Early childhood is a critical period for development, and early experiences can have long-term effects on brain function and cognitive and psychosocial functioning. Brain development is affected by the quality of the environment, including nutrition, infection, and stimulation. Synapse formation is experience dependent, and lack of stimulation and social interaction can have lasting cognitive and emotional effects (National Research Council and Institute of Medicine 2000; Thompson and Nelson 2001).

Lack of appropriate early experiences places children at a disadvantage on school entry and at risk of poor school progress and lower educational attainment. Longitudinal studies in low- and middle-income (LAMI) countries have shown that children with lower ability on school entry have poorer scores on achievement tests, are more likely to repeat grades and drop out of school, and leave school at a lower grade level (Grantham-McGregor and others 2007). Lower educational attainment is associated with subsequent lower adult earning. In addition, lower levels of parental education affect child care and are associated with poorer parenting practices (Ertem and others 2007; Paxson and Schady 2007). The impact of
early child development (ECD) on adult cognition, behavior, and earnings continues the poverty cycle. Thus, early childhood interventions to promote cognitive and social-emotional development will facilitate later gains from educational and societal opportunities and are a critical strategy to promote equity.

Several long-term studies of early childhood intervention for disadvantaged children in the United States have shown benefits for adult educational outcomes, behavior, and employment. Some of the key studies are summarized in table 4.1 (Campbell and others 2002; Eckenrode and others 2010; McCormick and others 2006; Reynolds and others 2007; Schweinhart and others 2005). The interventions have provided high-quality preschool experiences (Reynolds and others 2007; Schweinhart and others 2005), center-based care from infancy to five years of age (Campbell and others 2002), home visits during pregnancy and up to age two (Eckenrode and others 2010), and a comprehensive strategy of home- and center-based services up to age three (McCormick and others 2006). The most consistent benefits are for educational outcomes, whereas findings for employment and earnings, antisocial behavior, and other risk behaviors are more varied. Although these studies demonstrate the potential of early childhood interventions to modify outcomes over a lifetime, the interventions have generally been high intensity and high quality and involved human and financial resources not typical of large-scale programs in the United States and well beyond the reach of most LAMI countries.

In developing countries expansion of ECD programs has focused on children three years of age and older through expansion of access to preschools and efforts to improve the quality of preschools (EFA Global Monitoring Report Team 2006). Attention to this age group is facilitated by consensus on preschool attendance as the most appropriate strategy to promote young child development in this age range.

The focus of this chapter is on the newborn to three years of age group, for whom less information is available to guide policy on effective large-scale programs. ECD programs for this group have primarily concerned nutrition and health. This age is a critical period for nutrition (Lozoff and others 2006; Martorell and others 2010), and recent attention has been given to the potential impact of improvements in health and nutrition, not just for physical growth and development, but for gains in human capital as well (Hoddinott and others 2008; Victora and others 2008). However, substantial gains in cognitive and social-emotional development are unlikely without attention to ensuring quality interaction and stimulation, which is essential for optimal brain and behavioral development (M. M. Black and others 2008). The first part of this chapter reviews the evidence for the impact of interventions aimed at improving early stimulation for children from birth to age three in LAMI countries comparing various strategies
<table>
<thead>
<tr>
<th>Study and follow-up age and sample</th>
<th>Intervention</th>
<th>Cognitive/Educational</th>
<th>Employment</th>
<th>Violence</th>
<th>Risk behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abecedarian:</strong> 111 high-risk infants randomly assigned to experimental or control groups, 104 measured at age 21 Campbell and others 2002</td>
<td>Full-day educational day care infancy to age 5</td>
<td>Significant benefits to IQ (4.4 points). Benefits to reading and math (1.8 and 1.3 grade-level equivalent). More likely to be in college</td>
<td>No difference in whether employed but higher level of employment</td>
<td>No difference in self-reported weapon-carrying, violent behavior, convictions</td>
<td>Decline in teen pregnancy and marijuana, cigarettes, and alcohol not significant</td>
</tr>
<tr>
<td><strong>Perry Preschool:</strong> 123 low-income African American children randomly assigned to preschool or no preschool, follow-up at ages 19, 27, and 40 Schweinhart and others 2005</td>
<td>High-quality preschool from ages 3-4</td>
<td>More high school graduation. Higher literacy at age 27, better attitudes toward school at age 19</td>
<td>More likely to be employed, higher earnings at age 40</td>
<td>Fewer arrests, less time in prison</td>
<td>Decline in drug use (marijuana, pills)</td>
</tr>
<tr>
<td><strong>Chicago Child Parent Centre:</strong> Matched comparison of children attending intervention preschools and kindergarten with alternative kindergarten (no preschool), 1,389 of 1,539 followed up at age 24 Reynolds and others 2007</td>
<td>High-quality preschool and kindergarten compared with no preschool and regular kindergarten</td>
<td>Higher grade level, more school completion. More likely to attend 4-year college</td>
<td>No effects on employment, income, welfare</td>
<td>Fewer incarcerations, felony arrests, and convictions</td>
<td>No difference in drug use, smoking, teenage pregnancy</td>
</tr>
</tbody>
</table>
### Table 4.1 Summary of Long-Term Effects of U.S. ECD Programs (continued)

<table>
<thead>
<tr>
<th>Study and follow-up age and sample</th>
<th>Intervention</th>
<th>Cognitive/Educational</th>
<th>Employment</th>
<th>Violence</th>
<th>Risk behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Home Visitation Program: 400 pregnant women enrolled, randomly assigned to comparison, visits in pregnancy, or visits in pregnancy and up to age 2, 310 followed up at age 19</td>
<td>Average of 9 home visits during pregnancy and 23 up to age 2 aimed at improving health-related behaviors and child health and development through better care and maternal life choices</td>
<td>No effect on high school graduation</td>
<td>No effect on economic productivity (currently employed, or in school or job training). No effect on reliance on welfare.</td>
<td>Girls only, fewer arrests and convictions. No effect on self-reported criminal behavior.</td>
<td>No effect on drug use, use of family planning, or teen pregnancy</td>
</tr>
<tr>
<td>Eckenrode and others 2010</td>
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<td></td>
</tr>
<tr>
<td>Infant Health and Development Program: 985 LBW preterm infants in 8 sites randomized to intervention or follow-up only, 636 measured at age 18</td>
<td>Educational program through weekly home visits in first year and fortnightly in years 2 and 3. Daily center-based education began at 12 months as well as parent support groups every other month</td>
<td>No benefits for birth weight \leq 2,000 grams, benefits to receptive vocabulary (PPVT) and mathematics in high LBW group (2,001–2,499 grams). No differences in school dropout rate</td>
<td>Not measured</td>
<td>No difference in arrests or incarcerations</td>
<td>Fewer self-reported risk behaviors in HLBW. No difference in general behavior problems by youth or caregiver report</td>
</tr>
<tr>
<td>McCormick and others 2006</td>
<td></td>
<td></td>
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</tbody>
</table>

*Source:* Author’s compilation.

