associated with lower behavioural problem scores at age 24 months and 36 months. Meeting the recommended standards for group size was not significantly associated with any of the measured child developmental outcomes [67]. Another analysis of NICHD SECCYD data focused on communicable diseases. The researchers found that children aged 37 to 54 months attending ECEC in groups of more than 6 children were more likely to suffer from respiratory tract illness, gastrointestinal tract illness and ear infections, as compared with children attending ECEC in small groups and children cared for at home [70]. In another NICHD study which involved the follow-up of children at ages 15, 24, and 36 months, the study found that small group sizes and low child-staff ratios were positively related to quality of care [71]. As previously mentioned, it is hypothesised that structural quality features such as child-staff ratios and group size indirectly affect child outcomes, by directly influencing process features of quality. In line with this, a structural equation analysis of the data found that low child-staff ratios positively affected child cognition and social skills in a mediated pathway - from childcare- structural features of quality through process features to child outcomes [8]. Indeed, child-staff ratios were found to be the strongest and most consistent predictor of positive caregiving across different ECEC settings and child ages in the NICHD SECCYD (compared to group size, staff education, beliefs and experience), with 1:1 ratios being particularly beneficial. Notably, the effect size of child-staff ratio and group size decreased in childcare for children older than 3 years [71]. This suggests that small group sizes and child-staff ratios may have a greater impact on younger children than on older children such as those in preschool settings.

Similar to the limitations related to the effects of staff training and qualifications described above, there are significant gaps in the evidence regarding child-staff ratios and group sizes. This is largely due to confounding between various structural aspects of quality, and a lack of randomised controlled trials. A particular difficulty lies in setting appropriate standards for staff-child ratios or group sizes, given the variability in effects according to age group, the type of ECEC service, other potential factors related to local settings, and the difficulty in disentangling one structural quality feature from others.

In summary, the evidence indicates that for two highly correlated parameters (child-staff ratios and group size), child-staff ratio is the more important factor, although there is also substantial evidence on the impact of group size. However, the evidence also suggests that the benefits of further reductions in group size and child-staff ratios, beyond those already stipulated by regulations, are likely to be minimal in relation to the resources required. Of note, there is a paucity of randomised controlled trials in this field of research, and evidence instead comes from observational studies of ECEC settings in which existing standards of staff qualifications and staff-child ratios are usually met. Therefore, there is no data to support the lowering of thresholds for these aspects of staffing arrangements.

Wages and working conditions

A final structural aspect of staffing conditions that is likely to be associated with process quality is working conditions, including rates of pay for ECEC staff. As discussed in the European Commission

report, good conditions are likely to assist in the recruitment of motivated, high quality staff [33]. It is also argued that poor working conditions can be detrimental to the ability of ECEC centres to retain staff and therefore leads to high turnover rates, which in turn is detrimental to the quality of care being provided. The link between high turnover rates and the quality of relationships between staff and children is discussed in relation to *Quality Area 5*.

Standard 4.2 - Educators, co-ordinators and staff members are respectful and ethical

The evidence base concerning *Standard 4.2* is closely linked to *Quality Area 5 – Relationships with children*. Given the strong relationship between these standards, the evidence is summarised for both elements below.

In summary, there is evidence that certain aspects of staffing arrangements in ECEC settings affect cognitive child outcomes, including staff-child ratios, group size, staff experience and qualifications, and wages and working conditions. The evidence-base included three high quality systematic reviews/meta-analyses, data from several major longitudinal studies; the EPPE study, NICHD SECCYD, National Center for Early Development and Learning's Multi-State Study of Pre-Kindergarten, as well as local Australian data (directly generalisable and applicable) from the Longitudinal Study of Australian Children. The evidence-base also included a moderate quality systematic review and one meta-analysis, which were both rated as Promising in terms of supporting Quality Area 4.

The evidence-base as it relates to social-emotional outcomes was less compelling, with one high quality systematic review/meta-analysis supporting staffing arrangements and one longitudinal study rated as Promising. Although there were two other systematic reviews/meta-analyses, the findings related to staffing arrangements and social-emotional outcomes did not show an affect.

Based on the evaluation of these individual studies, the overall rating for Quality Area 4 was judged to be Supported. See Appendix E for a list of the evidence-base related to this quality area.

Quality Area 5—Relationships with children

Standard 5.1 - Respectful and equitable relationships are developed and maintained with each child

Standard 5.2 - Each child is supported to build and maintain sensitive and responsive relationships with other children and adults

Much of the evidence described above in relation to *Standard 1.2 - Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child* is relevant to *Quality Area 5: Relationships with children.* This is because the ability to tailor an educational program to the needs and abilities of an individual child rests, in a large part upon, the relationship between the staff member and the child (interactional quality). In particular, established relationships are crucial to

providing culturally appropriate education and care to a child [33, 66]. Children develop well when they take risks and explore new things. Trusting and warm relationships with ECEC staff can provide the secure basis which allows such exploration [66]. The evidence outlined in the following paragraphs, focuses on directly relating measures of the quality of relationships between staff and children to child outcomes. The body of evidence surrounding the effects of staff turnover and stability of care on child developmental outcomes (discussed briefly under *Quality Area 4*) will also be considered in the overall evaluation of the evidence. This is relevant to *Quality Area 5*, because the quality of interactions between children and staff is related to stability of care and child outcomes. Characteristics of the high quality relationships described above take time to develop, and the scope for strong relationships is likely to be limited where high staff turnover and irregular hours of work occur frequently in an ECEC setting.

No high quality systematic reviews or meta-analyses relevant to *Quality Area 5* were identified. However, a substantive and frequently cited literature review was identified and included. Whilst not as robust as a systematic review, this paper provided an overall perspective on the evidence base. Zaslow and colleagues conducted this literature review of 39 studies investigating the quality features, dosage, and thresholds of ECEC associated with positive child development [72]. They reported that (a) three studies found a reduction in behavioural problems associated with supportive relationships between children and ECEC staff [73-75], and (b) one study found a positive association between emotional support (as measured using the CLASS instrument) and mathematics skills [73]. These studies provide some support for an association between staff relationships with children and both behavioural and cognitive child development outcomes.

The EPPE study investigated the association between child developmental outcomes and interactional quality, as measured by the Caregiver Interaction Scale (CIS) [7]. In terms of cognitive outcomes, pre-reading progress was positively associated with positive relationships between staff and children, and negatively associated with the negative subscales (punitiveness, permissiveness, and detachment). In terms of social-emotional outcomes, total CIS scores were (a) positively associated with child independence and concentration, co-operation and conformity, peer sociability, and (b) negatively associated with anti-social/worried behaviour at school entry. These associations were even stronger when only the 'positive relationship' subscale of the CIS was considered [7]. High scores on the *interaction* subscale of the ECERS-R (which covers multiple aspects of staff-child and child-child interactions), was also positively associated with several cognitive and social-behavioural outcomes at entry to primary school. Socio-economic status did not influence these associations, indicating that children from all socio-economic groups can benefit from high quality relationships with ECEC staff [7].

Observations from the EPPE case studies further supported these findings. It was reported that good and excellent ECEC settings were generally "warm, caring, safe, secure and supportive" towards children, and that staff were respectful, calm and engaged with children [7]. In relation to disciplinary practices, staff in the most effective settings responded to behavioural problems by supporting children to rationalise and discuss their conflicts, rather than trying to distract children or command them to stop [31]. Furthermore, in highly effective ECEC settings there were generally higher proportions of long-serving staff. This provides some support for the idea that low staff turnover is related to better interactional quality and in turn, positive child development [76]. Children in effective ECEC settings

also participated in both individual and group play [7]. This finding is relevant to *Standard 5.2,* as it concerns the way children are supported to build relationships with their peers. The implications of mixed types of play (individual versus group) for child outcomes is explored below, in relation to findings from the NICHD SECCYD and IEA studies.

There is evidence that the way children are encouraged to interact in preschool effects both social and behavioural outcomes, as well as language development. The IEA Pre-Primary Project found that language scores at age 7 were likely to be higher when children spent less time during ECEC in whole group activities and were instead often allowed to freely choose their own activities [25]. It has also been suggested that social formats outside whole group activities require children to interact with their peers more meaningfully than during whole group activities, and as such, may support the development of relationship –building skills [25, 77].

Multivariate analyses of NICHD SECCYD data revealed (a) positive associations between positive caregiver ratings (as measured by the ORCE and CC-HOME scores) and cognitive ability and cooperation, and (b) negative associations between these ratings of quality and behavioural problems [4, 8, 78]. Another NICHD SECCYD study provided insight into the effect ECEC social formats may have on the way children interact with their peers later in childhood [79]. A long-term follow-up study investigated associations between child outcomes and the social format in which children spent their time in preschool (i.e. alone, in pairs, small groups, or in medium or large groups such as whole class activities). The authors reported that a greater amount of time spent in small groups and pairs (as opposed to alone or in medium or large groups) was associated with children being more socially outgoing and cooperative by the time they reached third grade. However, more time spent in small-medium sized groups or in pairs was also associated with increased aggression in third grade, suggesting that these arrangements may foster both positive and negative outgoing behaviour [79]. The study also investigated associations between the frequency of positive and negative peer interactions in preschool and social functioning at third grade (as assessed using mother report, teacher report, child self-report and classroom observations). More frequent positive peer interactions in preschool was associated with (a) lower rates of aggression in third grade according to maternal and teacher report, (b) more friends according to self and teacher report, and (c) higher popularity and lower isolation according to teacher report. In contrast, higher frequency of negative peer interactions was associated with greater aggression and fewer friends according to teacher report [79]. Another analysis of NICHD SECCYD data provided an indication that the disruption of relationships between staff and children may negatively impact upon child outcomes. The researchers found that changing from one ECEC setting to another predicted a negative effect on language development at 15 months [80], indicating that the stability of ECEC care may be important to child development, even at this young age.

Other evidence concerning the effect of stability of care comes from the Australian context. The Child Care Choices (CCC) Longitudinal Extension study of the ECEC experiences of 677 children in urban and rural New South Wales investigated the ECEC features predicting child adjustment and achievement until the first year of school [81]. Results showed that positive relationships between children and staff during early experiences of ECEC were predictive of (a) more positive relationships with staff in the year before school and in the first year of school, and (b) a higher frequency of children reporting that they liked school. By contrast, poorer relationships with ECEC staff in the early years of ECEC predicted more

socio-emotional difficulties and more conflict with teachers in the first year of school. The CCC study also reported on the relationship between attending more different types of child care arrangements and child outcomes. Children who attended more different types of child care arrangements per week generally had lower literacy scores in the year before school. Notably, this predictive effect had disappeared by school age, and there were no observed effects on numeracy. Children who attended higher numbers of different child care arrangements per week also demonstrated (a) lower levels of prosocial behaviour as rated by parents in the year before school and in the first year of school, (b) more behavioural difficulties in the year before school, (c) lower child-reported liking of school, and (d) more conflict between the child and teacher at school [81]. While these latter findings relate more to child attendance patterns than to features of ECEC settings, they do provide some support to the suggestion stability in relationships between staff and children is important to a range of child developmental outcomes.

The results from the CCC study are consistent with other research on stability of care in ECEC. In a literature review investigating associations between structural and process features of ECEC, Huntsman reported that stability in care was consistently related to positive child developmental outcomes (including greater wellbeing and less internalising behaviour), whereas high staff turnover was associated with poorer ratings of ECEC quality and poorer child outcomes [82].

The aforementioned evidence is not an exhaustive list of the research on this topic, and other longitudinal studies with large sample sizes (such as the Dutch pre-COOL study of 850 children, and a US study of 1175 ethnically diverse children) have produced broadly consistent results [83, 84]. This indicates that the association between positive staff-child relationships and child cognitive, social and emotional development are generalisable, including to the Australian population.

The importance of positive relationships between ECEC staff and children is also identified as a key principle in the European Commission report. Based on the Commission's literature review, the presence of trusting and stable interactions between staff and children is essential, in order to foster a child's sense of identity and meaning [33]. Respectful and equitable interactions allow for a balance between child-led and staff-led activities, and permits the optimisation of play opportunities in differing social formats, both being important for child cognitive development [33].

