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Outcomes of Early Childhood Education: Literature Review

Report to the Ministry of Education

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New Zealand Council for Educational Research

RESEARCH DIVISION



Wāhanga Mahi Rangahau

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Outcomes of Early Childhood Education: Literature Review

Report prepared for the Ministry of Education

Linda Mitchell, Cathy Wylie, and Margaret Carr
New Zealand Council for Educational Research

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Executive summary

This literature review was commissioned by the Ministry of Education to provide policy makers with a synthesis of research that analyses the impact of early childhood education (ECE) for children and families. It addresses three questions:

- (a) What (short-term and long-term) developmental, educational, social, and economic outcomes are associated with participation in ECE for learners and their families?
- (b) Are different outcomes associated with different population groups and under different circumstances/ contexts? In particular:
 - i. What types of institutional (e.g. differences in educational/care systems, types of services), funding and regulatory arrangements/frameworks are associated with achieving positive outcomes?
 - ii. When are adverse impacts more likely and for whom?
- (c) How do different outcomes interact/relate with one another?
 - i. What is the size/significance of the different impacts of ECE? How long do the effects last?

Methodology

A comprehensive search of material published in education, psychology, public policy, early childhood education, economics, family, and labour market databases was undertaken from May to August 2006, and contact made with key authors in the field.

We include in this review 117 studies reported after 1995, except for some key earlier works. The studies chosen had to meet criteria of having research methods, analysis, and findings sufficiently detailed to provide a sound basis for judgement about the robustness of the conclusions, and information about the characteristics of the context. The evidence demonstrated valid linkages between ECE participation and outcomes.

The studies chosen included longitudinal studies of interventions aimed at disadvantaged children, longitudinal studies of everyday early childhood experiences, analysis of databases comparing children with ECE participation and those without, survey information from parents, and cross sectional studies. The most useful studies analysed the impact of ECE over and above family socioeconomic characteristics linked to differences in children's outcomes, followed children over time, and provided direct data about children's ECE experiences.

Summaries of each of the reports of studies (contained in Appendix A¹) were used to synthesise what the research could tell us about outcomes for children (cognitive, learning dispositions and behaviour outcomes, and health), parenting and parent life course outcomes, and maternal employment. A summary of cost benefit outcomes in terms of public expenditure was drawn from two recent literature reviews.

¹ *Appendices - Outcomes of Early Childhood Education: Literature Review.*

Syntheses of main findings were compiled for each outcome and then brought together to address the three research questions.

An introduction frames the review by:

- examining the issues around the complexity of measuring the outcomes of ECE and establishing ECE's contribution, including the difficulty of isolating the impact of ECE;
- discussing the difficulty of measuring complex outcomes like dispositions and key competencies, although ethnographic studies highlight their importance;
- providing a guide to interpreting statistical effect sizes;
- summarising the overall picture of ECE impacts for each outcome from earlier reviews (pre 1995), and the differences in the size of impact (but not its patterns of effects) for children and parents that occur between studies of substantial "interventions" focused on ECE, and those that look at everyday ECE; and
- describing a model from Cunha, Heckman, Lochner, and Masterov (2005) explaining how ECE effects might endure, and "how skills beget skills".

Key findings from the review

Child outcomes

Cognitive

Consistent evidence from a large body of international and New Zealand evidence found ECE participation is positively associated with gains in mathematics and literacy, school achievement, intelligence tests, and also school readiness, reduced grade retention, and reduced special education placement. Medium to large effect sizes on the outcome measures were reported in United States (U.S.). "intervention" studies targeting children from low-income families, and combining good quality ECE with parenting support/education ($d=0.32$ to 0.81 for mathematics in the short term, 0.19 to 0.44 long term; 0.34 to 0.89 for reading in the short term, 0.17 to 0.44 long term). Small to medium effect sizes from ECE participation were found in studies reporting on everyday ECE experiences ($d=0.10$ to 0.23 for mathematics in the short term, 0.02 to 0.23 for reading).

Learning dispositions

Learning dispositions and key competencies are seen as combinations of ability, inclination, and sensitivity to occasion, and refer to the competencies and skills that enable children to keep learning. Learning outcomes in *Te Whāriki*, the national early childhood curriculum, are summarised as learning dispositions and working theories. Learning dispositions in the studies reviewed included attitudes of perseverance, curiosity, confidence, and social competence such as the ability to work with others. In general, the small number of New Zealand and international studies that examined associations between ECE participation and learning dispositions found positive impacts. Small to medium effect sizes were reported in the high-quality U.S. "intervention" studies (e.g. the *Chicago Child-Parent Centre* study found $d=0.21$ for task orientation and assertive social skills, $d=0.22$ for frustration tolerance, $d=0.33$ for social adjustment in school in the short term, and $d=0.34$ for social competence

in the long term). The *EPPE* (Effective Provision of Pre-School Education) study found evidence of “fade out” of effects by age 7; this did not occur in one New Zealand and one Swedish study following children in everyday ECE and three U.S. intervention studies that followed children long term. Life span modelling (Cunha, Heckman *et al.*, 2005) emphasises that later, successive, educational contexts are significant influences on the enduring effects of learning orientations and dispositions.

Antisocial/anxious behaviour

There are mixed findings on the impact of ECE participation on antisocial and worried behaviour. U.S. “intervention” studies found a small reduction in “acting out” behaviours (e.g. $d=-0.19$) in the short term. There was an indication (one study) that non-maternal care (including ECE), especially an early start before age 17 months, was associated with lower levels of physical aggression for children who were at risk of physical aggression. There was no effect on children not at risk. However, a small number of studies found an early starting age (before age 1 or 2) into low-quality child care was associated with higher levels of antisocial or worried behaviour at the time and at school entry. This could be tempered by subsequent high-quality ECE. Studies with longer time periods do not report antisocial/worried behaviour, indicating that these effects may not last.

Health

The picture on health outcomes is not solid. Except for increasing research on cortisol levels, most studies of health outcomes rely on parent reports, sometimes at a general level, and report short-term outcomes related to current ECE experience. There is a suggestion that children may catch more infections (ear, nose, and throat) through ECE participation, and that young children attending all-day centres may experience higher cortisol levels (symptom of stress). Where centres are good quality, cortisol levels tend to be lower, and ECE experience can decrease cortisol levels where there is parental stress or extremes of emotional expression. ECE programmes that include health support may improve health outcomes.

Population differences

The outcomes occur for all children across the socioeconomic range. Some additional gains are made by some groups.

Family income. New Zealand and international studies found cognitive gains for children from low-income/disadvantaged homes could be greater than for most other children in mathematics and literacy, if their ECE centre was of good quality.

English as an additional language. Children for whom English is an additional language, and children from some ethnic minority groups (including Black Caribbean and Black African), made greater progress on early number concepts and pre-reading measures during ECE participation than the white United Kingdom (U.K) children or those for whom English is a first language in the English *EPPE* study. Overall, these children started with significantly lower scores on language measures (but not nonverbal) and the ECE experience helped them start to catch up with peers in certain areas.

Gender. Gender differences were found in three studies and showed mixed differential gains for boys compared with girls:

- Boys gained more than girls on early number concepts over the time of ECE attendance in the English *EPPE* study. They also had lower home learning environment scores (measured by parent reports of activities such as playing with letters and numbers, going to the library, reading to the child) than girls.
- Long hours in low-quality child care appeared particularly detrimental for boys' serious externalising (e.g. acting up, self-control, interpersonal skills) behaviour problems, and high-quality more protective than for girls in a U.S. study of ECE experience for children from low-income families.
- In the U.S. *Cost, Quality and Child Outcomes* study, centres that met professional recommendations regarding teacher education tended to have girls with more enhanced receptive language skills than boys.

Socioeconomic mix of ECE centre. Children attending ECE centres with a middle class/better maternally educated mix had greater gains for mathematics, literacy, and other cognitive outcomes, both short term and long term.

No effects of socioeconomic mix were found for dispositions in the English *EPPE* study, except for "Peer sociability" where children attending settings where a higher proportion of mothers had degrees, higher degrees, or other qualifications made less progress after taking account of prior social behavioural development. This contrasts with findings for cognitive outcomes, where gains are greater in such settings.

Aspects of ECE that can affect ECE impact

Duration

Longer duration of ECE experience is linked with *cognitive* ("academic") gains for children from all family socioeconomic backgrounds. Benefits of longer duration diminish over time, but may still be evident for mathematics and other schooling outcomes. High-quality ECE with longer duration has the strongest effects. An early starting age before age 3 is associated with gains, but there is mixed evidence about whether starting before age 2 is more advantageous than starting between age 2 and 3.

With respect to *learning dispositions*, longer duration and an early starting age in good quality ECE centres is beneficial, but longer duration in centres rated low-quality in terms of structural features (especially teacher qualifications) and adult-child interactions and communication is not.

A small number of international studies found an early starting age before age 2 or 3 is associated with higher levels of *antisocial or worried* behaviour at the time of attendance or shortly after school entry. These associations were generally found in centres rated as low-quality, suggesting it is early entry combined with poor quality that contributes to negative impacts. Where included in the analysis, frequent change of care was associated with antisocial behaviour.

Hours per week

Full-time attendance has no benefits for *cognitive* outcomes over part-time attendance in studies of children from a range of socioeconomic backgrounds. Some U.S. studies found children from low-income homes attending good

quality ECE services gained more from full-time attendance (more than 30 hours) in literacy, mathematics, and other cognitive outcomes than those with part-time attendance.

U.S. studies report more hours (more than 30) of non-maternal child care (including care by relatives, not simply ECE) per week is associated with moderately more *antisocial/aggressive* behaviour at the time of attendance or shortly after school entry. Studies following children for longer periods do not report such findings.

Quality

Good quality ECE is the key to achieving gains on all outcomes measured. Aspects of adult–child interaction and opportunities afforded by the environment are associated with greater gains for cognitive outcomes and learning dispositions, and with lower levels of antisocial/worried behaviour. Aspects that are particularly important for outcomes are:

- the quality of staff–child interaction;
- the learning resources available;
- programmes that engage children; and
- a supportive environment for children to work together

The English *EPPE* study showed that “sustained shared thinking”, associated with better cognitive achievement was more likely to occur with adults working 1:1 with children, and during focused small group work. Qualified staff working with children and low ratios of children to teachers linked to better gains for children, although these variables were confounded in some studies. (ECE centres that provide qualified staff may have high ratios of children to staff and vice versa.)

There were greater cognitive and learning disposition gains for children, and reduced antisocial/worried behaviour, in centres that encouraged parents to be engaged in their children’s learning, with a focus on educational aims.

With respect to reducing problem behaviour and increasing levels of sociability, the closeness and quality of relationships between teachers and children was of core importance. Staff showing respect to children, listening to what they say, responding sympathetically, and using language and reasoning were associated with better social-emotional outcomes. The *EPPE* study also found better physical environment and space was associated with decreased antisocial and worried behaviours.

U.S. programmes catering for infants and toddlers and offering good quality centre-based ECE along with a range of family support services (health, community connections, parenting) were linked to positive outcomes for children (cognitive, learning dispositions, and social) and positive parent-child interactions.

Outcomes for parents

Parenting

Positive outcomes for parenting (improved interactions with child, home environment and help for the child to learn at home, father involvement in parenting, parental knowledge of child learning, development, and

behaviour) have been found in parent/whānau-led ECE centres where parent training and involvement in the education programme are core elements in programmes combining good quality ECE with parent education/support (integrated centres), and teacher-led centres where teachers have encouraged parents to work with them on educational aims. Specific efforts were taken in some programmes for teachers to work with hard to reach families, linguistic minority families, and teenage parents by providing interesting and accessible documentation, and by tailoring communication to parent interests and understanding.

Parental life course outcomes

Gains for parents were reported as follows:

- learning and undertaking study through the ECE service for a qualification;
- making social networks, community and cultural connections;
- increasing confidence and self-esteem; and
- favourable impacts on parenting-related stress and family functioning

These parent life course outcomes were associated with parent participation in the ECE community, in the education programme, formal learning opportunities, and parents taking up positions of responsibility within the ECE centre. Parent/whānau-led centres and integrated centres (centres that combine ECE and family support) seemed to offer wide opportunities for parents to enrich their lives.

Maternal employment

Policy changes in Quebec and Argentina that both increased ECE supply and reduced its costs contributed to increased maternal employment as measured by the percentage of mothers in paid employment. The rate of increases in maternal employment was lower than the rate of expansion of ECE places. Where one kind of ECE only is expanded, that may influence decisions about hours of employment, e.g. expansion of full-time ECE provision was associated with full-time employment increases in Quebec.

Studies estimating probabilities of being employed or on welfare in relation to changes in child care costs and subsidies indicate that decreasing ECE costs is one factor that contributes to increased employment of low-income mothers. The decrease in costs has to be sizeable to make a marked difference to maternal employment. Availability of ECE, whether the mother has previous work experience or higher education levels, employment conditions and rates of pay, and availability of paid parental leave are other factors in maternal employment decisions.

Economic outcomes

International evidence demonstrates that investing in good quality ECE can bring cost savings and benefits to governments and economies as well as to children and families. Although cost benefit analyses measure only some quantifiable outcomes, these find that through provision of good quality ECE services, employment and tax revenues are increased, and savings are generated in educational and social expenditure.

Economists have cautioned that social, economic, and school policies also affect ECE cost benefit returns.

Good quality ECE has greater benefits for children from low socioeconomic families, but children from middle and high socioeconomic families also gain, as our earlier chapters have demonstrated. Economists, using conservative estimates of benefits based on recent relevant research evidence of ECE effects for children from across the socio-economic spectrum, have projected cost benefits of offering universal high-quality ECE for 2-, 3- and/or 4-year-olds. Most of the economic evaluations of ECE programmes have shown that benefits of public spending exceed the costs. Gains are not realised, or are not as great, if the ECE is of poor quality. Without considering the opportunity costs of that spending, comparing the investment to other types of early years intervention or alternative policy options, these evaluation findings tend to suggest that public spending for ECE programmes will result in good returns in terms of maternal employment, higher levels of the participant's lifetime earnings, reductions in usage of special education services, lesser criminal activity, and reduced use of social services that are expected to have a flow-on effect to the economy.

Conclusion

In summary, the existing research base shows positive outcomes (cognitive, learning dispositions, and social-emotional) of ECE participation for learners in the short and long term. These were most evident in centres rated as good quality in respect to responsive and stimulating adult–child interactions and rich learning environments, and in centres employing qualified teachers, with adult: child ratios and group sizes that enabled teachers to work with small groups of children or interact one on one with individual children.

Negative associations with aggression, antisocial behaviour, and anxiety in the short term found in mainly U.S. studies are linked to an early starting age, long hours in centres rated as low-quality, and frequent changes in child care. Weak evidence that ECE may be associated with higher rates of infections and cortisol levels (where centres were low-quality) was found.

ECE participation can enable parents to learn more about parenting, develop social and community networks, and build greater confidence; and participate in paid employment. These gains can be thought of as empowering. They also interact with those found for children, and each contributes to family and societal functioning.

A number of studies showed that investing in universally available good quality ECE can bring benefits to governments, as well as to children and families.

The diagram below illustrates conditions that support the teaching and learning that in turn directly contributes to good quality outcomes for children and parents. The early childhood services that contribute to positive child and family outcomes are settings characterised by:

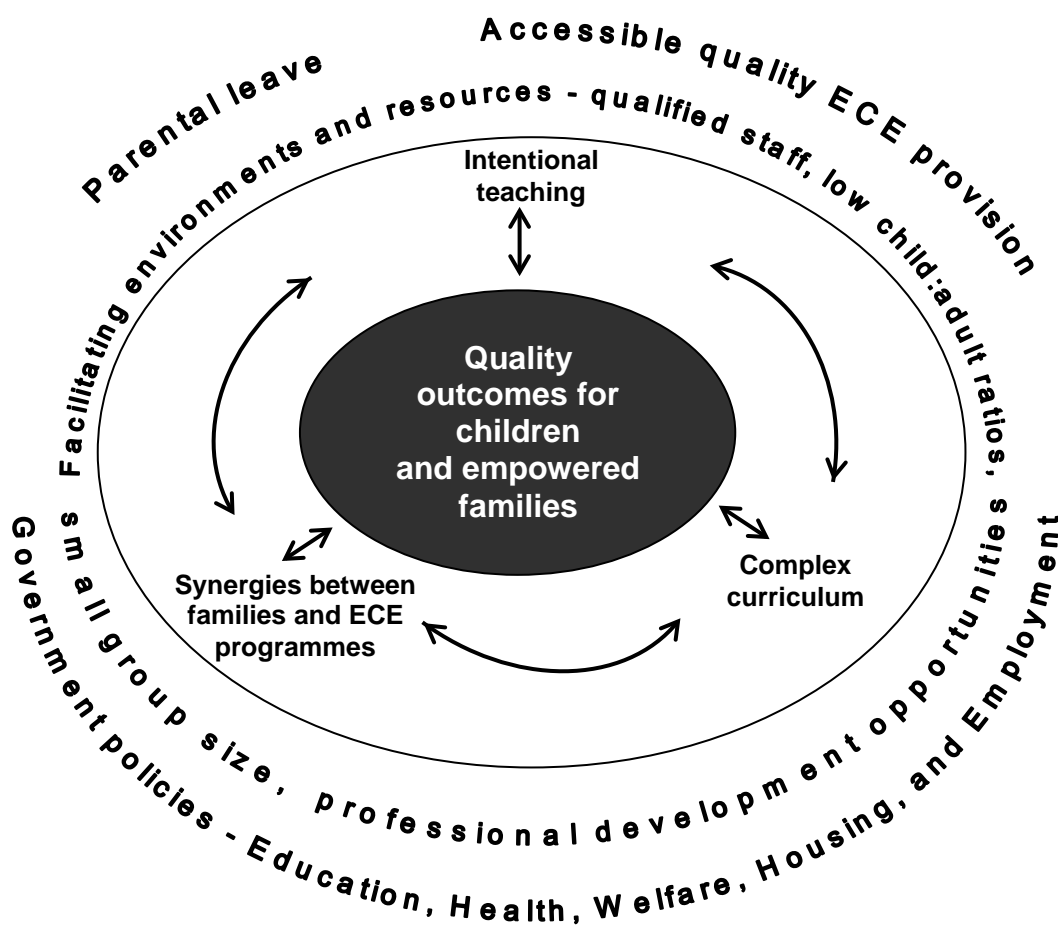
- intentional teaching;²
- family engagement with ECE teachers and programmes, where social/cultural capital and interests from home are included, and both family and teachers can best support the child's learning; and
- a complex curriculum involving both cognitive and non-cognitive dimensions.

² Settings that provide opportunities for “sustained shared thinking”, rich teacher–child interactions, engaging programmes, peers learning together, and assessments with valued outcomes in mind.

Participation in teaching and learning in effective ECE settings is not dominated by teachers, but shared with families and children. Children are active in their own learning and contribute to the learning of others, rather than simply being seen as the effect of inputs or external forces, or reacting to their current main contexts. Hence the reverse arrows in the diagram showing linkages from child outcomes back to the ECE setting.

Facilitating environments provide conditions for the kind of teaching and learning that lead to quality outcomes for children, especially qualified staff, low child: adult ratios, small group size, and staff professional development opportunities. Qualified teachers are likely to draw on their knowledge and experience of children and pedagogy to offer the kinds of cognitively challenging adult-child interactions that are linked with gains for children. The NICHD ECCRN (The National Institute for Child Health and Human Development Early Child Care Research Network) study (2002) using structural equation modelling, found a mediated path from structural indicators of quality (teacher qualifications and staff: child ratios) through process quality to cognitive competence and caregiver ratings of social competence. These authors suggest that “more caregiver training may lead to better interactions between children and adults, while lower ratios may lead to more interactions” (NICHD ECCRN, 2002, p. 206).

Diagram 1 Conditions, interactions, and outcomes for children and families



Government policies for education, health, housing, welfare, and employment also influence the wellbeing and support of families, and opportunities for parent employment and development. Employment policies, including

paid parental leave, influence the ability of parents to participate in paid employment and balance employment with family life. Several studies have emphasised the value for parents and children of extensive paid parental leave (12 months or more) from the child's birth. Our review has highlighted that returns from early investment in ECE are high, but good quality schooling is important in sustaining gains from ECE participation.

The kinds of institutional, funding, and regulatory arrangements that support provision of good quality ECE will enable these features to be achieved, e.g. through regulating recommended standards for staffing (qualifications, ratios, and group size), opportunities for professional development for all teachers, opportunities for teachers to investigate teaching, learning using inquiry approaches (Mitchell & Cubey, 2003), and support for good quality provision to be available in all communities. This review gives substantial support for continuing to give good quality ECE priority in New Zealand's efforts to improve outcomes for children.

1. Introduction

In this section, we describe the aim of this review of the outcomes of early childhood education (ECE), and outline the methods we used to select research to use in the review, synthesising what outcomes we covered and our approach to research findings for each outcome. Measuring the outcomes of ECE and establishing ECE's contribution is a complex area, so we then go on to discuss some of the issues around this, including the difficulty of measuring complex outcomes like dispositions and key competencies, although ethnographic studies highlight their importance. We also outline the meaning of effect sizes in quantitative analysis. Since this review is of more recent research, it is important to establish a kind of baseline in terms of the picture that emerges in earlier reviews about the impact of ECE, the differences in impact that occur between studies focused on substantial "interventions" for low-income children and families focused on ECE, and those that look at everyday ECE. We summarise the findings from these pre 1995 reviews for each of the main outcome areas included in this review. Finally, we describe a model from Cunha, Heckman *et al.* (2005) explaining how ECE effects might endure, and "how skills beget skills".

Aim

The intention of this review is to provide policy makers with a synthesis of research that analyses the impact of ECE for children and their families. It addresses three questions posed by the Ministry of Education. These are:

- (a) What (short-term and long-term) developmental, educational, social, and economic outcomes are associated with participation in ECE for learners and their families?
- (b) Are different outcomes associated with different population groups and under different circumstances/contexts? In particular:
 - i. What types of institutional (e.g. differences in educational/care systems, types of services), funding and regulatory arrangements/frameworks are associated with achieving positive outcomes?
 - ii. When are adverse impacts more likely and for whom?
- (c) How do different outcomes interact/relate with one another?
 - i. What is the size/significance of the different impacts of ECE? How long do the effects last?

Criteria for inclusion in the review

We include in this review reports of research that met the following criteria:

- The study is reported after 1995, except for some key works that were reported up to 1995. These are described as "key" if they are closely related to the review topic, and address aspects on which we have limited

evidence. We chose the date 1995, since many reviews on outcomes of ECE have examined pre 1995 evidence and we did not think it necessary to duplicate this work. Instead, we have summarised earlier reviews and discussed whether there is a general consensus from them about the impact of ECE. In addition, we were interested in studies that analysed the impact of ECE over and above family socioeconomic characteristics linked to differences in children's outcomes. There are more of these in recent years.

- The report provides information from a primary study, and is not a literature review. We have used other reviews to: source studies for their insights; use them in this introduction to frame the state of knowledge about ECE impacts, and have copied some summary tables of effect sizes from earlier studies calculated or compiled by earlier reviewers in this field (Appendix B). We are aiming to build on the review work that exists, rather than repeat or ignore it.
- Research methods, analyses and findings are sufficiently detailed to provide a sound basis for a judgment to be made about the robustness of the conclusions. This includes information on the characteristics of the sample.
- Information is provided about characteristics of the context, such as types of service, quality, staffing, funding, and regulatory framework.
- The evidence demonstrates valid linkages between ECE participation and outcomes. We included only studies where there was information about outcomes for learners or parents. We also aimed to focus on studies that provided analysis about the impact of ECE that allowed its effect to be separated from the family socioeconomic resources that are most likely to be associated with differences in children's outcomes. This was not always possible, particularly with cross-sectional studies of parent perspectives on their gains from ECE participation, and with qualitative studies.
- Where methods are qualitative, the qualitative chain of evidence is robust. Where quantitative approaches are used, there are enough in the sample to justify the analysis and conclusions.

This review is focused on outcomes resulting from ECE experience, as they have been measured in research. This posed some issues for us, because the measurement to date in quantitative studies has been limited to traditional approaches to outcomes of education. Some of the work being done about children's development of valuable dispositions and attitudes that are linked elsewhere (e.g., Wylie, Hodgen, Ferral, & Thompson, 2006) to gains in learning in more traditional and quantitatively measurable areas, such as reading and numeracy, is qualitative. This leading edge work does not approach learning "outcomes" as distinct domains, with a clear separation between cognitive ("academic"), and dispositional and social-emotional domains. Indeed, this is the approach taken in New Zealand's ECE curriculum, *Te Whāriki*, where the outcome areas are wellbeing, belonging, communication, contribution, and exploration. The key competencies in the draft New Zealand curriculum, included there because they are linked to the kind of critical enquiry and problem solving capacity we need for the 21st century (Gilbert, 2005), also cross the traditional distinctions between the cognitive and social-emotional areas. We have included some studies using this new approach in the section on children's dispositions and social-emotional outcomes.

The new approaches to learning also emphasise the importance of a less linear approach to children's development, and more appreciation of the contextual nature of display or realisation of an outcome than is taken in much of the research included in this review. Much of the quantitative analysis by necessity uses statistical models that assume that children develop linearly, and treats ECE experience as an input to a later outcome, rather than as a context in which children form their learning identities—taking something of the context into these

identities and also making something new of it in relation to what was already there. Thus the ECE experience is not standard, and its relation to children's learning identities is dynamic rather than fixed.

This review does not include studies of patterns of, or changes in, ECE participation rates unless these also included analysis relating these to outcomes. We have included less qualitative material than we anticipated, because much of it was about change in practice, and somewhat outside our brief. However, we do use some of these studies, where they help develop our understanding of why some aspects of ECE are important in enabling children and their parents to make the most of ECE experiences.

Our search, through the databases and contacts listed in Appendix C, included material we already had on hand, references in that material, and in the new material gained through the searching gave us over 300 articles. One hundred and seventeen of these met the criteria used for this review (p. 11 above). Final decisions on what to include were made by two of the research team. Because the research team included those also working on the *Competent Children, Competent Learners* study, Megan Clark of the Mathematics Department of Victoria University was asked to decide whether the findings from that study warranted inclusion. She concluded that the findings were robust (see Appendix D). Margaret Carr similarly reviewed three NZCER projects with data on outcomes for parents (her summaries are included in the summary section, Appendix A).

Outcomes for children

We summarised each of the reports of studies that we used in this review, and then used these to compile an overall picture of what the research could tell us (or not) about these outcomes for children:

- *Cognitive:*

the traditional “academic” aspects, such as mathematics, literacy, intelligence tests, and also school readiness, grade retention, and special education placement—decisions usually based on cognitive/knowledge performance (though some aspects of dispositions and social-emotional outcomes will be associated with the latter)

- *Dispositional and social-emotional:*

learning dispositions and orientations such as independence, perseverance, participation, curiosity, and social competence (and negative outcomes of antisocial/worried behaviour)

- *Health:*

cortisol levels, infections, and parent reports of health.

Three outcomes for parents:

- *Parenting:*

interactions with the child, home learning environment, parental understanding of child learning and development

- *Parent life course outcomes:*

education and training, social support, cultural connectedness, community participation, confidence and family functioning

- *Employment:*

Two cost benefit outcomes for government:

- *outcomes from children's ECE participation; and*
- *outcomes from increased taxation, through parental employment facilitated by access to child care*

We chose these outcomes on the basis of the kinds of evidence that was available in the research, and in consultation with the Ministry of Education.

Analysis

The summaries of the studies used in this review are given in Appendix A. These summaries were designed for quick reading and reporting of some additional information. We have aimed to give a snapshot of research method, sample, and findings, with a final column which includes relevant material that may aid policy makers, researchers, and others in the ECE sector. Most of this final column material is related to the interpretation of particular study findings, including comments on design and context (sometimes the authors, sometimes our own, and for one outlier study, brief summaries of relevant material from other studies).

We then compiled the syntheses of main findings for each outcome that follow this introduction. We did this by sorting the findings for each outcome into whether they were positive, negative, or showed no impact; adding the number of findings in each category (positive, negative, no impact). We then briefly discuss the trends in the findings, and the overall picture they give us of the research knowledge for each outcome.

These syntheses are also succinct, to allow quick reading, and include a summary for that outcome area. We then bring the results for each outcome area together in the conclusion to provide overall answers to the Ministry of Education's three research questions.³

Because the research around ECE outcomes is wide-ranging, and study results can show differences according to the nature of the ECE experiences, the comparisons made, and how something was measured, we move next to discussing some of the issues around estimating the effects of ECE.

Sizing up the ECE contribution to outcomes

ECE provision has become a major policy plank in many countries. This means that there are now more studies being undertaken, in a wider range of social contexts, and using a wider range of methods of analysis. The studies in this review include longitudinal studies of interventions, longitudinal studies of everyday ECE experiences, analysis of databases that include some information about ECE participation (usually limited to whether there is ECE participation or not, length of participation, sometimes type of ECE), survey information from parents using ECE, and cross-sectional studies, often focused on ECE quality. They include studies that take an experimental intervention approach, randomly assigning children from similar backgrounds who were then given different ECE

³ Originally, we used the three research questions to order this report, but this fragmented the evidence relating to each outcome, making it harder to get an overall picture of the impact on ECE for each outcome. We therefore made the outcomes the focus, and provided pictures of the research evidence relating to each outcome, before bringing this evidence together for each research question in the conclusion.

experiences or none; studies that use already existing variations in ECE experience to compare groups with different experiences; and studies that focus on description, particularly in reporting parental perspectives.