*Note:* Participants in the Abecedarian and Chicago studies also reported fewer depressive symptoms. HLBW = high low birth weight (2,001–2,499 grams); LBW = low birth weight; PPVT = Peabody Picture Vocabulary Test.
used to either enrich parenting practices or provide services directly to the child. Family, child, and program characteristics that influence benefits are then discussed, and opportunities for integration with health and nutrition services are identified. Finally the necessary program investments in terms of human and material resources are outlined, as well as research needs to inform expansion of programs to reach the large numbers of children affected. The focus on this age group rather than the wider age range of previous reviews (Engle and others 2007; Nores and Barnett 2009) is an attempt to draw attention to the need to find strategies to enhance learning opportunities for younger children and to begin to synthesize the existing evidence, which can inform policy development for these children.

**Concurrent Benefits of ECD Interventions for Child Development**

Children from birth to age three are primarily cared for in the home, although use of formal and informal day care is likely to increase with increased urbanization, fewer extended families, and increased maternal employment. Efforts to enrich environments for children in this age group have employed a variety of approaches aimed at enhancing the capacity of the mother or primary caregiver to provide stimulation and interactions. The evaluations of parent-focused interventions have mainly been efficacy trials with the interventions implemented by the research teams, although in some cases they were linked to existing programs or health services and may have involved training health service staff (Hamadani and others 2006; Potterton and others 2009; Powell and Grantham-McGregor 1989; Powell and others 2004). A few evaluations were of ongoing community or nongovernmental organization (NGO) programs (Pearison and others 2008; Powell 2004).

Parent-focused interventions are reviewed first and then provision of nonparental care through day care centers, of which there are fewer evaluations. Studies were identified by a PubMed search using several terms (for example, child development, language, and emotional development linked with terms such as early intervention, and stimulation). Citation lists in the articles retrieved were also reviewed to identify additional studies. Only evaluations that had appropriate comparison groups were included.

**Promotion of Better Parenting and Mother-Child Interaction through Home Visits**

Nine studies of the benefits for child development of home visits with parents to enhance their ability to facilitate their child’s development were evaluated (details are summarized in table 4.2). Two studies were conducted
Table 4.2 Promotion of Better Parenting and Mother-Child Interaction through Home Visits

<table>
<thead>
<tr>
<th>Authors, country</th>
<th>Sample and design</th>
<th>Intervention</th>
<th>Intensity: Average no. of contacts/ month&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Type of visitor, training, and supervision</th>
<th>Impact on child development&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamadani and others 2006, Bangladesh</td>
<td>20 community nutrition centers randomized to intervention (n = 10) or control (n = 10). Undernourished children (less than −2 z-scores WAZ) aged 6–24 months were enrolled, intervention n = 104, control n = 102</td>
<td>Weekly group meetings at nutrition centers for 10 months, then fortnightly for 2 months. Topics included child development and play. Home visits twice weekly for 8 months, then weekly for 4 months. Aims at promoting positive mother-child interaction and demonstrating play activities</td>
<td>Average number of home visits achieved: 68; duration of visits not stated. Average number of group sessions attended: 23. Average contacts per month: 7.6</td>
<td>Literate women from intervention villages, given 2 weeks' training. Supervisors observed visits, no information on frequency</td>
<td>Significant benefit for Bayley mental development index (d = 0.32) but not motor development (d = 0.17). During test session intervention children were happier, more cooperative and responsive, and vocalized more (d ranged from 0.17, responsive, to 0.45, cooperative)</td>
</tr>
<tr>
<td>Nahar and others 2009, Bangladesh</td>
<td>Severely malnourished children aged 6–24 months. Control group studied year before intervention group; 33/77 intervention children and 37/ 56 control children followed up</td>
<td>Daily half-hour group and individual sessions for mothers and children for 2 weeks in hospital. 11 home visits over a 6-month period after discharge and 7 visits to center. Using play sessions, mothers shown activities to promote child development</td>
<td>Duration of home visits not stated. Daily contact in hospital. Average of 3 contacts/ month after discharge</td>
<td>Visitors had 8 years schooling, given 2 weeks' training. Supervisors observed visits, no information on frequency</td>
<td>Significant benefits for Bayley mental score (d = 0.85) and motor (d = 0.50) development. No benefits for behavior during test session</td>
</tr>
<tr>
<td>Study</td>
<td>Design and Interventions</td>
<td>Outcomes</td>
<td></td>
<td></td>
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<tr>
<td>Eickmann and others 2003, Brazil</td>
<td>Quasi-experimental pre- and posttest. 78 infants tested at age 12 months in intervention town, 78 controls from 3 smaller towns. 66 and 70 tested at 18 months</td>
<td>Intervention after 12-month test. Three workshops (about 8 mothers per workshop) involving demonstration and practice to improve interaction through play. 10 home visit play sessions. Home visits 3–45 minutes’ duration. Approximately 2 contacts per month</td>
<td>Workshop trainers were occupational therapists with child development specialization. No information on home visitors.</td>
<td>Significant benefit for Bayley MDI ($d = 0.82$) and PDI ($d = 0.66$) at 18 months.</td>
<td></td>
</tr>
<tr>
<td>Grantham-McGregor, Schofield, and Powell 1987, Jamaica</td>
<td>Severely malnourished children aged 6–24 months on enrollment. 16 children given medical care only. 18 in subsequent year also received stimulation</td>
<td>Daily play sessions in hospital. After discharge weekly visits for 2 years and fortnightly visits in third year. Focused on mothers and helping them promote child’s development. Visitors demonstrated play techniques using homemade toys. Duration of visits 1 hour. 4 visits/month planned for first 2 years. No information on number of contacts achieved.</td>
<td>CHWs with primary education. No information on supervision.</td>
<td>At end of intervention (3 years after leaving hospital) large benefits for DQ ($d = 0.94$) and PPVT ($d = 0.96$).</td>
<td></td>
</tr>
<tr>
<td>Powell and Grantham-McGregor 1989, Jamaica</td>
<td>Study 1: children aged 6–30 months from poor neighborhoods randomly assigned to control, monthly, and fortnightly home visits. Study 2: children aged 16–30 months</td>
<td>Visits by CHWs. Objective to improve maternal-child interaction and promote development through play. Visits included combinations of language activities, visits lasted about 1 hour. Each CHW visited maximum of 13 families. Objective of study was to examine impact of visit frequency (weekly, fortnightly, monthly). Most CHWs had incomplete secondary education, given 8 weeks’ training in child development and intervention. Supervised by clinic.</td>
<td>Study 1: No significant benefits from monthly visits. Moderate benefits from fortnightly visits ($d = 0.43$ after 1 year). Comparing children in the same age range from Study 1 and Study 2: (continued next page)</td>
<td></td>
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</tr>
</tbody>
</table>
A table showing the promotion of better parenting and mother-child interaction through home visits.