In summary, the search strategy utilised did not yield any high quality systematic reviews or meta-analyses of relevance to Quality Area 5. However, a substantive and frequently cited literature review was identified, which reported that there was some support for an association between staff relationships with children and both behavioural and cognitive child development outcomes. The findings of that review were supported by a second review and international trials, (EPPE, NICHD SECCYD, IEA Pre-primary longitudinal, cross-national study, the Dutch pre-COOL study, and local Australian data), strengthening the generalisability and applicability of these findings. In addition, the evidence base related to Quality Area 1 (specifically Standard 1.2 - Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child) and Quality Area 4 (specifically Educators, co-ordinators and staff members are respectful and ethical) is also relevant to Quality Area 5, and so overall the evidence was rated as "Supported". See Appendix E for a list of the evidence related to this quality area.

Quality Area 6—Collaborative partnerships with families and communities

Standard 6.1 - Respectful and supportive relationships with families are developed and maintained

Standard 6.2 - Families are supported in their parenting role and their values and beliefs about childrearing are respected

A recent meta-analysis was identified relating to Quality Area 6. The study investigated the relationship between child outcomes and parental involvement in preschool and the early years of school [85]. Preschool children were the focus of six of the 46 studies, and the outcomes of these studies included reading, language, maths, literacy, overall grade, child behaviour, self-control and adjustment to school. The meta-analysis included a range of operationalisations of the concept of 'parental involvement' including: the educational activities of parents in the home; family-school partnerships characterised by open communication, healthy relationships, mutual respects and balance of power (the focus of *Standard 6.1* and *Standard 6.2*); and family-school-community partnerships (the focus of *Standard 6.3*). This paper reported a strong positive correlation (magnitude 0.509) between 'parental involvement' and child learning outcomes. However, the role of families (i.e., the educational activities of parents in the home) was the more important driver of this relationship compared with the role of preschools, schools, or communities (family-school and family-school-community partnerships). Furthermore, when age was taken into account, the relationship between 'parental involvement' and child outcomes was statistically significantly weaker for preschool children as compared with children in grades 3-6 [85]. This suggests that the influence of parental involvement in early childhood education and care may vary by age. It is also important to note that 'pre-school' (including children aged 3-5) was the youngest age category included in this meta-analysis, therefore there is no evidence regarding earlier years of ECEC. The risk of bias of this meta-analysis was rated as moderate. This was due to missing information around the design and results of individual studies, and the fact that both the search strategy and the funding arrangements were not reported. In addition, unpublished studies were included in an attempt to address publication bias, however the academic vigour of the unpublished studies was dubious and no effort was made to determine the quality of these studies. Overall, the

strongest findings of this meta-analysis pertain to children of school age and to the role of parents in the home, rather than the role of ECEC staff in liaising with parents (which is the focus of *Quality Area 6*). Coupled with the moderate quality and risk of bias, this meta-analysis alone provides only weak support for *Quality Area 6* in the context of ECEC.

The finding that parental involvement in the home learning environment is strongly related to child developmental outcomes is further supported by evidence from the EPPE study, NICHD SECCYD and IEA Pre-Primary project [24, 25, 59]. For example, quantitative data from the EPPE study support a link between what parents do with their children in the home environment (e.g. visiting a library, reading together, playing with letters and numbers, singing songs and rhymes) and cognitive outcomes at age 3 [59].

Quality Area 6 assesses the extent to which ECEC settings collaborate with families and other organisations in the community, resting on the assumption that such collaboration allows for greater gains in child development than when all these groups are acting in isolation. Findings from the EPPE study provide some evidence that child intellectual development is greater when ECEC settings encourage high levels of parental engagement in the child's learning. The quantitative data of the EPPE study included the 'Provision for Parents' item of the ECERS-R 'Parents and Staff' subscale. This item concern the extent to which parents are involved in decision making about the child's learning program, and the sharing of child-related information between staff and the parents. [59]. Analyses revealed a positive correlation between this item and child ability to identify picture similarities, although no significant associations with any other measures of cognition or social-emotional development were identified [59]. There are three major pathways by which such collaboration could be beneficial to child development. Firstly, it may allow ECEC staff to encourage and support parents to provide more effective education in the home environment. Secondly, input from parents may improve the quality of education and care in the ECEC setting (for example, by allowing for more appropriate tailoring of the learning program to each child, including culturally relevant activities/learnings). Thirdly, collaboration may shape ECEC service, improving the inclusiveness of services and increase participation in ECEC. The evidence regarding these three pathways is outlined below.

1. Collaboration leading to more effective learning in the home environment

In light of the association between collaboration between parents and staff and child development arising from the quantitative aspect of the EPPE study, the EPPE case studies investigated whether there were any attributes of effective ECEC settings which may have encouraged such parenting behaviours [59]. The researchers found that in all case study settings, parents were encouraged to read with their children. However in the most effective ECEC settings, the educational aims, child-related information, and decisions about the child's learning program were shared between parents and staff [7, 31, 59]. One reason this engagement was thought to be effective was that it allowed parents to support children at home with appropriate materials and activities [7]. The EPPE Researchers observed that some ECEC centres in high socio-economic status areas were producing greater gains in child development than expected after controlling for background characteristics, despite not displaying consistently good pedagogic practice. In seeking an explanation for this observation, researchers identified the strong collaborative relationships between parents and ECEC staff in these settings (involving shared educational aims and pedagogic efforts made at home by parents) as a likely factor [7{Siraj-Blatchford,

2002 #104, 59]. The benefits of such partnerships were also observed in low socio-economic status settings in the case studies. However in more disadvantaged areas, parental involvement was less common and more proactive efforts from staff were required in order to support parents in developing a positive home learning environment [59].

The NICHD SECCYD and the IEA Pre-Primary project did not include measures regarding the extent or nature of collaboration between ECEC settings and families [23, 25]. Therefore, these studies provide no further insight into any possible relationship between collaboration and improvements in parenting practice and child developmental outcomes.

The importance of collaboration between ECEC, families and other stakeholders in the community is emphasised throughout the European Commission report, which asserts that parents should be respected as the 'first educators of the child' [33]. The report recommends that parents be involved in an equal partnership, in which their voices inform educational practice and the development of the curriculum. This includes democratic decision-making structures (e.g. parental committee), clear communication and documentation of children's activities, and an openness to changing practices and values based on input from families of children [33]. The recommendation of equal partnership is made on the basis that such approaches can promote a higher level of parental engagement in child learning in the home environment. The is supported by evidence from the EPPE study described above, as well as from its Northern Irish counterpart EPPNI [69]. There is also evidence from a German study of 111 ECEC staff [33], which found a link between a measure of 'transparency towards parents' and several child cognitive outcomes including media literacy, maths/science, and learning and meta-cognitive competence. Notably, no significant link was found between 'cooperation with parents' and any child outcomes [86].

2. Collaboration leading to more effective learning in the ECEC environment

As described, the EPPE study provides some evidence that collaboration between families and ECEC staff is beneficial to child development, along with suggestions this may be due to positive effects on parenting practice as supported by some case study findings. However, the EPPE study does not investigate the possibility that improvements in child outcomes may also arise from parental input into ECEC practice. Likewise, the NICHD and the IEA Pre-Primary project did not include measures regarding the extent or nature of collaboration between ECEC settings and families; therefore an investigation of associations between such collaboration and improvements in ECEC practice or in child developmental outcomes was not possible [23-25].

The European Commission report suggested that collaboration with families improved child outcomes via improvements to ECEC practice, as well as via improvements to parenting practice. The report asserted that input from families assisted in the delivery of a learning program to each child through flexible, reflective practice, particularly in ECEC contexts of high cultural diversity. The evidence base around the importance of such flexible program delivery is strong, as described in relation to *Quality Area 1*. However, in the European Commission report, no direct evidence for an association between parental involvement in ECEC and improvements in ECEC staff delivery of an educational program was presented. Instead, these assertions were largely supported by grey literature and policy

recommendations, which were not traceable (in order to critique the primary evidence upon which these claims rest). Notably, the evidence that collaboration with parents is associated with improvements in ECEC quality is not required in order for *Standards 6.1* and *6.2* to be supported. This is simply one mechanism by which a collaboration has been hypothesised to operate, in addition to the impacts on parenting practices described above.

3. Collaboration shaping inclusive ECEC services

Involving parents in decisions around ECEC provision may improve the inclusivity of services, and is seen as a way to increase the likelihood that parents will develop a positive understanding of the benefits of their child attending ECEC [33]. The European Commission report brings together evidence suggesting that ECEC settings which are inclusive of families and diverse cultural values are likely to be better able to promote children's participation in ECEC, particularly in disadvantaged communities [33]. In this way collaboration between staff and parents may both improve the inclusiveness of services and increase participation in ECEC.

In summary, some evidence from the EPPE study suggests that collaboration between ECEC staff and families is associated with improvements in child cognitive development, due to improvements in parenting practice in the home learning environment. However, this is largely based on the EPPE case studies which are considered a "low" level of evidence according to the NHMRC hierarchy of evidence. There is also some evidence that collaboration may increase participation rates, however the overall evidence base is limited. The only meta-analysis identified as investigating this association was of moderate risk of bias, and found that partnerships between families and schools were less important than the role of parental involvement in child education in the home. Furthermore, the meta-analysis did not include children younger than preschool age, and the data suggesting the association between parental involvement and child outcomes at preschool-age was weak. There was no investigation of collaboration with families in other longitudinal studies such as the NICHD SECCYD and the IEA Pre-Primary project.

There is strong evidence that both the child's experience of ECEC and the child's experience of the home learning environment are associated with cognitive development; and the idea that collaboration between ECEC staff and families has the potential to be beneficial in both directions seems intuitive. This is reflected in the recommendations of policy-related documents such as the European Commission report, which highlights the potential of collaboration to increase the participation of a diverse range of families in ECEC services. In light of this, *Standard 6.1 - Respectful and supportive relationships with families are developed and maintained* and *Standard 6.2 - Families are supported in their parenting role and their values and beliefs about childrearing are respected* were rated as "*Promising*", due to the lack of direct evidence from large-scale, rigorous studies.

Standard 6.3 - The service collaborates with other organisations and service providers to enhance children's learning and wellbeing

Findings of a meta-analysis relevant to *Standard 6.3* are discussed in *Standard 6.1* and *Standard 6.2* above [85].

Neither the EPPE study, the NICHD SECCYD nor the IEA Pre-Primary project investigated associations between child learning, child wellbeing or ECEC quality *and* the extent or nature of collaborations between ECEC centres and other organisations or services in the community.

Specific policy-related reports advocate establishing collaborative relationships with a range of stakeholders in the community, including organisations and service providers. However, there is very little primary research that supports this philosophy [87, 88].

The European Commission report recommends collaboration between organisations with related but traditionally divided responsibilities regarding early childhood education, care and wellbeing. Recommendations include inter-agency cooperation, intra-professional partnerships, and networking between ECEC centres, social services and health services, NGOs, schools and local authorities. The report also suggests that these stakeholders (along with families) be included in monitoring and evaluation, in order to foster greater engagement and sense of ownership. However, the research listed in support of these recommendations does not include any substantial primary evidence investigating an association between ECEC collaboration with other organisations and child learning and wellbeing. It consists largely of other policy-related reports such as the OECD *Starting Strong III - A Quality Toolbox for Early Childhood Education and Care* report [89]. This OECD paper based its recommendations on this topic on a range of sources, including a literature review which reported benefits of collaboration with community organisations [90]. Notably, this review covered education from preschool through to high school, and upon closer investigation, none of the evidence in the literature review concerning community collaborations is drawn from the ECEC context. An exception to this lack of primary evidence came from a study of 111 individually licenced family child care providers in Canada [91]. The study found that the total score on the Family Day Care Rating Scale (a global observational measure of quality adapted from the ECERS to suit family day care rather than centre-based care) was predicted by whether the provider was involved with an organised child care association or network, and whether they made use of community resources to support caregivers [91]. As this finding is drawn from a very

In summary, one relevant meta-analysis was identified, of moderate quality and moderate risk of bias. The strongest findings of this meta-analysis pertained to children of school age, and to the role of parents in the home, rather than the role of ECEC staff in liaising with parents, which is the focus of QA6. There were no other effects found between aspects of collaborative partnerships with families and communities and other cognitive and social-emotional outcomes. This meta-analysis was therefore rated as Promising for Quality Area 6 in the context of ECEC.