Learning dispositions are more difficult to measure than cognitive outcomes. Some quantitative studies have included aspects of these (e.g., Competent Children, Competent Learners). We have also included robust qualitative studies for this outcome. These are longitudinal and ethnographic, where researchers follow closely children's learning pathways, seeking perspectives from families, teachers, and the children themselves. These studies become robust (trustworthy, accountable, empirically valid) through a range of processes that include: unobtrusive data gathering ("natural" social processes are undisturbed); respondent validation (subjects recognise and affirm the findings); triangulation (a variety of types of data are collected); clearly outlining the role of the researcher; the collection of additional structured data (e.g. interviewing the children); the robust nature of the primary data; taking a comparative approach, e.g. "case studies" within the same site; combining the analytic and the systemic (an early childhood setting as a complex system of interdependent and nested sub-units); and using a theoretical framework or model against which to "test" the data and to provide valuable insights for policy.

Some reviews have restricted themselves to only those that use an experimental intervention approach. A recent review of long-term economic impact of centre-based early childhood interventions is the most narrow (Penn *et al.*, 2006), using only three studies. The disadvantage of this idealistic, but also mechanical, approach is that it sets artificial limits on the understanding that can be gained by making connections across different studies, imperfect though they may be judged according to one set of criteria.

Most reviews have done what we do here, and have set the scope wide enough to gain as much understanding of what could be happening as possible. The design of the study and the method of analysis used are not the deciding factors: what matters is whether the study was done well (and reported clearly) within the framework of its design.

The studies that report the greatest impact from ECE are those with the most comprehensive and direct data about ECE experience, particularly its quality, and that follow children over time. Intervention studies, where the ECE experience has been particularly rich, and the target population particularly impoverished, with the most to gain from complementary and different experiences outside the home, show the largest and most long lasting impacts through comparisons of matched learners who had the intervention ECE experience, than those who did not. These studies involve random assignment to either the intervention or control group. They are also the most expensive, and so they are rare.

Recent studies that analysed the impact of ECE over and above family socioeconomic characteristics linked to differences in children's outcomes are valuable. These are more likely to use quantitative analysis.

However, like other aspects of education, it is difficult to isolate the impact of ECE, or to be conclusive that ECE alone has "caused" outcomes for learners and parents. The factors that contribute to children's development over time are manifold, making it impossible to include all of them in any one study. With ECE, "selection" factors are also at work: the things that have influenced whether a family decide a child shall take part in ECE (since it is voluntary), and if so, what kind of ECE is available). Again, research is increasingly seeking to gather information about likely main factors, but cannot always include them for both reasons of cost and respondent burden. The focus of a study can also limit the range of factors included. For example, while early intervention programmes with random allocation to the intervention and to the control group offer one of the best means of distinguishing ECE impacts from the impact of other factors, they are likely to be targeted to high-poverty learners and families,

and therefore of less use in finding out whether differences in the size of the impact of ECE are related to large differences in family income. In short, there is no perfect study in this area (nor is there ever likely to be one). Thus it is important to consider a range of studies together, and build connections between the findings of different studies with different designs, focus, and groups involved, as we have aimed to do in this review.

Effect sizes in quantitative studies

Just as each study has included different factors and measures of outcomes, there is also variation in how the size of the impact of ECE has been reported in quantitative studies. Some studies have reported the size in terms of a unit of the measure being used (e.g. scores on a reading test); others have given it in terms of percentage points relative to the mean of a measure (e.g. a difference as a percentage of a mean score); some have quoted one of the possible measures of effect size (see below); and some have given inadequate information on actual size, reporting only which differences were statistically significant. Where samples are small, statistical significance is likely to indicate a non-negligible difference (although in small samples even relatively large difference can be just by chance), but with large samples, very small sized differences can be statistically significant (and moderate to large differences are unlikely to be just by chance).

Where possible with the quantitative studies, we report the size of any impact in terms of effect sizes. There are several different possible measures of effect size, and these different measures need to be interpreted slightly differently. The most commonly used is d , which is a standardised difference between means (the difference between two group means divided by the common standard deviation). Examples of its use are mean cognitive scores in an experimental and control group, or the difference between the mean cognitive score between the highest and lowest socioeconomic groups. Also presented by some authors is f , which measures the trend, upward or downward, across three or more groups (e.g. levels of maternal qualification, or socioeconomic status). Some authors used d where f may be more applicable, as d only measures the difference between the most extreme groups, and f uses information from all groups. Both d and f can be considered to measure the ratio of “signal to noise”, however the values (Table 1) that are commonly used to benchmark a large, medium, or small effect are not the same.⁴

Other measures of effect size include estimates of the proportion of variation in a model that is accounted for by each of the explanatory variables in the model, or, alternately, the extra amount of variability accounted for in a model if a particular variable is included. The correlation between two variables included in a model can also be used to indicate effect size.

We have calculated values of d for studies that did not report effect sizes, but did include enough information for the computation. This was not possible for all studies that did not report effect sizes.

A guide as to how to interpret the different possible effect sizes is given in Table 1.

⁴ Shpancer (2006, pp. 227– 237) notes that “effect size is still reported primarily by referring to Cohen’s traditional small-medium-large power distinction—an expert opinion based on neither a mathematical formula nor specific and clearly established links to relevant developmental outcome.” Shpancer’s sceptical view of whether statistical research can establish firm links between ECE and outcomes includes a reminder of the weight that social context and changes, values, and multiple needs of parents, children, and society play in the reality of ECE experiences and its role in any given society, as well as in different children’s and families’ lives.

Table 1 **Guide to interpreting effect sizes**

Effect size	Lowest possible	Small effect	Medium effect	Large effect	Largest possible
<i>d</i>	0	0.2	0.5	0.8	No limit
<i>f</i>	0	0.1	0.25	0.4	No limit
<i>r</i> (correlation)	0	0.1	0.25	0.4	1.0
% variation accounted for	0	1	6	14	100

Effect sizes in different studies in the same area (the same or similar outcome and explanatory variables) are unlikely to be exactly the same. The main reasons why they vary are the sample size and variability in the explanatory variable. Effect sizes, like other statistics calculated from sample data, will vary from sample to sample, and this variation will be more marked in small samples than in large samples. Effect size measures for cognitive scores across different levels of family socioeconomic status, or quality of child care, would typically be bigger in studies where there was a wide range in socioeconomic status, or in quality of care. Calculation of *d* for the most extreme groups present in a study that only includes the lowest socioeconomic status families would be expected to give a value that is lower than that from a study that includes a wide range of families (if there is an association between the outcome and socioeconomic status).

The NICHD ECCRN team has noted that:

Evaluations of the practical importance of research findings that are modest in magnitude are not straightforward, because effect size estimates are affected by measurement, design, and method (McCartney & Rosenthal, 2000). In the health domain, small effects are taken seriously. Consider the fact that the effect of aspirin on reducing heart attack is statistically very small ($r^2 = 0.001$, with corresponding $r = 0.034$; Rosenthal, 1994), yet the findings have influenced medical practice (NICHD ECCRN, 2003b, p. 1001).

They concluded that:

Even small effects, when experienced by many children, may have broad-scale implications for larger policy discussions (Fabes, Martin, Hanish, & Updergraff, 2000; Jeffrey, 1989). Indeed, the detected effects may have no implications for how any individual child should be cared for or how any individual family functions, but could have implications at broader levels concerning how classrooms, communities, and even societies operate (NICHD ECCRN, 2003b, p. 1002).

What we aim to do in this review is provide a summary of the consistencies in findings around the impact of ECE, and advance likely reasons for differences in findings by looking at differences in the ECE context, or in the study design and analysis.

We start developing this picture by summarising the conclusions of earlier reviews.

Is there a general consensus in reviews of pre 1995 studies about the impact of ECE?

Cognitive outcomes—early intervention programmes

One of the reasons for the growth in policy interest in ECE is that there is growing consensus that ECE can have positive impacts for children's cognitive growth and school performance. The strongest evidence for this comes from U.S. early intervention programmes. These are the programmes most likely to be covered in reviews that use "scientific rigour" (random assignment to intervention and control groups) as the main criterion for inclusion (e.g. Anderson *et al.*, 2003; Karoly *et al.*, 1998). Anderson *et al.*'s appendices are particularly useful as they have calculated effect sizes for earlier studies pre 1995, and so we attach them in our appendices. Their estimates for a range of U.S. interventions (Abecedarian, Perry preschool, and various Head Start programmes) give a positive medium effect size overall of around $d=0.35$ for academic achievement tests, $d=0.38$ for school readiness tests, and $d=0.43$ for IQ test scores, a (positive) decrease of around $d=0.13$ in grade retention, and of around $d=0.14$ of placement in special education.

Barnett's (1995) summary of reviews of the impact of ECE written in the 1980s – early 1990s was that there were meaningful impacts on cognitive ability (the equivalent of an increase in 8 IQ points, and of "similar magnitude" on preschool and kindergarten achievement measures. There were also positive impacts for "socio-emotional outcomes such as self-esteem, academic motivation, and social behaviour" at the end of the interventions. These effects declined and were negligible several years afterwards. However, some interventions did show more persistent effects. These were ones that had more "intensity, breadth, and amount of involvement with the children and their families" (p. 27).

Barnett's own 1995 review of ECE impact after age 8 included 36 studies of programmes targeted at low-income children, that compared reasonably similar groups of children (those who had the programme, and those who did not). The programmes fell into two groups: model programmes, usually of higher-quality and including some parent involvement; and everyday, large-scale (mostly Head Start).

Barnett notes that none of the studies were perfect. For example, seven of the 15 model programmes used random assignment to form comparison groups; but four of these "had attrition rates so high that initial random assignment could have been invalidated". Several had small sample sizes that made it difficult to "detect even fairly large effects". However, his perspective, as with most reviewers, is that it is the overall picture built up through (imperfect) studies that is important.

The overall picture he reports shows:

- variation in cognitive gains retained using IQ and school tests;
- Five of 11 model programme studies with achievement data showed gains beyond age 8; of the 21 large-scale programmes, four found no cognitive effects (either short- or long-term), five found only short-term gains (no longer evident at age 8/3rd grade), and 12 found some positive cognitive effects at this age or later;
- Reductions in grade retention and special education programme assignment;
- These were found in all the model programme and large-scale programmes that collected this data (or were in environments where these were common practices); and

- High school graduation—a “large” effect shown for the five studies that had data (three model and two large-scale programmes).

Girls did better than boys on achievement test scores in four model programmes using experimental design (random allocation) and on graduation rates (two of these four model programmes), but there were no gender differences found in the other model programme or large-scale programme studies.

Within these studies, there was limited analysis of different experiences of ECE quality or duration. The few analyses of quality show higher-quality programmes had larger impacts. The *Chicago Child Parent Centre* study was the only one that allowed comparison of different starting ages. It found no greater gain for children who started the programme at age 3 compared with those who started it at age 4.

Karoly *et al.* (1998) reviewed the studies of nine model U.S. programmes and evaluations of Head Start programmes (which are less well resourced) to estimate the size of the gains for children, parents, and government (through eventual savings). Estimation of gains is done by comparison; most of the studies used random allocation to the programme and non programme groups. Five of these model programmes were included in Barnett’s review. The main findings of interest here are:

- All the programmes that measured IQ showed short-term gains for model programme participants; none show long-term gains;
- All six of the programmes that collected educational achievement data showed gains for participants at ages ranging from 7 to 15;
- Special education placement decreased in three of the seven programmes that measured this (over the course of school education);
- Grade repetition decreased in two of the seven programmes that measured this (six over the course of school education);
- One of the two programmes that collected data on school graduation showed a gain for programme participants; and
- One of the four programmes that collected data on behaviour showed gains (ages 4–7); one showed no effect; and two showed mixed results. Of the four that collected data on crime/delinquency, two showed gains, and two showed mixed results.

They report that the “size of many of the differences could be fairly characterised as substantial” (1998, p. xv). These reviewers also make the point that because most studies measure only a few outcomes, we do not know the full extent of ECE outcomes. Like other reviewers, they also note the differences found between programmes in terms of outcomes may reflect variation in the implementation of individual programmes, as well as differences in programme emphasis.

A recent update of this review included 20 programmes, with similar findings (Karoly, Kilburn, & Cannon, 2005). Three features of programmes that had larger or longer-lasting positive outcomes for children were identified: better trained staff than others; smaller staff/child ratios; and greater intensity (but no optimal number of programme hours could be estimated). The authors caution that while these programmes generally improved outcomes for participants, “they typically do not fully close the gap between the disadvantaged children they serve and their more advantaged peers” (p. xix).

Other reviews of ECE interventions cover much the same studies, and come to similar conclusions: that overall, there are positive outcomes for children from low-income homes who participate in intervention programmes, of a modest to large size; and that the size of the outcomes is related to the quality of ECE experienced.

Summarising eight U.S. ECE intervention programmes, Frede (1995) noted that part-day and full-day programmes seemed to be as effective; that while most programmes ran for two years or more, some ran for less than this. The lowest staff: child ratio of any of these programmes was 1:8; most were around 1:5, and less than that for infants and toddlers. Frede suggested that “Intensity may encompass more than time, also including the concentration that comes from low ratios, home visiting, and coherent curricula” (p. 123). She noted that these ratios were generally better on the whole than everyday ECE (including Head Start), and that the contact with parents was generally more frequent and focused than in everyday ECE: “the approaches identified as effective all increased the contact between teachers and children and gave the teachers greater knowledge about the children in their care, permitting the teachers to tailor their teaching styles to meet each child’s individual needs.”

Waldfogel (2002) cites evaluations of early interventions in France and Ireland that show some cognitive short-term gains, followed by the “wash-out” effect over the first few years of school, then a longer-term positive impact. The Irish study underlines the importance of context, including local peer culture and opportunities. The Rutland Street project began in 1969 in an area of high unemployment and poverty. It was a two-year programme, providing half-day ECE, with a cooked lunch, for 3–4-year-olds. The evaluation compared the outcomes for programme participants with a control group of others in the same neighbourhood. At the end of the two years, the participants had higher IQ scores and higher scores on measures of preschool readiness; they continued to have higher IQ scores after three years of school (though their scores did fall), but there was no difference in reading performance at age 8. However, at age 16 they were much more likely (two and three times) to take state examinations at secondary school, and just under a tenth took the leaving certificate, compared with none of the control group. There were no differences in school absenteeism or social deviance (Waldfogel, 2002; Nicaise *et al.*, 1999).

Cognitive outcomes associated with everyday ECE

Penn *et al.* (2006) reviewed nine studies that included child outcomes related to integrated care and education; these were drawn from the U.S., France, Israel, Korea, Norway, and Sweden. Their primary criteria were that the studies were clearly of ECE that was institutional, open for six hours a day, five days a week, with a formally agreed curricular framework and delivery of activities, and included analysis of outcomes. They were particularly interested in studies that provided analysis in terms of differences in attendance, as well as age, social characteristics, and health.

This review is very cautious in drawing universal conclusions from its suite of studies, and emphasises the importance of context. Thus, it notes that the four studies showing that children who had attended all-day ECE from an early age had better cognitive and socio-emotional outcomes than their peers who had stayed at home or received another kind of care, with similar outcomes for children from different home backgrounds⁵ were all in countries where the all-day ECE “was part of a universal service in which especially trained staff offered an

⁵ Leseman (2002) notes, however, that few children from very poor homes or from ethnic minorities were included in these programmes.

explicitly educational curriculum to the children. In addition, good parental leave arrangements meant that the children did not usually enter the setting before the age of one year (p. 39).

Boocock's (1995) review of research on ECE in non-U.S. countries also concluded that differences in context made a difference for ECE outcomes. She concluded that ECE benefited children and their families, particularly in countries "with a national policy of providing preschool services to all children and a tradition of ensuring the quality of those services through enforceable regulations" (p 110). The gains were usually greater for children from poor homes.

Leseman (2002) also notes the importance of context, in relation to the question of why some intervention studies targeted at disadvantaged children show clear and sizeable benefits, and others do not: "As programmes ... differ considerably in basic strategic design, structural quality, programme content and process quality, this may explain the mixed findings and point out the ways to improve efficacy" (p. 23). He cites Gilliam and Zigler's (2000) statistical meta-analysis (combining results from individual U.S. state-funded half-day preschools and then analysing as a single study) that found while overall these everyday centres showed little impact on children's outcomes, in some states the average effect size did approach the average 0.50 effect size (or half a standard deviation) reported in McKey *et al.*'s (1985) analysis of Head Start evaluations. These states had higher regulatory standards for staff training, group size, and staff: child ratios.

Leseman cites a 1998 meta-analysis⁶ he led that calculated effect sizes for 18 evaluations of centre-based preschool programmes, published between 1985 and 1996. This found:

- medium effect sizes of $d=0.41$ for cognitive performance and $d=0.49$ for verbal performance favouring experimental preschool programmes with everyday preschool or kindergarten;
- larger effect sizes, e.g. $d=0.67$ for IQ measures favouring experimental preschool programmes compared with no preschool participation;
- smaller effect sizes ($d=0.20$) favouring experimental preschool programmes (the comparative group is not given) for socio-emotional measures;
- effect sizes were stronger if children started ECE before age three, if they worked with professionals rather than paraprofessionals or parents, and if their ECE programme was developmental rather than didactic; and
- greater intensity (covering both duration and hours of attendance) was beneficial when outcomes were looked at long term—but not if outcomes were looked at short term

He cites two other meta-analyses reaching similar conclusions about the value of programme intensity long term; with one of these showing little gains from programmes that lasted for two hours or less a week.⁷

One area where there is less consistency of findings is around ECE experiences within the first year of life. Waldfogel (2002) notes that several U.S. studies find negative effects from starting ECE in the first year of life. However, she reports that these negative effects depend on the nature of the ECE experience, particularly its quality, type, and whether it was full- or part-time. Type of care can be a particularly important factor to have clear information about, since many studies of everyday experience are studies of out-of-home or non-maternal care, rather than formal ECE that is provided within policy or regulatory settings.

⁶ This is only available in Dutch, and we were therefore unable to get a more complete picture of its findings.

⁷ In Leseman's references, this study is shown as submitted for publication, but we have not been able to track it down.

Learning dispositions and social-emotional outcomes

The U.S. intervention studies have some information about social-emotional outcomes. They predate the recent and growing interest in the development of learning dispositions. Of those studies that do include social-emotional outcomes, there are mixed findings: some showing very positive outcomes; some with no effect; and a couple with short-term negative outcomes. Again, quality of ECE (and linkages between ECE and home) emerge as distinguishing features of ECE experiences with positive outcomes for children.

Anderson *et al.* (2003), noted that only the *Perry preschool* study met their criteria for inclusion in relation to this impact; effect sizes from this one study were medium and indicated positive associations with ECE experience: $d=0.38$ for assessments of social competence and $d=0.60$ on assessment of risk behaviours.

Yoshikawa (1995) covered 40 programmes for which there were comparison groups in his review of the long-term effects of early childhood programmes on social outcomes and delinquency. Eight were ECE programmes, 23 were parent-focused family support programmes, and 11 provided both ECE and family support. Eleven of these studies provided measures of antisocial behaviour. There was no difference between the programme participants and the control groups for four of the programmes; the programme participants were rated as more aggressive than the control groups at school entry for two of the ECE programmes. In one parent-focused family support programme, parents were less avoidant and angry than the control group at the end of the programme.

However, in all four of the programmes providing both ECE and family support, the long-term outcomes were positive and effect sizes medium to large for the children, in terms of parent or teacher ratings of behaviour, official delinquency, and criminal reports. The four programmes were the *Perry preschool* ($d=0.42$ overall effect size for behavioural outcomes), the *Yale child welfare project* ($d=1.13$ effect size), the *Syracuse University family development project* ($d=0.48$ effect size), and the *Houston PCDC project* (also $d=0.48$ effect size). Two of these started in the first year of the child's life; all involved ECE 4–5 days a week, some half-day, some full-day. These were quality child-centred ECE programmes, with strong theoretically based curricula, staff: child ratios of 1:3 for infants and toddlers, and 1:6 for 3–4-year-olds; staff had pre-service and in-service professional development. The programmes' home visits were regular (some weekly, some monthly).

McCartney (2004) notes “increasing evidence that hours in child care may constitute a risk factor for the development of behaviour problems, including aggression” (p. 3). This conclusion seems to be largely based on the NICHD study. McCartney observes in relation to this study's finding of increased problem behaviour at 54 months and in kindergarten (the first year of school in the U.S.) that “the effects are relatively small, that most children with extensive child care experience do not have behaviour problems, and that the direction of such effects is not clear—in other words, parents with more difficult children may enrol their children in child care for more hours” (p. 3). McCartney emphasises the need to understand why this may be occurring—since the effect was unrelated to the quality of non-maternal care—and speculates about whether large group sizes may “increase the frequency of acting out behaviours that go unnoticed, and therefore uncorrected, by caregivers” (p. 3).

The link between ECE quality and children's behaviour appears differently in Peisner-Feinberg's (2004) summary of research. She cites 13 studies (both intervention and everyday) showing “modest to moderate” links between good quality ECE and social skills at the time of ECE attendance, and two showing this in early school years. She also cites four studies that found little effect of ECE at the time, and two in early school years. The reasons for these different findings may be that the six studies showing no effect (either on social skills or cognitive) had

more limited variability in ECE quality or relatively small sample sizes, or in the outcomes measured (e.g. measuring social skills in terms of “very low-frequency behaviours such as social withdrawal (p.3)).

Love *et al.* (2003) amplify this point about how different findings reflect different contexts by contrasting findings from the NICHD study, Israel and Australia, and showing how they reflect differences in ECE quality and government regulation. These studies are included in our review.

Outcomes for parents

Evidence from interventions

There are fewer analyses of outcomes for parents, with most evidence available from intervention studies. The size of these effects is usually smaller than the size of effects for children. Karoly *et al.* (1998) found no negative outcomes for parents from the nine intervention studies included in their review. Of the six studies that had analysed changes to parenting behaviour, three showed improvements for the parents involved in a programme. Two of the four studies that had data on maternal educational attainment showed gains for mothers when the child was aged 5.

ECE and maternal employment

Labour force participation rates are generally lowest for mothers of preschool children. Childcare use allows maternal employment for this group. Reviews of ECE contribution to maternal employment related to everyday ECE have noted the importance of seeing ECE as part of a complex jigsaw determining whether mothers of preschool children will participate in the labour market. ECE affordability, accessibility, and quality play a part in employment decisions, but so too do other factors such as employment conditions, pay rates, parental leave policies, welfare benefits, taxation, and views about maternal roles (Gustafsson & Stafford, 1995; Wylie, Podmore, & Murrow, with Meagher-Lundberg, 1997). Gustafsson & Stafford report several studies showing that reducing ECE costs to parents in three countries (U.S., Sweden, and Netherlands) was more likely to increase ECE use, or a shift to higher-quality ECE, among those already using it than among those not using it. Studies included in this review also note increases in ECE use and a shift to more formal types of ECE *among current users* when ECE is made more affordable.

Two of three intervention studies included in the 1998 Karoly *et al.* review showed increased maternal employment when the children were taking part in the intervention. The authors also cite a 1992 review of 27 early intervention programmes (some home-based, some centre-based) that found increased maternal employment at the time of the programme in 10 of 11 studies that measured this; the impact was “modest” (Karoly *et al.*, 1998, p. 70, referring to Benasich, A.A., Brooks-Gunn, J., & Clewell, B.C. (1992). How do mothers benefit from early intervention programs? *Journal of Applied Developmental Psychology*, 13, pp. 311–362).

ECE costs and maternal employment

Kohen, Forer, and Hertzman (2006) note the finding from analysis of two Canadian national datasets showing that the labour force participation of this group in the late 1980s was influenced by child care costs, particularly in relation to taking full-time work. Centre-based care in this policy environment was more likely to be chosen by

mothers who worked full-time, had higher levels of maternal income, and whose youngest child was 2–3 years old, rather than an infant.

A review of more recent U.S. research on the relationship between child care subsidies targeted to low-income mothers and their labour force participation argues that employment and child care use decisions are probably made together, and that it is therefore difficult to assign causality to child care subsidies in relationship to employment. These child care subsidies seemed mostly to take the form of reduced fees, that is, they address access but not necessarily provision or quality. That said, Lawrence and Kreader (2006) conclude from the studies they reviewed that low-income mothers who use child care subsidies are more likely than their peers who do not to be in paid employment, work more hours, have more stable employment, with standard hours, and earn more. They were also more likely to return to work earlier after childbirth. These studies also found that mothers with low education levels were most likely to increase employment, as were single women. Lawrence and Kreader note that the research they cover is not experimental, and that the wide range of effect sizes found in this research is likely to reflect different approaches to modelling (including simulated subsidy use, where data on actual child care subsidy use was unavailable). They also note that different policy settings are also likely to play a role in different findings. Three experimental studies currently beginning in the U.S. should allow more testing of the direction (or simultaneity) of the relationship between child care subsidies and employment.

In our review, we have been able to include several quasi-experiments following policy changes from other countries that do indicate that improving access to affordable ECE supports maternal employment, though not necessarily immediately (suggesting that the employment/child care use decisions may not be as intertwined as Lawrence and Kreader surmise). Other 1990s U.S. studies cited by Queralt, Witte, and Griesinger (2000) also suggest that the availability of affordable and reliable ECE affects employment decisions.

Understanding how ECE outcomes can endure

In a review of 153 studies of empirical literature on skills formation, Cunha *et al.* (2005) developed a formal model of the economics of investing in human capital that describes two mechanisms: self-productivity and complementarity. These are multiplier effects which explain how “skills beget skills”. *Self-productivity* says that skills that develop in one period persist into future periods; skills are self-reinforcing. “For example, self-control and emotional security may reinforce intellectual curiosity and promote more vigorous learning of cognitive skills” (p. 5). Also “Students with greater early cognitive and non-cognitive abilities are more efficient in later learning of both cognitive and non-cognitive skills. Thus the enriched early environments of the Abecedarian, Perry and CPC programs promote greater efficiency in learning in high schools and reduce problem behaviours” (p. 65). *Complementarity* implies that early investment has to be followed up by later investment in order for the early investment to be productive. Facilitating environments have to follow facilitating environments.

This model also emphasises the role of non-cognitive skills. “Non-cognitive skills (perseverance, motivation, self-control and the like) have direct effects on wages (given schooling), schooling, teenage pregnancy, smoking, crime and achievement tests” (p. 85). Cunha *et al.* emphasise the contribution of family environments and add that the returns to investing early in the life cycle are high.

2. Children: Cognitive outcomes

“Cognitive” outcomes are the focus of much of the research on the impact of ECE. Cognitive outcomes were mainly defined as “academic knowledge” based on traditional academic subjects, or ability as measured by IQ tests or developmental quotients. Measures used were achievement tests or teacher assessments of school performance, particularly in mathematics, reading, and literacy; IQ; school readiness; grade retention; and special education placement. These outcomes are reported separately in many studies and in this chapter, but they are also linked to learning dispositions and social-emotional outcomes. Indeed, the longitudinal case studies of practice in the English *EPPE* study of over 3000 children and 141 centres found “The settings that viewed cognitive and social development [including learning dispositions] as complementary seemed to achieve the best outcomes” (Siraj-Blatchford *et al.*, 2003, p. vii).

In this and subsequent chapters we move on from our review of pre 1995 studies in Chapter 1, to examine research reports from 1995 onwards. The studies used are four U.S. intervention studies chosen because they followed children long term (the *Abecedarian* study, the *High/Scope Perry Preschool* study, the *Chicago Child-Parent Centre* study, and the *Infant Health and Development Program* study), studied general everyday ECE experiences, and studies using national survey data.

In this section, we have mapped out the size of results for cognitive outcomes, highlighted consistencies and differences across studies, and then analysed differences associated with child and ECE characteristics. Effect sizes are reported after taking account of background variables unless stated otherwise.

Mathematics

In all, 26 studiesⁱ reported on mathematics outcomes from ECE participation. Those that provided greatest insight for our research questions examined quality of ECE, types of ECE, stability, timing and duration of ECE, and characteristics of children.

Most studies comparing children who participated in ECE with those who did not, found positive gains from ECE participation for mathematics at the time of attendance and in the early years of schooling. In general, the intervention studies reported medium to large effect sizes at age 8, and the general studies reported small to medium effect sizes. All six studies measuring long-term effects of ECE participation found benefits for children continuing at least until at ages 15–16.

One study found negative impact of centre-based ECE for children from low-income families, but positive impact for children from high-income families.

Three studies found no impact of ECE on mathematics outcomes.