<table>
<thead>
<tr>
<th>Authors, country</th>
<th>Sample and design</th>
<th>Intervention</th>
<th>Intensity: Average no. of contacts/monthᵃ</th>
<th>Type of visitor, training, and supervision</th>
<th>Impact on child developmentᵇ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grantham-McGregor and others 1991, Jamaica</td>
<td>129 stunted children aged 9–24 months randomized to 4 groups: supplementation, stimulation, supplement and stimulation, control</td>
<td>Weekly home visits for 2 years to encourage positive interaction and demonstrate play activities. Homemade toys and simple picture books were provided. Mothers encouraged to play with child between visits. Supplementation: 1 kilogram milk-based formula/week. Control group weekly visits to obtain morbidity information</td>
<td>Home visits 1 hour duration. 4 visits/month planned; no information on amount achieved</td>
<td>CHWs conducted visits. Supervisor monitored 10% of visits</td>
<td>Significant benefit from stimulation to DQ (d = 0.86) and for all sub-scales. Significant benefit from supplementation with additive benefits for group receiving both interventions. In a subset of children, no impact of either intervention on behavior after 6 months of intervention (Meeks Gardner and others 2003)</td>
</tr>
</tbody>
</table>

ᵃ Intensity: Average no. of contacts/month
ᵇ Impact on child development
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Description</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powell and others 2004, Jamaica</td>
<td>Undernourished children aged 9–30 months attending nutrition clinics. 18 clinics randomly assigned to intervention children (n = 65) or control (n = 64)</td>
<td>Weekly half-hour visits for 1 year involving mother and child. Play activities demonstrated. Median number of visits achieved was 32.5 (of planned 50), about 2.7/month</td>
<td>CHWs given 2 weeks’ training on child development and intervention. Significant benefits for DQ (d = 0.91) and for mothers’ child-rearing knowledge (d = 1.25) and practices (d = 0.65)</td>
</tr>
<tr>
<td>Powell 2004, Jamaica</td>
<td>Matched design 78/90 intervention and 53/70 control children aged 12–30 months on enrollment followed up after 1 year</td>
<td>Weekly visits included songs, action rhymes, and play activities conducted with child. Discussed what child could learn from play activities with mothers. Monthly meeting for parents at a center to discuss child-rearing practices and other topics. Parents also made toys at these meetings. No information on duration of visits or frequency of visits achieved</td>
<td>“Roving caregivers,” recently completed secondary school, given 2 weeks’ preservice training. 1-day workshops held fortnightly to discuss visits and prepare weekly work plans and toy kits. 1-week courses run every 3 months. Significant effects for DQ (d = 0.70), benefits for hand and eye and performance subscales, not for hearing and speech</td>
</tr>
</tbody>
</table>
### Table 4.2 Promotion of Better Parenting and Mother-Child Interaction through Home Visits (continued)

<table>
<thead>
<tr>
<th>Authors, country</th>
<th>Sample and design</th>
<th>Intervention</th>
<th>Intensity: Average no. of contacts/month&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Type of visitor, training, and supervision</th>
<th>Impact on child development&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeks Gardner and others 2003; Walker and others 2004, Jamaica</td>
<td>140 term LBW infants randomly assigned to intervention or control</td>
<td>Weekly 1-hour visits from birth for 8 weeks, focused on improving maternal responsiveness. Weekly half-hour visits from age 7 to 24 months similar to previous Jamaican interventions. Control group visited to obtain morbidity and infant feeding information</td>
<td>Median of 75% of scheduled visits achieved, 3 visits/month</td>
<td>CHWs received 2 weeks’ training before each phase on child development and conduct of intervention. Supervisor observed visits once/month and met with CHWs weekly to review visits</td>
<td>Benefits of early intervention at 7 months for problem solving ($d = 0.30$) and behavior in test session (more cooperative and happy). At 24 months significant benefits of intervention for performance ($d = 0.42$) and hand and eye ($d = 0.36$) subscales of Griffiths test. Overall DQ $d = 0.27$</td>
</tr>
</tbody>
</table>

**Source:** Author’s compilation.

**Note:** May also involve group sessions. CHW = community health worker; DQ = developmental quotient; LBW = low birth weight; MDI = mental development index; PDI = psychomotor development index; PPVT = Peabody Picture Vocabulary Test; WAZ = weight-for-age z-score.

<sup>a</sup> Contacts include group sessions where used and are averaged per month; intensity may have varied during specific periods.

<sup>b</sup> Effect size (Cohen’s $d$) was calculated using unadjusted posttest values (Thalheimer and Cook 2002) to enable comparison among studies. Calculation of effect size using change, for those studies where information was available, showed effect sizes within the same range (small, medium, large).
in Bangladesh, one in Brazil, and the remaining six in Jamaica. In all studies the objective of the home visits was to help the parent become more effective at promoting development.

Interventions
In Jamaica, five intervention studies were led by the same research group. The studies targeted different risk groups—severely malnourished children (Grantham-McGregor, Schofield, and Powell 1987), stunted children (Grantham-McGregor and others 1991), and term low-birth-weight infants (Walker and others 2004)—and evaluated the impact of visit frequency (Powell and Grantham-McGregor 1989) and the feasibility of integrating with nutrition services (Powell and others 2004). Visits included demonstration of play activities and involving the mother, or primary caregiver if not the mother, in a play session with her child. Visits comprised various combinations of language activities, games, simple jigsaw puzzles, and crayon and paper activities. Homemade toys and simple picture books were used in the play sessions and left in the home and exchanged at the next visit. Emphasis was placed on enriching verbal interaction between the mother and child; mothers were encouraged to chat with their children and to name things and actions in the house and yard. Mothers were also encouraged to use positive feedback and praise and to avoid physical punishment.

The visits were conducted by community health workers (CHWs). In Jamaica, at the time the studies were conducted, CHWs generally had between primary and incomplete secondary-level education, although in the later studies some had complete secondary education. All received eight weeks of training provided by the Ministry of Health in nutrition and health care. They were given between two and eight weeks of additional training in (1) child development; (2) the intervention program, including teaching techniques; (3) the conduct of the visits, which emphasized a friendly, supportive relationship with the mother; and (4) toy making.

A curriculum manual was developed with suggested activities by stage of development and was provided to the CHWs. Together with the supervisor the appropriate stage in the curriculum for each child was determined. The CHWs were trained to ensure that the child and the mother experienced success during the visit. Supervision was provided by a member of the research team or in one study by health clinic nurses. CHWs met with the supervisor to discuss the visits, and the supervisor also observed between 5 and 10 percent of the visits.

A further Jamaican study was an evaluation of an ongoing program implemented by an NGO (Powell 2004). Although the objectives were similar, in this case visitors were young women who had just completed secondary school. They were given two weeks of training before beginning the
visits, and one-day workshops were held fortnightly to discuss the visits and prepare weekly work plans and toy kits. Observations and feedback from the mothers suggested that less emphasis was placed on including the mother in the play session. However, the program included monthly meetings for the parents at which child development, parenting, and other topics were discussed.

The two studies in Bangladesh adapted the intervention used in Jamaica for that culture, incorporating traditional games and songs. Visits were conducted by literate village women in one study and female health workers in the other. In addition to the home visits, in both studies mothers attended centers where individual play sessions (Nahar and others 2009) or group sessions on topics concerning child development and the importance of play (Hamadani and others 2006) were conducted.

The final study was implemented in Brazil (Eickmann and others 2003) and began with an initial home visit by one of the trainers (occupational therapists with specialization in child development) to introduce the program and discuss the importance of play for child development. Three half-day workshops were held for groups of about eight mothers, and 10 visits were made over six months by home visitors to reinforce the workshops through a play session with the mother and child. Workshops were conducted by the trainers and involved demonstration and practice of play activities to promote different aspects of development, toy making, interaction through everyday activities, and review and discussion of what was learned.

**Benefits for Child Development**

All studies of home visits demonstrated significant benefits of intervention for child development. A few had small effect sizes, but typically effects were medium to large (table 4.2).