The EPPE study suggested that collaboration between ECEC staff and families was associated with improvements in child cognitive development. This was based largely on the EPPE case studies, which are considered a "low" level of evidence according to the NHMRC hierarchy of evidence [34]; thus was also rated as Promising. There was one review that indicated a positive association between Quality Area 6 and cognitive and social-emotional outcomes, however this review focused on older school children. Other major international/national trials did not report on the relationship between child outcomes and collaborations with families. Therefore, Quality Area 6 was rated as Promising overall, based on the existing evidence. See Appendix E.

specific ECEC arrangement (individually licenced family child care providers in Canada), the generalisability of the findings to other ECEC contexts is uncertain.

Quality Area 7—Leadership and service management

Standard 7.1 - Effective leadership promotes a positive organisational culture and builds a professional learning community

Standard 7.2 - There is a commitment to continuous improvement

Standard 7.3 - Administrative systems enable the effective management of a quality service

There were no systematic reviews or meta-analyses identified investigating questions directly related to *Quality Area 7* in the context of ECEC.

The EPPE study produced a number of findings which support the importance of leadership and management in producing high quality ECEC service. As mentioned (*see Quality Area 1*), case studies of 'good' and 'excellent' ECEC centres revealed that curriculum leadership from managers, and curriculum knowledge amongst ECEC workers, were key attributes related to effectiveness in producing better child outcomes than expected (based on child and home characteristics). As described in relation to *Quality Area 4 – Staffing arrangements*, there was a link between manager qualification level and ECEC centre quality, as measured using the ECERS-R tool. Mean scores were higher in centres where managers had Level 5 qualifications (e.g. Bachelor of Education or Post Graduate Certificate of Education) compared to those with lower level qualifications (such as the National Vocational Qualification or the National Nursing Examination Board qualification) [7].

The importance of leadership and management can be inferred from much of the evidence from EPPE described in previous sections, by virtue of the control leaders and managers have over the operation, activities and culture of an ECEC setting. Examples include the provision of professional development opportunities (see *Quality Area 4*), curriculum development and systems for flexible implementation of the learning program (see *Quality Area 1*). However, more specific associations between leadership and management and ECEC quality or child outcomes have not been investigated in either the EPPE study or the NICHD SECCYD [24]. The IEA Pre-Primary project included questions regarding 'management policies' in a survey of ECEC providers, however no associations with ECEC process quality or child outcomes was reported [25].

The European Commission report recommended the importance of leadership in a range of contexts. The report advocated the need for support at all levels – including the level of ECEC management – to create working conditions which are supportive of effective teaching practices, including opportunities for teamwork, planning and reflective practice [33]. The evidence for such reflective and effective pedagogical practices is outlined in relation to *Quality Area 1*, however the assertion of links between leadership and such practices in the European Commission report rest upon common sense assumptions and existing policies or opinion surveys, rather than direct evidence of impact on ECEC process quality [33].

The European Commission report also emphasised the importance of monitoring and evaluation, which is in line with *Standard 7.2 - There is a commitment to continuous improvement* and *Standard 7.3 - Administrative systems enable the effective management of a quality service*. The report asserted that

monitoring and evaluation should involve all relevant stakeholders, and always be conducted according to the best interests of the child [33]. The report refers to research on the negative side-effects of making performance indicators of schools publicly available [92]. However, this assertion is drawn from the context of schools rather than ECEC, and relates to broader policy-level and regulatory questions rather than management practices within individual ECEC settings. Overall, there is a lack of direct evidence presented to link such management practices to improvement in ECEC process quality or child developmental outcomes.

The lack of the evidence around leadership and management in the context of ECEC stands in stark contrast to the depth of research into leadership and governance in the context of primary schools. Whilst it is not within the scope of this project to summarise the substantial research base at schools, it is reasonable to assert that leadership and management are also important for ECEC. Based on the small amount of evidence within the ECEC literature - but influenced by the potential link with the school-based evidence - *Quality Area 7* has been rated as *Promising*.

In summary, no systematic reviews or meta-analyses investigating questions directly related to leadership and service management were identified in the context of ECEC. The case studies from the EPPE Study suggested that curriculum leadership from managers, and curriculum knowledge amongst ECEC workers, were key attributes related to effectiveness in producing better child cognitive outcomes [31]. However, as mentioned above, this is considered a "low" level of evidence, so this study was only rated as *Promising*. There were several other studies, including a systematic review [93] and meta-analysis [94], which examined leadership/management in schools and the effect on cognitive outcomes. Although these findings are not directly applicable and generalisable to the ECEC context, they were rated as *Promising*. The IEA Pre-primary longitudinal, cross-national study examined management policies and the relationship to child cognitive outcomes via a survey, however no positive associations were reported. No studies were identified that reported on the relationship between leadership and social-emotion outcomes.

Therefore, the overall rating for *Quality Area 7* was "*Promising*" for cognitive/academic outcomes and "*Not adequately addressed in target evidence base*" for social-emotional outcomes.

Quality indicator

The proportion of ECEC services rated 'exceeding' the standard in quality areas 1, 4 and 5 and at least 'meeting' the standard in all other quality areas according to the ACECQA assessment

ECEC Participation

To determine participation indicators, this report focused on national and international longitudinal studies, and also utilised systematic reviews and meta-analyses where available with good quality and low bias. The evidence was examined to determine any differential effect related to universal or targeted program participation in children from 0 to 5 years (e.g., targeted according to housing vulnerable/poverty, culturally and linguistically diverse, low IQ).

Universal provision of ECEC

Starting Age, Intensity (dose) & Program Duration

There were three main factors identified that relate to Participation; i) starting age, ii) program duration, and iii) program intensity. The findings are detailed below, and an overview of the evidence ranking is presented in Table 6 for universal provision of ECEC. See Appendix F for a detailed list of the evidence; with individual studies were ranked as ("supported", "promising", "not supported").

Table 6: Summary of the overall evidence base; starting age, program duration, program dose (universal) - duplicated table

STARTING AGE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
0-2 years	• Supported	• Promising	• Mixed
2-3 years	• Supported	• Promising	• Mixed
3-4 years	• Promising	• Promising	• Not adequately addressed in target evidence-base
4-5 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base

PROGRAM DURATION	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Less than 1 year	• Not adequately addressed in target evidence-base	• Supported	• Not adequately addressed in target evidence-base
1-2 years	• Promising	• Supported	• Not adequately addressed in target evidence-base
2-3 years	• Supported	• Supported	• Not supported
More than 3 years	• Supported	• Supported	• Not supported

PROGRAM DOSE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Part time	• Supported	• Supported	• Not adequately addressed in target evidence-base
Full time (> 15 hours)	• Mixed	• Not adequately addressed in target evidence-base	• Not supported

Meta-analyses

Two relevant meta-analyses were identified by the search strategy [95, 96].

Leak and colleagues (2010) used a meta-analytic database that was compiled by the US National Forum on Early Childhood Policy and Programs. The database had (a) a complete set of impact data

for ECE programs meeting screening criteria and offered to children between the ages of 3 and 5, and (b) partially complete data for programs offered to younger children that also extended into ages 3-5. The researchers examined 117 studies on the effect of starting age and program duration on cognitive and achievement outcomes. Regarding starting age, the analyses by Leak et al reported wide variation in impact estimates on cognition and academic achievement at all starting ages. Although a simple trend line fit to these (unweighted) effect sizes had a modest negative slope, indicating somewhat larger effect sizes with earlier-starting programs, the relationship was not statistically significant. The mean effect size for programs beginning before age 3 was 0.39, and was 0.20 and 0.28 for programs starting between 3 and 4 and 4 or later, respectively. In regards to program duration, there was a modest increase in average effect size for longer programs. The mean effect sizes for the relatively small number of programs longer than 2 years averaged 0.21 SD larger than programs lasting between six months and one year, the difference was not statistically significant [95]. There were limitations to the report. It was unclear which studies were eventually included in the analyses, and indeed the quality of those included studies, despite the fact that that the analyses controlled for study quality [95]. Furthermore, there was inadequate information on both outcome measurements (e.g. valid and reliable tools) and domains (e.g. language versus IQ). As a result, the overall quality was rated as low-moderate, and It was not possible to drawn any meaningful conclusions about the potential differential effect of various ECEC programs on different cognitive or academic outcomes.

The second meta-analysis reviewed international evidence (non-US) on the benefits of early childhood interventions for cognition, behaviour, health, and amount of schooling, [96]. The review included 30 interventions in 23 countries (developed and developing countries). Analyses revealed that there was a small advantage (average effect size) for child development outcomes in interventions of 1 and 3 years or more duration (ES 0.30–0.31), compared with programs less than 1 year (ES 0.20). However, the results were not disaggregated into short versus long-term effects. Importantly, the duration of intervention had positive effects on health outcomes, but negative effects on schooling. The review also found that, intervention programs involving just infants/toddlers had larger average effect sizes (0.34) in relation to child development outcomes (cognitive gains; behavioural change; health gains; and amount of schooling) compared with pre-kinder (0.28) and programs with both infants/toddlers and pre-kinder (0.19) [96]. Interventions that targeted a more defined age bracket (infants/toddlers) versus infants to pre-kinder age (3 and 4 years) were more consistently related to better behavioural outcomes. Notably, the estimated cognitive effects declined over time: 0.69 for immediate impact; 0.35 at ages 5–10, and 0.28 beyond age 10. Inadequate information on the studies that were included/excluded and the level of study quality beyond mention of study design (e.g., RCT versus quasi-experimental design) was a serious limitation of this meta-analysis.

The EPPE study, as mentioned previously, was the first major European longitudinal study investigating the effects of ECEC on children's cognitive, social, and behavioural development. This study included children from a range of socio-economic backgrounds, and a comparison group of children who had minimal or no ECEC experience (this study is now referred to as the EPPSE study as it also includes secondary school outcomes (The Effective Pre-school, Primary, and Secondary Education project)). There are several papers that reported on the short and longer-term outcomes of the EPPE study in regards to intellectual functioning and social emotional development. Results suggest that more hours

of group care (versus more hours of individual care e.g., grandparents/nannies) up to 18 months of age were related to higher cognitive scores, including a marginal effect on language [97]. Furthermore, results at age 3 years demonstrated that children who attended centre-based care (pre-school) before the age of 3 years had better cognitive skills at the start of the project (i.e. when assessed at age 3 years) compared with those who started at over 3 years old (controlling for other child, parent, and home environment factors) [61]. There was no difference between children who started before age 2 years and those who started between 2 and 3 years. Conversely, the data also indicated that starting early in a group setting, particularly before the age of 2, led to slightly increased behaviour problems at age 3 and 5 years [31]. The cognitive gains present at age 3 years for children attending pre-school early continued to be evident at school-age (***key stage 1***: 6-7 years) [31, 61]. In relation to duration, moderate to strong effects at entry to primary school (age 5) and in Years 1 and 2 (ages 6 and 7 respectively) were identified for duration (in months) of children's pre-school experience [31].

Results from the end of ***key stage 2*** (7 to 11 years) found that children who attended pre-school, compared with those who had minimal or no ECEC experience, had higher levels of attainment in English and mathematics; with effect sizes of 0.22 and 0.26 respectively reported. The type of pre-school attended was also important. Significant differences were found for English in relation to the type of pre-school attended, as compared with none attended, for: Playgroup (ES=0. 22); Private day nurseries (ES=0.28); Local authority day nurseries (ES=0.20); and Nursery School (ES=0.35). However, for Nursery Classes and Combined Centres, effect sizes were not significant: Nursery Class (ES=0.10) Combined Centres (ES=0.18). A similar pattern was found for outcomes in mathematics, with significant benefits for attainment for: Nursery Class (ES=0.20); Playgroup (ES=0.26); Private day nurseries (ES=0.31); Local authority day nurseries (ES=0.28); and Nursery Schools (ES=0.30) compared with no pre-school. There was no difference for Combined Centres (ES=0.22) [98].