Table 2 Summary of evidence about effects of ECE participation for mathematics outcomes

Study type	Mathematics: Short-term	Mathematics: Long term
Intervention studies	Consistent benefits from <i>Abecedarian</i> , <i>Chicago Child–Parent Centre</i> and <i>Perry Preschool</i> programmes (small to medium effect sizes $d=0.29–0.45$) No difference in 1 study (<i>IHDP</i>), but benefits for heavier birth-weight premature children	Consistent benefits from <i>Abecedarian</i> , <i>Chicago Child–Parent Centre</i> and <i>Perry Preschool</i> programmes (small to medium effect sizes $d=0.19–0.44$)
General everyday ECE studies	Consistent benefits in 7 studies (small to medium effect sizes $d=0.18–0.43$)	Consistent benefits in 1 study, benefits from good quality ECE in <i>Competent Children</i> , <i>Competent Learners</i> study at age 14, but not 16
Studies using national survey data	Benefits in 5 studies Mixed impact in 1 study (benefits for children from high-income families, children from low-income families did less well) No impacts for children attending Head Start with peers who did not in 2 studies; no greater impact for children attending higher-quality centres compared with those attending poorer-quality centres in 1 study	Consistent benefits in 2 studies (but not significant in 1 of these—small effect size $d=0.05$)

Positive outcomes

Short-term gains

Intervention studies: Studies of the *Abecedarian*, *Chicago Child–Parent Centre* and *Perry Preschool* programmesⁱⁱ reported medium to large effect sizes at age 8 ($d=0.29–0.81$), for the full intervention versus none. The *Infant Health and Development* Programme, which did not find benefits overall, did find benefits for the heavier but not the lighter birth-weight premature children at age 8. The authors suggest the lighter birth-weight children may have needed continued support (the intervention finished at age 3), or may have included more neurologically impaired children who could not benefit from the intervention.

General studies: U.S. studies, the English *EPPE* study and Northern Ireland *EPPNI* study that followed children through from ECE programmes to the third year of schoolⁱⁱⁱ reported small to medium effect sizes ($d=0.07–0.43$), with most in the range $d=0.23–0.29$. Many of these are U.S. studies. The lowest effect sizes were in Gilliam and Zigler's (2004) summary of U.S. pre-K evaluations in the U.S. (using comparisons with national norms or comparison groups who may or may not have attended ECE), and a study of an entire kindergarten cohort in a large urban U.S. setting (Fantuzzo *et al.*, 2005), comparing those with centre-based ECE with those who had experienced informal care or no extra care. For example, in the pre-K evaluations, small effect sizes reported for South Carolina first grade and Texas 3rd grade ranged from $d=0.07$ to .09. Michigan reported an increase of 16 percent more students passing the Michigan Educational Assessment Mathematics test at fourth grade. The highest effect sizes were medium, and were found in the *EPPE* study ($d=0.43$) and Oklahoma's pre-K programme^{iv} ($d=0.38$) at school entry. In Oklahoma, some structural features of quality, i.e. teacher qualification requirements and pay rates, tend to be higher than in other states.

The EPPE study reported reducing effect sizes on early number from $d=0.43$ at school entry, to $d=0.38$ at age 6, and $d=0.2$ at age 7.

Studies using national survey data: Studies using U.S. national survey data^v reported small positive effect sizes in the first year of school ($d=0.10$ to 0.19). In Argentina, Berlinski, Galiani, and Gertler (2006) found positive impacts of pre-primary education on third grade standardised mathematics tests, following Argentina's expansion of universal pre-primary education between 1993 and 1999. They estimated one year of preschooling increased average third grade performance in mathematics (and Spanish) by 8 percent of a mean of 61.4 or by 23 percent of the standard deviation of the distribution of test scores. The Argentina preschools offered a curriculum aimed at developing personal autonomy and behavioural skills, social skills, logical and mathematics skills, and emotional skills, and average class sizes of 25 students and two shifts (i.e. 50 children in total).

Long-term gains

Six studies reported long-term gains in mathematics performance, with effect sizes generally decreasing over time. The *Competent Children, Competent Learners* study, focusing on aspects of ECE quality, found advantages of some aspects of high-quality ECE at age 14 and age 16.

Intervention studies: The *Abecedarian* project found medium effect sizes for mathematics of $d=0.45$ at age 8, $d=0.35$ at age 12, and $d=0.44$ at age 15. The *Chicago Child Parent-Centre* programme found smaller effect sizes of $d=0.32$ at third grade, $d=0.24$ at fifth grade, and $d=0.19$ at eighth grade (Karoly *et al.*, 2005). Both programmes combined parent education with good quality ECE, but the *Abecedarian* programme began in the child's first three months and the *Chicago Child Parent-Centre* programme at ages 3–4.

General studies: The *Competent Children, Competent Learners* study found modest contributions from early childhood education to age-14 and age-16 mathematics scores, with ECE quality variables and length of experience accounting for 2.5–5 percent of the variance in age-14 mathematics scores, and an ECE quality variable (ECE staff guiding the children) accounting for 4 percent of the variance in age-16 mathematics scores.

Two of the evaluations of pre-K summarised by Gilliam and Zigler (2004) measured long-term impacts. New York-EPK found significant positive impacts in mathematics at 6th grade. In Maryland there were statistically significant effects of pre-K participation on mathematics in 5th, 8th, 9th and 10th grades.

Studies using national survey data: Goodman and Sianesi, (2005), using British National Child Development Survey data found a small average gain for those who had attended ECE in mathematics tests of $d=0.08$ effect size at age 7, reducing steadily to $d=0.05$ effect size (not significant) at age 16.

Results for age-15 mathematics performance in the recent international PISA study showed students who had attended ECE for at least a year before school scored 8 points higher on average than those who had not, after taking socioeconomic background into account (OECD, 2004).

No impact

No ECE impact for mathematics was reported in three U.S. studies with children from low-income homes. Two found no gain for mathematics for children who had experienced Head Start, compared with their peers, at ages 3–4 (U.S. Dept. of Health and Human Services, 2005), and ages 12–17 (Aughinbaugh, 2001). However, it is not

clear how different the two groups were, since the non-Head Start group included some who had other ECE experience. One study comparing differences within everyday ECE experience of quality and type found that those who attended comparatively higher-quality ECE had much the same mathematics scores as those who attended lower quality (Votruba-Drzal, Coley & Chase-Lansdale, 2004). However, in this study, most of the ECE settings were minimally adequate in meeting basic developmental needs, even those that were of higher-quality.

Currie and Thomas (2000) have shown that poor school quality can undermine early gains. Another explanation for why the *Auginbaugh* study did not show long-term gains for Head Start children is that they may have gone on to attend poor quality schools with disadvantaged peers. Votruba-Drzal *et al.* suggest reasons why their findings differ from other studies are that within the normative range of child care quality available to low-income children in their communities, the sample children may need higher-quality ECE than was found in the study. Even relatively high-quality child care may not be able to make up for other environmental challenges. These children may also need consistently high-quality experience over a longer period to gain cognitively. The study did not collect data on length of ECE experience, and the authors noted other studies, e.g., the NICHD study, showing gains for cognitive performance related to ECE length. The data used was only a snapshot of children's child care experiences.

Mixed impact

One U.S. study using national survey data (Gamoran *et al.*, 1999) found that children from low-income homes who participated in centre-based care did less well on tests of mathematics, and high-income children did better, than similar children at age 6 who did not participate in this type of care, but could have been in non-maternal home-based or maternal care. Their study included only children with siblings and did not analyse centre care quality or duration. Burchinal and Nelson (2000) have summarised U.S. studies showing that children from more advantaged families tend to attend higher-quality child care than children from less advantaged families. Such selection factors could account for this study's findings. As well, a hierarchical model rather than the fixed effect model used may have been a more appropriate analysis for this data.

Differences for population groups

Gains in mathematics, from ECE participation were found for children across the board. However, there are also additional gains for children from low socioeconomic homes.

Low income: The *Competent Children, Competent Learners* study found an indication that children who had been in very low-income homes at age-5 appeared to benefit at age 14 more than most others in cognitive competencies, including mathematics, if their final ECE centre had been of the highest quality in terms of staff guidance.

In Argentina, Berlinski, Galiani, and Gertler (2006) found bigger gains for children living in poverty. While all children benefited, their gain was 1.6 points higher in mathematics at 3rd grade than the gain of children who were at the country median level of poverty. The curriculum in Argentina was designed to develop communication skills, personal autonomy and behavioural skills, logical and mathematical skills, and emotional skills.

In the U.S., implementation of a conceptually broad mathematics curriculum, involving teachers in professional development and parents having support for learning at home, was associated with benefits for all children. Benefits were greater for children from low-income families (low-income intervention versus comparison group

$d=0.931$; middle-income group versus comparison $d=0.723$). The rate of change was greater for children from low-income families than for children from middle income families. Effect sizes for change from fall to spring for the low-income group were $d>2.0$, and for the middle income group $d>1.5$.

Maternal education: The U.S. *Cost, Quality and Outcomes* study found the effect of high-quality child care for mathematics skills was greater for children whose mothers had less education than for children whose mothers had more education.

Ethnicity: The *EPPE* study reported that children from some ethnic minority groups (including Black Caribbean and Black African) made greater progress in early number concepts during preschool than white U.K. children or those for whom English was a first language, after taking account of background characteristics. These groups overall had significantly lower cognitive scores at entry to the study in language measures but not nonverbal measures. Sylva *et al.* (2004) suggest preschool provision may provide opportunity for such children to catch up.

Gender: Most studies found no gender differences in gains. However, in the *EPPE* study,^{vi} boys gained more than girls for early number concepts if they attended higher-quality centres. The home learning environment scores (measured by parent reports of activities such as reading to the child, playing with letters and numbers, painting and drawing, going to the library) were also lower than for girls, so boys may have been gaining less from home. The study found the home learning environment exerted a significant and independent influence on attainment both at age 3 and the start of primary school. The gains being made by boys from ECE participation were therefore particularly important.

Birth weight: The U.S. *Infant Health and Development* study^{vii} reported positive outcomes for the heavier birth weight intervention group during preschool attendance and to age 8 compared with a matched group that did not receive the intervention, but there were no differences in mathematics measures for the lighter birth weight intervention group. The authors suggested the lighter birth weight group may have included a higher proportion of neurologically impaired children who could not benefit from the intervention, who may have needed a more structured and professionally designed home environment, or may have needed continued support beyond the three years of the intervention.

Duration

All four studies examining the impact of length of ECE participation and one study on the intensity (hours per week) of ECE participation^{viii} found gains for mathematics from longer ECE experience. These lasted some time after the ECE experience finished.

Duration: The *Competent Children, Competent Learners* study found that the longer children had attended ECE, the higher their mathematics score at age 12. At age 14 this remained the case controlling for family income, with a significant contrast of around 15 percentage points between those who had attended for 48 months or more, and those who had not. The differences were reduced to the indicative level once maternal qualifications were taken into account. At age 16, though the trend was still evident, it was not statistically significant.

Longer duration in ECE was associated with more progress on number concepts at school entry in the *EPPE* study: The medium effect sizes increased with ECE duration. (<1 year: $d=0.460$; 1–2 years: $d=0.440$; 2–3 years: $d=0.568$; > 3 years: $d=0.631$).

One year or two years participation in ECE compared with no ECE participation was associated with development of mathematical competence just after kindergarten (first year of school in the U.S.) entry, with children attending for two years having slightly higher (not statistically significant) scores than those attending for one year in the Barnett and Lamy (2006) study of U.S. pre-K.

A Swedish study (Broberg, Wessels, Lamb and Hwang, 1997) reported higher scores for mathematical ability at age 8½ for children entering centre based care before the age of 40 months compared with those who started after 40 months.

Intensity: A U.S. randomised trial (Robin *et al.*, 2006) found children from low-income homes who had been assigned to an extended duration good quality ECE programme (8 hours for 45 weeks per year) improved by 12 standard score points on tests of mathematics skills, while children who had been assigned to participate in a 2½–3-hour programme for 41 weeks per year improved by 7 standard score points, in comparison with children cared for at home or in private care.

ECE centre peer group composition

Two studies have analysed ECE peer group composition in terms of likely advantages from socioeconomic mix, and found that higher socioeconomic mix does benefit children, over and above their own individual family characteristics. In the *EPPE* and *EPPNI* studies, children attending ECE centres with a higher proportion of children whose mothers had degrees, higher degrees, or other professional qualifications made more progress in early number concepts at school entry and age 8. The *Competent Children, Competent Learners* study reported that children whose final ECE centre served mainly middle-class families had higher scores for the cognitive competencies, including mathematics. These associations continued to be statistically significant at age 14 after taking into account family income and maternal qualification, but were not significant at age 16.

Quality

Process quality: Observed measures of the quality of experiences and interactions within the ECE setting have been found to be associated with mathematics development in three longitudinal studies, the *Competent Children, Competent Learners* study, the English *EPPE* and Northern Ireland *EPPNI* studies, and the U.S. *Cost, Quality and Child Outcomes* study.

The *Competent Children, Competent Learners* study found patterns of associations with mathematical competency scores and the following items to age 14:

- ECE staff responsiveness to children
- ECE staff guide children in the context of activities
- ECE staff ask open-ended questions
- Children can complete activities
- ECE staff join children in their play
- Provision of a print-saturated environment.

At age 16, some aspects of ECE centre quality were still having an impact over and above that of the equivalent age-5 competency, maternal qualifications, and age-5 family income: ECE staff guiding children accounted for just under 4 percent of the variation in age-16 scores.

In the *EPPE* study three caregiver interaction scales, which assess negative staff–child interactions (detachment, permissive, and punitive), showed a negative impact on early number concepts progress at the date of starting primary school. Conversely, scoring high on the “Positive relationships scale” was associated with more progress in early number.

Aspects of ECE programme focus had some association with later mathematics competency. Both the *EPPE* and *EPPNI* studies used the ECERS-E scale, designed to assess curricular provision in literacy, mathematics, science and environment, and diversity. Neither study found linkages between mathematical competence at age 6½ years and the mathematics subscale, but they found associations with other curriculum subscales. The *EPPE* study found a statistically significant association between early number concepts and high ratings on the diversity subscale, and a non-significant association with the literacy subscale. The diversity subscale is related to gender equity, multicultural education and “inclusive literacy”. The *EPPNI* study (Melhuish *et al.*, 2006) found that children who were in ECE centres rated higher on their provision of science attained better scores and made more progress in numeracy.

The *Cost, Quality and Child Outcomes* study found children in higher-quality care, with higher ratings on observed classroom practices, scored better in math skills after controlling for background variables, than those in lower-quality care. Effect sizes were small: Year 1 child care: $d=0.29$, Year 2 child care: $d=0.28$, kindergarten: $d=0.20$, 2nd grade: $d=0.29$.

Burchinal, Peisner-Feinberg *et al.* (2000) pooled data from the *Cost, Quality, and Child Outcomes* study, *North Carolina Head Start Partnership* study, and the *Public Preschool Evaluation project*. All these studies included the same measure of child care quality and family selection factors, and similar or the same measures of language and pre-academic development and social skills. In the short term, children in poor quality centres had significantly lower mathematics scores than those in high-quality (medium effect size $d=0.48$) and lower mathematics scores (not statistically significant, effect size $d=0.33$) than those in medium quality.

Structural quality: Structural aspects of staff: child ratios (more adults to children) and smaller group size were associated with enhanced mathematical abilities in a Swedish study (Broberg *et al.*, 1997) at age 8. Those in centre-based ECE did better than those in family day care.

Early *et al.* (2006) found teachers’ education (years of education, highest degree, and Bachelor’s degree versus no Bachelor’s degree) linked to gains on standardised measures of mathematics skills across the pre-K year. Children gained additional points where teachers had a Bachelor’s degree compared with less than a Bachelor’s degree. These associations were not found with language and early literacy. The authors suggested that because of a national focus in the U.S. on language and early literacy, it may be that teacher education programmes were preparing teacher trainees to work in that area, but were not specifically working with them on mathematical thinking.

In the *EPPE* study, higher levels of teacher qualifications were associated with positive aspects of adult–child interaction, which in turn benefited child outcomes, i.e. the linkage with outcomes was indirect through the association of qualifications with better quality ECE provision.

Curriculum: Starkey *et al.* (2004) examined the implementation of a conceptually broad mathematics pre-kindergarten curriculum, in which teachers undertook professional development and changed their curriculum,

and parents were offered materials and curriculum guide sheets and classes to help them support mathematics learning at home. Over the period of a year, intervention children in comparison with control children gained significantly enhanced mathematical knowledge (low-income intervention versus comparison group $d=0.931$; middle-income group versus comparison $d=0.723$).⁸

Reading and literacy

Positive impacts of ECE participation on reading and literacy were reported in 13 studies,^{ix} where small to medium effect sizes were maintained through the early years of schooling, declining over the long term. Mixed impact (neutral for one group, negative for another) was found in one study.^x No impact was found in three studies^{xi} using survey data.

Table 3 Summary of evidence of outcomes of ECE participation for literacy/reading

Study type	Literacy: Short-term	Literacy: Long term
Intervention studies	Consistent benefits in 3 studies (small to large effect sizes $d=0.34-0.89$)	Consistent benefits in 3 studies (small to medium effect sizes $d=0.17-0.44$)
Everyday ECE studies	Benefits in 8 studies, mixed impact in 1 study	Consistent benefits in 1 study (summary of 13 pre-K evaluations)
Survey studies	No significant effects in 3 studies (but positive correlation in 2)	

Short-term gains

Intervention studies: The U.S. intervention studies^{xii} reported medium to large effects for the full intervention versus no intervention. At age 8, these were 0.34 for the Chicago *Child Parent-Centre* programme and 0.89 for the *Abecedarian* programme for reading achievement.

General studies: Studies in the U.S., U.K., Sweden, and Bangladesh^{xiii} that followed children through from ECE programmes to the first and second year of school reported small to large effects, ranging from $d=0.20$ for a programme in rural Bangladesh to $f=0.68$ for Andersson's (1989) Swedish study. The large effect size in Andersson's study was at age 8 for children entering ECE between birth and age 1. The *EPPE* study found a medium effect size for language ($d=0.44$), and a smaller effect size for pre-reading ($d=0.28$) at age 6. Sammons *et al.* (2002) noted that "after controlling for the child, parent and home learning environments factors, a child with preschool experience attains on average a pre-reading score of 2.7 points higher than a child without such experiences" (p. 53). Although in the *EPPE* study, the effect sizes for reading are smaller than those for mathematics, there was less decline in effect sizes on reading tests over the first two years of school than for mathematics attainment (shift from approximately $d=0.28$ at school entry, to $d=0.23$ at age 6, to $d=0.28$ at age 7).

In their synthesis of early Head Start evaluations, Love *et al.* (2005) found overall positive impacts on language measures at age 3 (small effect sizes ranging from $d=0.09$ for centre-based programmes to $d=0.23$ for combined

⁸ A New Zealand study (Young-Loveridge, Carr, & Peters, 1995) also showed how professional development with teachers focused on mathematics contributed to enhanced mathematical experiences and resources within the ECE centres.

centre-based/home support programmes). They found significant reduction in those scoring more than 1 standard deviation below the mean on the PPVT-111 (receptive vocabulary) (small effect sizes $d=-0.05$ to $d=-0.23$).

National data: In Argentina, Berlinski, Galiani, and Gertler (2006) found positive impacts of pre-primary education on 3rd grade standardised Spanish tests, following Argentina's expansion of good quality universal pre-primary education between 1993 and 1999 (small effect size $d=0.23$).

Long-term gains

The effects of ECE participation on reading and literacy were reported for five long-term studies, with all showing positive impacts to age 14 or later.

Intervention studies: The largest effect sizes for reading were from the *Abecedarian* study ($d=0.89$ at age 8, $d=0.48$ at age 12, $d=0.44$ at age 15). The *Chicago Child Parent-Centre* programme found a medium effect size of $d=0.34$ at 3rd grade, and small effect sizes of $d=0.17$ at fifth grade and $d=0.17$ at eighth grade (Karoly *et al.*, 2005). The *High/Scope Perry Preschool* study showed the programme group compared with a control group had significantly higher scores in general literacy at age 19.

General studies: Gilliam and Zigler's (2004) summary of 13 U.S. pre-K evaluations reported that in Michigan 24 percent more pre-kindergarten participants passed the school administered reading test at 4th grade (the final level assessed). New York-EFK found impacts at 6th grade (the final level assessed). Maryland found statistically significant impacts at 5th, 8th, and 9th grade but not at 10th grade.

Mixed impact

The U.K. National Evaluation of Sure Start Local Programmes (SSLPs) found no impact on verbal abilities for more advantaged families (in a relatively disadvantaged community) from living in a SSLP community and adverse effects for the most disadvantaged families with 3-year-olds. Children of families with teen mothers, lone parents, and families with no unemployed parents had lower levels of verbal skills when living in a SSLP community than those who were in Sure Start-to-be communities. These programmes had core services of family/parent support, child and maternal health, and play and child care, and were intended to support social inclusion of very disadvantaged families. Quality and type of ECE services varied and it was not clear whether the teen families availed themselves of the services, so the impact of ECE *per se* was not separable.

No impacts

Studies using U.S., Dutch, and Canadian national survey data^{xiv} reported no significant effects of ECE participation (the U.S. study at age 6; the Canadian study at age 7; and the Dutch study at grade 4). There were weak positive relationships between ECE participation and language competencies in the analysis of Canadian and Dutch survey data, but these disappeared when background characteristics were taken into account.

Differences for population groups

Language and literacy seems to be an aspect where children who start at lower levels are particularly helped by ECE participation to catch up. Data from seven studies^{xv} examined differential effects of ECE participation for

population groups. In these studies, good quality ECE enabled ethnic minority children, children with English as an Additional Language (EAL), and children from low-income families to develop at a faster rate.

Low income: Barnett *et al.*, (2005) analysis of pre-K in five states found some evidence of a more positive effect of pre-K participation on early print awareness for children in low-income families. The overall gain for those who qualified for a free/partially subsidised school lunch was about three more items correct than for those who did not qualify. In Oklahoma and Carolina extra gains for children from low-income homes were about 8 percent more items correct. In Argentina, Berlinski, Galiani, and Gertler (2006) found bigger gains for children living in poverty (3.2 points higher in Spanish), compared with those at the median level of poverty.

Ethnicity: Burchinal, Peisner-Feinberg *et al.*'s (2000) secondary analysis of data from the *Cost, Quality and Child Outcomes* study, *North Carolina Head Start Partnership* study, and the *Public Preschool Evaluation* project found a greater positive impact of good quality of the ECE setting for language skills of “children of colour” compared with white children. Among “children of colour”, the large effect size for differences between the adjusted mean for children in poor quality and those in medium quality was $d=1.12$, and those in high-quality was $d=1.54$. Among white children, the effect sizes for differences were medium: $d=0.26$ and $d=0.48$ respectively.

The *EPPE* study also found differences related to ethnicity. Children from Black Caribbean, Black African, Black other, Indian, and mixed heritage ethnic groups made more progress on pre-reading than the White U.K. ethnic group, after controlling for SES and maternal education level. They started preschool with lower prior attainment and made significant gains during preschool. EAL children who had significantly lower scores at entry also made more progress than children whose first language was English during preschool.

Gender: The *Cost, Quality and Child Outcomes* study found (Burchinal, Roberts *et al.*, 2000) that centres that met professional recommendations regarding teacher education tended to have *girls* with more enhanced receptive language skills.

Birth weight: The *U.S. Infant Health and Development* study found positive outcomes for the heavier birth weight group in reading over the preschool years and at age 8 compared with a matched group that did not receive the intervention, but there were no differences in reading measures for the lighter birth weight intervention group.

Duration

Consistent findings in five studies^{xvi} linked longer ECE duration with reading and literacy gains. Benefits of longer duration were found in both services targeting children from low-income families and those catering for children from a wide socioeconomic range. The advantages of longer duration diminished over time.

Starting ECE before age 3 was associated with reading and literacy measures at school entry (English *EPPE* project), at 8½ years (Swedish study—Broberg, Wessels, Lamb & Hwang (1997) and at age 10 (New Zealand *Competent Children, Competent Learners* study). The overall length of ECE experience in the *Competent Children, Competent Learners* study did not make an independent contribution at age 14. These studies included children from a range of family backgrounds.

Two years' ECE experience versus one year. Two U.S. studies (Barnett & Lamy, 2006; Reynolds, 1995) of children from low-income families attending good quality ECE found some literacy measures at school entry favoured children with two years' duration. The differences between the groups at school entry did not last.

Full-time versus part-time

Findings about intensity of duration are mixed. One U.S. study, Robin *et al.* (2006), found children from low-income families in good quality extended duration programmes (8 hours for 45 weeks per year) improved 11 standard score points on vocabulary compared with children in half-day programmes (6 standard score points) at the end of first grade. In Loeb *et al.*'s (2005) U.S. study, children attending for 15 to 30, and over 30 hours, scored approximately 8 percent of a standard deviation higher on pre-reading skills than those attending for fewer than 15 hours per week.

The English *EPPE* study of everyday ECE serving children from a range of family backgrounds found no evidence that full-time provision resulted in better outcomes than part-time.

ECE centre peer group composition

The *EPPE* study found:

- Children attending centres, where there was a higher proportion of children with below average attainment, made less progress in pre-reading.
- Children attending ECE centres, where there were a higher proportion of children whose mothers had degrees, higher degrees, or other professional qualifications, made more progress in pre-reading and language. The Northern Ireland *EPPNI* study made a similar finding.

The *Competent Children, Competent Learners* study found that children whose final ECE centre served mainly middle-class families had higher cognitive scores for the cognitive competencies, including reading. These associations continued to be significant at age 14 after taking into account family income and maternal qualification, but were not significant at age 16.

Quality

Positive associations between children's literacy performance and aspects of quality ECE provision have been reported in studies in many countries, except for one U.S. study.

Process quality

In the *Competent Children, Competent Learners* study patterns of associations with reading and literacy measures and the following quality items were found to age 14:

- ECE staff responsiveness to children
- ECE staff guide children in the context of activities
- ECE staff ask open-ended questions
- ECE staff join children in their play
- Provision of a print-saturated environment.

By age 16, there were no longer statistically significant associations between these items and literacy, once the age-5 score and social characteristics had been included in the model.

Responsive and challenging adult–child relationships were also associated with pre-reading levels in the *EPPE* study, and a negative effect at school entry was found for children who had attended centres scoring highly on negative staff–child interactions (detachment, permissive, and punitive). The *EPPE* study also found a statistically significant association between pre-reading levels at school entry and high ratings on the ECERS-E literacy subscale.

The U.S. *Cost, Quality, and Child Outcomes* study (Peisner-Feinberg *et al.*, 1999) calculated effect sizes for child care quality aspects to grade two. Children attending child care with higher ratings on observed classroom practices and teacher–child closeness scored better than those in lower-quality care for receptive language ability, after controlling for background variables. The differences were between the lowest quartile on the quality measure and the highest quartile after adjusting for background variables and the other child care quality measures. Unlike the associations between receptive language ability and the classroom practices index, the association with teacher ratings of teacher–child closeness did not decline over time. Effect sizes were as follows:

- observed classroom practices: child care year 1, $d=0.60$; child care year 2, $d=0.51$; kindergarten, $d=0.30$, second grade, $d=0.14$
- teacher–child closeness: child care year 1, $d=0.30$; child care year 2, $d=0.35$; kindergarten, $d=0.17$, second grade, $d=0.33$.

A study using pooled data from the *Cost, Quality, and Child Outcomes* study, *North Carolina Head Start Partnership* study, and the *Public Preschool Evaluation* project (Burchinal, Peisner-Feinberg *et al.*, 2000) found children in poor quality centres had significantly lower reading scores than those in medium quality (medium effect size $d=0.42$) or high-quality (medium effect size $d=0.52$).

Montie, Xiang, and Schweinhart (2006) analysed data from 10 countries in the IEA Pre-primary Project (Finland, Greece, Hong Kong, Indonesia, Ireland, Italy, Poland, Spain, Thailand, and United States) to identify how process and structural characteristics of the ECE settings children attended at age 4 are related to age-7 competencies. In all countries children in ECE settings with free choice activities (teachers allow children to choose their own activities) achieved significantly higher average language scores at age 7 than their counterparts in centres where personal care and group activities predominated, and a nearly significant higher score than counterparts in centres where pre-academic activities predominated. The authors suggested free choice activities may be more interesting and engaging to the child, and the difficulty level more suitable than those that are proposed by teachers. In addition, these activities allow opportunities for children to interact verbally with other children, and for teachers to engage in relevant conversation and introduce new vocabulary.

Some findings varied across countries, and these seemed to relate to differences in countries' culture and beliefs about children:

- Increased adult–child interaction was related to better age-7 language scores in countries that have less adult-centred teaching or activities that require group responses, and poorer language scores in countries that have more adult-centred teaching or activities that require group responses. The authors suggested that in countries where child-centred teaching is typical and children are encouraged to express their views, “adult–child interaction is likely to encourage independent thought and freedom of expression, thus fostering language learning” (Montie *et al.*, 2006). Conversely where adult-centred teaching is the norm, children are expected to

listen, learn from, and obey teachers. In these situations, with increased adult–child interaction, children may have less opportunity to plan their play or solve problems.

- Increased child–child interaction was related to better age-7 language scores in countries that have fewer whole-group activities or more teachers who rank language skills among the most important, and poorer language scores in countries that have more whole-group activities or fewer teachers who rank language skills among the most important.