Two studies showed large benefits for mental development for children recovering from severe malnutrition (Grantham-McGregor, Schofield, and Powell 1987; Nahar and others 2009). These both involved daily play sessions while, children were in the hospital followed by home visits for six months (Nahar and others 2009) or three years (Grantham-McGregor, Schofield, and Powell 1987). Thus, the potential for benefits for extremely disadvantaged children is clear. Three other studies focused on undernourished children. The Jamaican study of stunted children (height-for-age less than \(-2\) standard deviations [SD] of reference values) showed a large effect on the developmental level (Grantham-McGregor and others 1991), as did another study in which children were somewhat less undernourished on enrollment (weight-for-age less than \(-1.5\) SD, with weight-for-age less than \(-2\) SD in the last three months; Powell and others 2004). Surprisingly, the study in Bangladesh with undernourished children (weight-for-age less
than −2 SD) in the community demonstrated a relatively small although significant benefit to scores on the Bayley mental development index (MDI) and no significant benefits for motor development (Hamadani and others 2006). Another study of the benefits of psychosocial stimulation for term low-birth-weight infants who have experienced undernutrition in utero also had modest benefits (Walker and others 2004).

The remaining three studies did not focus specifically on undernourished children but targeted children in poor communities. All showed medium-to-large effects on developmental levels (Eickmann and others 2003; Powell 2004; Powell and Grantham-McGregor 1989).

Only three of the studies described attempted to measure effects on children’s behavior. In all three this was by rating of behavior while the developmental tests were being conducted. Results were inconsistent. One study showed no benefits for behavior (Nahar and others 2009), two showed benefits for the children’s cooperation with the tester and to their emotional tone (children were happier), and in one of these studies children vocalized more (Hamadani and others 2006; Meeks Gardner and others 2003).

Lessons from Home Visiting Interventions

One clear conclusion from the evaluations of home visit interventions is that they can be successfully implemented by women who have completed only their primary education or partially completed their secondary education. Visitors included CHWs, literate village women, and young women who had just completed secondary education. Some important caveats must be made to this. Although the CHWs (Jamaica) and female health workers (Bangladesh) generally had no more than incomplete secondary education, they had successfully gained employment in a context of high unemployment and may well have had important noncognitive skills that facilitated their effectiveness. In one study that did not use paraprofessionals as visitors but recruited literate village women, the impact of the intervention was modest, particularly given the intensity of contacts (Hamadani and others 2006). It is not clear from the study how these women were identified or what, if any, prior work experience they had.

In most studies visitors have been mature women of similar age or older than the mothers being visited. In contrast, the program of “roving caregivers” in Jamaica used young women in the National Youth Service, for many of whom this was their first working experience. Although the intervention had a significant benefit for child development, some concern was expressed that these young women were less able to engage the mothers and to ensure they participated fully in the visits and sometimes conducted the play sessions with the child alone (Christine Powell, personal communication). This may have implications for the sustainability of benefits.
Although accepting that visits can be conducted by paraprofessionals, an additional issue that needs to be considered is the important role of supervision. Supervision was usually conducted by a professional with training in child development, although in one study this role was accomplished by the clinic nurse (Powell and Grantham-McGregor 1989). Supervision involved observation of visits and regular meetings with the visitors to discuss the visits and plan for subsequent ones. This enabled the supervisor to provide guidance on the content of the visits to ensure the activities were at appropriate levels for individual children and to give feedback on both the content of the visits and the manner in which they were conducted. For example, in addition to the actual activities engaged in, a focus of the Jamaican interventions has been the empathy of the visitor and her role in supporting the mother in becoming more effective at promoting development. Supervision is an essential component of the programs that have been evaluated and is an important consideration in planning for scaling up of interventions.

The frequency of visits necessary to achieve benefits to child development is also important in determining the feasibility of implementing similar interventions on a larger scale. The study by Powell and Grantham-McGregor (1989) is the only one to formally evaluate the impact of visit frequency on the level of benefit achieved and concluded that monthly visits did not benefit development and that a minimum of fortnightly visits was necessary. However, the size of the benefits from fortnightly visits was less than half that of weekly visits (see table 4.2 for details). The frequency of contacts (home visits plus group sessions where used) in most of the interventions was two to four times per month. Thus, it is reasonable to conclude that benefits to child development can be anticipated from programs where at least two visits are achieved per month. It is interesting to note that the intervention with the highest frequency of contacts (7.6 a month) achieved only a modest impact on development. This may suggest that a visit frequency greater than weekly does not lead to additional benefits; however, other aspects of the intervention, families, and children may have contributed to the relatively small impact.

Another characteristic of the programs important for expansion is the duration of the visits. Information on this is not available for all studies but where reported has been a half hour (Powell and others 2004; Walker and others 2004), half to three-quarters of an hour (Eickmann and others 2003), or one hour (Grantham-McGregor, Schofield, and Powell 1987; Grantham-McGregor and others 1991; Powell and Grantham-McGregor 1989). The Jamaican intervention with low-birth-weight (LBW) infants (Walker and others 2004) that used a half hour visit duration had smaller benefits than other similar interventions in Jamaica where the visit duration was longer, but it is unclear whether this or other aspects of the intervention or target
group led to the difference in benefits. Information is currently insufficient to determine whether visit duration could be reduced to facilitate program expansion.

Evaluations of the interventions were conducted after they had been implemented for periods ranging from six months to three years. The results suggest that benefits begin to emerge within six months of intervention. In the Jamaican study of stunted children, development was assessed after six months of intervention and then every six months thereafter up to two years, when the intervention ended. Benefits of intervention were evident at the first six-month assessment, and further gains occurred throughout the two years of intervention (Grantham-McGregor and others 1991). What remains to be answered is how the duration of intervention affects the sustainability of benefits.

In addition to intervention characteristics, it is possible that characteristics of the child or caregiver may affect the impact of the intervention. As mentioned in the preceding section, large benefits have been seen in interventions targeted to severely malnourished and to stunted and undernourished children, although in one study benefits were less. The single study with term LBW infants had smaller benefits (Walker and others 2004). Three interventions were implemented more generally with children from poor families that also demonstrated benefits (Eickmann and others 2003; Powell 2004; Powell and Grantham-McGregor 1989). Thus, it seems reasonable to conclude that the loss of developmental potential in children disadvantaged through poverty, undernutrition, or both, can be reduced or prevented through home visits that help parents learn how to promote child development.

The age at which intervention begins might also be hypothesized to affect impact, but little evidence is available from the studies reviewed to address this. In many of the evaluations children’s ages on enrollment spanned an age interval of 12 to 24 months (for example, in separate studies, age on enrollment 6 to 24 months and 9 to 30 months), and no investigation has looked at whether children who were enrolled in infancy benefited more or less than those who were older on enrollment. The age at which intervention ends may have implications for sustainability.

Characteristics such as maternal education and family resources may also influence the impact of the interventions, but these have rarely been investigated as potential moderators. Mothers in the studies reviewed usually had no more than an incomplete secondary education (Eickmann and others 2003; Hamadani and others 2006; Powell and others 2004; Walker and others 2004), with many having an incomplete primary education. Although some of the analyses of intervention impact have controlled for the level of maternal education (Eickmann and others 2003; Powell and others 2004), no evaluation has been done of whether the interventions
were more effective in mothers with higher or lower education levels. This is important to ensure that mothers of varying education levels are able to gain from the interventions.