The duration of attendance at pre-school (measured in months) was also of relevance. There was a statistically significant benefit for English for those who attended pre-school (compared with those with minimal or no ECEC) with the exception of the largest duration – over 36 months: Months 0-12 (ES=0.23); Months 12-24 (ES=0.20); Months 24-36 (ES=0.24); Months Over 36 (ES=0.20)[98]. For mathematics, each time period was statistically significant when compared to "no pre-school": Months 0-12 (ES=0.28); Months 12-24 (ES=0.24); Months 24-36 (ES=0.26); Months over 36 (ES=0.32). The findings suggest that there is no clear advantage for longer pre-school attendance related to better academic outcomes, but rather, suggest that attending pre-school at all is better than not attending at all [98].

The quality of pre-school was also found to be an important determinant of cognitive attainment. Results from the EPPE study cohort at age 11 years, found that children who attended low quality pre-schools no longer showed a significant cognitive benefit in attainment after six years in primary school, as compared with children who had minimal or no ECEC experience. This was also the case for children who attended medium quality pre-schools, for English but not Mathematics. It was also reported that the cognitive attainment of more disadvantaged children is enhanced by having attended high quality or highly effective pre-schools; however it was the more advantaged pupils that gained most from attending such pre-schools [98].

The EPPE study also looked at the social-behavioural development. Attending pre-school compared with staying at home still had a positive effect on 'Pro-social' behaviour at age 10 years [99, 100]. There was no difference between groups on any other dimensions of social-behavioural development. An early start at pre-school (i.e., before the age of 2 years) was significantly associated with better 'Pro-social behaviour', and was no longer associated with increased 'Anti-social' behaviour at age 10. This was in contrast to findings at earlier follow-up time points [31, 100]. As with cognitive development, it is the quality of the pre-school experience that matters. Children who attended higher quality pre-schools showed the most benefits in all-round social behavioural development at age 10 years, including 'Self-regulation' and 'Prosocial behaviour' [100]. In contrast, children without pre-school experience showed better outcomes for 'hyperactivity' (i.e., showed fewer hyperactive symptoms), when compared with children who attended pre-school [99, 100].

The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) [23, 24], which has been mentioned previously, is part of the National Institutes of Health (NIH) and lies within the U.S. Department of Health and Human Services. This study aimed to collect data about different non-maternal child care arrangements, and about the children and families who do and do not use child care. There were four phases to the study, based on the ages of the children when the information or data were collected (Phase 1: 0-3 years; Phase 2: through first grade; Phase 3: through sixth grade; Phase 4: through ninth grade). The researchers collected data at 10 sites around the country. On average, children in the NICHD Study spent 27 hours each week in child care, between the ages of 6 months and 4½ years. The main findings for each phase of the study in relation to intensity and duration are as follows:

Phase 1 (0-3 years):

- Analyses (adjusted for maternal vocabulary score, family income, child gender, observed quality of the home environment, and observed maternal cognitive stimulation) indicated that the overall quality of child care, and language stimulation in particular, was consistently but modestly related to cognitive and language outcomes at ages 15, 24, and 36 months [101].

- After adjusting for child care quality, cumulative experience in centre-based care was associated with better outcomes than participation in other types of care.

- The cumulative number of hours in child care did not contribute to the prediction of children's cognitive or language development in any analysis [101].

Phase 2 Findings (through first grade):

- The more time children spent in any of a variety of non-maternal care arrangements across the first 4.5 years of life, the more externalising problems and conflict with adults were manifested at 54 months of age and in kindergarten (as reported by mothers, caregivers, and teachers) [102, 103].

- More time in care not only predicted problem behaviour as measured on a continuous scale in a dose-response pattern, but also, predicted at-risk (though not clinical) levels of problem behaviour, as well as assertiveness, disobedience, and aggression [102].

- The number of hours in centre care were also related to cognitive and language outcomes. More hours of childcare in infancy was associated with lower pre-academic test scores and more hours in the toddler period was associated with higher language scores [8, 13, 78, 104].

Phase 3 Findings (through sixth grade):

- The results indicated that although parenting was a stronger and more consistent predictor of children's development than early child-care experience, higher quality care predicted higher vocabulary scores and more exposure to centre care predicted more teacher-reported externalizing problems [105].

Phase 4 Findings (through ninth grade):

- Higher quality care predicted higher cognitive–academic achievement at age 15, with escalating positive effects at higher levels of quality [106].
- The association between quality and achievement was mediated, in part, by earlier child-care effects on achievement [106].
- High-quality early child care also predicted youth reports of less externalizing behaviour [106].
- More hours of non-relative care predicted greater risk-taking and impulsivity at age 15, relations that were partially mediated by earlier child-care effects on externalizing behaviours [106].

NICHD SECCYD is a landmark study and has involved considerable investment both financially and in terms of child follow-up and measurement. As such, the results from this study have received substantial attention and credibility. It should be noted, however, that the sample size is relatively small (n=1,300) and the follow-up phases suffered from significant attrition. Although scores were imputed for missing data, it is possible that it was missing in a systematic way (i.e. which ECEC refused to participate in quality measurement).

The Longitudinal Study of Australian Children (LSAC) follows the development of 10,000 children and their families from all parts of Australia. A report on the analysis of LSAC data (n=5,107) examined the relationship between children's early education and care from infancy through preschool and their cognitive and behavioural functioning in 1st grade. It was found that greater duration (number of years) and intensity (number of hours) of exposure to centre settings predicted small benefits for fluid intelligence, but no gains in vocabulary or academic skills. Greater duration and intensity of centre ECEC exposure was also predictive of behavioural issues (i.e., lower attention skills, higher conduct problems, and lower prosocial behaviours). Results were not moderated by family socio-economic resources (i.e., household income, parent's highest educational level, and home cognitive stimulation) [107].

The Effective Pre-school Provision in Northern Ireland (EPPNI) project [108], the North Ireland counterpart of the EPPE study as previously mentioned, is a longitudinal study of child development

from 3 to 11 years. The cohort included 683 children randomly selected from 80 preschools, and 151 children recruited without preschool experience. Analyses revealed that preschool experience was related to performance in English and mathematics at age 11. Specifically, high-quality preschools showed consistent effects that were reflected not only in improved attainment at age 11 years in English and mathematics, but also, in improved progress in mathematics over primary school. Children who attended high-quality preschools were 2.4 times more likely to attain Level 5 in English, and 3.4 times more likely to attain Level 5 in mathematics, compared with children without preschool experience [108].

Trends in International Mathematics and Science Study (TIMSS) & Progress in International Reading Literacy Study (PIRLS) [109, 110].

TIMSS and PIRLS are large-scale assessments designed to inform educational policy and practice by providing an international perspective on teaching and learning, in mathematics and science in the case of TIMSS, and reading literacy in the case of PIRLS. TIMSS conducts comprehensive assessments of mathematics and science for students in Year 4 and Year 8. This is combined with extensive data about country, school, and classroom learning environments. TIMSS was first conducted in 1995, and reports every four years on the achievement of Year 4 and Year 8 students. More than 60 developed and developing countries from across the world participated in TIMSS in 2015. Australia has participated in all six TIMMS cycles, with over 570 schools and more than 16 000 students at Year 4 and Year 8 involved. PIRLS involves comprehensive reading literacy assessments for Year 4 students, and has been conducted every five years since 2001. Around 50 countries and 11 benchmarking entities participated in PIRLS 2016. Australia participated in PIRLS for the first time in 2011, and in 2016 around 286 Australian schools with over 6000 students in Year 4 involved.

Results from TIMMS and PIRLS show that in the countries with near-universal participation in early education and care (>70 per cent), there is a strong correlation between pre-primary education and grade 4 test scores [109, 110]. Attendance in pre-primary education differed dramatically from country to country. However, on average, the fourth grade students with at least 3 years of pre-primary education (43%), or even more than one year (33%), had higher average achievement than their counterparts with only one year or less of pre-primary education. Most notably, the 13% of students, on average, that did not attend preschool, had much lower than average mathematics achievement [109].

Child Care and Early Education Quality Features, Thresholds and Dosage and Child Outcomes project (USA). The overarching goal of this project was to examine existing evidence and provide new evidence on the issue of early education and care. The literature review examined research data on quality and the threshold of dosage related to child outcomes. The review revealed that greater exposure to centre-based care was associated with stronger cognitive outcomes in young children. However, the results were inconsistent for social outcomes. The researchers also found that in more recent research, greater sustained exposure to high quality care was found to narrow the gap on measures of achievement between children from low versus high income backgrounds [72].

Appendix F provides a citation list by evidence ranking (“supported”, “promising”, “not supported”).

Summary

Starting Age

There was only one systematic review or meta-analysis of moderate quality and risk of bias that evaluated the effect sizes of starting age in relation to cognitive and academic achievement [95]. This work revealed that programs commencing before age 3 had larger effect sizes in comparison with programs that started later. The longitudinal EPPE study provided support for programs that start early (0 to 3 years) across all domains of functioning. Another high quality trial (NICHD SECCYD) presented data which suggested that earlier starting ages are "Promising" for cognitive and academic achievement. The evidence-base related to starting age and social-emotional outcomes was more variable than for academic and cognitive achievement, however local data suggest that starting early (2 to 3 years) is related to *poorer* outcomes in this domain [107]. The NICHD study also reported poorer social-emotional outcomes with earlier starting ages [102] [103], and the findings of the EPPE study varied depending on when the follow-up occurred, some demonstrating a positive effect [111], others negative consequences [31].

The evidence is not clear-cut across domains of functioning (cognition and language, academic, and social-emotional), however a starting age between 3 and 4 years provides the best balance of outcomes with no "risk or harm" documented in the studies reviewed.

Program Duration

Two meta-analyses examined program duration in relation to cognitive and academic achievement. One was of moderate quality and risk of bias, and reported that programs longer than two years were associated with moderate increases in effect size for cognitive and academic outcomes [95]. This study was therefore rated as *Promising* for programs lasting two years or longer. The other meta-analysis was of low quality, with several sources of bias identified [96]. However, it found a small advantage for child developmental outcomes for programs with durations of one and three years. This study was rated as *Promising* for programs of three years or more.

The EPPE study was the only longitudinal international trial to report on program duration. The study found that high quality preschool coupled with longer duration (two to three years) had the strongest effect on cognition and academic achievement, and demonstrated sustained benefits of approximately two to four years [31]. This was supported by another EPPE follow-up approximately four years later, which showed that preschool duration of between 24 and 36 months had the largest positive effects on English at age 7 to 11 [98].

Local data from LSAC showed that program durations from two to more than three years resulted in cognitive and academic gains, but had detrimental effects on social-emotional outcomes [107]. Data from TIMSS and PIRLS studies supported programs of at least three years related to academic achievement [109, 110].

On balance, the evidence related to duration *Supports* programs of two years. Although there was good evidence for programs between two and three years' duration for cognitive and academic achievement, there was also some evidence (local data) which suggests programs longer than two years have detrimental effects on social-emotional outcomes.

Program Dose (intensity)

The EPPE study provided support for part-time universal provision of ECEC, which is consistent with local data from the LSAC [31] [108] [107]. Several papers reporting on the US-based NICHD Study found evidence for a positive relationship between full time provision of ECEC during toddlerhood and higher language scores; but also found that greater hours of ECEC in infancy was related to lower pre-academic scores [8, 13, 78, 104]. The NICHD studies also reported that higher ECEC doses (average of 27 hours per week) related to poorer social-emotional outcomes in grade one of school.

Due to the potential detrimental effect of full time provision of ECEC on child outcomes, the evidence best *Supports* part-time provision for universal access.

Universal participation indicator

Proportion of all children attending ECEC for 15 hours or more per week, for the two years before starting formal school

Targeted provision of ECEC

The findings for the targeted provision of ECEC are detailed below, and an overview of the overall evidence ranking for this topic is presented in *Table 7*. See Appendix G for a detailed list of the evidence; individual studies were ranked as ("supported", "promising", "not supported").