Votruba-Drzal *et al.*'s (2004) study of U.S. low-income families found no significant associations between child care quality and development of quantitative and reading skills. The authors suggest two reasons for their findings being different from other studies: low-income children need higher-quality ECE than was found in the study; and they may also need longer consistent experience to gain cognitively.

Structural measures of quality

Positive associations with structural measures of quality were reported in four studies.

Teacher education and ratios: Positive associations with levels of ECE teacher education were consistently found^{xvii}—generally higher levels of teacher education were associated with children's reading and language progress in the first two years of schooling. These included Montie *et al.*'s (2006) findings from the IEA Pre-primary Project in 10 countries that as the level of teacher education increased, children's age-7 language performance improved.

The NICHD Early Child Care Research Network (1999) also found linear associations between the number of recommended standards⁹ for quality (teacher training, teacher education, group size, and teacher: child ratios) met and language comprehension scores at 36 months. There was no evidence of threshold effects. Not meeting any of the quality standards was related to lower than average scores at 36 months for language comprehension, and meeting all of them with above average scores. Child outcomes were best predicted by *staff: child ratio* at 24 months and *caregiver training and education* at 36 months. These authors also noted that classes for older children were more likely to meet the standards than classes for infants and toddlers.

Burchinal, Roberts *et al.*'s (2000) study of 89 African American children attending community based child care centres (they enrolled before age 12 months) found that children in classrooms that met professional recommendations regarding *staff: child ratios* scored significantly higher across time for receptive communication with an estimated difference of 1.01 points in terms of developmental months at each age—12, 18, 24, and 36 months (effect size $d=0.34$), and higher expressive communication skills at 36 months. They also had significantly higher overall communication skills with adjusted means of 103.8 for children in classrooms with good ratios and 98.1 for children in classrooms with poor ratios (effect size $d=0.54$). These are large effect sizes given the sample in this study was small. The authors suggested this finding is consistent with the fact that scaffolded conversations are especially important for language development during early childhood.

⁹ Ratios: 1:3 at 6 and 15 months, 1:4 at 24 months, 1:7 at 36 months.

Group size: 6 at 6 and 15 months, 8 at 24 months, 14 at 36 months.

Qualifications: formal post-high training in child development, ECE, or related field at all four ages.

They also found girls (but not boys) in classes with a lead teacher who had over 14 years' education showed larger gains in receptive and expressive language over time. This may have been because girls were more likely to seek out the attention of adults and converse with them.

In the EPPE study, percentage of time qualified staff spent working with children was also related to pre-reading progress at school entry. Montie *et al.* (2006) suggested teachers with more education use more words and more complex language when communicating with children.

Group size: Montie *et al.* (2006) found that group size did not relate to children's age-7 language scores for the 10 countries studied. The NICHD study above also did not find that group size predicted child outcomes at 36 months when considered separately from other structural measures. Montie *et al.* suggested group size could be country specific, giving as an example that having a large number of children in the classroom is considered desirable in Japan because children have more opportunity to learn from one another and it reduces the demand for one-to-one interaction with teachers. This is in contrast to U.S. studies where group size is shown to be associated with positive child outcomes.

School performance, cognitive scores, and IQ

In this section, studies reporting on knowledge-based competencies of school performance, school achievement tests, grade retention, and special education placement, or overall cognitive scores and IQ are examined.

Intervention studies: The three U.S. intervention studies, *Abecedarian*, Chicago Child-Parent Centre, and *High/Scope Perry Preschool* study, reported strong positive impacts of ECE participation on cognitive competence through to school leaving age. Medium to large effect sizes were found for school performance (0.33 to 0.77), IQ (0.5 to 0.9 at school entry), fewer grade retentions (2 percent to 23 percent at age 15), and reductions in special education placements (23 percent to 48 percent).

General studies and survey data: Positive effects of ECE participation on cognitive outcomes were found in most studies, overall. No negative effects were found. The only studies reporting no impact on any of the measures were in the U.S.

Table 4 **Summary of evidence about long-term outcomes of ECE participation on children's cognitive competence for non-intervention studies**

Overall cognitive (ECE versus none)	IQ	Grade retentions	Special education placements	Highest grade, school leaving, higher level school
Consistent benefits in nine studies in Bangladesh, Sweden, U.S., Northern Ireland, and England ^{xviii}	Consistent benefits in 2 U.S., and 1 Canadian study ^{xix}	Consistently reduced grade retentions in 3 U.S. studies ^{xx}	Lower rates of special education placement in 2 U.S. studies, no difference in 1 U.S. study ^{xxi}	Benefits in 1 Uruguayan study, 1 U.S. study, 1 West Germany study ^{xxii}

Cognitive performance effect sizes close to school entry, where reported, ranged from medium ($d=0.39$) in Oklahoma's pre-K programme (Gormley *et al.*, 2005) to large ($f=1.0$) in rural Bangladesh (Aboud, 2006) where children in villages with preschools were compared with children in villages without preschools.

Love *et al.* (2005), in an evaluation of early Head Start, reported small effect sizes from a combined ECE and parent support programme of $d=0.28$ on Bayley MDI scores and $d=0.34$ on percentage of children scoring below 85 on PPVT-III when children were aged 3.

Effect sizes increased in a U.S. study (Bagnato *et al.*, 2002) following children enrolled in a high-quality early childhood initiative over the time of preschool attendance. The impact on a composite score of teacher and parent assessed developmental and behavioural outcomes increased from $-.0084$ (50th percentile) to $.8489$ (80th percentile) after 12 months.

Two studies found gains in the early years magnified as children grew older. In Andersson's (1992) Swedish study, children who entered ECE between birth and 1 year compared with home care children had significantly better teacher assessed school performance at age 8 (medium effect size $d=0.49$) and age 13 (large effect size $d=0.74$). Berlinski, Galiani, and Manacorda (2006), using Uruguayan household survey data, found significant positive effects for those with pre-primary education compared with those without on number of years schooling completed. At age 10, those with pre-primary education had 0.28 years more completed years of schooling than those without, and at age 12, 0.32 more years. By 13, these children were less likely to drop out of school, and by 16, they were 27 percentage points more likely to be in school and to have accumulated more than one year of extra education.

On the other hand, the *EPPE* study (Sammons *et al.*, 2002) found effects of ECE versus none on nonverbal reasoning and spatial awareness/reasoning were stronger at age 6 than at age 7. The authors noted that this could be accounted for by the change in the measures used in the study from standardised tests (British Ability Scales) at school entry and age 6 to national assessments at age 7; or by the "rise of the primary effect", i.e. the result of the accumulating and powerful effects of the primary school (Sylva *et al.*, 2004, p. 44).

Differences for population groups

Good quality ECE had benefits for children with learning or behavioural difficulties in two studies. Those who were at risk of these difficulties benefited significantly from good quality provision and showed further benefit when there was a mixture of children from different social backgrounds (*EPPE* study). The *EPPE* study found that more of the children who did not have ECE participation were "at risk" of special educational needs at primary school entry, and were identified by teachers as showing some form of special educational needs during the early years of schooling. Bagnato *et al.* (2002), evaluating a high-quality Early Childhood Initiative in Pittsburgh, found progress of 1.6 months of gain for every month of programme participation for children with mild developmental delays. Approximately 14 children at the start demonstrated delays that would have categorised them with a mental health diagnosis. At the end of two years, only one showed significant needs.

A second U.S. study (Booth & Kelly, 2002), where quality of setting was not assessed, found no effects of child care participation on cognitive development of children with special needs compared with home children at 30 months.

Quality

Evidence was consistent across all nine studies investigating quality of associations between good quality ECE and cognitive development.^{xxiii}

Those investigating structural features found relationships between levels of teacher education and staff: child ratios and cognitive development. The NICHD Early Child Care Research Network found linear associations between the number of recommended standards¹⁰ for quality (teacher training and teacher: adult ratios) met and child outcomes at 24 and 36 months, with higher effect sizes at 36 months.

Montie *et al.*'s (2006) analysis across findings from the IEA Pre-primary Project for 10 countries found that less time spent in whole-group activities was associated with better age-7 cognitive performance. It did not find associations with group size. This study also found that as the number and variety of materials in settings increased, children's age-7 cognitive performance improved. Increased adult-child interaction was related to better age-7 cognitive performance in countries where teachers included a lot of free choice activities, and poorer cognitive performance in countries where teachers proposed few free choice activities.

The *Cost, Quality and Child Outcomes* study (Helburn, 1995; Peisner-Feinberg *et al.*, 1999) and Smith's (1996) New Zealand study of infant child care centres found high teacher compensation was linked to higher ratings of the quality of the ECE service, which in the *Cost, Quality and Child Outcomes* study was linked to child outcomes.

Marcon (2002), in a U.S. study to compare different preschool models (child-initiated, academically directed, or a combination approach) on later school performance, found children whose preschool class had been academically directed (and so children had less choice and were not enabled to investigate and think for themselves) had significantly lower grades in year six than children whose preschool class had been child-initiated (small effect size $d=0.34$). On the other hand, those whose preschool was academically directed were retained in grade less often at end of the 5th year, perhaps because the academic model was closer to the school model.

The *EPPE* study found that integrated ECE centres that included flexible hours for child care and health and family support services, and nursery schools had higher scores on ECE quality and better cognitive outcomes than playgroups, private day nurseries, and local authority day nurseries. The integrated centres and nursery schools have a higher proportion of trained teachers than the others.

The *REPEY* study (*Researching Effective Pedagogy in the Early Years*) followed on from the *EPPI* and *EPPNI* studies. It analysed the pedagogic models and practices being applied by 12 settings classified in the *EPPE* study as having good to excellent practice in terms of the children's developmental progress in cognitive, social, or dispositional outcomes. Good outcomes in terms of cognitive, social, and dispositional outcomes for children were linked to early years settings that:

- view cognitive and social development of children as complementary and do not prioritise one over the other
- have strong leadership and long-serving staff (three years plus)

¹⁰ Ratios: 1:3 at 6 and 15 months, 1:4 at 24 months, 1:7 at 36 months.

Group size: 6 at 6 and 15 months, 8 at 24 months, 14 at 36 months.

Qualifications: formal post-high training in child development, ECE, or related field at all four ages.

- provide a strong educational focus with trained teachers working alongside and supporting less qualified staff
- provide children with a mixture of practitioner initiated group work and learning through freely chosen play
- provide adult–child interactions that involve ‘sustained shared thinking’ and open-ended questioning to extend children’s thinking
- have practitioners with good curriculum knowledge and knowledge and understanding of how young children learn
- have strong parent involvement, especially in terms of shared educational aims with parents
- provide formative feedback to children during activities and provide regular reporting and discussion with parents about their child’s progress
- ensure behaviour policies in which staff support children in rationalising and talking through their conflicts
- provide differentiated learning opportunities that meet the needs of particular individuals and groups of children (Sylva *et al.*, 2004, p. i).

Their analysis showed an association between curriculum differentiation and matching in terms of cognitive challenge, and “sustained shared thinking”. In respect to parent involvement, children had better cognitive outcomes in those settings that encouraged continuity of learning between the early years setting and home, through sharing educational aims with parents, engaging parents in regular ongoing assessment of children’s learning, and supporting parents where this support was combined with educational aims. The qualitative evidence also suggested that the better a setting did on each of these elements of pedagogic practice, the greater was the positive effect on children’s cognitive progress (Siraj-Blatchford, 2004; Siraj-Blatchford & Sylva, 2004).

Duration

Positive associations with length of ECE experience have been reported. Generally, children who have attended ECE for longer show higher cognitive performance levels,^{xxiv} provided that the ECE is good quality. Using data from the Infant Health and Development Program, Lee (2005) found that hours spent in the good quality care provided by the intervention was positively related to cognitive outcomes at age 3. For children who were not in the intervention, hours spent in care (which was likely of poor quality) was negatively related to cognitive performance.

There is some indication that longer duration may impact differentially on children from lower- and higher-income families. Loeb *et al.*’s (2005) analysis of data from a large nationally representative U.S. sample (14,162) of kindergarteners estimating the influence of different amounts of participation in preschool centres on cognitive and social-emotional outcomes found, on average, that children attending centres for 15 to 30 hours per week experienced stronger cognitive gains than those attending for less than 15 hours per week. Attendance for more than 30 hours per week did not yield additional gains on average. For children from lower-income families, additional hours (more than 30) did advance cognitive gains, but for children from higher-income families no further gains were found.

Summary

Consistent evidence from a large body of international and New Zealand evidence shows that ECE participation is positively associated with gains in mathematics and literacy, and other measures of cognitive performance such as

intelligence tests, school readiness, grade retention, and special education placement or identification as having special educational needs, after controlling for home environment and other background variables. Short-term, medium to large effect sizes on all the outcome measures were reported in U.S. intervention studies targeting children from low-income families, and combining good quality ECE with parenting support/education, and small to medium effect sizes from ECE participation were found in studies reporting on everyday ECE experiences. Many of these were general population studies. Long term, participation in high-quality ECE was linked to gains on these outcomes in most studies.

Effect sizes tended to diminish during schooling, but not in all studies. Reasons for different trajectories are complex, but students' early learning as well as subsequent schooling and other experiences have a powerful effect. It is notable that impacts endured long term.

Aspects of ECE that can affect ECE impact

Quality

Children in high-quality ECE settings experienced significantly greater cognitive gains than children in low-quality settings, with medium effect sizes reported from participation in high- compared with low-quality services in mathematics, reading/literacy, and school performance. In evaluating quality, measures of process, structure, curriculum, and relationships with parents have been used.

Positive effects of ECE participation were found in settings described as good quality in terms of adult–child interactions that are responsive, cognitively challenging, and encourage joint attention and negotiation or “sustained shared thinking”.

There is evidence that a curriculum where children can investigate and think for themselves is associated with better cognitive performance in later schooling than one that is academically oriented.

Significant associations were found between staff: child ratios, teacher qualifications and education, teacher compensation, and children's cognitive outcomes. Group size was not measured in most studies, but less time (but not small group size) spent in whole-group activities was associated with better age-7 cognitive performance in analysis of the IEA Pre-primary Project. It may be that how children are grouped within settings, rather than child-initiated overall centre size, is what counts for quality.

This clear evidence showing associations between cognitively challenging adult–child interactions and gains for children, and the association between teacher qualifications and these kinds of interactions suggests a mediated path may be through teacher qualifications (teachers drawing on knowledge and experience of pedagogy), to ways in which teachers interact with children, to child outcomes. One study (NICHD ECCRN, 2002), using structural equation modelling, found a mediated path from structural indicators of quality (teacher qualifications and staff: child ratios) through process quality to child outcomes, including cognitive competence. These authors suggest that “more caregiver training may lead to better interactions between children and adults, while lower ratios may lead to more interactions” (p. 206).

The *EPPE* study found that having strong parental involvement in terms of educational aims could help improve the home learning environment and reinforce learning between home and the ECE service.

Duration

Longer duration of ECE experience is linked with *cognitive* gains for children from a range of family socioeconomic backgrounds. Benefits of longer duration diminish over time, but may still be evident for mathematics and other schooling outcomes long term. High-quality ECE with longer duration has the strongest effects. An early starting age before age 3 is associated with gains, but there is mixed evidence about whether starting before age 2 is more advantageous than starting between age 2 and 3.

Hours per week

Full-time attendance has no benefits for *cognitive* outcomes over part-time attendance in studies of children from a range of socioeconomic backgrounds. Some U.S. studies found children from low-income homes attending good quality ECE services gained more from full-time attendance (more than 30 hours) in literacy, mathematics, and other cognitive outcomes than those with part-time attendance.

Population differences

Family income. New Zealand and international studies found gains for children from low-income/disadvantaged homes could be greater than for most other children in mathematics and literacy, if their ECE centre was of high-quality.

English as an additional language. Children for whom English is an additional language, and children from some ethnic minority groups, made greater progress on early number concepts and literacy/language measures during ECE participation than others in the English *EPPE* study. These children tended to start with lower scores on language measures (but not nonverbal) and the ECE experience helped them start to catch up with peers.

Gender. Gender differences were found in three studies:

- Boys gained more than girls on early number concepts over the time of ECE attendance in the English *EPPE* study. They also had lower home learning environment scores (measured by parent reports of activities such as playing with letters and numbers, going to the library, reading to the child, teaching songs and nursery rhymes, painting and drawing, teaching the alphabet and numbers, taking children on visits, and creating regular opportunities for them to play with their friends at school) than girls, so ECE could be more effective.
- In the U.S. *Cost, Quality and Child Outcomes* study, centres that met professional recommendations regarding teacher education tended to have girls with more enhanced receptive language skills than boys.

Socioeconomic mix of ECE centre. Children attending ECE centres with a middle class/better maternally educated mix had greater gains for mathematics, literacy, and other cognitive outcomes, both short term and long term.

3. Children: Learning dispositions and social-emotional outcomes

In this section, we focus on two outcomes: learning dispositions; and more traditional measures of (lack of) confidence, respect for others, and awareness of context, such as aggression and anxiety.

Learning dispositions and key competencies are seen as combinations of ability, inclination, and sensitivity to occasion by Perkins, Jay, and Tishman (1993) and Rychen and Salganik (2003), and in *Te Whāriki* and the new key competencies included in the draft New Zealand curriculum. These competencies include some aspects that have formerly been thought of more in terms of “behaviour” or “social-emotional” approaches, such as social skills, the ability to work with others, and perseverance and self-control. The idea of learning dispositions goes beyond this though, by focusing on the development of identities that are positive about learning, and able to support further learning, e.g. Dweck and Leggett’s (1999) work on “self-theories”, and Dweck and Leggett’s (1988) work on “mastery orientation”. Siraj Blatchford (2004) describes mastery orientation as children tending, after a setback, to “focus on effort and strategies instead of worrying that they are incompetent” (p. 11), and problem solving. Siraj-Blatchford concludes that in order to address orientations that can lead to lower outcomes, educators are required to “take an active role in planning for, supporting and developing individual children’s identities as masterful learners of a broad and balanced curriculum” (p. 11).

The term “identity” is becoming increasingly used in research that focuses on this intersection between cognitive and non-cognitive dimensions, rather than outcome, because longitudinal studies have been able to show the dynamic nature of this development. The most well known of these studies in recent times is the longitudinal work of Pollard and Filer (1996, 1999, 2000)¹¹. They concluded (i) children’s social development can be conceptualised in terms of “strategic biography”, represented by four major dimensions of strategic action; (ii) over time, characteristic patterns of strategic action and orientation to learning tend to become established. Parents, particularly mothers, played a significant role in discussing, mediating, and helping to interpret new experiences and new challenges; (iii) the strategies are also dynamic, as learners negotiate their pathways. In particular changing power relations in a setting may enhance or threaten a child’s established sense of self as a pupil; (iv) the concept of “pupil career” reflects the interplay of previous orientations and context: “it has particular consequences in terms of identity, self-confidence and learning disposition” (1999, p. 304). The children could develop new patterns of strategies or adapt familiar ones; and they drew on identities developed in the home and wider community (including early childhood experiences, informal “playgroup” for three of the children; more formal nursery school for one) in elaborating and evolving their identities as pupils (p. 301).

¹¹ Nine children were followed from their early years (age 4) to age 11 (and further follow-up is in progress). Although not about ECE services, this is a good example of research about the interface between environment and outcomes (as orientation or strategies) in the early years.

The authors found three principal components of the children's careers (p. 284): (i) *patterns of outcomes related to the learning and social contexts* of successive classrooms (together with those of the wider school and playground); (ii) *patterns of strategic action developed in coping with, and acting within, these contexts*, and (iii) the *evolving sense of self* which pupils bring to, and derive from, school, playground, and external contexts. There is a parallel here with the model of "life cycle skill formation" in the review by Cunha *et al.* (2005): orientations and dispositions build on earlier orientations and dispositions to develop an evolving sense of self, while the "investment" in this learning in successive contexts (e.g. the power relations and assessment methods) are significant influences. Statistical analysis of different trajectories of children's development in the *Competent Children, Competent Learners* longitudinal study has also shown the importance of seeing children as active in their own development, rather than simply being the effect of inputs or external forces, or reacting to their current main contexts (Wylie, with Ferral, 2005).

However, how adults perceive the outcomes of ECE can have a bearing on how children are perceived and treated within the schooling context (and thereby alter the effect of ECE experience). In a longitudinal ethnographic study, Peters (2004) followed the progress of seven case study children and their families, from the children's last months in ECE, when they were 4 years old, until the children were 8 and had been at school for three years. The author describes the transition to school as the border between different "cultures". The "dispositions, resources and demand characteristics" of the case study children interacted with features of the environment that appeared to inhibit, permit, or invite engagement. Deficit¹² approaches, assessed by a list of basic skills, were in some cases a major focus for intervention at school, overshadowing much of the child's previous experience.

Another insight into the role of learning dispositions as outcomes comes from an ethnographic study over a period of 18 months that followed the learning pathways of 16 four-year-old children from working class backgrounds, who started school in a single reception class in school in a poor inner urban neighbourhood (Brooker, 2002). Eight of the children were "Anglo" (their parents born and educated in the U.K.; eight were from Bangladeshi homes. This research was responding to the statistics showing a growing gap between the highest and lowest achieving ethnic groups in many areas in the U.K., and asked why children from poor or minority communities have poorer educational outcomes. Four learning dispositions were important for the success of the children in this first year of school: compliance (self-regulating, takes responsibility); prosociality (interacts with peers and adults, co-operates, and collaborates); independence (selects and sustains a range of activities without adult direction); and involvement (absorbed, focused, committed, and curious).

A forthcoming publication (Carr *et al.*, in preparation) will provide the findings from a three-year New Zealand research project that followed the learning trajectories of 25 children from five early childhood sites into their first year of school, with a specific focus on three domains of learning disposition: resilience; reciprocity; and imagination. It will document the transactional relationship between these three dispositional domains and three

¹² A deficit approach holds to a "notion of the developing child as incomplete, a jigsaw with parts missing". The educational focus is on what children cannot do. In contrast, the educational interest in a credit model is on learning dispositions and encouraging a view of the self as a learner. This approach to learning encourages skills and funds of knowledge that the child will need to be able to participate in a domain of learning disposition. A deficit model takes a narrower view of learning (Carr, 2001, pp. 11–12).

associated features of the learning environment in the five early childhood contexts and the children's first year classrooms.

We found 47 studies^{xxv} (some with more than one report) analysing relationships of ECE to the development of learning dispositions and social-emotional outcomes. Some of these were primarily concerned with the conditions under which negative or positive relationships were found. Positive relationships between ECE participation and these outcomes at the time of attendance or later, through school years^{xxvi} were found in 25 studies. These positive effects were generally found in settings described as good quality in terms of staffing (particularly qualified staff), teacher-child interactions and communication, and close associations developed with children's families. Some small negative effects on aggression, antisocial, and worried behaviour have been reported in 13 studies.^{xxvii} Some of these studies have analysed the impact of ECE for children with extensive out of home care experience in terms of both duration and long hours per week, usually more than 30, and compared outcomes for centres with higher and lower levels of quality. An early starting age (before age 2) and long hours in low-quality centre-based ECE were associated with negative effects.

The studies used a range of methods to measure outcomes of learning dispositions and behaviour. These include documented evidence of key competencies (e.g. narrative assessments), learning dispositions (e.g. perseverance, motivation, self-control), observations of social interactions, self-assessments by the child, and teacher and parent assessments of the child.

Learning dispositions

Learning outcomes in *Te Whāriki*, the national early childhood curriculum, are summarised as learning dispositions and working theories.

Intervention studies: The three U.S. intervention studies, *Abecedarian*, *Chicago Child Parent-Centre*, and *High/Scope Perry Preschool* all found positive impacts of ECE on a range of key competencies and learning dispositions in the short and long term. For example, the *Chicago Child-Parent Centre* study found small to medium positive effect sizes from programme participation at ages 7 and 8-9 ($d=0.44$ and 0.33). These included social adjustment in school ($d=0.33$), assertive social skills ($d=0.21$), task orientation ($d=0.21$), frustration tolerance ($d=0.22$), and peer social skills ($d=0.24$); and small effect sizes on students' perceived competence. These findings indicated that participants in the intervention programme "experienced a social advantage that persisted up to four years post-programme" (Niles *et al.*, 2006, p. 7). Long term, participants had higher social adjustment scores, and slightly lower acting out behaviours, a greater ability to tolerate frustration, less shyness/anxiety, and lower rates of emotional and behavioural disturbance placement behaviours at ages 11-13. Small effect sizes ranged from $d=-0.19$ (for acting out behaviours) to $d=0.34$ for social competency. Niles *et al.* pointed out that though effect sizes of around $d=0.20$ are "small", (e.g. for acting out behaviour), they may be practically significant to the teacher, parent, or social worker. At age 21, the programme participants had had lower rates of high school dropout, fewer juvenile arrests, and higher projected lifetime earnings than those not participating in the programme.

As Cunha *et al.* (2005) point out, skills that develop in the early years, both cognitive and non-cognitive, are self-reinforcing into the future, especially when followed up by facilitating environments in school and home. Hence,

in the Chicago Child-Parent Centre programme, those children and parents with extended programme participation from preschool through primary school second or 3rd grade (which also involved parent participation), did better than those with less extensive participation, who in turn did better than those with no programme participation. Reynolds, Ou, and Topitzes (2004) found the main mediators of effects for higher educational attainment and lower rates of juvenile arrest for the participants were “attendance in high-quality elementary schools (school support hypothesis), literacy skills in kindergarten and avoidance of grade retention (cognitive advantage hypothesis), and parent involvement in school and avoidance of child maltreatment (family support hypothesis)” (p. 1299).

Everyday ECE: The studies of everyday ECE found positive outcomes of ECE interacting with characteristics of individual children, ECE quality, home environment, and school environment.

Long-term effects of ECE participation on attitudinal competencies (curiosity, communication, perseverance, self-management, self-efficacy, and social skills) were found in the *Competent Children, Competent Learners* study linked to variables measuring the quality of the setting and the starting age in ECE. Andersson’s (1992) Swedish longitudinal study found earlier age of entry to ECE was linked to social competence at ages 8 and 13.

In the short term, three New Zealand studies, the *EPPE* study, and *EPPNI* studies in England and Northern Ireland, a Canadian study, and evaluations of integrated centres in the U.K. and Canada^{xxviii} found positive impacts on a range of outcomes, including learning orientations and dispositions.

All of these studies examined the processes and conditions under which outcomes were achieved. The *EPPE* and *EPPNI* studies each examined the impact of any preschool experience (using some similar and some different factors) versus none after controlling for child, parent, and home learning environment factors. Children with any preschool experience in the *EPPE* study were at an advantage on measures of “Independence and concentration”, “Co-operation and conformity”, and “Peer sociability” compared with those with none. Sammons *et al.* (2003) noted that these behaviours are likely to be important for successful adjustment to primary school. “Independence and concentration” was modestly associated with cognitive attainment at entry to school, providing evidence of linkage between learning dispositions and cognitive outcomes for this outcome. In the *EPPNI* study, children with any preschool experience versus none were at an advantage on “Independence and concentration”, “Sociability”, “Peer empathy”, and “Confidence”, but there were no differences between groups on “Co-operation/conformity” at the start of primary school. (The *EPPE* study reported on three factors only.) These studies were in different countries with quite large samples (*EPPE*: home children, n=304–308, preschool experience children, n=2562–2570; *EPPNI*: home children, n=150+, preschool experience children, n=685). It is unclear why the *EPPNI* study did not find significant differences on the “Co-operation/conformity” scale, since Northern Ireland services were rated as higher-quality on the ECERS-R scale, and higher rating on the ECERS-R scale is associated with this factor (Sylva *et al.*, 2004). The ECERS-R scale measures space and furnishings, personal care routines, language reasoning, activities, interaction, programme structure, parents, and staffing.

The *EPPE* study found reduced and non-significant evidence of benefits of preschool attendance versus none by the second year of schooling. The authors suggested that learning dispositions and social competence may be more influenced than cognitive outcomes by the peer group during schooling. Five studies (the three intervention studies, the New Zealand, and the Swedish study following children over time), continued to show positive gains

long term. It could be that in different countries/policy settings, there may be less consistency between ECE and school settings, and thus more likelihood of fade out.

Duration

Five studies examined associations between outcomes and starting age or length of ECE experience. These suggest that more months in ECE is advantageous for some learning dispositions outcomes. Studies found an interaction between effects of duration with quality: longer duration in good quality ECE centres was beneficial, but longer duration was not beneficial in centres rated low-quality in terms of structural features (e.g. qualifications and ratios) and adult–child interactions and communication.

Long term, Andersson's (1992) Swedish longitudinal study found earlier age of entry to ECE linked to social competence at age 8 ($d=0.32$) and 13 ($d=0.66$) in Swedish centres. (Effect sizes were not statistically significant because of the small sample size, but are indicative.) These authors took this to mean “early entry into day care tends to predict a creative, socially confident, popular, open and independent adolescent” (p. 33). In “excellent Montreal day care centres, over the time of attendance, an early age of entry into the present centre was associated with increased interest and participation (large effect size $r=0.35$), but not in low-quality centres (Hausfather *et al.*, 1997). The number of months spent in high-quality centres was also negatively associated with measures of apathy-withdrawal (large effect size $r=0.38$), but not in low-quality centres, i.e. children who had spent a similar length of time in ECE were less likely to show apathy or withdrawal if they had attended high-quality ECE. The comparisons were between children who entered day care before 12 months and those who entered later.