**Individual Counseling of Mothers at Clinics**

Despite the consistent evidence that providing parenting education through home visits benefits child development and that these visits can be effectively conducted by paraprofessionals, the model remains a high-intensity one in terms of human resources. Alternate strategies to reach greater numbers of children are needed, but evidence of their impact on child development is limited. One approach has been to provide parents with counseling and training when they access health services. This model has been developed by the World Health Organization (WHO) and UNICEF as the Care for Development module to be part of the Integrated Management of Childhood Illnesses. The module provides guidelines for health professionals to counsel parents on how to promote development and includes counseling cards with age-specific messages and illustrations of activities. Counseling is done with individual mothers and can be done whenever the mother and child attend the health service for well child or sick visits. Surprisingly, given the efforts to develop the program and materials, only one published evaluation of the impact on child development was identified. This study conducted in a rural county in China demonstrated significant benefits for child development in those randomized to intervention compared with controls (Jin and others 2007; see table 4.3). Although the findings have to be interpreted with caution because the person who conducted the developmental assessments was aware of the children’s group assignment, they suggest that this approach has the potential to benefit development. Differences were also seen in how this intervention was implemented and how Care for Development is likely to be implemented at scale. Counseling sessions lasted 30 to 60 minutes, which is unlikely to be achieved in routine child health clinics, and in addition to the clinic session an additional session was conducted within six months to relate the advice to the home environment using materials in the home. Sessions involved both demonstration of activities and practice by mothers. Potential obstacles to implementation were also discussed with the mothers and solutions to these suggested.

Two other studies provided intervention by training mothers of high-risk children at a clinic or hospital. One involved HIV-infected children whose mothers or caregivers were given individualized stimulation programs when they attended the clinic for the child’s regular three-month visit (Potterton and others 2009). Activities centered on developmentally appropriate play that could be part of the family’s usual daily routine (see table 4.3 for more
<table>
<thead>
<tr>
<th>Study authors and year, country</th>
<th>Jin and others 2007, China</th>
<th>Potterton and others 2010, South Africa</th>
<th>Nair and others 2009, India</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample and design</strong></td>
<td>100 families with a child younger than 2 years from 7 randomly selected villages. Families randomly allocated to intervention (n = 50) or control condition (n = 50)</td>
<td>122 HIV-positive children aged less than 30 months randomly assigned to intervention or control groups (institutionalized children excluded)</td>
<td>800 infants (27% preterm, 50% LBW) admitted to special care nursery randomized to intervention or control groups. 665 infants tested at age 1 and 735 at age 2</td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
<td>Two 30–60-minute counseling sessions using the WHO “Care for Development” guidelines, one on enrollment and one within 6 months. Mothers were given a card depicting age-specific messages. The card was discussed in the counseling sessions using demonstration and practice of play activities, discussion of obstacles to implementation, and help with problem solving</td>
<td>Caregivers given home stimulation programs individualized for children when they attended for usual clinic visit every 3 months. Structured around daily activities and developmentally appropriate play. Caregivers given a picture book and asked to spend time with child looking at and talking about pictures daily</td>
<td>Control group routine postnatal checkup. Intervention mothers trained individually and in groups to give stimulation and to continue at home. Compliance assessed at monthly home visits for 1 year</td>
</tr>
<tr>
<td><strong>Type of trainer</strong></td>
<td>Health professionals conducted counseling. Not clear where counseling was done. Likely that counseling at first visit was done at clinic, second at home</td>
<td>Intervention done by physiotherapist</td>
<td>Training of mothers conducted by occupational therapist. Number of training sessions and duration not given. Unclear whether training also given during home visits or just monitored compliance</td>
</tr>
</tbody>
</table>

(continued next page)
Impact on child development

Significant benefits at end of 6 months to Gesell quotients in adaptive ($d = 0.49$), language ($d = 0.52$), and social ($d = 0.17$) development. No significant benefits for motor development.

Significant improvement after 12 months in intervention group compared with control in Bayley MDI ($d = 0.27$) and PDI ($d = 0.19$)

Intervention infants had higher Bayley MDI ($d = 0.38$) and PDI ($d = 0.40$) scores. Benefits for VLBW, LBW, and NBW infants.

Comments

Tester not blind to children’s group

Severe developmental delay in both groups. Despite improvement in intervention group, children remained severely delayed. Moderate to severe growth retardation. 16% on HAART at baseline, 86% at end of year

Benefits at age 2, half that at end of intervention

Source: Author’s compilation.

Note: HAART = highly active antiretroviral treatment; LBW = low birth weight; MDI = mental development index; NBW = normal birth weight; PDI = psychomotor development index; VLBW = very low birth weight; WHO = World Health Organization.

a. Effect size (Cohen’s $d$) was calculated using unadjusted posttest values (Thalheimer and Cook 2002) to enable comparison among studies. Calculation of effect size using change, for those studies where information was available, showed effect sizes within the same range (small, medium, large).
intervention details). After one year, significant benefits to mental and motor development were seen from intervention, although both intervention and control groups remained severely delayed. In the other study mothers of high-risk neonates received individual and group training in a hospital in early stimulation, which they were to continue at home (Nair and others 2009). Monthly home visits were made for one year to assess whether mothers were implementing the program; it is unclear whether these visits were also used for further training. Benefits at the end of the intervention year were small to moderate, and one year later the size of the benefits was cut in half, suggesting benefits may not be sustained.

These studies are insufficient to reach conclusions on the benefits of strategies using counseling attached to health services but suggest that the approach has potential and needs further evaluation. In these studies interventions were conducted by health professionals and in two of the three studies were individualized for the mother and child. It is also likely that counseling sessions need to be long enough to allow time for demonstration of activities and for mothers to practice.

**Parent Training at Group Sessions**

The numbers of parents and children reached by interventions to improve parenting behaviors could also be increased by delivering interventions through group sessions. Again, relatively few evaluations of this approach have been done (table 4.4). In India, mothers and children who attended a village crèche (nursery) were compared with those in a village without a crèche (Sharma and Nagar 2009). At the crèche, age-appropriate toys and play materials and activities to promote development were provided. Information on providing a good home environment such as stimulation, parental involvement, and play materials was given to mothers and discussed. After 18 months a large benefit for motor development was seen; mental development was not reported. It is unclear from the report of the study who was responsible for implementing the crèche, how often mothers and children attended, the duration of the sessions, and the extent of child-directed activities.

In a parenting program in Bangladesh, groups of about 20 mothers attended 90-minute educational sessions on health, nutrition, and promotion of child development (Aboud 2007). Sessions were conducted by women with some secondary education who were given training and supervision. Mothers attended an average of 16 sessions. No benefits were seen for children’s receptive vocabulary, which was the only measure of child development, or mother-child verbal interaction. Small-to-moderate effects on mothers’ knowledge and stimulation in the home were seen. Within the sessions emphasis was placed on encouraging
### Table 4.4 Parent Training at Group Sessions