Table 7: Summary of the overall evidence base; starting age, program duration, program dose (targeted) – duplicated table

STARTING AGE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
0-2 years	• Supported	• Supported	• Supported
2-3 years	• Not adequately addressed in target evidence-base	• Supported	• Not supported
3-4 years	• Supported	• Supported	• Supported
4-5 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base

PROGRAM DURATION	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Less than 1 year	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base
1-2 years	• Supported	• Supported	• Supported
2-3 years	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base	• Not adequately addressed in target evidence-base
More than 3 years	• Supported	• Supported	• Supported

PROGRAM DOSE	COGNITIVE & LANGUAGE	ACADEMIC	SOCIAL-EMOTIONAL
Part time	• Supported	• Supported	• Supported
Full time (> 15 hours)	• Supported	• Supported	• Supported

Starting Age, Intensity (dose) & Program Duration

The Abecedarian Project [112] is a longitudinal study, beginning in the 1970's, which targeted African-American mothers with low IQ and low income in North Carolina. One hundred and eleven children of

these mothers were randomised into 2 groups. The intervention group participated in a full-time program, involving centre-based care and home-visits from 3 months of age until school-age (5 to 8 years). The control group received family support, social services, low-cost or free paediatric care, and child nutritional supplements but no additional childcare. The ECEC program had one qualified early childhood educator for (a) every three infants and toddlers until age 3, and (b) every 6 children over age 3 years. The program focused on language, cognitive, perceptual-motor, and social aspects of development.

Study participants were assessed during the intervention years on a range of developmental domains, with assessments at 6, 12, 18, 24, 30, 42, 48, and 54 months of age. Results indicated that children who participated in the intervention arm of the project out-performed control participants on every follow-up test from 18 months to 54 months. Of note, intervention participants consistently scored in the "average" range, whereas children in the control group scored in the "below average" range from 18 months (having scored in the "average" range up until 12 months of age) [113].

Subsequent follow-up of families who participated in the Abecedarian project were conducted at age 5, 8, 12, 15, and 21 years. Results indicated that the positive effects of ECEC on cognition and academic skills continued through primary school [114], and persisted to age 15 years [112, 115]. The effect for cognitive outcomes in elementary school was reported to be 0.71 SD [116]. The results generally supported an intensity hypothesis, in that scores on cognitive and academic achievement measures increased as the duration of treatment increased [112]. Furthermore, there were positive educational, occupational, and socio-emotional outcomes identified in young adulthood, showing the long-term positive effects of the Abecedarian project [117, 118]. As with other follow-ups on the Abecedarian Project, earlier starts in ECEC resulted in larger effect sizes [118, 119].

Early Head Start, a US federal intervention program, began in 1995 and targeted disadvantaged communities, serving parents and children from birth to age 3 years [120]. Early Head Start aimed to promote children's development and provided childcare, developmental assessments, and health and parenting services. There were 3 models of intervention; centre-based, home visiting, and a combination of the two.

Early Head Start was later evaluated through a RCT across 17 sites in the US, including 3,001 families; intervention group (n=1,513) and control group (n=1,488). The RCT involved a comprehensive follow-up of children and families at the end of the Head Start program, when children were aged 3 years. The trial found that children participating in the program performed better than control children in cognitive and language development, and showed higher emotional engagement sustained attention, and lower aggression [120]. Inferences, based on the findings above, regarding optimal starting age and program duration are complicated by the fact that there was variably around when children entered and left the Early Head Start program. For example, programs had latitude as to when to enrol families—in the prenatal period or during the first year of life. The average age at random assignment was 5 months, with one quarter of the families enrolling while the mother was still pregnant. The average length of enrolment for Early Head Start families in the research sample was 22 months. Results

imply that a starting age between 0-5 months for approximately 2 years result in positive cognitive, language, and social gains.

Subgroup analyses examining the effect of the mode of delivery (i.e. centre-based, home-based, or both) found that the mixed approach resulted in significant gains for children in language and social-emotional domains as compared with the control group. Additionally, parents in the mixed approach group were rated as more supportive and less detached during play, were more likely to read to their child daily, and a smaller number reported spanking their child when compared with the control group [120].

The Milwaukee Project [121], was designed to facilitate the intellectual development of very young, disadvantaged children. The Milwaukee Project employed an intensive (full day) educational program that was child-oriented and centre-based. The program was for very young, high-risk children, beginning before 6 months of age and finishing at school-age. The program also provided job and academic training for mothers. The original cohort was selected from 40 newborns who had a mother with an IQ lower than 80.

The development of the intervention cohort was assessed from infancy through to age 15 years (n=17) and compared with a control group (n=18). Effects of the program on IQ at age 6 years showed that all intervention children had higher IQs than controls, with an average gain of 25 points. Although IQ declined after leaving the program, there were still beneficial effects reported into adolescence [121]. Academic achievement on the other hand, was reported to be similar in both groups at age 14 years. It is important to note that the Milwaukee Project had a small sample size and a relatively high attrition rate, making the findings difficult to generalise. Thus for the purposes of this report, the results have been rated as *Promising*.

Project Care, run by the team involved in the Abecedarian Project, was a RCT involving 65 families, with 2 intervention arms and one control condition. The most intensive intervention included family education combined with a centre-based educational day-care program; and the less intensive intervention group received the home-based family education program only. The control group receive neither [122]. The program targeted low income African-American families, starting shortly after birth and continued for a period of 54 months. It was unclear how many hours of centre-based educational care were received.

Children were assessed using (a) the Bayley Scales of Infant Development at 6, 12, and 18 months of age, (b) the Stanford-Binet Intelligence Test at 24, 36, and 48 months, and (c) the McCarthy Scales of Children's Abilities at 30, 42, and 54 months. Children in the educational day-care plus family support group scored higher on each of the tests compared with the other intervention group and the control condition [122].

This study is limited by the small sample size and insufficient data surrounding duration and intensity of attendance. The population studied (i.e. African-America families) is specific to the USA and as such, the findings of the study may not be generalisable or applicable to the Australian context. As a result, this program was rated as *Promising*.

The Perry Preschool Project is a longitudinal study that began in the 1960's, for children aged 3 years from African-American families and low socio-economic status. One hundred and twenty-three children with IQs lower than 90 were randomly assigned to intervention (n=58) or control (n=65). The control group did not receive a preschool program. The intervention group received a centre-based program run for half a day, 5 days a week, supplemented by 90-minute weekly home visits. The intervention condition involved high-quality educationally oriented curriculum (High Scope curriculum – active participatory learning) and well-trained staff. Preschool was provided each weekday morning in 2.5-hour sessions taught by certified public school teachers with at least a bachelor's degree. About 75 percent of the children participated for two school years (at ages 3 and 4); the remainder participated for one year (at age 4). The teachers also provided a weekly 1.5-hour home visit to each mother and child, designed to involve the mother in the educational process and help implement the preschool curriculum at home.

Follow-up data from program has suggested that at the end of the program when children were aged 5-6 years, language and general cognitive ability had improved for the intervention group as compared with the control group. IQ gains were no longer apparent at age 8 years, however gains in academic skills (reading and maths) were present and remained so at age 14 and 27 [123]. In addition, the intervention group had better classroom and personal behaviour as reported by teachers.

Although there were very few reported group differences in intellectual and academic performance between ages 15 and 23 years, a pattern of group differences in community behaviour did emerge at age 15 and became more pronounced at age 23. These differences were revealed in follow-up studies, conducted when participants were aged 27 and 40 years. The follow-up data demonstrated that the intervention group experienced less youth misconduct, fewer years of special education, reduced drug use, reduced teen pregnancy, enhanced employment, reduced welfare dependence, reduced crime, and a higher high school graduation rate [123-125].

A study on the Perry Preschool Project which performed a cost-benefit analysis [125] reported that the program had significant individual financial benefits and financial benefits to the general public. The treatment group were reported as having significantly higher earnings at age 40 years. For the general public, higher tax revenues, lower criminal justice system expenditures, and lower welfare payments easily outweighed program costs; they repay $12.90 for every $1 invested. Program gains were mainly from reduced crime by males [125].

Major strengths of this study were the low attrition rate and the long follow-up period (data on 91 to 94% of participants were included up until age 40 years). Although the effects of this program on cognitive and academic gains were limited, the social and financial benefits were significant.

Head Start

The Head Start program was initiated in the 1960s. It typically includes centre-based early education and care from 3 years of age on at least a half-time basis. The Head Start intervention is federally funded, but administered by each US state independently. As such, the program varies considerably between and even within states, which makes the program difficult to evaluate as the results are unlikely to be comparable between sites.

To this end, it is difficult to synthesise the findings on this program. However, Bloom and Weiland (2015) have provided a comprehensive analysis of variation in Head Start effects across individual children, policy-relevant subgroups of children, and Head Start centres. This was performed by using data from the Head Start Impact Study - a nationally representative multi-site randomised trial. As expected, past estimates of the average effect of Head Start programs mask a wide range of relative program effectiveness [126]. The following points are a summary of the main findings from this study:

- Head Start produced a "compensatory" pattern of effects that increased cognitive outcomes the most for the children with the weakest initial cognitive skills. This tended to equalise cognitive skills across program participants.

- Head Start increased cognitive outcomes more for dual language learners and Spanish-speaking children (two highly overlapping subgroups) than for other children. This suggests that much of the program's effect on cognitive outcomes represents "compensation" for limited prior English.

- The Head Start "treatment contrast" (differences between key features of individual Head Start programs and their local alternatives, including parent care) varied substantially across Head Start centres, reflecting the fact that the "value added" by any Head Start program depends on both the program itself and the quantity and quality of other local options for early child education. For example, there was substantial variation in the treatment contrast with respect to hours of care, teacher education, and classroom quality.

- Head Start effects on cognitive and socio-emotional outcomes relative to those of local alternatives varied substantially across Head Start centres. Some Head Start centres were much more effective than their alternatives, while others are much less effective than their alternatives, with a broad range of centres operating between these extremes.

[126].

Due to the issues discussed above, it is difficult to summarise the potential benefits of the Head Start program. However, it appears that cognitive, educational, and social gains are possible and that the quality of such programs is a significant determining factor.

<u>The Effective Provision of Pre-School Education (EPPE) study</u>

The EPPE study (described in more detail above) was not designed specifically for highly vulnerable families. However, subgroup analyses at Key Stage 2 were undertaken to understand the differential effect of attending pre-school at age 2 compared with age 3 years or older for varying degrees of disadvantage. No differential effects were found in academic or social-behavioural outcomes for children eligible for Free School Meals and for children whose mothers had low educational qualifications, as compared with mothers who had higher educational qualifications. However, children classified as "high multiple disadvantage" who attended pre-school at age 2 compared with 3 years or older, were found to have better English attainment in Year 6 (ES=0.19). Furthermore, children from families with a medium-level income and children from families of medium-level socio-economic status (SES) (i.e., skilled manual/skilled non-manual) had better "self-regulation" in Year 6 if they started

preschool at age 2, compared to those who started pre-school later at age 3 years or older (ES=0.18 for medium SES and ES=0.22 for medium income level). Controlling for significant background characteristics (e.g., gender, home learning environment), there were also differential effects for children who came from unemployed families. Children from this background who started pre-school at age 2 years had worse 'pro-social' behaviour in Year 6 compared with children from similar families who started pre-school at age 3 years or older (ES=-0.35). There were no other significant differential effects on social-behavioural outcomes (hyperactivity, self-regulation, and anti-social behaviour) for other measures of disadvantage (e.g., SES, level of mother's qualification) [111].

Appendix G provides a citation list by evidence ranking ("supported", "promising", "not supported").

Summary of Targeted provision

Starting Age

For highly vulnerable children and families (with low socio-economic status or risk of low IQ), the developmental benefit of targeted provision of ECEC - and an early starting age of 0-2 years - is well supported by evidence from the Abecedarian Project (e.g. [112, 117, 118]). This was a well-designed randomised controlled trial, with multiple follow-up studies ranging from 18 months to adulthood. The Early Head Start program also supports an early start to ECEC, with benefits across all domains [120]. Two other US-based programs (Milwaukee Project and Project Care), were rated as *Promising* in relation to a starting age of 0-2 years for improved outcomes for cognition and language [121, 122], due to their small sample size and selective populations (i.e. low IQ; African-American mothers) which affects the generalisability to the Australian context.

The EPPE study examined academic and social-emotional outcomes in a subset of disadvantaged children who attended preschool at either 2 years or 3 years. A positive association was reported for English attainment, however there were some negative associations with prosocial behaviour [111].

The Perry Preschool Project, on the other hand, found positive associations between a starting age 3-4 years and cognition, academic achievement, and social-emotional functioning [123-125].