Length of ECE experience is not the same as starting age since some who started early had breaks in experience. Three studies indicated advantages of longer ECE experience on a range of non-cognitive and composite outcomes. In the *Competent Children, Competent Learners* study, at age 14, children who attended ECE for 48 months or more had significantly higher scores for attitudinal competencies (curiosity, perseverance, social skills with adults, and the composite competencies) than those who attended for less than 24 months. At age 16, the length of ECE experience was no longer significant after maternal qualifications and relevant age-5 competency had been accounted for. Both the *EPPE* and *EPPNI* studies showed children who spent more months (more than 36 months) in ECE had higher scores on non-cognitive outcomes (*EPPE* for “Independence and concentration” and “Peer sociability”; *EPPNI* for “Self regulation” at primary school entry). For social/behavioural outcomes in the second year of schooling, there was less evidence of the benefits of duration.

Quality

Studies found interactions between aspects of the quality of the ECE setting, other settings such as home, child characteristics, and learning dispositions, and composite competency scores.

Adult–child interactions, communication, and relationships with parents

The *Competent Children, Competent Learners* study found that children whose ECE setting was rated higher on aspects of teacher–child interaction (staff responsiveness, guidance, asking open-ended questions, and joining children in play) and opportunities for children to select from a variety of learning areas, had higher scores on attitudinal competencies when children were aged 14. Children whose centres scored lower on providing a print-saturated environment also had lower attitudinal competency scores at age 14.

At age 16, ECE staff guidance of, and responsiveness to, children had an indicative effect on social skills. Children whose final ECE centre was rated highly for staff asking open-ended questions were less likely to score highly on the measure of “social difficulties”, after age-5 competency scores and social characteristics were accounted for.

In the *EPPE* study, quality was also measured by process measures of observed quality of the ECE environment including teacher–child interactions, and by staff qualifications and ratios. In terms of the outcomes of “Independence and concentration”, “Co-operation and conformity”, “Peer sociability”, and “Antisocial/worried” behaviour:

- high ECE centre ratings on measures of social interaction and language and reasoning had positive impacts on “Co-operation and conformity”; and
- high ECE centre ratings on the positive relationships scale of the Caregiver Interaction Scale related to greater developmental gains on “Independence and concentration”, “Co-operation and conformity”, and “Peer sociability” and lower levels of “Antisocial/worried” behaviour at school entry.

Frequency of parental visits to the ECE centre and parent involvement in centre meetings showed positive associations with children’s gains in “Independence and concentration”, “Co-operation and conformity”, and “Peer sociability”, and reductions in “Antisocial/worried” behaviour. These findings make sense if the nature of parental involvement is focused on pedagogy. The *EPPE* project found that home environment measures of parents undertaking stimulating activities with their children at home were associated with developmental gains. For example, parents taking their children to the library, painting and drawing with children at home, playing with letters and numbers, and encouraging children to learn songs, poems, and nursery rhymes were all associated with gains for the child in “Independence and concentration”.

Qualifications and ratios

In the *EPPE* study, teacher qualifications mattered. Children who attended centres where staff with higher-level qualifications spent proportionately more time with children than those with lower-level qualifications had higher ratings on “Co-operation and conformity” and reductions in “Antisocial/worried” behaviour. Conversely, children in those centres where staff with lower-level qualifications spent more time with children had poorer outcomes for “Peer sociability” and “Co-operation and conformity”. The authors suggested that qualification levels may have an indirect effect on these factors through being associated with better quality of ECE provision, and perhaps through staff having better knowledge of children’s social and behavioural development (with an influence on adult–child interactions and communication).

No significant associations were found between staff: child ratios and children’s social-emotional gains. Sammons *et al.* (2003) noted that centres with less-qualified staff tended to have “more favourable” staff: child ratios, which might account for this finding. A similar lack of coherence in indicators of structural quality was also found in the *Competent Children, Competent Learners* age-5 report.¹³

¹³ The statutory ratios in England for 3–5-year-olds were 1:13 for nursery classes (sessional), nursery schools (half-day), and integrated centres (include full-day and parent involvement), and 1:8 for local authority day care (full-day), playgroup

Participation in good quality integrated ECE centres offering extended services to children and their families was shown to be associated with measures of positive attitudes and dispositions to learning, enhanced social skills and wellbeing, and reduced number of children at risk in Bertram and Pascal's (2001) U.K. evaluation of early excellence centres and with measures of social competence in Corter *et al.*'s (2006) evaluation of Toronto's First Duty sites.

Contextualised analyses

Two New Zealand studies examined the ECE contexts, pedagogy, and child characteristics that contributed to learning dispositions. These are each in a single ECE setting and the impact of ECE can be gauged through tracking factors associated with learning dispositions over time.

A study of how contexts can promote outcomes that weave together the cognitive and the non-cognitive (Ramsey *et al.*, 2006) is provided by an action research project in one New Zealand kindergarten over three years. Data showing changes in dispositions and communication competencies were documentation of children's learning over time and interviews with participants. Five action "spirals" are reported on the role of Information Communications Technology (ICT) in enhancing family participation and child outcomes consistent with *Te Whāriki*. The integrated and increased use of ICT in everyday pedagogic practice within the kindergarten added a mode of communication for children who had not yet learnt to read and write, and enhanced children's dispositions to use other modes of communication (visual, oral, and physical). Children's story-telling competence improved in complexity, coherence, and narrative continuity. The ECE experiences helped children to become more confident and to participate in learning situations. The experiences also encouraged children to take responsibility, collaborate with, and teach others. ICT enabled deeper connections to be made with families by providing a common language for families, teachers, and children to communicate. The study concludes that simply introducing new ICT will not be sufficient to make a difference; ICT use in ECE needs to be associated with changes to the distribution of power or responsibility, for example children being encouraged to take greater responsibility for learning, the engagement of the wider community (families), the establishment of new routines and a culture off "what we (regularly) do here", and other supporting artefacts (e.g. assessment approaches).

Another New Zealand study (Carr, 1997, 2000, 2001a, b) investigated the learning outcomes for a group of 4-year-olds as they worked in the construction area of a sessional early childhood setting. This study compared five activities as environments that encouraged (or discouraged) learning dispositions. Episodes of joint attention and negotiation about difficulty were associated with "friendship" or "technologist" intentions. Episodes characterised by performance goals (avoiding challenge, displaying ability) were associated with being "good", being appropriately a boy or a girl, or displaying appropriate "nearly school" intentions. Activities had become "homes" for these discourses or intentions. Of particular interest was the disposition to tackle and persist with challenge or mastery orientation. The research found that activities had also become "dispositional niches". Outcomes in activities where adults mostly provided support and approval, or tutorials, were characterised by performance goals and low challenge intentions. Outcomes in activities where adults provided collaboration and challenge but the initiative was still with the child were characterised by learning goals. These ideas about privileged or

(sessional), and private day nursery (full-day), although in reality the integrated centres tended to negotiate lower (better) ratios.

preferred discourses and dispositions connect with the notion that children are developing learning identities in the early childhood setting (Carr, 2001b).

Antisocial/worried behaviour

Belsky's analysis of research on non-maternal care suggests that early and extensive non-maternal care carries the risk of greater aggression and non-compliance during the toddler preschool and early primary school years, and of increasing the probability of insecure infant–parent attachment (Belsky, 2001). Much recent research on antisocial behaviour is in centre-based child care, which involves children spending time with peers in a wider group. Here there may be more opportunities for physical aggression to arise—and also more opportunities to resolve conflict (Borge *et al.*, 2004).

As with studies of other ECE outcomes, the studies analysed in this section indicate that the question of whether ECE versus no ECE participation is associated with negative outcomes is simplistic. Contextual factors also come into play.

ECE participation versus none

Aggressive and anxious behaviour

Two studies found ECE participation increased scores for aggressive behaviour comparing children who attended ECE with those who did not (U.S. study), or comparing greater with lesser use of ECE (Quebec study). There was some indication in the U.S. study that increased aggressive behaviour was not found in higher-quality provision. The quality of provision was not measured in the Quebec study, which also found increased anxiety scores. Another Quebec study, analysing effects of non-maternal care on trajectories of physical aggression for at-risk and not at-risk children, found non-maternal care was associated with lower levels of physical aggression for at-risk children, especially those who started before age 17 months. There was no effect on children not at-risk.

Magnuson *et al.* (2004), using U.S. survey data with a large sample, found pre-kindergarten attendance compared with parent-only care was associated with small increased teacher reports of externalising behaviour ($d=0.19$ and 0.14) and decreased self-control ($d=-0.12$ and -0.08) at school entry. However, when pre-kindergarten programmes were located in the same public schools that children attended, there were no increases in behaviour problems. The authors noted some evidence that these pre-kindergartens are of relatively high-quality; a possible explanation for the differential findings. Externalising behaviour refers to aggressive behaviour (how frequently the child fights, argues, gets angry, acts impulsively, or disturbs ongoing activities). Absolute levels of aggression were quite low, and levels of self-control quite high. Externalising behaviour was highly negatively correlated with self-control (-0.70 , $p<.01$).

Baker *et al.* (2005) reported increases in anxiety scores for 2–4-year-olds (from around 1 to 1.6) and in aggression scores (from around 1 to around 1.2), yet a decrease in hyperactivity (from around 4.2 to around 3.8), and no effect on separation anxiety following introduction of near-free ECE provision in Quebec in 1997–2000¹⁴ and

¹⁴ Space for 4-year-olds in Quebec at \$5 per day became available in 1997, for 3-year-olds in 1998, and for all children in 2000 (Friendly & Beach, 2005).

subsequent take-up of more hours of maternal employment (average increase from 13.7 to 20.1 hours). This study used a general database and was not a direct study of ECE influences. There are three possible reasons why the Baker *et al.* (2005) study was an outlier among the studies: the use of a database which does not allow analysis of effect of actual ECE experience on outcomes; possibly the specifications used for Quebec/other Canadian provinces in the difference-in-differences modelling; and low-quality of ECE in Quebec. Tougas (2002) suggests that the priority to rapidly expand places to meet demand may have overshadowed improvement of quality. Japel, Tremblay, and Côté's (2005) study of quality in 1500 daycare settings in 2000–2003, for children in the Quebec Longitudinal study of Child Development (n=2223) showed only 27 percent of these provided good or better quality; most provided adequately for health and safety, but not education. Unregulated care and for-profit care¹⁵ offered lower quality.

The Baker *et al.* (2005) study found only small effect sizes. In another Quebec study, a group of 1691 children born in Quebec in 1997–1998 were followed annually from their birth to 60 months Cote *et al.* (2007). The authors analysed effects of any regular non-maternal care (at least 10 hours per week) and age of entry on trajectories of physical aggression. Non-maternal care in this study was broader than early childhood education. It included any services provided by a person caring for the child other than the mother.¹⁶ The authors cited evidence from studies showing that maternal characteristics, especially low maternal education, are among the best predictors of high physical aggression from early childhood to adulthood. Their study found that children of low-educated mothers had significantly lower levels of risk of physical aggression if they received non-maternal care before age 17 months (large effect size $d=-0.62$), and after 17 months (medium effect size $d=-0.38$), compared with those who never received it. The authors interpreted this to mean that at-risk children are likely to have reduced exposure to family risks by attending non-maternal care. The data did not differentiate between types of non-maternal care. Non-maternal care during infancy or preschool did not have a positive or negative effect on physical aggression of children of mothers who graduated from high school (who were at less risk of physical aggression problems).

Sammons *et al.* (2003) reporting on the *EPPE* study, found no statistically significant differences between the home and preschool groups in terms of “Antisocial/worried” behaviour, but did find differences between these groups when it examined types of ECE, duration, and quality. Children in private and local authority day nurseries and children who had more than three years’ preschool experience (see below) had higher levels of antisocial/worried behaviour compared with the home group. In terms of quality, local authority day nurseries were somewhere in the middle of service types.

Duration

Negative concurrent effects of long hours in child care (including any non-maternal care, thus private non-centre care) have been found in a small number of recent studies.

¹⁵ For-profit centres have lower requirements to employ qualified staff (1/3, 50 percent of time, cf. 2/3 for centre-based settings where quality was higher, and similar for children from poor and privileged homes); this was not the case with other types of care, where children from poor homes were likely to be attending lower quality.

¹⁶ The definition did not state whether paternal care was counted as “non-maternal care”.

The large U.S. NICHD study of Early Child Care (SECC) (ECCRN, 2006) reported that children with *more hours* of child care per week were rated by their caregivers as showing moderately more behaviour problems at 36 months and 54 months ($d=0.29$ and 0.42 respectively), and more caregiver conflict with child at 54 months ($d=0.40$). In observations, children who had longer hours in child care exhibited somewhat more negative behaviour with peers at 54 months, adjusted for family and other characteristics ($d=0.30$). Care included any regular non-maternal care. More hours in care predicted at-risk but not clinical levels of problem behaviour. Hours were the mean hours per week that the child experienced between birth and assessment. On average these were: 18.2 hours per week in first 15 months; 20.1 hours per week in first 24 months; 21.6 hours per week in first 36 months; and 23.7 hours per week in first 54 months. The effects were cumulative. At 3rd grade, using comparisons of children with 10 hours per week and 30 hours per week child care, relationships between more time in centre care and externalising behaviour had decreased and was not significant (NICHD ECCRN, 2005). Children with fewer hours showed larger increases in externalising behaviour between kindergarten and grade 3. However, more hours of care were associated with poorer work habits and poorer social skills—as well as better memory—at grade 3.

Findings about the proportion of time the child was enrolled in *centre care* indicated that this type of non-maternal care had somewhat more positive effects than those found overall. It was related to more positive peer interactions at 54 months ($d=0.21$), but also to more behaviour problems at 36 months ($d=0.20$), and lower ratings of social skills at 24 months ($d=-0.28$) and 36 months ($d=-0.18$) according to the caregiver. These negative effects did not last to age 54 months.

The NICHD ECCRN study (Love *et al.*, 2003) reported that the non-maternal care provisions in the U.S. were of a narrow quality range. Studies of quantity of time in care where quality was higher found different results.

Longitudinal results from the Sydney Family Development Project (SFDP) found no relationship between quantity of care and *mother* reported internalising, externalising, and total behaviour at 30 months and 5 years. *Teacher* ratings at 6 years were of a wider range of measures. Like findings for mothers' ratings of externalising behaviour, no relationships were found between teacher ratings of teacher–child conflict and quantity or type of care. However, teacher–child conflict was associated with patterns of more unstable care over time. The change in the percentage of variation accounted for¹⁷ that was attributed to unstable care was 3.9 percent, a small to medium effect size. Ratings of social-emotional adjustment were related to stability of care (change in percentage of variation accounted for of 3.1 percent, a small to medium effect size). Children who attended formal (i.e. higher-quality in respect to equipment, space, programming, and staff qualifications) care before 30 months were rated as more outgoing and extroverted and less shy and anxious than children whose care had been unregulated (change in percentage of variation accounted for of 6.1 percent, a medium effect size). Although quantity of care was linked to teacher ratings of competence in learning (task orientation, creativity, intelligent behaviour, distractibility), regardless of care type, competence scores were highest for children who had attended formal care for fewer hours, and lowest for children receiving more hours of informal care.

Evidence from the Early Head Start project (providing good quality centre-based infant–toddler care for children from low-income families) found that more time in child care was not associated with aggressive behaviour.

¹⁷ This change is the difference in the percentage of variation accounted for by two models, identical except for the care characteristic of interest which is included in only one model.

A key difference between the NICHD ECCRN (2003b, 2006) study and the SFDP and Early Head Start studies was the higher levels of quality in the latter two studies. Love *et al.* (2003) concluded from this evidence “that quality of child care is an important factor influencing children’s development and that quality may be an important moderator of the amount of time in care, particularly when the child care contexts differ from those of the NICHD research” (p. 1031). In the SFDP study, children who had experienced less stable care were rated by teachers as having more conduct problems and less effective social skills. There was no association between social-emotional problems and quantity of care.

The studies reporting negative impacts on antisocial/aggressive behaviour of more hours in care were all studies in everyday settings reporting on impacts at the time of attendance or shortly after school entry, i.e. it was not clear if they last. Levels of quality of ECE settings are influential, with negative short-term outcomes associated with long hours in poor quality care and with less stable care.

Early starting age

In terms of length of experience, Sammons *et al.* (2003) found in the *EPPE* study that at age 3 and start of school children who had attended nurseries (with an emphasis on care rather than education) before the age of 2 had slightly higher levels of “antisocial/worried behaviour”. Only a small proportion of children showed difficulties for this outcome. When a measure of preschool quality was added, the impact of duration was reduced (although still significant). The authors also found that if children with higher antisocial behaviour at age 3 attended a high-quality setting between ages 3 and 5, their antisocial behaviour decreased, and that generally, starting preschool between the age of 2 and 3 was beneficial for children’s social skills with peers.

Likewise the *EPPNI* study found children with more group care in the first three years showed less empathy and more conduct problems, but the more months that children had attended “preschool” (an educational setting for children aged 3–5), the less conduct problems they displayed at the end of the first year of primary school. Having a leader in preschool who had a degree qualification was associated with decreased problem behaviours compared with preschools with a leader without qualifications.

Haskins (1985) and Egeland and Heister (1995), reported by Sammons *et al.* (2003, p. 59), found increased anti-social behaviour at 3–5 years associated with early day care, but also that this dissipated when children were 8 years or older. The NICHD Early Child Care Research Network (NICHD ECCRN, 2005) also found the relation between amount of care and externalising behaviour decreased and was not significant in the third grade, although some new associations were detected between hours of care linked to poorer work habits and poorer social skills.

A small Canadian study (Hausfather *et al.*, 1997) reported an early age of entry into present centre was positively associated with anger-defiance ($r=0.45$) and negatively associated with interest-participation ($r=-0.46$) for children attending low-quality ECE centres, but longer exposure to high-quality ECE had no association with anger-defiance and was positively associated with interest-participation ($r=0.35$), and the time spent in the high-quality centre was negatively correlated with the apathy/withdrawal measure ($r=-0.38$). All children attended ECE full-time. A hierarchical regression analysis suggested the following factors might constitute an additive risk for aggressive behaviour: early entry to low-quality day care; stress in parenting; male gender; and life events stressful for the child.

Campbell *et al.* (2006) showed that both levels and patterns of aggression (increasing/decreasing) were important predictors of adjustment in middle childhood. In their study using data from the NICHD study of Early Child Care and Youth Development, even quite low aggression at 24 months that was stable was a risk for some social problems at 9–12 years, while children with moderate aggression at 24 months that was reducing appeared well adjusted at follow up. Unfortunately these authors did not include ECE experience in their analysis.

Childcare can be a protective factor for children in families with high levels of risk. Borge *et al.* (2004), using data on 3431 Canadian 2–3-year-olds from the Canadian National Longitudinal Survey of Child and Youth, found aggression was significantly more likely in high-risk families looked after by their own parents than children from high-risk families in group care. They argued the effects of home care may be beneficial or risky depending on family risk factors, and more thought needs to be given to the pattern of care for high-risk families.

Quality

Love *et al.* (2003) provide findings from three settings with different mixes of quality (both structural—primarily staff: child ratio, group size, staff qualifications, and process—related to staff–child and child–child interactions and kinds of learning experiences offered) and government regulations (e.g. maximums for group size or staff: child ratio). These settings, which were different from the NICHD SECC study and from each other, were Sydney in Australia, Haifa in Israel, and Head Start programmes in the U.S.).

In the Sydney study, social-emotional adjustment and teacher–child conflict were associated with stability of care: children who had experienced more changes in care arrangements (both formal and informal non-maternal care) had lower teacher ratings for their social-emotional adjustment at age 6 than others. Formal care, in centres that had to meet regulations for employing qualified staff and for programmes, equipment, and space, was positively associated with higher ratings for competencies in learning (paying attention and interest) in comparison with informal care in people’s homes, where children who had longer hours of care had lower ratings for these competencies.

The Haifa study parallels the NICHD SECC study, but does not have quite the same confounding of quality of care with socioeconomic status, because it includes public centres that include children from both middle- and low-income homes. These centres have very poor caregiver: infant ratios of 1:8, and this ratio was found to be associated with a much higher proportion of insecure infants. The Head Start national evaluation also covers a different range of experience than the NICHD study, with children from low-income homes attending higher-quality programmes than their counterparts in the same community, or nationwide. This evaluation found positive associations with children’s cognitive and social-emotional development and their Head Start experience, and no negative associations with large quantities of early childhood education (typically attending 30 hours a week or more, all year).

Love *et al.* (2003) suggest that the reason the associations found in these three studies between quality and children’s social-emotional outcomes, in relation to length of care, were not apparent in the NICHD study was because of the smaller range of quality in the NICHD study centres.

Higher levels of quality than those in the NICHD study centres were offered in the U.S. early Head Start programme for low-income pregnant women and families with infants and toddlers. Love *et al.*’s (2005) evaluation of early Head Start reported 3-year-old programme children displayed lower aggressive behaviour and

higher engagement of their parent and sustained attention during play than controls. The strongest positive results were from an approach to service delivery that offered a mix of centre-based care and home visiting, and that implemented early in its establishment Head Start performance standards (rated on early childhood development and health services, family and community partnerships, programme design, and management).

The NICHD ECCRN (1996) found more positive caregiving for infants (aged 6 months) when group sizes and child: adult ratios were smaller, caregivers held less authoritarian beliefs about childrearing, and there were safe, clean, and stimulating physical environments.

The *EPPE* study found where the physical environment and space was better a decrease in “antisocial/worried” behaviour was shown. Higher scores for the centre’s social interaction score on the ECERS-R subscale (which emphasises staff showing respect to children, listening to what they say, and responding sympathetically), and language and reasoning on the ECERS-R scale, and Arnett’s Caregiver Interaction scale which provides measures of adult–child interaction, were associated with better social behavioural development outcomes at school entry. The study also found positive associations between a higher proportion of staff hours at a high qualification level and reductions in “anti social/worried” behaviours, but no associations with staff: child ratios *per se*. Staff: child ratios were confounded with qualifications in this study.

One study, (NICHD ECCRN, 2002), using structural equation modelling, found a mediated path from structural indicators of quality (teacher qualifications and staff: child ratios) through process quality to child outcomes, including caregiver ratings of social competence.

Closeness of teacher–child relationships was also associated with lower levels of problem behaviour as well as with higher levels of sociability in the *Cost, Quality and Child Outcomes in Child Care Centres* study (Peisner-Feinberg *et al.*, 1999). Effect sizes for centres rated high compared with centres rated low on the closeness of teacher–child relationships ranged from large ($d=-0.92$) during year 1 child care to small ($d=-0.35$) at second grade for problem behaviours, and large ($d=1.54$) during year 1 child care to medium ($d=0.41$) at second grade for social skills. There appeared not to be a threshold at which quality began to have a positive effect: any enhancement of quality had an impact. Peisner-Feinberg *et al.* (2001) found the moderating effect of quality was present for all children but stronger for children at risk.

Montes, Hightower, Brugger, and Moustafa (2005) also found that increasing the quality of centres from good to excellent was associated with a decline in low-income children’s socio-emotional risk factors.

Votruba-Drzal *et al.*’s (2004) study of ECE experience for low-income children found positive associations between early childhood education experience and children’s positive behaviour, unless the care was of low-quality. Hours in low-quality child care appeared particularly detrimental for boys’ serious externalising (e.g. acting up, interpersonal skills, and self-control in the classroom) problems, and high-quality more protective for boys’ serious externalising behaviour than for girls.

Summary

Learning dispositions

Learning outcomes in *Te Whāriki*, the national early childhood curriculum, are summarised as learning dispositions and working theories. Learning dispositions are seen as combinations of ability, inclination, and sensitivity to occasion. Learning dispositions build on earlier dispositions, are dynamic and influenced by children's participation in successive contexts, and are associated with the development of identities that are positive about learning and able to support further learning. Measures of learning dispositions are broad, and in the studies reviewed included independence, responsibility, concentration, interest, participation, resilience, curiosity, self-management, assertiveness, and social competence. Learning dispositions are a combination of cognitive and non-cognitive and are associated with success in schooling.

Positive associations between ECE participation and development of learning dispositions have been found in studies carried out in everyday ECE settings in New Zealand, England, Northern Ireland, and Canada, and intervention programmes in the U.S. Gains have been found in the short and long term, although the English *EPPE* study found no significant effect of participation by age 7. This may have been because of lack of cohesion between the schooling and ECE contexts.

Positive effects of ECE participation were found in settings described as good quality in terms of adult-child interactions that are responsive, cognitively challenging, and encourage joint attention and negotiation or "sustained shared thinking". The *EPPE* study (Siraj-Blatchford *et al.*, 2003) found excellent settings in terms of very positive social and behavioural outcomes adopted discipline/behaviour policies that involve staff in rationalising and talking through their conflicts. Studies analysing the context for outcomes that weave together the cognitive and non-cognitive also suggest greater distribution of power or responsibility to children, and engagement of families focused on pedagogical outcomes are factors supporting the development of learning dispositions and social competence. Having qualified teachers is associated with gains. Favourable staff: child ratios were not associated with gains in the *EPPE* study, but were confounded with teacher qualifications (those with qualified teachers tended to have less favourable ratios). There is some limited evidence that provision of good quality integrated ECE centres offering extended services to children and families is associated with positive learning dispositions and social-emotional outcomes.

We have reported on the NICHD ECCRN (2002) study finding of a mediated path between structural indicators of quality (teacher qualifications and staff: child ratios) through process quality to cognitive competence. A similar path was found between these indicators and caregiver ratings of social competence.

There is limited evidence about age of entry (before 12 months), with favourable gains for earlier age of entry being conditional on centres being of high-quality. Poorer outcomes are associated with long duration in low-quality ECE centres. Longer duration in ECE seemed associated with gains, but long duration was measured differently in studies (e.g. more than 48 months in the *Competent Children, Competent Learners* study, and more than 36 months in the *EPPE* study). In the *EPPE* study the effect of longer duration was stronger for academic skills than social-emotional outcomes and learning dispositions.

Antisocial/worried behaviour

Small negative effects of ECE participation on aggression, antisocial behaviour, and worried behaviour have been found in some studies at the time of ECE attendance or shortly after school entry.

A number of studies found an early starting age (before age 1 or 2) into low-quality child care was associated with higher levels of antisocial/worried behaviour at the time and at school entry. This could be tempered by subsequent high-quality ECE. Longer hours in low-quality centre care (more than 30) from an early age were associated with moderately more negative behaviour at school entry.

Consideration of the quality of the ECE experience is crucial in interpreting negative impacts. In general, children attending ECE centres where staff qualifications, programme, equipment, physical environment, and space were rated highly did not experience the same negative outcomes. Social interactions which emphasise staff showing respect to children, listening to what they say, responding sympathetically, using reasoning and talking through conflict, and closeness of teacher–child relationships are associated with better social-emotional outcomes. The moderating effect of good quality was present for all children.

4. Child health

Except for the increasing research on cortisol levels, and another study that included hearing tests, most studies of the impact of ECE on children's health rely on parent reports, sometimes at a general level. We found 11 studies^{xxix} of the relationship of ECE participation and children's health outcomes. These are all short-term outcomes, related to current ECE experience.

Positive outcomes were reported in five intervention studies, including the two that asked about dental cavities and care. Neutral outcomes were reported in six studies. Four of these were interventions, and one the Baker *et al.* (2005) study of ECE expansion in Quebec. Two of the studies that asked about injury rates found no differences; the other outcomes were home cortisol levels (comparing those who attended ECE and those who did not), and parent reports of general health, and asthma.

Negative outcomes were reported for four studies. These include higher cortisol levels for children less than 36 months (medium effect size, $r=0.25$) in a meta-analysis of seven studies (Vermeer & van IJzendoorn 2006), higher levels of ear infections in two studies (one an intervention in England, one the Baker *et al.* study, with a small effect size of $d=0.05$), higher nose/throat infection levels (a small effect size of $d=0.013$), and fewer in excellent health (a small effect size of $d=-0.05$) (the Baker *et al.* study).

Overall, the picture from research to date of health outcomes for children from ECE experience is not solid. There is a suggestion that children may catch more infections (which makes sense); and that programmes that include health support may improve health outcomes. But there is no longitudinal research on whether the impacts from ECE experience are enduring.

Research on cortisol levels is interesting: on the one hand, there is some indication that young children attending all-day care may experience higher levels; other studies indicate that this pattern is less evident in high-quality centres, or that ECE experiences can decrease cortisol levels for children where there is some parental stress or extremes of emotional expression. There are no longitudinal studies of the effects of higher cortisol levels, and Vermeer and van IJzendoorn's review suggests that the relevant studies indicate that there are no longitudinal effects.

5. Parenting and life course outcomes

Studies of parent outcomes from ECE are rare. There is some descriptive information from parent surveys of their views on gains; and there are a few studies that have compared parent groups between programmes with different levels of parent involvement/support in terms of the home learning environment, parent–child interactions, and parent attitudes and views. Those studies that reported findings on parent outcomes were mainly in ECE centres that made parent communication and support a special focus, alongside provision of ECE. Statistical analysis appears to be available only for the outcome of parental employment, and for longitudinal intervention studies.