<table>
<thead>
<tr>
<th>Study authors and date, country</th>
<th>Sample and design</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aboud 2007, Bangladesh</strong></td>
<td>Mothers recruited from 22 villages that had received a parenting intervention in the previous year ($n = 170$) and 22 villages with no intervention ($n = 159$). Children aged 2–3 years during intervention. Post-test comparison of intervention and control.</td>
<td>90-minute weekly education sessions to groups of about 20 mothers. Topics included nutrition and health as well as child development. Mothers attended an average of 16 sessions over the year. Emphasis was on positive behaviors, but only 20% were demonstrated and few materials used.</td>
</tr>
<tr>
<td><strong>Sharma and Nagar 2009, India</strong></td>
<td>Infants &lt;18 months, 69 infants from intervention village and 76 infants from a control village</td>
<td>Mothers and infants attended crèche in village for 18 months and were given age appropriate toys and activities to enhance development and information on child development and providing a good home environment.</td>
</tr>
<tr>
<td><strong>Pearson and others 2008, Paraguay</strong></td>
<td>Infants 0–24 months. From remote rural areas. 46 no intervention and 60 had participated in Pastoral del Niño. Intervention and no intervention families from same areas but different communities. No significant differences between intervention and no intervention in parental education, employment and income.</td>
<td>Monthly meetings at community centre. Parents encouraged to promote development through play and to converse with child. Intervention also focused on health and nutrition. Attendance at meetings from pregnancy to age 5 years.</td>
</tr>
<tr>
<td>Type of trainer and supervision</td>
<td>Facilitators had some secondary education and received 17 days’ training and a manual of topics. Supervision was done on 4 days/month – not clear what this involved or by whom</td>
<td>No information on how often mothers attended crèche or who conducted the sessions or duration of sessions.</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impact on child development</td>
<td>Significant benefits to mothers child-rearing knowledge (effect size $d = 0.31$) and stimulation in the home ($d = 0.34$). No benefits to verbal interaction or child receptive vocabulary</td>
<td>No differences between villages on pre-test. At post-test infants in intervention village had significantly higher Bayley motor score ($d = 1.72$) and HOME score.</td>
</tr>
<tr>
<td>Comments</td>
<td>Benefits to stimulation greater if mothers had at least some education (one year or more)</td>
<td>Bayley MDI not reported. No investigation of any village level differences which may have affected results</td>
</tr>
</tbody>
</table>

**Source:** Author’s compilation.

**Note:** HAART = highly active antiretroviral treatment; LBW = low birth weight; MDI = mental development index; NBW = normal birth weight; PDI = psychomotor development index; VLBW = very low birth weight; WHO = World Health.

a. Effect size (Cohen’s $d$) was calculated using unadjusted posttest values (Thalheimer and Cook 2002) to enable comparison among studies. Calculation of effect size using change, for those studies where information was available, showed effect sizes within the same range (small, medium, large).
positive behaviors and attempts were made to engage the mothers in discussion and problem solving, but use of demonstration was limited and very few materials were used.

A community-based group parenting program in Paraguay, run as an outreach program of the Roman Catholic Church, using volunteer leaders, had significant benefits on children’s mental development (Peairson and others 2008). Parents attended monthly meetings at which they were encouraged to promote development by playing and chatting with their children. Volunteers also conducted home visits, but little information is available on what these involved or their frequency.

The conclusions that can be reached from these studies are limited. Again, evidence seems to suggest the need for demonstration and practice, given the lack of child benefits in the Bangladesh program. The choice of trainers may also be important. In the Paraguay study the volunteer leaders were from the same communities, which may have facilitated understanding and rapport with the parents and contributed to program benefits.

In these, and in the individual parenting sessions described in the previous section, mothers’ education ranged from an average of two to three years in Bangladesh to five to eight years in Paraguay. About one-third of the mothers in the study in China were described as illiterate, whereas in the South African study about 25 percent of the mothers had completed secondary school. Mothers with limited education, therefore, seem to benefit from these interventions. Only the study by Aboud (2007) specifically examined whether maternal education moderated benefits and found that benefits for stimulation were less in mothers who did not have at least a minimum of exposure to formal education (one year).

Center-Based Strategies

Provision of early childhood stimulation for children less than three years of age at centers has not been a frequent strategy in LAMI countries, where most of the attention for this age group has been on working through parents. However, as increasing numbers of mothers work, and in urban areas do not always have the support of family members, use of informal day care arrangements is likely to increase. Low-income women are unlikely to be able to afford formal day care; therefore, attention to the quality of care provided in these informal settings will be an essential component in ensuring adequate care for young children.

Two large-scale examples of community-based day care from Latin America have been evaluated. In Bolivia, the Proyecto Integral de Desarrollo Infantil (PIDI: Integrated Child Development program) provided care for children aged six months to six years in homes of women within the
community. Children were cared for in groups of up to 15 children by two to three caregivers. Caregivers were from a social background similar to that of the children’s parents and received training in child development. The goal of the program was to provide an integrated program of health, nutrition, and education. Meals were provided, and caregivers were trained to provide a stimulating environment. The program served poor children mainly in urban areas.

An evaluation of the program used two rounds of survey data collected in 1995–96 and 1997–98 (Behrman, Cheng, and Todd 2004). Comparisons were made with children from areas without the program and with children from areas with the program who had not been enrolled in day care, and these comparisons indicated benefits from the program for motor, language, and psychosocial development. We focus on the results for younger children and on the comparison that used only children enrolled in the program, comparing those who had been enrolled for one month or less with those enrolled for 13–18 months. For children aged 6–24 months, those who had been in the program for 13–18 months had benefits in all areas of development; children aged 25–36 months showed benefits for gross motor but not fine motor development and benefits for language and psychosocial skills. Finally, children aged 37–41 months (who would have been younger than age three for the majority of their time in the program) showed improved psychosocial skills but not significant benefits for motor or language development. The size of the increases in scores ranged from 3 to 10 percent. Based on assumptions of the link between improved cognitive skills and nutrition and adult earnings, the benefit-to-cost ratio of the program was estimated at 1.4–3.7.

The Colombia Programa Hogares Communitarios de Bienestar (Program for Home-Based Community Day Care) uses a similar approach to that of PIDI. Begun in 1987, it targets children up to age six from families in the lowest income groups. Although delivered throughout the country, it has been reported to be best suited for urban areas. Up to 15 children are cared for by a mother from the community and an assistant. Both attend a 40-hour training workshop and are supervised by staff from the Colombia Family Welfare Institute, an agency of the Ministry of Health. Parent associations are also involved in organization and supervision of centers, and parents pay 25–37 percent of a daily minimum wage per month. Children are provided with meals and snacks to provide 50–70 percent of daily requirements, and activities to foster social maturity and development are conducted, such as supervised free play, creative activities, language activities, and a variety of new experiences. In later years, concerns that children under age two were not adequately cared for when mixed with older children led to a similar but separate program for younger children, the Child and Family Care program.
The Colombia program was evaluated in 2007 (Bernal and others 2009), at which time over 61,000 day care centers were serving approximately 780,000 children. We again focus on the results for younger children that compare those exposed to the program for 16 months or more with those enrolled for less than two months. Children aged 36–48 months (the youngest age group evaluated) who had been in the program for at least 16 months had better verbal comprehension and better scores in verbal ability, mathematical reasoning, and general knowledge than those recently enrolled, although no significant differences were seen in overall intellectual ability. Effect sizes were generally small but probably important at the population level. Benefits were also seen for children’s social development with better interaction and fewer problems with social isolation in those with greater exposure to the program. However, exposure to the program was associated with higher levels of aggression.

The longer-term benefits of the program were also investigated in children who were eligible for the program from birth to six years of age, comparing 943 children who had participated with 947 nonparticipants by means of their scores on a national test administered in grade 5 of primary school. Controlling for potential confounders such as parental education and home characteristics, children who had been exposed to the program had higher scores. The gain in scores was mainly due to benefits to language.