Most of the population samples of the aforementioned studies are drawn from the US and may differ in some meaningful ways, affecting the generalisability and applicability to the Australian context. For example, most of the targeted samples are drawn from predominantly African-America populations and are from 1960s and 1970s. On balance, children from at-risk backgrounds would likely benefit from an earlier start to ECEC compared with the general population. Data *Support* a starting age of 0 to 2 years.

Program Duration

The Abecedarian Project demonstrated a positive association between ECEC for greater than 3 years duration and cognitive, academic, and social-emotional outcomes [112, 118, 119, 127]. Findings from the Milwaukee Project and Project Care were consistent with these results [121, 122], but were rated as *Promising* due to the small sample size and selective populations (i.e. low IQ; African-American mothers), which affect their generalisability to the Australian context.

The Early Head Start program and the Perry Preschool Project support programs of two years across all three outcome dimensions (cognitive, academic, and social-emotional).

Unlike for the universal provision of ECEC, there was no evidence of an increased risk of social-emotional difficulties associated with programs of longer duration for targeted provision of ECEC. The limitations noted above regarding generalisability and applicability to the Australian context are also relevant here, however given the quantity and relative strength of the Abecedarian findings the evidence *Supports* programs of at least 3 years duration.

Program Dose (intensity)

There was limited data available to compare the relative benefit of higher levels of ECEC intensity. However, the results of the Abecedarian project are convincing - suggesting full time provision is related to better cognitive and language, academic, and social-emotional outcomes in both the short- and long-term [112, 118, 119, 127].

The Perry Preschool project (part-time provision) reported significant social gains over a sustained period into adulthood, as well as 1 – 2 year sustained cognitive and language benefits.

The research regarding program dose for children from disadvantaged backgrounds *Supports* full time provision; noting that there are some potential issues with the generalisability (US-based research, selective samples of low IQ, African-American people).

Targeted participation indicator

Proportion of all children experiencing disadvantage who attend ECEC for 15 hours or more per week, for at least three years before starting formal school

ECEC Quantity

The search strategy utilised did not yield any relevant studies related to quantity. However nationally, Australia collects data on 2 relevant workforce metrics:

- The proportion of paid primary contact staff employed at approved child care services with a relevant formal qualification (at or above Certificate level III), or three or more years of relevant experience
- The proportion of teachers delivering preschool programs (across all services) who are at least three year university trained and early childhood qualified. Teachers are defined using the following worker roles: principal/director/coordinator/teacher in charge and group leader/teacher. At least three year university trained includes: 'Bachelor degree (3 years or more equivalent)', 'Bachelor Degree (4 years pass and honours)', 'Graduate diploma/certificate and above.'

Data for the first measure is collected through the National Early Childhood Education and Care Workforce Census. Data for the second comes from 'Microdata: Preschool Education, Australia' which is part of the National Early Childhood Education and Care Collection.

There is no national measure/indicator for service availability.

The determination of required quantity of ECEC services in a given community is a function of the size of the population, the portion of the population participating, and the effort required to provide the right standard of care. This is largely a practical consideration, and the literature reviewed did not provide any specific data related to this driver. However, there are two dimensions that are related to quantity:

- Is there sufficient ECEC infrastructure? i.e., the number of ECEC places per defined population (per 15 hours).
- Is there sufficient workforce? i.e., the number of ECEC workers/teachers.

Quantity indicator

The number of ECEC places for 15 hours per week available to 2-5 year olds

CONCLUSIONS

Using the factors identified in the research literature, key indicators were developed using quality, quantity, and participation metrics that informed the development of an evidence-based benchmark framework for ECEC.

ECEC quality indicators

Restacking the Odds **proposes using the evidence related to the Quality Areas to recalibrate how a service is rated for overall quality, by emphasising the three Quality Areas that have a significant effect on child outcomes.**

The current Quality Rating System

A service can receive an overall "Exceeds" the National Quality Standard if:
The service meets *all* standards and receives an Exceeds National Quality Standard rating in at least four Quality Areas, including at least two of the following areas:

- QA1 - Educational program and practice
- QA5 - Relationships with children
- QA6 - Collaborative partnerships with families and communities
- QA7 - Leadership and service management

Restacking the Odds Quality Rating System

To receive an exceeding rating, a service would need to attain an *Exceeds* National Quality Standard rating in all three evidence-based Quality Areas:

- QA1 – Educational program and practice
- QA4 – Staffing arrangements
- QA5 – Relationships with children

And must at least "Meet" the National Quality Standard in the remaining four Quality Areas.

Quality indicator

The proportion of ECEC services rated 'exceeding' the standard in quality areas 1, 4 and 5 and at least 'meeting' the standard in all other quality areas according to the ACECQA assessment

ECEC participation indicators

Universal Provision

Two indicators were selected that encapsulated the three factors related to participation; one pertained to universal participation whilst the other related to targeted participation of ECEC. The indicators were:

- The proportion of all children, aged 3 to 5 years in a given area, who attend ECEC for at least 15 hours per week.

- The proportion of children, aged 2 to 5 years in a given area, from disadvantaged backgrounds and/or with special needs (children residing in an area with a Socio-Economic Index for Areas [SEIFA] Index of Relative Socio-economic Disadvantage [IRSD] quintile of 1, non-English speaking background, Aboriginal and Torres Strait Islander children, children with disability) who attend ECEC for at least 15 hours per week.

Current Australian Indicators

Nationally, Australia collects participation data on subgroups of children who are considered "targeted special needs" and "disadvantaged", as follows:

- The proportion of children aged 3–5 years enrolled in a preschool program who are from targeted special needs groups (non-English speaking background, Aboriginal and Torres Strait Islander children, children with disability & children from regional & remote areas);

- The proportion of children aged 4 to 5 years enrolled in a preschool program in the year before school who are disadvantaged (residing in an area with a Socio-Economic Index for Areas (SEIFA) Index of Relative Socio-economic Disadvantage [IRSD] quintile of 1).

The national indicators do not provide sufficient information about whether the level of participation in ECEC is reaching the level research has identified as important to benefit child outcomes. Over the next three years *Restacking the Odds* will endeavour to collect *actual* attendance data (i.e. not enrolment data) on the 2 indicators.

Universal participation indicator

Proportion of all children attending ECEC for 15 hours or more per week, for the two years before starting formal school

Targeted participation indicator

Proportion of all children experiencing disadvantage who attend ECEC for 15 hours or more per week, for at least three years before starting formal school

ECEC quantity indicators

The determination of the required quantity of ECEC services in a given community is a function of the size of the population, the portion of the population participating, and the effort required to provide the right standard of care. This is largely a practical consideration, and the literature reviewed did not provide any specific data related to this driver. However, there were two dimensions that were related to quantity:

- Is there sufficient ECEC infrastructure? i.e., number of ECEC places per defined population (per 15 hours).

- Is there sufficient workforce? i.e., number of ECEC workers/teachers.

Current Australian Indicators

Nationally, Australia collects data on 2 relevant workforce metrics:

- The proportion of workers delivering preschool programs who are at least three year university trained and early childhood qualified.
- The proportion of teachers delivering preschool programs who are at least three year university trained and early childhood qualified.

There is no national measure/indicator for service availability.

> **Quantity indicator**
>
> The number of ECEC places for 15 hours per week available to 2-5 year olds

Strengths of approach

One of the major strengths of the approach used was that it was pragmatic, fitting within already established systems and processes. To this end, there were no attempts to reinvent new methods and metrics, but rather we utilised an already well established national quality rating system.

Limitations of approach

By utilising a targeted restricted review methodology certain concessions are made about the depth and breadth of the reviewed literature. Therefore, we did not systematically critique all relevant literature with the broad quality areas review. This means that there may be a number of relevant trials and studies that could add value to the literature summarised in this review.

Implications

The preliminary indicators and thresholds we have selected will help identify gaps and priorities for ECEC in Australian communities. We will test them in ten communities over the next three years to determine which are pragmatic to collect, resonate with communities, and provide robust measures to stimulate community and government action. We will follow a similar path for the other four fundamental strategies that Restacking the Odds is focusing on – antenatal care, sustained nurse home visiting, parenting programs, and the early years of school.

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APPENDICES

Appendix A: National Quality Standards

Elements	
Quality Area 1: Educational program and practice	
Standard 1.1	An approved learning framework informs the development of a curriculum that enhances each child's learning and development
1.1.1	Curriculum decision making contributes to each child's learning and development outcomes in relation to their identity, connection with community, wellbeing, confidence as learners and effectiveness as communicators
1.1.2	Each child's current knowledge, ideas, culture, abilities and interests are the foundation of the program
1.1.3	The program, including routines, is organised in ways that maximise opportunities for each child's learning
1.1.4	The documentation about each child's program and progress is available to families
1.1.5	Every child is supported to participate in the program
1.1.6	Each child's agency is promoted, enabling them to make choices and decisions and influence events and their world
Standard 1.2	Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child
1.2.1	Each child's learning and development is assessed as part of an ongoing cycle of planning, documenting and evaluation
1.2.2	Educators respond to children's ideas and play and use intentional teaching to scaffold and extend each child's learning
1.2.3	Critical reflection on children's learning and development, both as individuals and in groups, is regularly used to implement the program
Quality Area 2: Children's health and safety	
Standard 2.1	Each child's health is promoted
2.1.1	Each child's health needs are supported
2.1.2	Each child's comfort is provided for and there are appropriate opportunities to meet each child's need for sleep, rest and relaxation
2.1.3	Effective hygiene practices are promoted and implemented
2.1.4	Steps are taken to control the spread of infectious diseases and to manage injuries and illness, in accordance with recognised guidelines
Standard 2.2	Healthy eating and physical activity are embedded in the program for children
2.2.1	Healthy eating is promoted and food and drinks provided by the service are nutritious and appropriate for each child
2.2.2	Physical activity is promoted through planned and spontaneous experiences and is appropriate for each child
Standard 2.3	Each child is protected
2.3.1	Children are adequately supervised at all times
2.3.2	Every reasonable precaution is taken to protect children from harm and any hazard likely to cause injury
2.3.3	Plans to effectively manage incidents and emergencies are developed in consultation with relevant authorities, practised and implemented
2.3.4	Educators, co-ordinators and staff members are aware of their roles and responsibilities to respond to every child at risk of abuse or neglect
Quality Area 3: Physical environment	

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Standard 3.1	The design and location of the premises is appropriate for the operation of a service
3.1.1	Outdoor and indoor spaces, buildings, furniture, equipment, facilities and resources are suitable for their purpose
3.1.2	Premises, furniture and equipment are safe, clean and well maintained
3.1.3	Facilities are designed or adapted to ensure access and participation by every child in the service and to allow flexible use, and interaction between indoor and outdoor space
Standard 3.2	The environment is inclusive, promotes competence, independent exploration and learning through play
3.2.1	Outdoor and indoor spaces are designed and organised to engage every child in quality experiences in both built and natural environments
3.2.2	Resources, materials and equipment are sufficient in number, organised in ways that ensure appropriate and effective implementation of the program and allow for multiple uses
Standard 3.3	The service takes an active role in caring for its environment and contributes to a sustainable future
3.3.1	Sustainable practices are embedded in service operations
3.3.2	Children are supported to become environmentally responsible and show respect for the environment
Quality Area 4: Staffing arrangements	
Standard 4.1	Staffing arrangements enhance children's learning and development and ensure their safety and wellbeing
4.1.1	Educator-to-child ratios and qualification requirements are maintained at all times
Standard 4.2	Educators, co-ordinators and staff members are respectful and ethical
4.2.1	Professional standards guide practice, interactions and relationships
4.2.2	Educators, co-ordinators and staff members work collaboratively and affirm, challenge, support and learn from each other to further develop their skills, to improve practice and relationships
4.2.3	Interactions convey mutual respect, equity and recognition of each other's strengths and skills
Quality Area 5: Relationships with children	
Standard 5.1	Respectful and equitable relationships are developed and maintained with each child
5.1.1	Interactions with each child are warm, responsive and build trusting relationships
5.1.2	Every child is able to engage with educators in meaningful, open interactions that support the acquisition of skills for life and learning
5.1.3	Each child is supported to feel secure, confident and included
Standard 5.2	Each child is supported to build and maintain sensitive and responsive relationships with other children and adults
5.2.1	Each child is supported to work with, learn from and help others through collaborative learning opportunities
5.2.2	Each child is supported to manage their own behaviour, respond appropriately to the behaviour of others and communicate effectively to resolve conflicts
5.2.3	The dignity and rights of every child are maintained at all times
Quality Area 6: Collaborative partnerships with families and communities	
Standard 6.1	Respectful supportive relationships with families are developed and maintained
6.1.1	There is an effective enrolment and orientation process for families
6.1.2	Families have opportunities to be involved in the service and contribute to service decisions