Parenting outcomes in the studies found for this review include improvements in interactions with the child, home environment and help for the child to learn at home, father involvement, and parental understanding/knowledge of child learning, development, and behaviour.

Parent life course outcomes were education and training, economic self sufficiency, and employment. Yoshikawa (1995) terms these “life course outcomes” because they could be expected to influence family socioeconomic status. We have also included social support, cultural connectedness, community participation, confidence/self-esteem, and family functioning outcomes under this category since these relate to adult and family wellbeing. Incidences of abuse and neglect, for example, are associated with families lacking mutually supportive relationships and social support (Jack & Jordan, 1999).

A somewhat wider range of parenting and life course outcomes was measured in the family support programmes that were included in Yoshikawa’s (1995) review of early childhood education and family support programmes associated with long-term effects on social outcomes and delinquency. These family support programmes were designed mainly to serve adults and are not included here because they did not have an ECE basis.

Parenting

In all, fourteen studies^{xxx} (some with more than one report) reported parenting outcomes. All, except one (the National Evaluation of Sure Start), were positive. The national evaluation of the U.K.’s Sure Start Local Programmes (SSLPs) which compared families in SSLPs with families in Sure Start-to-be communities (National Evaluation of Sure Start Team, 2005a) was the only study to find some positive and some neutral impacts, and no benefits for measures of supportive parenting. A key flaw with this evaluation in relation to the research questions for this review is, that although parents were living in communities where they could access a range of family and child services, it is not known whether they were in fact accessing them.

These 14 studies also examined aspects of service operation or ways of working with families that contributed to parenting outcomes:

- Two compared integrated programmes (providing ECE services consolidated with family support, health, and advocacy services) with nonintegrated programmes (in Toronto and U.K.).^{xxxi}

- Four were in parent-led ECE centres (in New Zealand and France)^{xxxii} where parents took responsibility or worked with staff to implement the curriculum and parenting skills were emphasised.
- Five were in teacher-led services in Australia, England, New Zealand, and Canada analysing ways teachers work with parents.^{xxxiii}
- One compared responses of parents in preschool groups in England with high levels of parent involvement with parents in preschool groups with low levels of parent involvement;^{xxxiv} the longitudinal *Competent Children, Competent Learners* study^{xxxv} reported parent views of benefits of parent involvement in their child's ECE centre.
- One was in an intensive programme. The evaluation of 17 *Early Head Start* programmes for low-income families with infants and toddlers compared participants in these programmes with controls on parent-child interactions and parent self-report.^{xxxvi}

Integrated ECE centres, parent-led centres, and the intensive *Early Head Start* programme were more likely to have a range of parenting goals and to gather outcome data across the range. Teacher-led centres were more likely to trial specific approaches to working with parents/whānau, such as engaging parents in curriculum, assessment, and planning, involving fathers, and book reading practices, and to measure the specific impact of these approaches, or generally assess the impact of parent involvement in the ECE programme on parenting.

Table 5 summarises parenting outcomes from these 14 studies.

Table 5 Summary of evidence of impacts of ECE on parenting outcomes

Outcome	Integrated ECE centres and intervention programme (3 studies)	Parent/whānau-led ECE centres (4 studies)	Teacher-led centres working with parents (5 studies)	Centres analysing parent involvement in education programme (2 studies)
Interactions with child	<p>Of 3 studies:</p> <p>2 positive (E>C* parent–child interactions—supportive of learning and development, reading daily, less smacking; E>C for help child learn at home)</p> <p>1 mixed (E>C* for non-teen mothers of 3-year-olds for less slapping, scolding, physical restraint, and less negative parenting, but no impact for teen mothers or mothers of 9-month-olds; no impact on supportive parenting for both groups; E>C for less household chaos for mothers of 9-month-olds but not mothers of 3-year-olds)</p>	<p>Of 4 studies:</p> <p>4 positive for parents supporting and encouraging learning, communication skills, positive behaviour management</p>	<p>Of 5 studies:</p> <p>5 positive (e.g. greater acceptance of child behaviour, more frequent and appropriate book reading and other practices)</p>	<p>Of 1 study:</p> <p>1 positive (increased ability to help children learn, better relationships with children)</p>
Father involvement	<p>Of 1 study:</p> <p>1 mixed (E>C* for involving fathers in families at top end of low-income families)</p>		<p>Of 1 study:</p> <p>1 case study centre that worked on involving fathers positive in fathers feeling more valued, comfortable, participating more in the ECE centre, supported in parenting</p>	
Understanding and knowledge of child learning and behaviour		<p>Of 3 studies:</p> <p>3 positive for understanding child development and learning, undertaking relevant courses</p>	<p>Of 2 studies:</p> <p>2 positive for centres that involved parents in assessment, planning, and explaining curriculum</p>	<p>Of 2 studies:</p> <p>2 positive. Parent involvement linked to better understanding of programme, greater interest and knowledge of child development</p>
Communication with teacher about child	<p>Of 1 measured:</p> <p>1 positive (E>C* for talking to teacher)</p>		<p>Of 2 studies:</p> <p>2 positive for more communication with teacher about the child</p>	

* E = the experimental group, C = comparison group

Only some studies gave sizes for these impacts on parenting. These were:

- Parents in Toronto integrated ECE settings with a range of family support programmes had average ratings (on a 5-point scale) of 4.4 and 4.3 on “more likely to talk to the teacher” and “help the child at home” out of 5 compared with 4.2 and 4.0 in kindergarten only, and 4.1 and 3.9 for parents in kindergarten with one family support programme (Corter *et al.*, 2006).
- *Early Head Start* parents (with babies and toddlers) in programmes offering child development services usually in centre-based child care, with parenting education and home visits, were more supportive of their child during play ($d=0.27$), more likely to read to their child daily ($d=0.46$), and smacked less ($d=0.26$) than controls (Love *et al.*, 2005).
- Sixty-two to 100 percent of parents in the four parent-led centre studies reported learning that supported parenting (Mitchell *et al.*, 2004; Mitchell, Royal, Tangaere, 2006b; Powell, 2006; Tijus *et al.*, 1997).
- Nineteen to 36 percent of parents in teacher-led services reported better understanding of their child’s learning and development through ECE centre involvement (Elias *et al.*, 2006; McNaughton *et al.*, 1996; Mitchell with Haggerty *et al.*, 2006; Pagani *et al.*, 2006).
- Amount of parent–child reading time doubled from 38 to 89 minutes per week in a parent–child book reading programme in a teacher-led centre (Pagani *et al.*, 2006).

In two studies, parents who had been involved in assessment, planning, and evaluation reported greater understanding of learning processes, the ECE curriculum, and/or communication with teachers about home activities. This is consistent with the benefits of including families and whānau in assessment described with exemplars in *Kei Tua o te Pae. Assessment for Learning: Early childhood exemplars* (Ministry of Education, 2004).

Work with parents that focuses on pedagogical aims can be a very powerful role for ECE centres and links to gains for children. The *EPPE* study found that settings that engaged parents in regular ongoing assessment of children’s learning supported parents to engage more in complementary activities at home. The project found that higher home learning environment scores were associated with higher cognitive development scores, increased co-operation/conformity, peer sociability and confidence, and lower antisocial and worried behaviour scores.

Differences in population groups

Overall, parenting gains were found in every study, but only two analysed differences for population groups (National Evaluation of Sure Start Team, 2005b; Pagani *et al.*, 2006).

The national evaluation of the SSLPs found that teen mothers, the most disadvantaged group in their study, did not gain from being in an SSLP community (which offered accessible family/parent support services, child and maternal health services, and play and child care). For teen mothers, there was no positive impact on maternal acceptance of the child’s behaviour (evidenced by avoidance of slapping, scolding, physical restraint) and on reducing negative parenting (when child aged 36 months), as was experienced by non teen mothers. As well, father involvement improved only for the middle-income group.

The SSLP evaluation team suggests several reasons for these differences in outcomes:

- relatively more advantaged families were found to use more services (and so reap more benefits);

- possible adverse reaction by most disadvantaged families to home visiting (this was a core service in most SSLPs); and
- SSLP staff may prefer working with the more co-operative groups, and spend more time delivering services to them.

Pagani *et al.* (2006) found that when Canadian teachers offered a wider range of ways to communicate with parents, parents of linguistic minority children, whose children were showing less improvement in verbal skills, were more likely to take these up than other parents. Some other studies have shown value in adapting ways of communication in order to engage with specific groups of families. In England, Whalley and the Pen Green Centre Team (2001) have illustrated successful ways of working with “hard to reach” families. The changes made by teachers in a New Zealand ECE centre for children of teenage mothers (Mitchell with Haggerty *et al.*, 2006) also improved their communication with mothers about children’s learning.

Scope of programme

Centres that combine ECE and family support (integrated ECE centres) have a wider range of goals and therefore wider potential impact than those that provide ECE only. Gains for parents in ECE-only centres tend to relate to the specific area of ECE practice focus. This finding is consistent with Yoshikawa’s (1995) review of the impact of different types of ECE programmes:

. . . only combination early childhood education/family support programs affected a broad range of outcomes for both children and parents. . . . Six of 8 combination programs which sought to measure parenting benefits found positive effects, and all 4 of those which sought to measure maternal life course outcomes found benefits.

It may be that parents saw integrated centres as offering opportunities for themselves as well as for their children. Although parental goals for children were more important than the goals they had for themselves, 40 to 60 percent of parents in each of the five integrated centre sites in Toronto (Corter *et al.*, 2006) had parenting education goals for themselves when they first joined.

Parent/whānau-led centres in New Zealand also have goals that are wider than children’s early education. “Parents using these services emphasised the importance of their own involvement in, or gain from, the service” (Mitchell, Royal Tangaere *et al.*, 2006, p. 58). The four studies in parent-led centres found that parents reported gains for parenting outcomes. In New Zealand, these were greatest in playcentres, which aim to provide adult education as well as early childhood education, and offers support for adults to learn.

Quality

Five studies^{xxxvii} compared services that made greater gains on parenting outcomes with services where gains were less strong, or there were no gains. These highlighted factors contributing to positive outcomes for parenting: parents participating in the ECE centre programme and in education opportunities for themselves; good quality services offered for children and parents; and services offering an empowering or partnership approach.

Mitchell, Royal Tangaere *et al.* (2006) found parent participation in the education programme and in adult education courses, and leadership for adult learning, were associated with greater gains for parenting in parent/whānau-led centres in New Zealand.

The English *EPPE* case studies of effective practice (Siraj-Blatchford *et al.*, 2003) found that excellent ECE settings shared child-related information between parents and staff, and parents were often involved in decision making about the education programme. In disadvantaged areas, staff offered advice on how parents could complement the educational aims within the home. In addition, the quality of the home learning environment scores rated by the activities parents do with the child at home (reading to child, library visits, child paints/draws, parent teaches letters/numbers, alphabet, songs, and nursery rhymes) were found to be more important than parents' socioeconomic status and levels of education in relation to child outcomes. "In other words, *EPPE* found that it is what parents did that is more important than who they were" (Melhuish, E., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggart, B., 2001). These ECE centres that help enhance parenting are likely to impact also on child outcomes through the home learning environment.

The U.K. National Evaluation of SSLPs (2005b), which examined links between aspects of SSLP implementation and the level of change in child and parenting outcomes, found in general that tackling the range of disadvantages associated with child poverty in an integrated way was more likely to produce better child and parenting outcomes. Specific additional findings for parenting outcomes were as follows:

- For families with a 9-month-old:
 - more empowerment¹⁸ by SSLPs was related to more maternal acceptance of the child's behaviour¹⁹.
- For families with a 3-year-old:
 - stronger ethos and overall scores on 18 ratings of what was implemented (service quantity, service delivery, identification of users, reach, reach strategies, service innovation, and service flexibility), processes of implementation (partnership composition, partnership functioning, leadership, multi-agency working, access to services, evaluation use, and staff turnover), and holistic aspects of implementation (vision, communications, power, ethos) were related to more maternal acceptance of child's behaviour.
- More empowerment was related to more stimulating home environments.
- Having more inherited (and established) range of parent-focused services was related to less negative parenting.
- Having more child-focused services that were improved by the SSLPs was related to more maternal acceptance of child's behaviour.
- Having a greater proportion of staff who were health-related within an integrated package of services (broader than ECE) was associated with more maternal acceptance of child's behaviour.

Love *et al.*'s (2005) evaluation of *Early Head Start* comparing 1,513 *Early Head Start* families with 1488 families in a control group, found the strongest impacts on positive parenting were for programmes offering a mix of centre-based and home-visiting provision and implementing Head Start standards early. These standards covered

¹⁸ Empowerment referred to specific procedures, e.g. users on the board, community volunteers, training for volunteers, a balance of voluntary and paid staff, built-in features to develop local people's involvement, clearly defined exit strategies for users, and services that included self-help groups or other services run by users.

¹⁹ Maternal acceptance was rated through observation of whether or not parent displayed scolding, physical restraint, and slapping/spanking.

the quality of early childhood development and health services, family and community partnerships, programme design, and management.

Yoshikawa (1995) found that effective programmes that had the broadest range of positive effects for children and parents provided good quality ECE as well as support to adults.

Duration and timing

None of the studies analysed outcomes in relation to different lengths of time that individuals participated. The integrated and parent/whānau-led centres, which achieved positive results over a range of parenting outcomes, provided for children from birth to school entry. *Early Head Start* provided ECE and parenting services from birth to age 3, and the Sure Start Local Programmes were working with families of children from before birth. Yoshikawa's (1995) review suggested that because prenatal and early infancy periods may be a time of heightened stress for parents, family support interventions may be especially beneficial.

Parental life course outcomes

Education and training

Six studies reported positive education and training outcomes for parents. Three were in New Zealand parent/whānau-led centres,^{xxxviii} one was in an integrated centre in a long-term intervention, the *Abecedarian* study,^{xxxix} and two compared centres with differing levels of parent involvement (the *Competent Children*, *Competent Learners* study and an English preschool group study).^{xl}

Intervention study: The *Abecedarian* study reported increasing advantages over time in levels of maternal education for programme group parents compared with control group parents, who were comparable on levels of education pre intervention. Programme mothers had on average one more year of education than controls when their child was 54 months. By the time their child was 15, programme group mothers were significantly more likely to have post high school educational attainment (80 percent) compared with the control group (28 percent).

General studies: Short-term, parents reported gaining skills and knowledge through participation in education courses provided by the ECE centre (parent/whānau-led centres) and involvement in the ECE service (both those in teacher-led and parent/whānau-led centres reported gains). Sixty to 73 percent of parents in parent/whānau-led centres reported learning about organisation and management, and facilitation, as well as learning for parenting through course participation and involvement in the ECE programme and running the centre. In a variety of ECE centres in the *Competent Children*, *Competent Learners* study, 20 percent of parents reported improving their own skills through involvement in their current ECE centre when children were age 4, compared with six percent in their first ECE. Involvement was through a variety of ways, e.g. as a committee member, in the education programme, fundraising, working bees, and resource development.

The English preschool group study (McGivney, 1997) found differences related to subgroups: those parents who had left school at age 15 were more likely to attach importance to personal skills and to gaining qualifications from learning through ECE participation than those who had left later. Possibly this latter group already had qualifications. The former group reported greater gains: in self-confidence and enhanced communication skills,

social skills, practical skills; and wider aspirations and motivation to undertake learning activities. This study did not provide effect sizes.

Social networks, cultural connections, and community participation

Five studies (not the *Abecedarian* study) provided evidence of parents forming social networks, making cultural connections, and participating in community through their ECE participation. These effects appeared to be stronger in parent/whānau-led centres where 71 to 98 percent reported making friends, compared with 41 percent in a variety of ECE centres in the *Competent Children, Competent Learners* study.

Parents in rural centres in a New Zealand playcentre study and the English preschool group study^{xlii} were more likely to report social support as a gain than parents in urban playcentres and preschool groups.

In New Zealand, kōhanga reo, community language playgroups, and Pasifika ECE centres contributed to parental language learning and cultural connections. Twenty-two to 67 percent of parents from these centres reported such gains (Mitchell, Royal Tangaere *et al.*, 2006).

Confidence and self-esteem

Two New Zealand playcentre studies and the English preschool group study^{xliii} reported enhanced personal confidence and self-esteem as gains from ECE participation.

Parents responding to a survey in Powell's (2006) playcentre study reported increased personal knowledge and confidence in assuming playcentre roles (88 percent), in themselves and their abilities (79 percent), and interactions with other adults (75 percent).

The English preschool group study reported that those who left school at 16 were most likely to report increases in self-confidence and enhanced communication skills, social skills, and practical skills, and wider aspirations to undertake learning.

The national evaluation of SSLPs found no benefit for maternal wellbeing in mothers being in an SSLP community compared with a Sure Start-to-be community.

Family functioning

Two studies are useful in providing insight into how ECE participation could support family functioning. Duncan, Bowden, and Smith (2005) studied three ECE centres in low-income New Zealand communities. All the centres in this study met criteria for being of high-quality on measures of quality and according to external review. Parents identified a range of stress factors associated with finances, work pressures, health issues, family dynamics, and isolation. ECE centres were able to support family resiliency through helping families to help themselves, providing a protective environment that was neutral and valued by parents, and offering families access to information, social resources, support personnel, and encouragement. These roles were harder to enact when ratios or group size were unfavourable and teachers were too busy working with large groups of children to engage with families. Flexibility of hours, a private space for adults to talk, mixed age groupings of children where parents could bring more than one child, and stable staffing were regarded as supportive conditions. Most important were the interactions between teachers and families which needed to be non-judgemental and support family strengths.

In their evaluation of Early Head Start's national infant-toddler programme, Love *et al.* (2004) found favourable impacts of participation on parenting-related stress and negative feelings and on family conflict, but these did not persist a year later. (Early Head Start families were compared with controls.) There were more and larger impacts in a mixed approach where centre-based education was combined with home-based services, compared with impacts from one or other service on its own.

Quality

Parent life course outcomes were associated with parent participation within the ECE centre community, and in formal learning opportunities, involvement in the education programme, and taking up positions of responsibility within the centre. Parent/whānau-led centres and integrated centres seemed to offer wider opportunities for these types of participation.

Mitchell, Royal Tangaere *et al.* (2006) compared parent/whānau-led centres that were rated more highly in providing parents with mutually supportive networks with those that were rated less highly. Those that were rated more highly made sure there was comfortable provision for adults as well as children, and shared leadership responsibilities. They offered opportunity for parents to participate regularly and were mainly sessional centres.

In language immersion centres, cultural connectedness was enhanced through parents participating in the centre with others from their own culture. Language learning was supported through parents participating in the education programme alongside fluent speakers or taking part in language education courses.

Duration and timing

Powell's (2006) playcentre study found parents who had been in playcentre for more than five years were more likely to have learned about teaching approaches, and organisation and management skills than those with less than five years' experience. The study did not report percentage differences.

Summary

Parenting

Parenting outcomes associated with participation in ECE services were improved interactions with the child, including greater acceptance of the child's behaviour and positive parenting, activities to help the child learn at home, father involvement in the ECE setting and in parenting, and parental knowledge of child learning, development, and behaviour.

Parenting outcomes were stronger in some contexts and were linked to good operational standards. The more effective services for parenting were rated as good quality for early childhood education and other services offered, worked in an "empowering" or partnership approach with families and communities, and had effective leadership. Integrated ECE centres that provided ECE services consolidated with family support, health, and advocacy services, and parent-led centres, where parents participated regularly in the education programme and undertook training courses, were likely to have positive associations with a wide range of parenting outcomes. In all service types, involving parents in assessment and curriculum, and sharing educational aims, was associated

with greater parental understanding of learning processes and could positively impact on home learning activities. These services tailored ways of communicating about learning to the interests and understanding of parents.

There was support for Yoshikawa's (1995) review finding that family support interventions may be especially beneficial during prenatal and early infancy periods when parental stress may be high. Integrated and parent-led services which combine good quality ECE with family support/ parent learning opportunities can offer social and practical support at that time.

ECE services that help enhance parenting are likely to impact also on child outcomes through the home learning environment.

Parental life course outcomes

Gains for parents were reported as:

- learning and undertaking study through the ECE service for a qualification;
- making social networks, community, and cultural connections;
- increasing confidence and self-esteem; and
- favourable impacts on parenting-related stress and family functioning.

These parent life course outcomes were associated with parent participation in the ECE community, in the education programme, and formal learning opportunities, and parents taking up positions of responsibility within the ECE centre. Parent/whānau-led centres and integrated centres seemed to offer wider opportunities for these outcomes.

6. Maternal employment

We found 12 studies analysing the impact of ECE on maternal employment for mothers with preschool children. All of these focused on the cost of ECE for parents, with some also looking at the expansion of ECE. All found that decreasing ECE costs for parents encouraged maternal employment.

Four recent studies use policy changes as “natural experiments” and aimed to isolate the effects on maternal employment of two-pronged policies that both increased ECE supply and reduced its costs (for Quebec: Baker *et al.*, 2005, & Lefebvre and Merrigan, 2005; Argentina: Berlinski & Galiani, 2005; Israel: Schlosser, 2005). These policy changes contributed to increased maternal employment, within a range of 7–14 percent. The degree of expansion of maternal employment, and of the number of ECE places made available, matched each other most closely in Israel; in Argentina, employment increased at about 50–75 percent of the rate of expansion of ECE places, and in Quebec, at about a third of the rate of ECE expansion.

Hours of work also increased in Quebec and Argentina; they were not included in the Israeli study. The estimate of increased hours varies: in Quebec, up 30 percent in the Baker *et al.* study focused on two-parent families, but only 14 percent in the Lefebvre and Merrigan study focused on all families; in Argentina, an additional 10 percent, on an average of 32 hours a week (for all families).

Where one kind of ECE only is expanded, that may influence employment decisions: in the Quebec setting, which subsidised full daycare, it was full-time maternal employment that increased.

The evaluation of 17 Early Head Start programmes (Love *et al.*, 2001, 2002) found that these two-generation intervention programmes for low-income families with infants and toddlers had small effect sizes of $d=0.09$ for being in employment when children were aged 3 compared to a (randomly assigned) control group.

The other main approach to analysing the impact of ECE costs, and policies affecting these costs, has come mainly from economic modelling studies using U.S. administrative or census datasets on employment, welfare, and child care subsidy receipt, and other data-sets which provide information about the local or regional setting, e.g. average child care costs, unemployment rates, and working family tax credit levels. Most analyses by economists estimate probabilities of being employed or on welfare in relation to changes in child care costs or subsidies. Some of these studies use actual child care costs; others use average costs. This difference in approaches, and what is specified in models, makes for a somewhat larger range of estimation of effects than “natural experiments” find.

For example, Queralt *et al.* (2000) estimate that an increase in child care subsidy for welfare recipients in Florida will increase the likelihood of their being employed by 9 percent if they face few other barriers. Lemke, Witte, Queralt, and Witt (2000), comparing the likelihood of employment with taking up education or training in Massachusetts, estimate the probability at 3.6 percent (and find a greater likelihood where mothers are living in an area with stable ECE centres). Baum (2002), using a national sample, estimates a 30 percent child care subsidy for low-income mothers would increase employment after the child’s first year from 41 percent to 49.5 percent, a 15 percent increase, and no increase for non low-income mothers. Connelly and Kimmel (2003) find that welfare

mothers would increase their employment by 26 percent if their child care costs were reduced by 50 percent, but only by 4.3 percent if the costs were reduced by 10 percent. In California, if the subsidy was 27 percent of costs, 49 percent of mothers on welfare (with children aged up to 14) would be engaged in labour market activity (cf. 21 percent if they did not receive a subsidy), an increase of 28 percent. A comparison of working poor families in Georgia found that mothers with a child care subsidy were more likely to be employed than those on the waiting list for the subsidy (98 percent cf. 80 percent) (Brooks, F., Risler, E., Hamilton, C., & Nackerud, L., 2002). Several of the studies note that the effect of child care subsidies on maternal employment is also dependent on how accessible both the subsidy and ECE are, since usually demand exceeds availability for both.

Overall, from these studies of the relation of ECE costs to low-income maternal employment, one could conclude that decreasing ECE costs for low-income parents does contribute to increased maternal employment—as one factor among others; and that the decrease in cost has to be sizeable to make a marked difference to employment. ECE availability is another factor in employment decisions, as are maternal characteristics, e.g. when looking at outcomes for low-income women, it may be easier for those with previous work experience or higher education levels to gain employment.

7. Economic returns from ECE

This review has focused on ECE outcomes for participating children and their parents. A third party interested in ECE outcomes is government. In this section, we describe the main findings of studies of economic returns from ECE for children, parents and government. We used Penn *et al.*'s (2006) definition of economic returns as referring to

. . . the outcomes for children (and for mothers of participants) to which a cost has been assigned, including long-term social integration or mental or physical health, rates of incarceration, remedial education, teenage pregnancy rates, employment and earnings (p. 1).

Cost benefit analysis was the main tool used to determine economic returns from ECE in the studies that we reviewed. Masse and Barnett (2003) defined cost-benefit analysis in this way:

As informed by economic theory, our perspective is that education is both a social good that confers immediate benefits and an investment good that confers personal and social benefits well into the future (Becker, 1964; Haveman & Wolfe, 1984). Benefit-cost analysis involves estimating the monetary values of streams of cost and benefits in order to measure the program's net value as a social investment (p. 6).

This requires a detailed estimation of programme costs and identification and estimation of the value of benefits or effects. Meadows (2001) set out the seven steps involved in cost benefit analyses:

- Measure the costs;
- Measure the effects;
- Estimate the monetary value of the effects;
- Adjust for the effects of inflation by placing all costs and benefits in terms of constant values;
- Discount future costs and benefits to take account of the opportunity costs of the use of the original resources;
- Identify the distribution of costs and benefits across different groups (children, their families, the local community and the wider public); and
- Undertake sensitivity analyses (p. 15).

Cost benefit analyses are limited by the range of benefits to which a cost can be assigned, and the length of follow up. For example, "quality of life" indicators such as wellbeing are valuable outcomes of ECE (Penn *et al.*, 2006), but are not amenable to quantification in numerical or monetary terms. Pascal and Bertram (2001) argued wellbeing and happiness need to form an important part of cost benefit analysis. Long-term evaluations enable quantification of benefits into adulthood, but these studies are few. Cunha *et al.*'s (2005) model of the economics of investing in human capital, discussed in the *Introduction*, shows that early investment has to be followed up by later investment in order for the early investment to be productive.

Karoly *et al.* (2005) identified other methodological issues that influence levels of comparability between studies: methods of discounting dollars; whether outcomes are measured or projected; whether benefits should be weighted according to valued outcomes (they were not weighted in any of the studies reviewed); what costs are projected; and use of adjusted or non-adjusted effect sizes.

Economists (e.g., Cleveland & Krashinsky, 1998; Meadows, 2001) have also pointed out that cost-benefit analyses should include a measure of the benefits that would have been received if the resources had been devoted to the next best policy alternative. Is investment in ECE programmes a good investment compared with alternative investments? Only one study that we reviewed offered such an analysis.

This section draws predominantly on a review by Karoly, Kilburn and Cannon (2005) of cost benefit analyses of intervention programmes in terms of public expenditure in relation to children's participation in ECE, the EPPI-Centre systematic review (Penn *et al.*, 2006) that covers three of the six studies used by Karoly *et al.*, a cost benefit analysis of the Abecedarian Project by Masse and Barnett (2003), and a recent review with recommendations and cautions for policy makers (Barnett & Ackerman, 2006). We also consider two studies (Muller Kucera & Bauer, 2002; Pricewaterhouse Coopers, 2004) discussed in the recent OECD review of ECE in 20 countries (OECD, 2006) which used survey data to estimate revenue through taxation and/or GDP from parental use of childcare to support employment. Four further studies projected the monetary value from providing high-quality universal ECE (Cleveland & Krashinsky, 1998; Dickens, Sawhill, & Tebbs, 2006; Karoly & Biglow, 2005; Oppenheim & MacGregor, 2002).

We examine evidence on the benefits of ECE attendance and then give a synthesis of cost-benefit findings.

Employment-related benefits

Employment-related benefits have been studied in U.S. intervention studies, studies using survey data and studies estimating costs and benefits of providing universal quality ECE. Outcomes can be measured for the mothers of children participating in the ECE programme and for participating children when they reach adulthood. Employment for mothers and programme participants in turn contributes to economic returns for government through gains in taxation.