An integrated program was conducted in the Philippines that included provision of health and nutrition services as well as parent education and home-based day care. Parent education seminars were implemented in all the program areas, and 44 percent had day care compared with none in the nonprogram areas. However, day care was predominantly for children three to five years of age because there was little uptake of the “Day Care Mom” program for those under age three. Although it is not possible to identify the impact of the individual components of the program, among children less than age three at the final survey those with at least 12 months of exposure to the program had better motor, cognitive, language, and socioemotional skills than those with less than four months’ exposure (Armecin and others 2006).

Impact of Parental Enrichment on Parenting Knowledge and Behavior

The objective of the parental enrichment programs (and, to a lesser extent, center-based programs, which have outreach for parents or involve them in the running of the centers) is to enhance parents’ knowledge of child development and enable them to provide the stimulation and experiences
promoting equity through early child development interventions in the home necessary to promote their children’s development. These changes in parental behavior are then expected to be part of the mechanism through which the child’s development and behavior benefit (for home-visits programs, more direct benefits from the visits themselves may also be seen). Thus, benefits to parental outcomes have also been used as indicators of the success of interventions (table 4.5). Several home-visits interventions have demonstrated benefits for mothers’ knowledge (Hamadani and others 2006; Powell 2004; Powell and others 2004; Rahman and others 2008), and, more important, some have shown benefits for the level of stimulation provided in the home (Powell and others 2004; Walker and others 2004), although where measured, this has not always been found (for example, roving caregivers in Jamaica; Powell 2004). Improvements in maternal sensitivity and responsiveness have also been shown (Cooper and others 2009). Parent training using group sessions has also benefited home stimulation, with effects varying from small to large (Aboud 2007; Pearison and others 2008; Sharma and Nagar 2009). Only one study using individual counseling of the mother measured effects on stimulation and showed modest benefits (Ertem and others 2006).

Whether change in parental behavior mediates the benefits for child development from early intervention programs has been examined on only a few occasions. In the intervention with term LBW infants in Jamaica, improvements in the level of stimulation in the home mediated some of the intervention benefits for developmental quotient (DQ; Walker and others 2004); however, recent analysis of the trial with stunted Jamaican children showed that change in home stimulation contributed to a relatively small proportion of intervention benefits for development (unpublished results).

Only three studies were identified that have examined whether changes to parental behavior from early childhood programs are sustained. In one, with follow-up conducted when children were aged 9 to 11, home stimulation and provision of play materials were not different, but mothers in the intervention group provided more school books and had sent the children to preschool earlier (children in the intervention group attended preschool for approximately twice as long as control children; Grantham-McGregor and others 1994). In the study of stunted children, follow-up when children were seven years of age showed no intervention differences in parental behavior (Grantham-McGregor and others 1997); however, at age 11 mothers who participated in the stimulation intervention provided their children with more reading materials but not more toys and games than mothers in nonstimulation groups. They were also more likely to support the child in homework and provide a variety of activities (trips, visits to public library). Among mothers of term LBW infants, no intervention benefits for stimulation were seen at age six years, measured with the Middle Childhood Home Observation for
### Table 4.5 Impact of Interventions on Parenting Knowledge and Stimulation

<table>
<thead>
<tr>
<th>Study</th>
<th>Parenting outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home visits</strong></td>
<td></td>
</tr>
<tr>
<td>Hamadani and others 2006, Bangladesh&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Knowledge of child rearing, ( d = 1.02 )</td>
</tr>
<tr>
<td>Grantham-McGregor and others 1991, Jamaica&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Stimulation (HOME), ( d = 0.49 )</td>
</tr>
<tr>
<td>Powell and others 2004, Jamaica&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Child-rearing knowledge (( d = 1.25 )) and practices (( d = 0.65 ))</td>
</tr>
<tr>
<td>Powell 2004, Jamaica&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Benefits for child-rearing knowledge (( d = 0.64 )), no benefits for HOME</td>
</tr>
<tr>
<td>Walker and others 2004, Jamaica&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Stimulation (HOME), ( d = 0.37 )</td>
</tr>
<tr>
<td>Cooper and others 2009, South Africa</td>
<td>Mother-child interactions at 6 and 12 months more sensitive (( d = 0.24, 0.26 )) and less intrusive (( d = 0.26, 0.24 ))</td>
</tr>
<tr>
<td>Rahman and others 2008, Pakistan</td>
<td>At 3 months, knowledge of early infant development increased, ( d = 2.23 )</td>
</tr>
<tr>
<td><strong>Group training</strong></td>
<td></td>
</tr>
<tr>
<td>Sharma and Nagar 2009, India&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Stimulation (HOME), ( d = 3.51 )</td>
</tr>
<tr>
<td>Aboud 2007, Bangladesh&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Stimulation (HOME) (( d = 0.34 )), knowledge (( d = 0.31 )), no benefits for verbal interaction</td>
</tr>
<tr>
<td>Pearson and others 2008, Paraguay</td>
<td>Significantly higher HOME, ( d = 1.16 )</td>
</tr>
<tr>
<td><strong>Clinic-based counseling</strong></td>
<td></td>
</tr>
<tr>
<td>Ertem and others 2006, Turkey</td>
<td>Stimulation (HOME) 1 month after visit, median scores not different, but greater proportion of intervention group had “optimal” scores (equal to 38 or above)</td>
</tr>
</tbody>
</table>

**Source:** Author’s compilation.

**Note:** HOME = Home Observation for Measurement of the Environment.

<sup>a</sup> See table 4.2 for details.

<sup>b</sup> See table 4.4 for details.
Measurement of the Environment (HOME; Walker and others 2010). The limited information available suggests that any long-term benefits to parental behavior may be mainly related to decisions about schooling and provision of support for schooling. It is possible that intervention alters parents’ perception of their child’s potential, with subsequent changes to decisions related to investments in education. More evidence is needed in this area because this could be a significant additional benefit from early intervention, which would in turn increase the long-term gains for children’s educational outcomes.

Evidence for Long-Term Benefits for Child Cognition and Behavior

The studies reviewed in this chapter provide consistent evidence that interventions to provide stimulation and learning opportunities for children from birth to age three through a variety of approaches can be successful in preventing the loss of developmental potential in children from poor families in LAMI countries. The evidence base is strongest for home-visits programs where trained paraprofessionals work with the mother and child. Children who receive early intervention are therefore likely to benefit more from preschool and then from formal schooling. Findings from at least five LAMI countries demonstrate that early cognitive ability predicts school outcomes such as achievement levels and grade level attained (Grantham-McGregor and others 2007). It is therefore reasonable to anticipate that gains in early development will be associated with long-term gains in education to the benefit of both the individual and society.

Medium- and long-term follow-up has been performed for children who received early intervention. In Jamaica, a home-visits program to improve mother-child interaction benefited development of term LBW infants at age two when the intervention ended. Children were reassessed at age six when the majority of them had just started primary school. Significant benefits were seen from the intervention for their performance IQ and memory, and they had significantly fewer behavioral difficulties (Walker and others 2010). No benefits for language were found. The effect sizes for benefits to cognition at age six were moderate and similar to those seen in early childhood and slightly greater (0.58 SD) for behavior. The reduction in behavior difficulties may be particularly important for these children at a time when they are making the transition to primary school.