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6.1.3	Current information about the service is available to families
Standard 6.2	Families are supported in their parenting role and their values and beliefs about child rearing are respected
6.2.1	The expertise of families is recognised and they share in decision making about their child's learning and wellbeing
6.2.2	Current information is available to families about community services and resources to support parenting and family wellbeing
Standard 6.3	The service collaborates with other organisations and service providers to enhance children's learning and wellbeing
6.3.1	Links with relevant community and support agencies are established and maintained
6.3.2	Continuity of learning and transitions for each child are supported by sharing relevant information and clarifying responsibilities
6.3.3	Access to inclusion and support assistance is facilitated
6.3.4	The service builds relationships and engages with their local community
Quality Area 7: Leadership and service management	
Standard 7.1	Effective leadership promotes a positive organisational culture and builds a professional learning community
7.1.1	Appropriate governance arrangements are in place to manage the service
7.1.2	The induction of educators, co-ordinators and staff members is comprehensive
7.1.3	Every effort is made to promote continuity of educators and co-ordinators at the service
7.1.4	Provision is made to ensure a suitably qualified and experienced educator or co-ordinator leads the development of the curriculum and ensures the establishment of clear goals and expectations for teaching and learning
7.1.5	Adults working with children and those engaged in management of the service or residing on the premises are fit and proper
Standard 7.2	There is a commitment to continuous improvement
7.2.1	A statement of philosophy is developed and guides all aspects of the service's operations
7.2.2	The performance of educators, co-ordinators and staff members is evaluated and individual development plans are in place to support performance improvement
7.2.3	An effective self-assessment and quality improvement process is in place
Standard 7.3	Administrative systems enable the effective management of a quality service
7.3.1	Records and information are stored appropriately to ensure confidentiality, are available from the service and are maintained in accordance with legislative requirements
7.3.2	Administrative systems are established and maintained to ensure the effective operation of the service
7.3.3	The Regulatory Authority is notified of any relevant changes to the operation of the service, of serious incidents and any complaints which allege a breach of legislation
7.3.4	Processes are in place to ensure that all grievances and complaints are addressed, investigated fairly and documented in a timely manner
7.3.5	Service practices are based on effectively documented policies and procedures that are available at the service and reviewed regularly

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Appendix B: NQS comparison with European Commission Quality Statements & Standardised Measures of Quality

National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
Quality Area 1: Educational programs and practice			
An approved learning framework informs the development of a curriculum that enhances each child's learning and development. Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child.	**Classroom Organization**: Productivity: How well teachers manage instructional time and routines so that students have the maximum number of opportunities to learn. **Instructional Support:** Concept Development: The degree to which instructional discussions and activities promote students' higher-order thinking skills versus a focus on rote and fact-based learning. **Instructional Support**: Language Modelling: The quality and amount of teachers' use of language stimulation and language-facilitation techniques during individual, small-group, and large-group interactions with children. **Instructional Support**: Literacy Focus: Reflects the quality with which teachers deliver activities focusing children on "code units" of early literacy (e.g., letters, words, phonemes) **Emotional support:** Teacher sensitivity: Encompasses teachers' responsivity to students' needs and awareness of students' level of academic and emotional functioning. The highly sensitive teacher helps students see adults as a resource and creates an environment in which students feel safe and free to explore and learn	**Language Reasoning**: Encourage children to communicate: Activities and materials that promote language development should be available for use throughout the classroom and the daily schedule. Teachers should establish an environment where language exploration and usage is encouraged. **Interactions**: Supervision of gross motor activities: Caregivers should use gross motor activities as learning opportunities to promote positive social interactions and to encourage the development of skills and new experiences. **Program Structure**; Group time: In group-care situations, the focus needs to be on meeting individual needs and guiding children as they interact in small groups. Whole group activities should be kept to a minimum and limited to gatherings that follow the interests and involvement of the children. **Language Reasoning**; Using language to develop reasoning skills: Children are encouraged to talk through their thought processes.	**Statement 5**; a curriculum based on pedagogic goals, values and approaches which enable children to reach their full potential in a holistic way. **Statement 6;** a curriculum which requires staff to collaborate with children, colleagues and parents and to reflect on their own practice**.**
Quality Area 2: Children's health and safety			

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National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
Each child's health is promoted.		**Personal care routines**; Nap/Rest: Nap and/or rest time should be appropriately scheduled and supervised for the children in the group. Adequate separation of cots helps to prevent the spread of germs. Soft music or a soothing story helps to facilitate a peaceful rest time that is important in helping children to balance the day and renew their energy. **Personal care routines;** Health practices: Practicing preventive measures, such as washing hands after handling pets or wiping noses, help to educate children to achieve life-long health practices. Taking appropriate action when children are sick will minimize the spread of germs. **Personal care routines**; Safety practices: Protecting children is critical in providing quality care, whether through adequate supervision or minimizing hazards both inside and outside. Caregivers should anticipate potential safety problems and demonstrate, model, and teach children safe practices. **Space and furnishings**; Gross motor play: Children need daily opportunities to exercise large muscles, run in open spaces, and practice gross motor skills. (Safety is always a number one priority.) Space to develop children's large muscles through a variety of play experiences should be made safe by providing adequate cushioning for fall zones. All play equipment should be safe and effective monitoring should be implemented to teach children safe play behavior and to safeguard against accidents.	
Healthy eating and physical activity are embedded in the program for children.			
Each child is protected.			
Quality Area 3: Physical environment			

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National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
The design and location of the premises is appropriate for the operation of a service.	**Classroom Organization**; Instructional Learning Formats: The degree to which teachers maximize students' engagement and ability to learn by providing interesting activities, instruction, centres, and materials. Considers the manner in which the teachers facilitate activities so that students have opportunities to experience, perceive, explore, and utilize materials.	**Space and furnishings**; Child related display: Every child needs to know that others value his/her play or work. Artwork or other individual work that is created by the children should be displayed in the classroom at the child's eye-level. This promotes feelings of positive self-esteem and sends the message to the child that his/her work is valued and appreciated Indoor space Furniture for routine care, play and learning Furnishings for relaxation and comfort Room arrangement Space for privacy Gross motor play Gross motor equipment	
The environment is inclusive, promotes competence, independent exploration and learning through play.			
The service takes an active role in caring for its environment and contributes to a sustainable future.			
Quality Area 4: Staffing arrangements			
Staffing arrangements enhance children's learning and development and ensure their safety and wellbeing.		**Parent and Staff;** Staff continuity is maintained with groups of children in care. This includes one to two staff members who lead the group everyday. Children rarely change to new groups or staff members. A stable group of substitutes familiar with the children and program are always available. **Parent and Staff;** Separate adult bathrooms are provided for staff. Storage for personal belongings with security provisions and facilities for meals and snacks are provided when	**Statement 3;** Well-qualified staff whose initial and continuing training enables them to fulfil their professional role.

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National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
Educators, co-ordinators and staff members are respectful and ethical.	Entire **Emotional support** domain	necessary. At least one break daily is scheduled for staff working in classrooms. Lounge or adult planning space is available with adult sized furniture. Accommodations are made for staff members that have disabilities **Parent and Staff**; Equipped office space, which includes file/storage space and office equipment including phone, needed for daily use. Some space available for individual adult meetings that are separate from areas used by children.	
Quality Area 5: Relationships with children			
Respectful and equitable relationships are developed and maintained with each child.	**Emotional support;** Positive climate: Reflects the overall emotional tone of the classroom and the connection between teachers and students. Considers the warmth and respect displayed in teachers' and students' interactions with one another as well as the degree to which they display enjoyment and enthusiasm during learning activities. Negative climate: Reflects the level of expressed negativity such as anger, hostility, or aggression demonstrated by teachers and/or children. Low scores represent fewer instances of expressed negativity in the classroom. Regard for student perspectives: The degree to	**Interactions;** Staff-child interactions: Caregivers, who are nurturing and responsive, promote the development of mutual respect between children and adults. Children, who trust adults to provide for their physical, psychological, and emotional needs, develop their own sense of self-worth and self-esteem. **Interactions;** Interactions among children: Because self-regulation, proper emotional expression, and positive social relationships are such essential skills for later schooling and life, teachers must encourage children to develop acceptable behaviors by providing a setting that encourages real opportunities for initiative	**Statement 2;** provision that encourages participation, strengthens social inclusion and embraces diversity

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National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
Each child is supported to build and maintain sensitive and responsive relationships with other children and adults.	which the teachers' interactions with students and classroom activities place an emphasis on students' interests, motivations, and points of view, rather than being very teacher-driven. This may be demonstrated by teachers' flexibility within activities and respect for students' autonomy to participate in and initiate activities.	taking and competence building. Providing opportunities for children to work and play together, to solve conflicts in productive ways, and to participate in group activities are ways teachers promote positive social relationships. **Space and furnishings;** Child related display: Every child needs to know that others value his/her play or work. Artwork or other individual work that is created by the children should be displayed in the classroom at the child's eye-level. This promotes feelings of positive self-esteem and sends the message to the child that his/her work is valued and appreciated.	
Quality Area 6: Collaborative partnerships with families and communities			
Respectful supportive relationships with families are developed and maintained.		**Parents and Staff;** Parents and staff participate in an evaluation of the program annually. Parents are made aware of philosophy and approach practiced in the program and is urged to observe in child's group prior to enrollment. Much sharing of child-related information between parents and staff with a variety of alternatives are used to encourage family involvement in the children's program. Parents and staff participate in an evaluation of the program annually. Parent resources are provided and parents are referred to other professionals when needed.	**Statement 6;** a curriculum which requires staff to collaborate with children, colleagues and parents and to reflect on their own practice. **Statement 2;** provision that encourages .participation, strengthens social inclusion and embraces diversity. **Governance statement;** Stakeholders in the ECEC system have a clear and shared understanding of their role and responsibilities, and know that they are expected to collaborate with partner organisations.
Families are supported in their parenting role and their values and beliefs about child rearing are respected.			
The service collaborates with other organisations and service providers to enhance children's learning and wellbeing.			
Quality Area 7: Leadership and service management			

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National Quality Framework (NQS) for ECEC	Classroom Assessment Scoring System (CLASS)	Early Childhood Environment Rating Scale - Revised (ECERS-R)	European Commission Key principles of a Quality Framework
Effective leadership promotes a positive organisational culture and builds a professional learning community.		**Parents and Staff;** Thorough orientation for new staff takes place and monthly staff meetings are held to include staff development activities. In-service training, workshops, and conferences are provided for staff members. This includes opportunities to belong to professional organizations supporting young children. Professional resources and materials are provided on site for staff to access. Annual written evaluation of performance shared with staff at least yearly. This includes supervisory observations and well as feedback from individual staff members regarding their identified strengths and weaknesses. Action is taken to implement the recommendations of the evaluation.	**Statement 4**; supportive working conditions including professional leadership which creates opportunities for observation, reflection, planning, teamwork and cooperation with parents. **Statement 7;** monitoring and evaluating produces information at the relevant local, regional and/or national level to support continuing improvements in the quality of policy and practice. **Statement 8;** monitoring and evaluation which is in the best interest of the child.
There is a commitment to continuous improvement.			
Administrative systems enable the effective management of a quality service.			