Table 6 **Summary of evidence about effects of ECE provision, experience and employment and earnings outcomes**

Study type	Maternal employment and earnings outcomes	Cost benefit to government	Child participant employment and earnings outcomes in adulthood	Cost benefit to government
Intervention studies	<p><i>Abecedarian</i> study: higher paying jobs at child age 12, 15 and 21. Teen mothers self-supporting (E=70%, C=58%), teen mothers post-secondary training (E=46%, C=13%). Estimated higher earnings for <i>Abecedarian</i> mothers \$3,750 per year compared with control group mothers. No other study costed maternal earnings outcomes directly.</p> <p><i>Infant Health and Development</i> study: higher level of employment – average one month during the 3 years of project.</p> <p>No employment difference for <i>Perry Preschool Project</i> mothers.</p>		<p><i>Abecedarian</i>: in skilled jobs at age 21 (E=70%, C=40%).</p> <p><i>Chicago Child-Parent Centres</i> projections for lifetime earnings and tax revenues based on differences between participants and control group in high school completion age 21.</p> <p><i>Perry Preschool Project</i> Employment rate age 19 (E=50%, C=32%), Employment rate at age 27 (E=71%, C=59%), Monthly earnings at age 27 (1993\$) E=\$1219, C=\$766).</p> <p>Received public welfare at age 27. E<C; E=59%; C=80%</p>	<p>Tax benefits: <i>Abecedarian</i> - \$16,460 (projected), <i>Chicago Child-Parent Centres</i>-\$3,300 (projected), and <i>Perry Preschool Project</i> (\$6,566) (actual).</p> <p>Tax contribution differential for <i>Perry Preschool</i> children for each year up to age 40 and projected to age 65: \$30,146 (male), \$37,191 (female).</p>
Studies using national survey data	<p>Outcomes in studies in Zurich (Muller Kucera & Bauer, 2002) and Quebec (Baker, Gruber, & Milligan, 2005) from provision and/or reduction in cost of ECE. In Zurich, estimated income effect CHF 44.1 million. In Quebec, labour force participation of married women rose by 7.7 percentage points.</p>	<p>Zurich study: Cost CHF 18 million, additional tax revenues CHF 29 million.</p> <p>Quebec study: taxes from new labour supply after expansion near-free ECE covered 40% of new subsidies.</p>		

Study type	Maternal employment and earnings outcomes	Cost benefit to government	Child participant employment and earnings outcomes in adulthood	Cost benefit to government
Study estimating costs and benefits of expanding universal quality ECE provision and paid parental leave and providing a home care allowance	(Pricewaterhouse Coopers, 2004) study assumed increase in female employment rates towards rates in Sweden/Denmark, which offer universal early years provision and paid parental leave. Estimated average effect on maternal earnings 3 percent for those working fulltime, 1 percent for those working part-time.		Estimated average effect on life-time earnings 3 percent for participants who benefit from additional early years education. Takes into account fact that there may be lower benefits for better-off children than for families in disadvantaged areas, but that nevertheless studies have shown benefits of good quality ECE for all children.	Overall, outcomes of maternal employment contribute to rise of 1.1 percent GDP and from participants' lifetime earnings 0.4 percent of GDP. Total 1.5 percent. Note: subject to uncertainties – plausible range of economic benefits 1–2 percent GDP. Excludes important social benefits. Estimated cost to government around 2.2 percent GDP. Benefits would largely offset costs in monetary terms.

Positive outcomes

Maternal employment

Chapter six of this review discussed evidence that decreasing ECE costs for parents and offering accessible ECE services can encourage maternal employment. This section examines evidence of outcomes of maternal employment.

Intervention studies: Three intervention studies, the Abecedarian Project, the Infant Health and Development Project, and the Perry Preschool Project compared the employment status of mothers of participating children with the employment status of control groups. These were summarised by Masse and Barnett (2003) and Karoly *et al.* (1998). Two of these found employment advantages for participating mothers. Abecedarian mothers had higher paying jobs than the control group mothers at child participant ages of 12, 15 and 21. IHDP mothers had a higher level of employment (one month on average) compared with the control group during the three years of the programme (Karoly *et al.*, 1998).

Studies using national survey data: Two studies, in Quebec and Zurich respectively (Baker *et al.*, 2005; Muller Kucera & Bauer, 2002), showed increased revenue from taxation generated through availability of child care and maternal employment. These were not direct studies of ECE experience and outcomes.

The Zurich study (Muller Kucera & Bauer, 2002) was based on individual household data comparing the weekly working hours and composition of households that used child care in 1999 with comparable households not using child care. It evaluated and quantified costs and benefits of use of childcare. The study found that the city's public investment of CHF 18 million annually in child care is offset by at least CHF 29 million of additional tax revenues

and reduced public spending on social aid. Use of child care was estimated to result in the rate of maternal hours worked almost doubling, especially for single-headed households with one or more children.

Baker *et al.* (2005) found employment expanded after the introduction of near free child care for 4-year-olds and then younger age groups from 1997 in Quebec, but at a slower rate than provision of ECE places. This was partly accounted for by parents who had already been employed moving from informal to formal ECE (i.e. they were already in the labour market). The taxes generated by the new labour supply covered about 40 percent of the cost of the child care subsidies, less than the Zurich study. This difference could be accounted for by the different measures used — taxes from the entire labour supply using childcare in Zurich, and taxes from the new labour supply resulting from expansion of childcare in Quebec.

Study estimating costs and benefits of expanding universal quality ECE: In Britain, PricewaterhouseCoopers (2004) estimated that expansion of free ECE services for 2, 3, and 4 year-olds in the U.K., and improvement in the quality of ECE services through upskilling the workforce, would contribute to a rise in GDP from between 1 percent and 2 percent through higher rates of maternal employment and increased lifetime employment. This rise in GDP would broadly offset incremental costs to government. PricewaterhouseCoopers did not include estimates of social benefits, such as any impact on income distribution, child poverty, remedial education, improved health or lower crime rates: it is likely that such estimates would substantially increase the value of benefits at least for disadvantaged children, as was found in U.S. intervention projects discussed above. These are estimates: the authors expressed some concerns about the reliability of available cost data and uncertainties around precise cost estimates.

No impact

Intervention study: No differences in maternal employment were found for Perry Preschool Project mothers compared with their control group. One difference between the Perry Preschool Project and other intervention studies was that the Perry Preschool Project was part-time; the others offered full-time year round childcare (Masse & Barnett, 2003). Barnett and Ackerman (2006) noted that services operating only part-day can cause potential constraints to employment. Likewise, the operating times of the Perry Preschool Project may have been an employment constraint.

Value to government of maternal employment

Only the Abecedarian Project directly measured the value of employment-related outcomes arising from the employment of mothers of participants in the project. The higher earnings for these mothers were estimated to be \$3,750 per year compared with control group mothers (Masse & Barnett, 2003).

The PricewaterhouseCoopers study assumed the average effect on maternal earnings of a “vision” of providing good quality free ECE for 2, 3 and 4 year olds in the U.K., wrap around care for school age children, a home care allowance, and paid parental leave would be three percent for those working fulltime while their children are aged 1–7 years, and one percent for those working part-time. This was assumed on the basis that a movement would be seen towards the average Swedish and Danish employment rates (where ECE, paid parental leave and wrap around care are similar to the “vision” for the U.K. that was analysed) and of differences between the U.K. and these countries in work culture. It also took into account the effect of avoiding long career breaks for mothers. Effects on maternal employment of extended parental leave and enhanced childcare for school age children were

assumed to cancel each other out on the basis that reductions in those working because of paid parental leave and the home care allowance would be offset by greater employment of mothers of primary school children. Short-term, the share of extra economic benefits was calculated at 0.9 percent of GDP, based on Office of National Statistics figures on the proportion of gross income paid in direct and indirect tax. Long-term, extra benefits from parental lifetime earnings were projected to be a further 0.2 percent of GDP.

Differences for population groups

The only studies assessing participants' gains in maternal employment directly were the three intervention studies, which are targeted to low income groups. Therefore no comparisons across different groups were possible. However, the PricewaterhouseCoopers study did estimate the employment rate for women from all income groups, not just low income groups, would rise.

Participant employment benefits (lifetime earnings)

Higher educational attainment for the children participating in ECE may be an economic benefit when they reach adulthood because of the extra productivity of the educated person. The monetary value of taxation offers a measure of this effect. However, the costs of attaining higher levels of attainment should also be taken into account.

Intervention studies: Only the Perry Preschool Project and Abecedarian Project measured participants' employment related outcomes directly.

Nores, Belfield, Barnett and Schweinhart (2005) analysed data on outcomes for Perry Preschool Project participants at the age of 40, compared with the control group. Earnings profiles were calculated from self-reported data about the current job and work history. There were clear earnings gains for both male and female participants compared with control group participants who did not experience the intervention. The differential in tax contributions for male participants was + \$30,146 and for female participants was +\$37,191 over the course of a working life. The earnings were calculated for each year up to age 40 and projected to age 65. Fringe benefits worth 29.2 percent of salary were included.

When they were aged 21, 70 percent of the Abecedarian participants were engaged in skilled jobs (above entry level positions) compared with 40 percent of the control group (Ramey & Ramey, 2004).

Study estimating costs and benefits of expanding universal quality ECE: In Britain, PricewaterhouseCoopers (2004) estimated the earnings benefit for participants from expansion of free ECE services for 2, 3, and 4 year-olds in the U.K. and improvement in the quality of services through improving ECE service staff qualifications. They estimated that lifetime earnings for those children who benefit from additional early years education and care would be on average three percent higher than they would have been without this provision. The estimated economic benefits were 0.4 percent of GDP from the participant's lifetime earnings.

Differences for population groups

The only studies assessing participants' employment gains directly were for children in targeted intervention studies. The differential for earnings was higher between females in the Perry Preschool Project and control group females than was the differential for males.

Employment-related benefits not costed

Other potential employment-related benefits from investing in universal ECE that have not been costed were described by Karoly and Bigelow (2005): labour force recruitment; participation rates among the working age population; workforce performance; and long-term economic growth, competitiveness, and equality.

Education

Three intervention studies, the Abecedarian Project, the Infant Health and Development Project, and the Perry Preschool Project measured educational benefits of their interventions in terms of the proportion of children in the intervention and control groups who were retained in grade and/or required special education assistance. These studies also measured differences in rates of high school completion, high school graduation, and/or post-secondary education. These constitute a cost to the taxpayer, but the cost is counterbalanced by tax returns from participants having greater lifetime earnings.

Positive outcomes

In all three studies, a smaller proportion of the experimental group were retained in grade or required special education assistance compared with the control group. A higher proportion completed high school, graduated from high school, or gained a post-secondary qualification. The table below is from Penn *et al.*, 2006, p. 18.

Table 7 **Comparison of intervention programme outcomes: Education**

Measure	Perry High Scope*	Chicago Child Parent Centres**	Abecedarian***
Special education by age 9		E<C; E=8%, C=9%	
Special education (yrs) through age 14		E<C; E=0.6, C=0.9	
Special education (yrs) through age 18		E<C; E=0.7; C=1.5	
Years retained in grade by age 15			E<C; E=31%, C=55%
Special education by grade 9 (age 14)			E<C; E=25%, C=48%
Time in special education by age 19	E<C; E=16%, C=28%		
Years in special education to age 27	E<C; E=1.1, C=2.8		
High school completion	E<C; E=49%, C=39% (by age 21)	E<C; E=50%; C=39%	E<C; E=67%, C=51%
High school graduation to age 27	E<C; E=66%, C=45%		
Post-secondary education	E<C; E=33%, C=28% (credits by age 27)		E<C; E=36%, C=13% (college enrolment by age 21)

* Figures from Karoly *et al.* (2001, p. 51)

** Figures from Karoly *et al.* (2001, p. 53) and Reynolds *et al.* (2002, tables 1, 2 and 4).

*** 3 Figures from Masse and Barnett (2003, Tables 8.1 and 8.7).

The size of savings was summarised by Penn *et al.* (2006). Different data was collected for each study which may explain some differences in cost savings.

Table 8 **Cost savings calculations: Education**

Measure	Perry High Scope* (n=121, 4% discount rate, 1996 dollars)	Chicago Child Parent Centres** (n=1,281, 4% discount rate, 1998 dollars)	Abecedarian*** (n=112, 5% discount rate, 2002 dollars)
Reduction in education services (special education, grade retention)	\$6,566	\$3,300	\$16,460

Reductions in criminal activities

Lower public spending on justice is another outcome that has been attributed to participation in good quality ECE. The table below (from Penn *et al.*, 2006, p. 20) compares programme outcomes for criminal offending for three U.S. intervention studies: the Perry High Scope, Chicago Child-Parent Centres, and Abecedarian studies comparing the experimental group with the control group. The incidence of crime for both experimental and control groups is high in the Perry High Scope study even though there are differences between the groups.

Table 9 **Comparison of intervention programme outcomes: Crime**

Measure	Perry High Scope*	Chicago Child Parent Centres**	Abecedarian***
Ever arrested by age 27	E<C; E=57%, C=69%		
Lifetime arrests through age 27	E<C; E=2.3, C=4.6		
Delinquency rate at age 13–14		E<C	
Crime rate age 16–21			E=C
Juvenile court petitions through age 17		E<C; E=16%, C=26%	
Violent offences by age 17		E<C; E=9, C=15.3	
Child abuse and neglect		E<C; E=5%, C=10.3%	

* Figures from Karoly *et al.* (2001, p. 51)

** Figures from Karoly *et al.* (2001, p. 53) and Reynolds *et al.* (2002, tables 1, 2 and 4).

*** 3 Figures from Masse and Barnett (2003, Tables 8.1 and 8.7).

The value of savings in criminal justice costs and reduction in tangible losses to crime victims are estimated as highest for the Perry High Scope Project and nil for the Abecedarian Project. Different measures of outcomes and different measures to estimate savings were used for the three studies.

Table 10 Cost and benefit calculations: Crime

Measure	Perry High Scope* (n=121, 4% discount rate, 1996 dollars)	Chicago Child Parent Centres** (n=1,281, 4% discount rate, 1998 dollars)	Abecedarian*** (n=112, 5% discount rate, 2002 dollars)
Reduction in criminal justice cost	\$10,195	\$6,085	
Reduction in tangible losses to crime victims	\$10,690	\$4,859	

Total benefits in relation to costs

Intervention studies. Table 11 presents the results of cost benefit analyses for five intervention programmes that included ECE, synthesised by Karoly *et al.* (2005, pp. 109–111). As Karoly *et al.* pointed out, programmes with longer follow-up periods (the Abecedarian, Chicago Child-Parent Centre, and Perry Preschool) tended to have higher estimates of total benefits. This is because the longer term studies could measure outcomes at adulthood that were more readily translated into dollar benefits, such as higher earnings (benefiting the participant and the taxpayer), reduced reliance on welfare programmes (a benefit to taxpayers), and reduced contact with the criminal justice system (a benefit to taxpayers and other members of society). This is illustrated by the Perry Preschool Project benefit-cost ratios which increased with participants' age (a return of just over \$17 for every dollar invested at age 40).

The short-term intervention study, Infant Health and Development Project (IHDP), showed no reduction in government costs at age 8. The IHDP used test scores as its child outcome measure to which a cost was assigned. The *Cognitive outcomes* section of this review has noted that the IHDP intervention finished when children were aged 3, and the lighter birth weight children who did not benefit may have needed a longer period of intervention or have been neurologically impaired. It is also the most expensive ECE programme analysed (\$49,021 per child). We have not included the Comprehensive Child Development Programme findings also reported by Karoly *et al.* (2005) because of flaws in the experimental design for the evaluation (see for example, Goodson, Layzer, St Pierre, Bernstein, & Lopez, 2000).

Table 11 Cost benefit results of selected intervention programmes

Distribution of benefits per child \$							
Programme (last follow-up age)	Programme costs per child \$	Participants	Savings to government	Rest of society	Total benefits to society per child \$	Net benefits to society per child	Benefit cost ratio
Follow-up during elementary school years							
IHDP (age 8)	49,021	0	0	0	0	-49,021	-
Follow-up to early adulthood							
Abecedarian (age 21)	42,871	na	na	na	138,635	95,764	3.23
Chicago CPC (age 21)	6,913	22,715	19,985	6,637	49,337	42,424	7.14
Perry preschool (excluding intangible crime costs) (age 27)	14,830	22,599	37,724	16,104	76,426	61,595	5.15
Perry preschool (including intangible crime costs) (age 27)	14,830	23,486	106,136		129,622	114,792	8.74
Good quality ECE for low income 3 and 4 year-olds (Aos <i>et al.</i> , 2004, meta-analysis) (age varies)	6,681	6,036	4,329	5,377	15,742	9,061	2.36
Follow-up to middle adulthood							
Perry Preschool (age 40)	14,830	61,866	191,288		253,154	238,324	17.07

Studies estimating costs and benefits of expanding universal quality ECE: Four studies analysed the costs and benefits of providing universal, high quality early childhood education for all children or high quality early childhood education targeted to low income families. In all four studies, projected benefits exceeded the costs. Cost: benefit ratios were 1:2 or greater in three studies, and the effect on GDP in the fourth study was 1.34 to 4.02 percent.

A Canadian study, carried out by economists from the University of Toronto (Cleveland & Krashinsky, 1998), used research undertaken during the late 1980s and 1990s on children's academic success and mothers'

employment in the labour force to estimate benefits and costs of providing high-quality ECE for all preschoolers in Canada aged between 2 and 5. Using conservative estimates, they calculated that providing high-quality ECE for all these preschoolers in Canada would cost approximately \$5.3 billion per year and the value of additional benefits to children and parents would be about \$10.6 billion per year. Benefits to children through participation and to mothers from employment were about equal. For society, the benefits arise from increased productivity, higher generation of tax revenues, decreased social assistance and health costs, and improved citizenship.

The economics of paid parental leave versus infant ECE programmes are relevant to discussion of economic impacts from parental workforce participation. High quality ECE for babies is equally, or possibly more, expensive than paid parental leave, as Cleveland and Krashinsky (1998) note, and vital bonding occurs between parents and children in the early months. Access to paid parental leave significantly improves infant health. Ruhm (1998), for example, has provided evidence of a strong negative relationship between duration of parental leave and post-neonatal mortality between the first and fifth birthday. Cleveland and Krashinsky (1998) argued that key elements of child care policy should include universal provision of good quality ECE for all children aged 2 to 5 and a well-designed family benefit and parental leave policy²⁰ for parents with babies. On the other hand, there may be a negative cost for the labour market outcomes of mothers using extended paid parental leave. Parents are likely to return to work earlier and place children in childcare where there are generous childcare subsidies and meagre paid parental leave (Waldfogel, 2001). Use of parental leave is associated with increases in women's employment long term, but is also associated with reductions in their relative earnings (Ruhm, 1998).

In the U.S., Oppenheim and MacGregor (2002) used actual average per-child costs of the Head Start programme to calculate costs of providing high-quality preschool education to all 3 and 4 year olds from low-income families in the United States in general, and especially four states (Arkansas, Louisiana, Mississippi, and Texas). They used information from intervention studies on returns associated with school measures (including higher levels of education, reduced grade retention, and need for special education), crime, earnings, taxation, welfare, and employment to estimate a cost: benefit ratio of 1:2.4 overall.

Karoly and Bigelow (2005) used results from the Chicago Child-Parent Centre programme to estimate the cost benefits of providing good quality ECE²¹ to a single cohort of California's 4-year-olds. In making their estimates they projected greater benefits for disadvantaged children, lesser benefits for advantaged children, and greater benefits for children attending no ECE programme and moving to an ECE programme than for those already in ECE. They also factored in the kind of preschool a child would have attended without a universal programme. Their estimates are conservative. They include fewer grade retentions, less need for special education, reduction in child abuse or neglect, reduced costs to the criminal justice system, and increased earnings by parents (in the shorter term) and children (in the longer term). They do not include improved labour market outcomes for parents, improved health and wellbeing of children, reduced reliance on public welfare, lower crime, neglect, child abuse, and "the intergenerational transmission of favourable benefits" (Karoly & Bigelow, 2005, p. xxvi). They found that California would expect to gain between \$2 and \$4 for every \$1 invested.

²⁰ Sweden's policy, which Cleveland and Krashinsky favour, is for 16 months of publicly funded paid parental leave divided between mother and father.

²¹ Programme is voluntary for all age eligible 4-year-olds, maximum class size 20, staff:child ratio 1:10, ECE qualified teaching staff.

Dickens *et al.* (2006) used results from the Perry Preschool programme to determine the magnitude of the effect of high-quality universal ECE for 3- and 4-year-olds on Gross Domestic Product. They adjusted the Perry Preschool programme results for probable attenuation from delivering the programme to less disadvantaged children, and estimated effects based on a range of assumptions. They estimated that by 2080, investment in high-quality ECE could raise the U.S. GDP by between 1.34 and 4.02 percent. This analysis concentrates on the fact that the Perry Preschool Program led to participants having an additional 0.9 years of education compared with non-participants. The analysis did not include other benefits found in the Perry Preschool Program, such as reduced rates of teenage pregnancy and lower rates of criminal activity. The models used to project GDP took account of expected less than universal take-up levels of enrolment and the differing quality of ECE currently received. They also included roll-on benefit or dynamic feedback in the increase in physical and human capital over time.

Assessment of findings

Generalisability from longitudinal studies

Evidence for long term actual cost benefits of early childhood education emerged from three longitudinal intervention studies, the Abecedarian, Perry Preschool and Chicago Child-Parent Centre projects. Penn *et al.* (2006) raise issues about the generalisability of these three long-term intervention studies given their samples of disadvantaged children from low-income African American families in the U.S., and the context of the times when they were initiated (1960s and 1970s). They question the relevance of studies outside the U.S.

New Zealand also has children from low income families, with parents having low levels of formal qualification and relatively high levels of unemployment (and welfare assistance), and who are less likely than other children to participate in centre-based ECE. However, New Zealand's cultural context is quite different from the U.S. and the context of the times is also different. In addition, the model of schooling, which forms the basis for calculations of costs and benefits, is different from schooling in New Zealand. For example, New Zealand does not hold children back a level (grade retention). In two of the intervention studies the benefits from reduction in costs of crime are calculated to be very high. Incarceration rates are higher in the U.S. than any industrialised country, at 701 per 100,000 people. New Zealand's rate of 155 places it seventh highest in the OECD (Statistics New Zealand, 2005). We would therefore expect some lesser gains than the U.S. from reduction in costs of crimes.

Economic data and analytic methods

Differences in the measures of costs and benefits are some of the reasons for variations in cost-benefit ratios in the studies reviewed. Programmes with longer term follow-ups tend to have higher estimates of benefits and cost-benefit ratio because in adulthood some benefits are easier to measure. The studies with longer term follow ups were also intensive targeted interventions. As we have also discussed, there may be many intangible benefits of early childhood education which are difficult to cost. These are reasons why it is important to regard cost-benefit analyses as only estimates. Penn *et al.* (2006) have argued that headline figures, such as a saving of \$7 for every dollar spent, should be treated as tentative. "The evidence is suggestive rather than incontrovertible" (p. 28).

At the same time, Karoly, Kilburn and Cannon (2005) have argued that cost-benefit analyses tend to provide conservative estimates because data limitations preclude measuring the economic benefits associated with all

potential benefits. They noted linkages between the level and growth of human capital and the rate of economic growth:

Investments in early childhood interventions, to the extent that they raise eventual educational attainment and other measures that are valued in the workplace, can help raise the overall skill level in the economy and contribute to the economic success of the [country] (p. 118).

Such macroeconomic benefits were not costed in most of the studies reviewed.

Targeting

Barnett and Ackerman (2006) summarised the extent to which variations in the populations served, programme characteristics, and the educational and community context of the ECE service alter the magnitude of educational benefits. Their analysis indicated that gains are highest for children who are poor, but children from middle-income homes also benefit, creating a potential for much larger net benefits from universal programmes. Contrasts in programme quality are likely to explain gaps between potential returns and actual performance of programmes. Barnett and Ackerman also argued that universal programmes within a community will be expected to produce larger gains because of previously unrealised peer effects, i.e. “if everyone in a classroom has experienced preschool, classroom climate will change, median ability will rise, and dispersion in ability will narrow, with those at the bottom gaining most” (Barnett & Ackerman, 2006, p. 94). In addition, these authors highlighted benefits of access to acceptable ECE for maternal employment. Constraints to realising this benefit are the programme schedule (times and hours) and cost. They cited an analysis by Blau (2001) estimating full government funding of child care would result in a 9.5–10 percent increase in overall employment.

Barnett and Ackerman (2006) proposed the following reasons why investing in universal ECE is likely to be more efficient than targeting funding to disadvantaged children:

- Targeting is inaccurate, especially in relation to a status such as maternal employment and poverty that can change fairly often. Costs associated with administering and monitoring targeting can be high.
- Substantial benefits to children’s learning extend to children from middle and higher socioeconomic backgrounds, not just low socioeconomic backgrounds. Peer effects from enrolling children from a variety of socioeconomic backgrounds are positive.
- Free public ECE offered universally may increase the child care options of those not in the labour force to participate in employment thereby providing further benefits. Timetabling and costs are key issues in providing support for employment.

These authors also discussed how to enhance the benefits of current services:

- Large additional gains at modest additional costs can be achieved by improving quality in services that are of low-quality.
- The ECE goals should include a range of child outcomes, or results will be inefficient. These should include cognitive and non-cognitive outcomes, not just academic outcomes.
- Broader policies, such as social, economic, and school policies affect economic returns from ECE. These need to be considered alongside ECE policies.

Cleveland (2006) also points to the very positive impacts of high-quality ECE on cognitive and language development from other U.S. studies, Andersson’s (1989, 1992) Swedish studies, and the English *EPPE* study for

children from across the socio-economic range. All the studies he cited have been included in earlier chapters in this review, as well as additional studies providing further substantial evidence of positive impacts of ECE. Cleveland argued that evidence from what we know about good quality statistical studies should be included in cost benefit analyses. He argued that it is reasonable to infer, given the evidence of positive outcomes from ECE participation for children from all socio-economic levels, that there are likely to be economic benefits from universal programmes in other countries. The studies reviewed provide evidence that supports this inference.

Applicability of benefits to New Zealand

The government savings and benefits most commonly measured in the general population studies and the targeted intervention studies would also apply in New Zealand:

- increased maternal and participant employment resulting in higher income tax payments (from the participating parents in the short term and children from low income families in the long term);
- reduced welfare assistance (for the parent in the short term and children in the long term), including unemployment benefits;
- reduced costs for special education interventions; and
- reduced burden in the criminal justice system.

The same is true for those often listed, but less often measured:

- reduced property loss, pain, injury and death from a reduced crime rate;
- reduced rate of child abuse and neglect;
- reduced need for late-childhood interventions, which are more costly and less effective;
- life-long improvement in level of cognitive, attitudinal, and achievement skills;
- peer group benefits if more children start school with improved behaviour in the classroom and better skills (cognitive and attitudinal);
- improved nutrition and health, reducing healthcare costs (including reduced substance abuse and teen pregnancy);
- “multiplier” effects on those around the children, and the next generation; and
- increase in GDP.

The rates of return derived vary considerably, depending on the assumptions used about the costs, benefits, and varying rate of benefit across the whole population. However, even the most conservative estimates show cost-savings benefits for providing high-quality ECE for all children, whether they include all the benefits listed above, or merely look at the effect of improved qualifications on the GDP as a whole.

Summary

International evidence demonstrates that investing in good quality ECE can bring cost savings and benefits to governments and economies as well as to children and families. Although cost benefit analyses measure only some quantifiable outcomes, these find that through provision of good quality ECE services, employment and tax revenues are increased, and savings are generated in educational and social expenditure.

Economists have cautioned that social, economic, and school policies also affect ECE cost benefit returns.

Good quality ECE has greater benefits for children from low socioeconomic families, but children from middle and high socioeconomic families also gain, as our earlier chapters have demonstrated. Economists, using conservative estimates of benefits based on recent relevant research evidence of ECE effects for children from across the socio-economic spectrum, have projected cost benefits of offering universal high-quality ECE for 2-, 3- and/or 4-year-olds. Most of the economic evaluations of ECE programmes have shown that benefits of public spending exceed the costs. Gains are not realised or are not as great if the ECE is of poor quality. Without considering the opportunity costs of that spending, comparing the investment to other types of early years intervention or alternative policy options, these evaluation findings tend to suggest that public spending for ECE programmes will result in good returns in terms of maternal employment, higher levels of the participant's lifetime earnings, reductions in usage of special education services, lesser criminal activity and reduced use of social services that are expected to have a flow-on effect to the economy.

8. Conclusion

What answers do we have now in response to the four large research questions underpinning this review of research on the impact of ECE?

What (short-term and long-term) developmental, educational, social, and economic outcomes are associated with participation in ECE for learners and their families?

The existing research base as a whole shows positive outcomes for learners, with a small number of studies showing some neutral effects, and an even smaller number of studies showing negative effects or positive outcomes for ECE associated with participation in quality programmes.

Most of the research to date on outcomes for children has focused on cognitive and social-emotional aspects, with only a small number collecting more than general information about health. There is little yet specifically on the learning dispositions and key competencies identified as important for learning in the 21st century, and included in *Te Whāriki* and the draft New Zealand school curriculum, although some of the research more traditionally framed has relevance to these outcomes.

Outcomes for learners

ECE experiences are generally associated with positive outcomes for children in both the short and long term for mathematics, reading, and general cognitive or school performance. Effects are usually more marked in the short term.

They are generally associated with positive outcomes for children in both the short and long term for learning dispositions and social-emotional wellbeing. Again, the short-term positive effects are more marked than the long-term. However, there are some studies that find associations in the short term with increases in the small proportions of children who are at the extremes for aggression, antisocial behaviour, or anxiety. These associations do not appear to persist in the long term, though the NICHD study showed some poorer social skills and poorer work habits related to longer hours at ECE (intensity) lasting until about age 8. The *EPPE* study found high-quality ECE after the age of 3 can have a positive impact in reducing antisocial behaviour associated with long hours and an early age of entry into centre-based ECE.

The picture in relation to health outcomes is less solid than the aspects of cognitive and learning dispositions. Where there is information about infections, it seems that they can increase in children in the short term; the information about cortisol levels suggests these may be higher, but the effect of this is not as clear as, say, the picture from the research on cognitive outcomes. We found no analysis of long-term health outcomes.

Outcomes for parents

Research on outcomes for parents generally shows positive short-term outcomes for parenting and parent life course outcomes (studying for a qualification, making social connections, increasing confidence, and reducing stress), and for maternal employment. We found no long-term studies of outcomes for parents.

Cost benefits to government

A small number of studies showed that investing in good quality ECE can bring actual cost benefits to governments, as well as to children and families. These may arise through increased tax revenues from parental take-up of employment while the child attends ECE, and savings generated in educational, welfare, and justice expenditure. The evidence of larger effect sizes for children's outcomes from very good quality ECE indicates greater returns will be likely from investing in high-quality ECE. All children benefit from such provision.

Are different outcomes associated with different population groups and under different circumstances/contexts?

What types of institutional (e.g. differences in educational/care systems, types of services), funding, and regulatory arrangements/frameworks are associated with achieving positive outcomes?

When are adverse impacts more likely and for whom?

On the whole, positive ECE outcomes are not confined to particular population groups. Positive outcomes are supported by the provision of ECE of sufficient quality to complement home and other experiences, or, in the case of children from impoverished homes, to strongly augment their learning opportunities and social support. The few studies that have included peer socioeconomic mix as one of the ECE variables analysed have found that it is preferable not to segregate low-income children—that (as in schools), children benefit from peer mixes that contain well-nourished human capital.

There is some indication that cognitive gains from good quality ECE may be greater for children from low-income homes than for children from higher-income homes (although all benefit), and that children for whom English is an additional language may make faster progress on early mathematics and literacy measures during ECE attendance. ECE attendance may help them to “catch up” with peers.

There is some indication from the research—but without clear specification—that longer ECE experience is beneficial for cognitive outcomes and learning dispositions. There is little indication that one particular kind of ECE (e.g. full-day or part-day), is better for children's outcomes in all contexts.

The quality of their ECE setting is central to ECE's contribution to positive outcomes for children. What seems to matter for positive outcomes for children is:

- the quality of staff–child interaction;
- the learning resources available;
- programmes that engage children; and
- a supportive environment for children to work together.

We explore how these aspects of quality matter in the next section.

Interaction or process quality. Positive effects of ECE participation were found in settings described as good quality in terms of adult–child interactions that are responsive, cognitively challenging, and encourage joint attention and negotiation. In higher-quality ECE settings, adults offer learning environments where there is opportunity for dialogue and use of complex language, children may choose activity levels that are suitable and engaging, children are encouraged to problem solve, and adult–child interactions involve sustained shared thinking and open-ended questions to extend thinking.

Educational curriculum. There is evidence that a curriculum where children can investigate and think for themselves is associated with better cognitive performance in later schooling than one that is academically oriented. Providing differentiated learning opportunities that meet the needs of individuals and groups, and staff who view cognitive and social development as complementary and do not prioritise one over the other, were features of effective settings in the large-scale English *EPPE* study. Studies suggest greater distribution of power or responsibility to children, and engagement of families focused on pedagogical outcomes are factors supporting learning dispositions and social competence.

Structural quality refers to the structures needed to support good quality in early childhood education programmes. Significant associations were found between teacher qualifications and education, and child outcomes. Qualified and educated teachers use more words and more complex language when communicating with children, and use more sustained shared thinking episodes that are associated with positive outcomes.

Higher staff: child ratios (i.e. more staff to children), where measured, were associated with positive outcomes in some studies. Where an association was not found, ratios were confounded with teacher qualifications. Good adult: child ratios are important in enabling teachers to be responsive, and scaffold and stimulate learning. Ratios were found to be especially important for language stimulation of babies and toddlers.

Qualified teachers are likely to draw on their knowledge and experience of children and pedagogy to offer the kinds of cognitively challenging adult–child interactions that are linked with gains for children. The NICHD ECCRN study using structural equation modelling, found a mediated path from structural indicators of quality (teacher qualifications and staff: child ratios) through process quality to cognitive competence and caregiver ratings of social competence. The authors suggest that “more caregiver training may lead to better interactions between children and adults, while lower ratios may lead to more interactions” (NICHD ECCRN, 2002, p. 206).

Group size was not measured in most studies, but less time (but not small group size) spent in whole-group activities was associated with better age-7 cognitive performance in analysis of the IEA Pre-primary Project. It may be that how children are grouped within settings, rather than overall centre size, is what counts for quality. The English *EPPE* study showed more “sustained shared thinking” which is associated with better cognitive achievement was more likely to occur with adults working 1:1 with children and during focused small group work.

Recommendations for child care standards for qualifications, ratios, and group size in the U.S. and associated in the NICHD study with better child outcomes were:

Qualifications: ECE teacher qualifications

Ratios: 1:3 at 6 and 15 months; 1:4 at 24 months; 1:7 at 36 months.

Group size: 6 at 6 and 15 months, 8 at 24 months, 14 at 36 months.

ECE services for babies and toddlers need to be of the highest quality, given the fast rate of development occurring then, and the findings that an early age of entry into low-quality ECE centres is detrimental to social-emotional outcomes. The recent OECD report examining ECE policy issues in 20 OECD countries argues for provision of extensive paid parental leave in the first year, alongside high-quality ECE:

The provision of remunerated parental leave of about a year, followed by a child's entitlement to place in an early childhood service, allows parents to be with their child in the critical first year, supports the family budget and also facilitates the return to employment. This is a human support to family life and bonding that advanced industrial economies should consider (OECD, 2006, p. 207).

In the Nordic countries generous parental leave provisions are an alternative to infant ECE programmes, and babies in the first year are almost always at home.

Relationships with parents. All studies using statistical analysis controlled for home background variables. The *EPPE* study found that engaging parents in ongoing assessment of children's learning and sharing educational aims with parents could help improve the home learning environment and reinforce learning between home and the ECE service. This is a potentially powerful role for ECE services. There is some limited evidence that provision of good quality integrated ECE centres offering extended services to children and families is associated with positive learning dispositions and social-emotional outcomes. Perhaps the connection made with families through this type of service provision enables greater sharing of information and feedback.

Professional development can make a valuable contribution to enhancing the kinds of interactions and curriculum knowledge that are associated with effective pedagogy and outcomes for children (Mitchell & Cubey, 2003). Siraj-Blatchford (2004) highlights the importance of professional development for developing and monitoring provision for diversity and encouraging development of parental partnerships focused on children's learning, which were associated in the *EPPE* project with achievement for all children. The research being undertaken by New Zealand's Centres of Innovation (COI) and the Teaching Learning and Research Initiative projects offer examples of how ECE centres in New Zealand have approached building up teaching and learning processes that are associated with positive outcomes. Reports from the first round of COIs (such as Roskill South Kindergarten's (Ramsey *et al.*, 2006), which illustrates an interweaving of dispositions and cognitive outcomes and approaches to enhancing family participation and child outcomes consistent with the national curriculum, *Te Whāriki*) show how practices can be lifted and children extended through teachers engaging in critical, reflective investigation, and acting on their findings. Opportunities for such investigation can be supported through institutional frameworks and could be the focus of policy that ensures they are available for all practitioners.

We envisage outcomes, context, and pedagogy as contributing to and reinforcing each other. Children also negotiate their own learning pathway and contribute to the environments and learning of others.

Institutional, funding, and regulatory frameworks

Extrapolating from this, the kinds of institutional, funding, and regulatory arrangements that support provision of good quality ECE will enable these features to be achieved, e.g. through ensuring recommended standards for staffing (qualifications, ratios, and group size), opportunities for professional development for all teachers, support for good quality provision to be available in all communities, and opportunities for teachers to engage in

critical reflective investigation of pedagogy consistent with the national curriculum, *Te Whāriki*. Thus, the test of any framework should be whether it provides sufficient incentives and support for these aspects of quality to be included in every ECE setting.

If one wants the outcomes to be distributed fairly, then such frameworks also need to focus on ensuring sufficient provision of quality ECE in all communities. The need is greatest in low-income communities.

As yet, there is no systematic research comparing different configurations of quality provision across countries in relation to children's outcomes. Such (expensive) research might be able to provide more understanding of how different policy frameworks support quality and positive outcomes for children, but there would be difficult questions of comparable measures of outcomes.

Adverse outcomes from ECE are rare in the research literature. They are more likely where ECE quality is poor, with suggestions that intensity of ECE experience (long hours each week) and early starting age may have negative short-term outcomes for antisocial and worried behaviour, for children in everyday ECE—but not for low-income children in “intervention” ECE, where good quality staffing standards, parent support, and education are features. The findings for early starting age highlight the importance of centres catering for babies and toddlers meeting recommended standards for quality. The evidence so far is unclear whether these adverse outcomes persist.

How do different outcomes interact/relate with one another?

What is the size/significance of the different impacts of ECE?

How long do the effects last?

The Competent Children, Competent Learners study shows how cognitive and social-emotional performance is related, while also being distinct (Wylie *et al.*, 2006). We learn within social settings, often through our interaction with others, both adults and peers: each kind of competency supports the other. Most studies of the impact of ECE do not portray it as producing one kind of outcome at the expense of another.

Outcomes are sensitive to context, so that parallel or successive contexts, such as schooling, may build on or overshadow competencies developed during ECE experiences. Positive identities as learners are able to support further learning. Cunha *et al.*'s (2005) formal model of the economics of investing in human capital describes two mechanisms: self-productivity and complementarity, which explain how “skills beget skills”. *Self-productivity* says that skills that develop in one period persist into future periods; skills are self-reinforcing. “For example, self-control and emotional security may reinforce intellectual curiosity and promote more vigorous learning of cognitive skills” (p. 5). So early skills may change their character but still be part of an educational pathway. Also “Students with greater early cognitive and non-cognitive abilities are more efficient in later learning of both cognitive and non-cognitive skills. Thus the enriched early environments of the Abecedarian, Perry and CPC programs promote greater efficiency in learning in high schools and reduce problem behaviours” (p. 65). *Complementarity* implies that early investment has to be followed up by later investment in order for the early investment to be productive. Facilitating environments have to follow facilitating environments.

Cunha *et al.*'s model also emphasises the role of non-cognitive skills: (“Non-cognitive skills (perseverance, motivation, self-control and the like) have direct effects on wages (given schooling), schooling, teenage

pregnancy, smoking, crime, and achievement tests” p. 85.) The model emphasises the contribution of family environments.

Where the size of the contribution of ECE to outcomes for children has been statistically assessed, it is strongest for the cognitive areas. In the studies reviewed here, it ranges from 0.02–0.28 for reading, and 0.10–0.23 for mathematics in analyses of the contribution of everyday ECE centres serving a range of populations; it is much higher for the well-resourced intervention studies, serving children from low-income homes, ranging from 0.32 to 0.81 for mathematics in the short term, and 0.19 to 0.44 in the long term, and for reading, from 0.34 to 0.89, and 0.17 to 0.44 in the long term. The differences in ranges is related to the kind of provision, but effect sizes also reflect the size of a study sample, and the difference between groups being compared, as well as how variables were measured and specified, and the richness of datasets available.

But overall, these effect sizes are indicating that ECE can make a real contribution to the development of mathematics and reading, in both the short and long term.

There are similar trends in relation to more generally measured cognitive and school performance outcomes, though these tend to be measured more in intervention studies designed to support low-income children.

There is more variation in effect sizes for social-emotional outcomes: somewhat lower than the cognitive outcomes for everyday ECE for social skills and social-emotional wellbeing, sizeable (even if for small proportions of children) for the studies finding short-term negative impacts for antisocial, anxious, or aggressive behaviour, but equally strong for the longitudinal intervention studies, where these are gauged in terms of persistence and avoidance of crime.

One indication of how these long-term intervention findings may translate into “ordinary” terms is Karoly *et al.*'s (2005) estimate of the California state fiscal benefit from providing universal ECE for 1–2 years before school entry, at about 23 percent of the level in the Chicago Parent–Child programme. This estimation was related to expected increases in student years of education, and decreases in grade retention, use of special education (number of students and years), secondary school dropouts, decreases in the number of children abused or neglected, and decreases for court cases involving juveniles. No New Zealand study has collected this kind of data to allow a similar estimate, and differences in systems, e.g. identification of special education needs and funding for moderate- and low-needs students would mean that the estimate for New Zealand might be different. However, the salient point here is the difference in the size of the impact between expensive targeted interventions, and everyday universal provision.

We cannot estimate a range of effect sizes for health, or for parenting outcomes.

ECE contribution to maternal employment shows a range of an increase of 7 to 14 percent from “natural experiments” that increased provision and affordability, and these increases as a proportion of the increase in ECE places ranged from about a third to almost 100 percent: indicating the role of other factors in deciding when mothers take on paid employment. Analysis focused on changes to child care costs, mainly for low-income mothers, shows a greater range of variability, some linked to the kind of ECE made available (and how available it was), and some to maternal experiences and attributes. But, on the whole, ECE's contribution to maternal employment is notable.

Most children in New Zealand now have some ECE experience, but other experiences, particularly home, strongly influence children's learning and development. ECE has become part of the tapestry of growing up in most Western countries. When compared with the contribution to children's development and wellbeing of family income levels (or rather, poverty), or the human capital from their parents' education, the size of the ECE contribution is much smaller: usually around a third to a half at most. But countering the trend for income disparities to widen, or making a large shift in parental human capital, is a much harder policy and practical task than improving the provision of good quality ECE. The review provides substantial support for continuing to give good quality ECE priority in New Zealand's efforts to improve outcomes for our children.

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EndNotes

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- ⁱ **Studies reporting mathematics outcomes:** (Aboud, 2006; Aughinbaugh, 2001; Barnett, Lamy, & Jung, 2005; Broberg, Wessels, Lamb, & Hwang, 1997; Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000 (pooled data from three studies); Campbell & Ramey, 1995 (*Abecedarian* study); Corter *et al.*, 2006; Driessen, 2004; Fantuzzo *et al.*, 2005; Gamoran, Mare, & Bethke, 1999; Gilliam & Zigler, 2004; Goodman & Sianesi, 2005; Gormley, Gayer, Phillips, & Dawson, 2005; Hodgen, 2006 (*Competent Children, Competent Learners* study); Hodgen, 2006 (*Competent Children, Competent Learners* study); Infant Health and Development Research Group, 1997 (*IHDP* intervention); Magnuson, Ruhm, & Waldfogel, 2004; McCarton *et al.*, 1997 (*IHDP* intervention); Melhuish, Sylva, Sammons, Siraj-Blatchford, & Quinn, 2006 (*EPPNI* study); NICHD Early Child Care Research Network, 2003a, 2006; OECD, 2004; Peisner-Feinberg *et al.*, 2001 (*Cost, Quality and Outcomes* study); Peisner-Feinberg *et al.*, 1999 (*Cost, Quality and Outcomes* study); Reynolds, Temple, Robertson, & Mann, 2002 (*Chicago Child-Parent Center* study); Robin, Frede, & Barnett, 2006; Starkey, Klein, & Wakeley, 2004; Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004 (*EPPE* study); Wylie, Hodgen, Ferral, & Thompson, 2006 (*Competent Children, Competent Learners* study); Yao & Hearn, 2003)
- ⁱⁱ **Intervention studies:** (Campbell & Ramey, 1995 (*Abecedarian* study); Reynolds, 2000 (*Chicago Child-Parent Center* study); McCarton *et al.*, 1997 (*IHDP* study); Schweinhart, Barnes, & Weikart, 1993 (*Perry Preschool* study))
- ⁱⁱⁱ **Everyday ECE studies:** (Aboud, 2006; Barnett *et al.*, 2005; Burchinal, Peisner-Feinberg *et al.*, 2000 (*Cost, Quality and Outcomes* study); Fantuzzo *et al.*, 2005; Gormley *et al.*, 2005; Melhuish, *et al.* (2006) (*EPPNI* study); Peisner-Feinberg *et al.*, 2001 (*Cost, Quality and Outcomes* study); Sammons *et al.*, 2002 (*EPPE* study); Sylva, 1999 (*EPPE* study))
- ^{iv} **Highest effect sizes:** (Gormley & Gayer, 2005; Gormley *et al.*, 2005)
- ^v **Lowest effect sizes:** (Fantuzzo *et al.*, 2005; Gamoran *et al.*, 1999; Magnuson *et al.*, 2004)
- ^{vi} (Sammons *et al.*, 2002; Sylva, 1999)
- ^{vii} (Infant Health and Development Research Group, 1997)
- ^{viii} **Duration and intensity:** (Barnett & Lamy, 2006; Broberg *et al.*, 1997; Robin *et al.*, 2006; Sammons *et al.*, 2002 (*EPPE* study); Sylva *et al.*, 2004 (*EPPNI* study); Wylie *et al.*, 2006 (*Competent Children, Competent Learners* study))
- ^{ix} **Reading and literacy outcomes:** (Aboud, 2006; Andersson, 1992; Bagnato, Suen, Brickley, Smith-Jones, & Dettore, 2002; Barnett & Lamy, 2006; Barnett *et al.*, 2005; Driessen, 2004; Fantuzzo *et al.*, 2005; Love *et al.*, 2005; Magnuson *et al.*, 2004; Reynolds, 1995, 2000; Reynolds *et al.*, 2002; Sammons *et al.*, 2002 (*EPPE* study); Schweinhart *et al.*, 1993 (*High/Scope Perry Preschool* intervention); Sylva *et al.*, 2004 (*EPPE* study); Wylie *et al.*, 2006 (*Competent Children, Competent Learners* study); Yao & Hearn, 2003)
- ^x **Mixed impact:** (National Evaluation of Sure Start Team, 2005a)
- ^{xi} **No impact:** (Driessen, 2004; Gamoran *et al.*, 1999; Kohen, Lipps, & Hertzman, 2006)

- xii **US intervention studies:** (Karoly *et al.*, 2005 (intervention studies synthesis); Reynolds, 2000 (*Chicago Child-Parent Center* study); Schweinhart *et al.*, 1993 (*High/Scope Perry Preschool* study))
- xiii **General studies:** (Aboud, 2006; Andersson, 1992; Bagnato *et al.*, 2002; Barnett *et al.*, 2005; Fantuzzo *et al.*, 2005; Magnuson *et al.*, 2004; Sammons *et al.*, 2002 (*EPPE*); Sylva *et al.*, 2004 (*EPPE*); Yao & Hearn, 2003)
- xiv **No impacts:** (Driessen, 2004; Gamoran *et al.*, 1999; Kohen *et al.*, 2006)
- xv **Duration:** (Barnett *et al.*, 2005; Berlinski, Galiani, & Gertler, 2006; Burchinal, Peisner-Feinberg *et al.*, 2000; Burchinal, Roberts, Nabors, & Bryant, 1996; Burchinal, Roberts *et al.*, 2000; National Evaluation of Sure Start Team, 2005; Sammons *et al.*, 2002 (*EPPE*); Wylie *et al.*, 2006 (*Competent Children, Competent Learners*))
- xvi **Duration:** (Barnett & Lamy, 2006; Broberg *et al.*, 1997; Reynolds, 1995; Robin *et al.*, 2006; Sylva *et al.*, 2004 (*EPPE*); Wylie *et al.*, 2006; Wylie & Thompson, 2003 (*Competent Children, Competent Learners*))
- xvii **Teacher education:** (Burchinal *et al.*, 1996; Burchinal, Roberts *et al.*, 2000; Montie *et al.*, 2006; NICHD Early Child Care Research Network, 1999; Sammons *et al.*, 2002 (*EPPE*); Sylva, Melhuish *et al.*, 2004 (*EPPE*))
- xviii **Overall cognitive benefits:** (Aboud, 2006; Andersson, 1992; Bagnato *et al.*, 2002; Gilliam & Zigler, 2004; Gormley *et al.*, 2005; Loeb, Fuller, Kagan, & Carroll, 2004; Love *et al.*, 2005; Melhuish *et al.*, 2006 (*EPPNI*); Sammons *et al.*, 2002 (*EPPE*))
- xix **IQ positive:** (Infant Health and Development Research Group, 1997; Love *et al.*, 2005; Toroyan *et al.*, 2003)
- xx **Reduced grade retentions:** (Bagnato *et al.*, 2002; Gilliam & Zigler, 2004; Marcon, 2001)
- xxi **Special education placements:** (Bagnato *et al.*, 2002; Gilliam & Zigler, 2004; Marcon, 2001)
- xxii **Higher grades/reduced drop-outs/higher level school:** (Berlinski, Galiani, & Manacorda, 2006; Gilliam & Zigler, 2004; Spiess, Buchel, & Wagner, 2003)
- xxiii **Quality:** Berlinski, Galiani, & Gertler, 2006; Burchinal, Roberts *et al.*, 2000; Hill, Waldfogel, & Brooks-Gunn, 2002; Love *et al.*, 2003; Marcon, 2002; Montie *et al.*, 2006; NICHD Early Child Care Research Network, 2002, 2003a; Peisner-Feinberg *et al.*, 2001; Peisner-Feinberg *et al.*, 1999; Sylva *et al.*, 2004 (*EPPE*); Wylie *et al.*, 2006 (*Competent Children, Competent Learners*))
- xxiv **Duration:** (Andersson, 1992; Bagnato *et al.*, 2002; Lee, 2005; Loeb *et al.*, 2005; Sylva *et al.*, 2004 (*EPPE*); Votruba-Drzal *et al.*, 2004)
- xxv **Learning dispositions and social-emotional outcomes: impact of ECE:** (Aboud, 2006; Andersson, 1992; Bagnato *et al.*, 2002; Belsky, 2001; Bertram & Pascal, 2001; Booth & Kelly, 2002; Borge & Melhuish, 1995; Borge, Rutter, Cote, & Tremblay, 2004; Brooker, 2002; Burchinal & Nelson, 2000; Burchinal *et al.*, 2000; Campbell, Spieker, Burchinal, Poe, & NICHD Early Child Care Research Network, 2006; Carr, 1997; Corter *et al.*, 2006; Cote *et al.*, 2007; Deater-Deckard, Pinkerton, & Scarr, 1996; Fantuzzo *et al.*, 2005; Farrell, Taylor, & Tennent, 2002; Gilliam & Zigler, 2004 (*Evaluation of Pre-K*); Goodman & Sianesi, 2005; Gormley & Gayer, 2005 (*Evaluation of Oklahoma Pre-K*); Gormley & Phillips, 2003 (*Evaluation of Oklahoma Pre-K*); Harrison & Ungerer, 2000, 2002; Hausfather, Toharia, La Roche, & Engelsmann, 1997; Hodgen, 2006 (*Competent Children, Competent Learners* study); Karoly *et al.*, 2005 (reviews intervention studies); Kohen, Hertzman, & Wiens, 1998; Lee, 2005; Loeb *et al.*, 2004; Love *et al.*, 2003; Love *et al.*, 2005 (*Early Head Start*); Marcon, 2002; Magnuson *et al.*, 2004; Melhuish *et al.*, 2006 (*EPPNI* study); Milfort & Greenfield, 2002; National Evaluation of Sure Start Team, 2005a; NICHD ECCRN, 2003, 2005; Pagani, Larocque, Tremblay & Lapointe, 2003; Peisner-

Feinberg *et al.*, 1999 (*Cost, Quality and Child Outcomes* study); Peisner-Feinberg *et al.*, 2001 (*Cost, Quality and Child Outcomes* study); Peters, 2004; Pierrehumbert, Ramstein, Karmaniola, Miljkovitch, & Halfon, 2002; Ramsey, Breen, Sturm, Lee, & Carr, 2006; Reynolds, 2000 (*Chicago Child-Parent Center* study); Sagi, Koren-Karie, Gini, Ziv, & Joels, 2002; Sammons *et al.*, 2003 (*EPPE* study); Schweinhart *et al.*, 1993 (*Perry Preschool* study); Sylva *et al.*, 2004 (*EPPE* study); US Department of Health and Human Services 2005; Wylie *et al.*, 2006 (*Competent Children, Competent Learners* study))

xxvi **Positive impacts on learning dispositions and social-emotional outcomes:** (Aboud, 2006; Andersson, 1992; Bagnato *et al.*, 2002; Bertram & Pascal, 2001; Borge *et al.*, 2004; Brooker, 2002; Burchinal & Nelson, 2000; Carr, 1997; Corter *et al.*, 2006; Cote *et al.*, 2007; Fantuzzo *et al.*, 2005; Gilliam & Zigler, 2004; Hausfather *et al.*, 1997; Karoly *et al.*, 2005 (intervention studies); Lee, 2005; Love *et al.*, 2003 (*Early Head Start*); Love *et al.*, 2005; Melhuish *et al.*, 2006 (*EPPNI* study); Peters, 2004; Ramsey *et al.*, 2006; Reynolds, 2000 (*Chicago Child-Parent Center* study); Sammons *et al.*, 2003 (*EPPE* study); Schweinhart *et al.*, 1993 (*Perry Preschool* study); US Department of Health and Human Service, 2005; Wylie *et al.*, 2006 (*Competent Children, Competent Learners* study))

xxvii **Negative impacts on antisocial and worried behaviour:** (Baker, Gruber, & Milligan, 2005; Belsky, 1999; Booth & Kelly, 2002; Goodman & Sianesi, 2005; Lee, 2005; Loeb *et al.*, 2004; Magnuson *et al.*, 2004; National Evaluation of Sure Start Team, 2005; NICHD Early Child Care Research Network, 2003, 2005; Niles, Reynolds, & Nagasawa, 2006; Pagani *et al.*, 2003; Sammons *et al.*, 2003 (*EPPE* study); Sylva *et al.*, 2004 (*EPPE* study))

xxviii **Short-term gains learning dispositions and social-emotional outcomes:** (Bertram & Pascal, 2001; Brooker, 2002; Carr, 1997; Corter *et al.*, 2006; Hausfather *et al.*, 1997; Peters, 2004; Ramsey *et al.*, 2006)

xxix (Baker *et al.*, 2005; Chryssanthopoulou, Turner-Cobb, & Jessop, 2005; Gilliam & Zigler, 2004; Infant Health and Development Research Group, 1997; National Evaluation of Sure Start Team, 2005; Paquet & Hamel, 2005; Rao, 2005; Sims, Guilfoyle, & Parry, 2005; Taylor, Tennent, Farrell, & Gahan, 2006; Toroyan *et al.*, 2004; US Department of Health and Human Services, 2005; Vermeer & van IJzendoorn, 2006)

xxx **ECE and parenting outcomes:** Corter *et al.*, 2006; Elias, Hay, Homel, & Freiburg, 2006; McGivney, 1997; McNaughton, Wolfgramm, & Afeaki, 1996; Love *et al.*, 2001, 2002, 2004, 2005 (*Early Head Start*); Mitchell, Cubey, Engelbrecht, Lock, Lowe, & van Wijk, 2004; Mitchell, Haggerty, Hampton, & Pairman, 2006; Mitchell, Royal Tangaere, Mara, & Wylie, 2006; National Evaluation of Sure Start Team, 2005a; Pagani, Jalbert, Lapointe, & Hebert, 2006; Powell, 2006; Siraj-Blatchford *et al.*, 2003 (*EPPE* study); Tijus, Santolini, & Danis, 1997; Wylie *et al.*, 1996 (*Competent Children, Competent Learners* study))

xxxi **Integrated ECE and parenting:** (Cortier *et al.*, 2006; National Evaluation of Sure Start Team, 2005a)

xxxii **Parent/whānau-led ECE and parenting:** (Mitchell *et al.*, 2004; Mitchell, Royal Tangaere *et al.*, 2006; Powell, 2006; Tijus *et al.*, 1997)

xxxiii **Teacher-led ECE and parenting:** Elias *et al.*, 2006; McNaughton *et al.*, 1996; Mitchell, Haggerty *et al.*, 2006; Pagani *et al.*, 2006; Siraj-Blatchford *et al.*, 2003 (*EPPE* study))

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- xxxiv **Parent involvement and parenting:** (McGivney, 1997, Wylie *et al.*, 1996)
- xxxv **Longitudinal study and parenting:** (Wylie *et al.*, 1996)
- xxxvi **Intervention programme and parenting:** (Love *et al.*, 2001, 2002, 2004, 2005)
- xxxvii **Quality ECE and parenting:** (Mitchell, Royal Tangaere *et al.*, 2006; National Evaluation of Sure Start Team, 2005c; Siraj-Blatchford *et al.*, 2003 (*EPPE* study))
- xxxviii **Parent/whānau-led centres and education and training:** (Mitchell, *et al.*, 2004; Mitchell, Royal Tangaere *et al.*, 2006, Mitchell, Haggerty *et al.*, 2006; Powell, 2006)
- xxxix **Integrated intervention programme and education and training:** (Ramey *et al.*, 2000)
- xl **Parent involvement and education and training:** (McGivney, 1997; Wylie *et al.*, 1996)
- xli **Rurality and parent support:** (McGivney, 1997; Mitchell, Royal Tangaere, *et al.*, 2006)
- xlii **Confidence and self-esteem:** (McGivney, 1997; Mitchell *et al.*, 2004; Powell, 2006)