Appendix C: PRISMA Systematic review & meta-analysis quality and bias checklist

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	☐	☐	
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	☐	☐	
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract	☐	☐	
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	☐	☐	
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	☐	☐	
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	☐	☐	
Support					
Sources	5a	Indicate sources of financial or other support for the review	☐	☐	
Sponsor	5b	Provide name for the review funder and/or sponsor	☐	☐	
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	☐	☐	
INTRODUCTION					
Rationale	6	Describe the rationale for the review in the context of what is already known	☐	☐	
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	☐	☐	
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	☐	☐	

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	☐	☐	
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	☐	☐	
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	☐	☐	
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	☐	☐	
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	☐	☐	
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	☐	☐	
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	☐	☐	
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	☐	☐	
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	☐	☐	
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)	☐	☐	
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)	☐	☐	

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Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	☐	☐	
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)	☐	☐	
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	☐	☐	

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Appendix D: Overall ranking of the evidence

OVERALL RANKING OF THE EVIDENCE	
	Definition
Supported	No evidence of harm or risk to participants. A well conducted systematic review or meta-analysis or at least one longitudinal study found the intervention to be more effective than a comparison group on at least one child outcome related to cognition and language, academic achievement, or social-emotional functioning. A positive effect was maintained at least 12 months. Populations examined are similar to, and results are sensible to apply to, the Australian context.
Promising	No evidence of harm or risk to participants. A systematic review or meta-analysis of moderate quality or at least one longitudinal study found the intervention to be more effective than a comparison group on at least one child outcome related to cognition and language, academic achievement, or social-emotional functioning. A positive effect was maintained at least 6 months. Populations examined may be somewhat different to the Australian population; affecting generalisability and applicability to the Australian context.
Mixed	The data reported across studies is inconsistent. Some data may provide evidence of harm or risk to participants. Generalisability and applicability to the Australian context is also variable.
Not adequately addressed	The data reported across studies is very limited (i.e. only focuses on a small aspect of the concept) or a small number of studies have reported null results. Data is unclear as it relates to the Australian context.
Not Supported	A well conducted systematic review or meta-analysis or at least one longitudinal study found harmful effects or the overall weight of the evidence suggest a negative effect on participants.

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RESTACKING THE ODDS

Appendix E: Evidence list by quality area

EARLY CHILDHOOD EDUCATION & CARE			
UNIVERSAL			
QUALITY AREA 1 - Educational program and practice			
Standard 1.1: An approved learning framework informs the development of a curriculum that enhances each child's learning and development **Standard 1.2:** Educators and co-ordinators are focused, active and reflective in designing and delivering the program for each child			
	Supported	**Promising**	**Null**
Cognitive /Academic	• Systematic Review [21] • EPPE/EPPSE [5, 31, 128] [5, 7, 59] • NICHD SECCYD [60] • IEA Pre-primary longitudinal, cross-national study [25]	• Systematic Review [20] • Meta-analysis [22]	
Social-emotional	• EPPE/EPPSE [5, 31, 128]	• Systematic Review [20]	
QUALITY AREA 2 - Children's health and safety			
Standard 2.1: Each child's health is promoted **Standard 2.2:** Healthy eating and physical activity are embedded in the program for children **Standard 2.3:** Each child is protected			
	Supported	**Promising**	**Null**
Cognitive /Academic			• EPPE/EPPSE [61] • NICHD SECCYD [23]
Social-emotional			• EPPE/EPPSE [61] • NICHD SECCYD [23]
QUALITY AREA 3 - Physical environment			
Standard 3.1: The design and location of the premises is appropriate for the operation of a service **Standard 3.2:** The environment is inclusive, promotes competence, independent exploration and learning through play **Standard 3.3:** The service takes an active role in caring for its environment and contributes to a sustainable future			
Cognitive /Academic		• Systematic review [62] • NICHD SECCYD [60] • IEA Pre-primary longitudinal, cross-national study [25]	• EPPE/EPPSE [61]

		• Australia study [64]	
Social-emotional			• EPPE/EPPSE [61]

QUALITY AREA 4 - Staffing arrangements			
Standard 4.1: Staffing arrangements enhance children's learning and development and ensure their safety and wellbeing **Standard 4.2:** Educators, co-ordinators and staff members are respectful and ethical			
	Supported	**Promising**	**Null**
Cognitive /Academic	Systematic review & meta-analysis [27] [28] [26] • EPPE [31] • NICHD SECCYD [8, 101] • IEA Pre-primary longitudinal, cross-national study [25] • Australia: LSAC/NAPLAN results [30] • EPPNI Project [69] • National Center for Early Development and Learning's (NCEDL) Multi-State Study of Pre-Kindergarten [32]	• Meta-analyses [22] Systematic review & meta-analysis [29]	
Social-emotional	Systematic review & meta-analysis [27]	• NICHD SECCYD [8]	Systematic review & meta-analysis [29] [26]

QUALITY AREA 5 - Relationships with children			
Standard 5.1: Respectful and equitable relationships are developed and maintained with each child **Standard 5.2:** Each child is supported to build and maintain sensitive and responsive relationships with other children and adults			
	Supported	**Promising**	**Null**
Cognitive /Academic	• Review [82]	Review [72]	

	• EPPE [31] • NICHD SECCYD [4, 8, 80, 101] • IEA Pre-primary longitudinal, cross-national study [25] Australian studies (CCC): [64, 81] • Dutch pre-COOL study [129]		
Social-emotional	• Review [72] [82] • EPPE [31] • NICHD SECCYD [4, 8, 101] • Dutch pre-COOL study [129]	• EPPE [31] – case studies	

QUALITY AREA 6 - Collaborative partnerships with families and communities

Standard 6.1: Respectful and supportive relationships with families are developed and maintained
Standard 6.2: Families are supported in their parenting role and their values and beliefs about childrearing are respected
Standard 6.3: The service collaborates with other organisations and service providers to enhance children's learning and wellbeing

	Supported	**Promising**	**Null**
Cognitive /Academic		• EPPE [7, 31, 59] – case studies • Germany study [86] • Review [90]	• Meta-analysis [85]
Social-emotional		• Review [90]	• Meta-analysis [85]

QUALITY AREA 7 - Leadership and service management

Standard 7.1: Effective leadership promotes a positive organisational culture and builds a professional learning community
Standard 7.2: There is a commitment to continuous improvement
Standard 7.3: Administrative systems enable the effective management of a quality service

	Supported	**Promising**	**Null**
Cognitive /Academic		• *Indirect:* EPPE [31] – case studies	• IEA Pre-primary longitudinal, cross-national study

		• Impact of leadership in schools: ○ English national mixed methods study [130] ○ Systematic review [93] ○ Meta-analysis [94] ○ Synthesis of >800 meta-analyses [131]	[25]
Social-emotional			

* Indirect evidence of association with outcome

** No evidence of association between staff-child ratios & outcomes, however ratios were in compliance with regulations

Appendix F: Citation List by Evidence Ranking: universal provision

EARLY CHILDHOOD EDUCATION & CARE			
UNIVERSAL			
Starting Age	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
0-2 years	• EPPE [61, 97]		• EPPE [111]
2-3 years	• EPPE [61, 97] – **Key Stage 1**		• EPPE [111]
3-4 years			
4-5 years			
Promising			
0-2 years	• NICHD [101]– **Phase 1** • NICHD [105] – **Phase 3**	• NICHD [106] – **Phase 4**	• EPPE [99, 100] – **Key Stage 2**
2-3 years	• *Meta-analysis [95]* • NICHD [101]– **Phase 1** • NICHD [105] – **Phase 3**	• *Meta-analysis [95]* • NICHD [106] – **Phase 4**	
3-4 years	• NICHD [105] – **Phase 3**	• NICHD [106] – **Phase 4**	
4-5 years			
Not Supported			
0-2 years			• EPPE [31] – **Key stage 1** • NICHD [102, 103]
2-3 years			• LSAC [107] • NICHD [102, 103]
3-4 years			
4-5 years			
Program Duration	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
0 to 12 months		• EPPE [98] – **Key stage 2**	
12 to 24 months		• EPPE [98] – **Key stage 2**	
24 to 36 months	• EPPE [31] – **Key stage 1** • LSAC	• EPPE [31] – **Key stage 1** • EPPE [98] – **Key stage 2**	

	[107]		
Over 36 months	• LSAC [107]	• TIMSS & PIRLS [109, 110]	
Promising			
0 to 12 months			
12 to 24 months	• *Meta-analysis* *[95]*	• *Meta-analysis* *[95]* • TIMSS & PIRLS [109, 110]	
24 to 36 months		• *Meta-analysis* *[96]* • TIMSS & PIRLS [109, 110]	
Over 36 months		• *Meta-analysis* *[96]*	
Not Supported			
0 to 12 months			
12 to 24 months			
24 to 36 months			• LSAC [107]
Over 36 months			• LSAC [107]
Program Dose	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
Part time	• EPPE [31] • LSAC [107]	• EPPE [31, 108]	
Full time > 15 hours	• NICHD [8, 13, 78, 104] – **Phase 2 (TODDLER PERIOD)**		
Promising			
Part time			
Full time > 15 hours	• LSAC [107]		
Not Supported			
Part time			
Full time > 15 hours	• NICHD [8, 13, 78, 104] – Phase 2 **(INFANCY)**		• LSAC [107] • NICHD

			[23, 24] NICHD [102, 103] **Phase 2**

Appendix G: Citation List by Evidence Ranking: targeted provision

EARLY CHILDHOOD EDUCATION & CARE			
TARGETED			
Starting Age	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
0-2 years	• Abecedarian project [113] – **Follow-Up: 18-54 months** [114, 116] – **school-age** [112, 115] – **15 years** [117, 118] [119] – **young adulthood** • Early Head Start [120]	• Abecedarian project [114] – **school-age** [112, 115] – **15 years** [117, 118] [119] – **young adulthood** • Early Head Start [120]	• Abecedarian project [118] [117, 119] – **young adulthood** • Early Head Start [120]
2-3 years		• EPPE [111] – **Key Stage 2 (high disadvantage)**	
3-4 years	• Perry Preschool Project [123-125]	• Perry Preschool Project [123-125]	• Perry Preschool Project* [123-125]
4-5 years			
Promising			
0-2 years	• Milwaukee Project [121] • Project Care [122]		
2-3 years			
3-4 years			
4-5 years			
Not Supported			
0-2 years			
2-3 years			• EPPE [111] – **Key Stage 2 (high disadvantage)**
3-4 years			
4-5 years			
Program Duration	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
1 year			
	• Early Head Start [120]	• Early Head Start [120]	• Early Head Start [120]

2 years	• Perry Preschool Project [123-125]	• Perry Preschool Project [123-125]	• Perry Preschool Project [123-125]
2-3 years			
More than 3 years	• Abecedarian [127] [112] [118] [119]	• Abecedarian [112] [118] [119]	• Abecedarian [118] [119]
Promising			
1 year			
2 years			
24 to 36 months			
Over 36 months	• Milwaukee Project [121] • Project Care [122]		
Not Supported			
1 year			
2 years			
24 to 36 months			
Over 36 months			
Program Dose	**Studies**		
	Cognitive & language	**Academic**	**Social-emotional**
Supported			
Part time	• Perry Preschool Project [123-125]	• Perry Preschool Project [123-125]	• Perry Preschool Project [123-125]
Full time	• Abecedarian [127] [112] [118] [119]	• Abecedarian [112] [118] [119]	• Abecedarian [118] [119]
Promising			
Part time			
Full time	• Milwaukee Project [121]		
Not Supported			
Part time			
Full time			

* Socio-emotional outcomes include reduced youth misconduct, crime, & drug-us

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THE TEAM

Restacking the Odds is a collaboration between three organisations, each with relevant and distinctive skills and resources:

- ***Murdoch Children's Research Institute (MCRI)*** brings deep knowledge and credibility in the area of health and educational research, along with a network of relevant relationships
    - **Prof Sharon Goldfeld** –Director Centre for Community Child Health and Theme Director Population Health, Royal Children's Hospital and Murdoch Children's Research Institute
    - **Dr Carly Molloy** – Senior Project Lead, Murdoch Children's Research Institute
- ***Bain & Company*** brings expertise in the development of effective strategies that deliver real results
    - **Chris Harrop** – a senior partner, and a member of Bain's worldwide Board of Directors

- ***Social Ventures Australia (SVA)*** brings expertise in providing funding, investment and advice to support partners across sectors to increase their social impact
    - **Nick Perini** – Director, SVA Consulting.

Suggested citation: Molloy C., Quinn, P., Perini, N., Harrop C., Goldfeld S. Restacking the Odds – Technical Report: Early childhood education and care: An evidence based review of indicators to assess quality, quantity, and participation. Melbourne, Australia, 2018.

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