Sustained benefits in primary-school-aged children were also reported in an evaluation of the Colombian home day care program, where benefits were found for achievement in language (described earlier; Bernal and others 2009), and in an earlier Colombian study home visits up to age three
were associated with better reading readiness at age seven in boys only (Super and Herrera 1991).

Two small groups of children, severely malnourished between 6 and 24 months of age, were followed up to late adolescence. One group received stimulation in the hospital followed by home visits to help mothers promote development through play and better interaction. Visits were weekly for two years and then fortnightly for the third year. The stimulation group had higher scores on the Wechsler Intelligence Scales for Children than children who had not had intervention 14 years after they left the hospital (11 years after intervention ended; Grantham-McGregor and others 1994). The effect size was large (0.92 SD) and comparable to that seen when IQ was first measured, two years after intervention ended. The participants who had received stimulation also had higher scores in reading and overall school achievement ($p < 0.1$).

The most comprehensive evidence of long-term benefits from early intervention comes from the Jamaican study of stunted children, aged 9–24 months on enrollment, who participated in a two-year randomized trial of supplementation and/or psychosocial stimulation (for details of the original study and findings, see table 4.2). The children were reassessed at ages 7, 11, and 17 (table 4.6; Grantham-McGregor and others 1997; Walker and others 2000, 2005). Benefits to cognition were seen at each follow-up, whereas benefits in tests of educational achievement started to emerge at age 11 ($p < 0.1$) and were significant for reading at age 17 years. Similarly, behavior differences were not seen when first assessed by teacher and parent report at age 11 (Chang and others 2002), but by age 17 parents reported that the participants had fewer problems with attention and tended to show less oppositional behavior (Walker and others 2006). In addition, participants self-reported fewer symptoms of depression and anxiety and better self-esteem (Walker and others 2006).

The results of this study indicate that early intervention has long-term benefits for IQ, educational achievement, and behavior and supports the hypothesized benefits for long-term outcomes for children who receive early intervention. The size of the benefits for IQ and reading ability suggests that benefits for adult employment are likely. Further, better psychological functioning seen in program participants is likely to benefit functioning in the workplace and within society.

In this Jamaican study, visits were conducted weekly for two years. The program focused on working with mothers to enable them to be more effective in promoting their child’s development. Mothers were encouraged to chat with and listen to their children, to use everyday activities to teach concepts, and to integrate play activities into their daily routine. It is likely that this emphasis on reaching the child through the mother contributed to the sustainability of intervention benefits.
As is typical for Jamaica, 99 percent of the children in the study (control and intervention) attended preschool, with 91.7 percent attending for at least two years. Thus the sustained benefits are in a context where children who received early intervention went on to center-based early education.

### Table 4.6 Long-Term Effects of Psychosocial Stimulation: The Jamaica Study

<table>
<thead>
<tr>
<th>Age at Follow-up (Years)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognition</td>
</tr>
<tr>
<td>7–8</td>
<td>Benefits for IQ (effect size 0.41 SD) and other cognitive tests not significant individually, but stimulation groups (and supplement only group) had better scores than control group on 13–14 of 15 tests (sign test $p = 0.01$). Significant benefits for perceptual motor function.</td>
</tr>
<tr>
<td>11–12</td>
<td>Significant benefits for IQ (effect size 0.52 SD), reasoning ability, and vocabulary compared with control group. No benefits for 2 other language tests and tests of memory and attention</td>
</tr>
<tr>
<td>17–18</td>
<td>Significant benefits to IQ (effect size 0.51 SD) vocabulary (analogies and PPVT) and reasoning ability compared with no stimulation groups (control and supplement only)</td>
</tr>
</tbody>
</table>

**Source:** Author’s compilation.

**Note:** PPVT = Peabody Picture Vocabulary Test; SD = standard deviation.
Long-term gains from strategies to promote optimal development in the birth to age three group are likely to be most successful where attention is also placed on ensuring continuing access to learning opportunities.

**Linking Early Intervention with Health and Nutrition Programs**

Recent reviews have highlighted the importance of nutrition and health issues for ECD in LAMI countries (Walker and others 2007) and have estimated the cost-effectiveness of interventions to address these (Behrman, Alderman, and Hoddinott 2004). Nutrition and health factors that contribute to poor young child development are summarized in table 4.7. These conditions affect large numbers of children in LAMI countries (for example, linear growth retardation in 32 percent of children under age

### Table 4.7 Priority Nutrition and Health Risks Affecting Children from Birth to Three Years of Age in LAMI Countries

<table>
<thead>
<tr>
<th>Risk</th>
<th>Summary of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear growth retardation</td>
<td>Cohort studies show poor cognitive and social-emotional outcomes. Supplementation trials show benefits for development (one with long-term gains)</td>
</tr>
<tr>
<td>Iodine deficiency</td>
<td>Meta-analyses show consistent deficits, and trials show benefits of prenatal and postnatal supplementation</td>
</tr>
<tr>
<td>Iron deficiency anemia</td>
<td>Cohort studies show long-term deficits. Preventive supplementation benefits motor, cognitive, and social development</td>
</tr>
<tr>
<td>Malaria</td>
<td>Severe malaria is associated with neurological deficits. Frequent uncomplicated attacks and asymptomatic parasitemia may lead to poor cognitive and educational outcomes</td>
</tr>
<tr>
<td>Intra-uterine growth restriction</td>
<td>Consistent evidence for lower developmental levels in early childhood</td>
</tr>
<tr>
<td>Environmental toxins</td>
<td>Most consistent evidence for lead with deficits beginning at low levels of exposure</td>
</tr>
<tr>
<td>Maternal depressive symptoms</td>
<td>Associated with poorer quality parenting and poor developmental outcomes</td>
</tr>
<tr>
<td>Exposure to violence</td>
<td>Domestic and community violence affects family functioning and young child outcomes</td>
</tr>
</tbody>
</table>

*Source:* Adapted from Walker and others 2007.

*Note:* LAMI = low- and middle-income countries.
Interventions to reduce the prevalence of nutrition and health risks and to treat affected children are essential for optimal child development. These interventions include promotion of exclusive breast feeding; improved young child nutrition, in particular complementary feeding; iodine fortification programs; prevention of iron deficiency anemia; and early effective treatment of malaria.

Children with health and nutrition risks are also likely to be at risk of inadequate early learning environments. Thus, linking ECD programs with those targeting children identified through nutrition and health programs is likely to be an effective way of ensuring that ECD interventions reach children in greatest need. As reviewed earlier, substantial evidence shows that children with nutrition and health risks benefit from interventions to promote increased stimulation and improve parent-child interaction. Thus, integrated programs are likely to be a cost-effective approach to achieving gains in ECD. Evidence from a meta-analysis of non-U.S. studies also shows that the impact on cognitive and social emotional development was greater when interventions included stimulation compared with interventions comprising only nutrition or financial assistance (Nores and Barnett 2009).

In many countries the health services are the main government service for children under three years of age. Thus, these services, which also provide nutrition programs, offer a potential infrastructure in which to integrate early development programs. A critical need exists for evaluation of strategies within health services to reach high-risk children and to provide more general parenting programs. However, in some countries attendance at health services decreases once the early immunization schedule is complete at 18–24 months. A further challenge is how to reach children after this and before enrollment in center-based early education.

**Comparing Strategies and Investments for the Birth to Age Three Group**

Early intervention leads to gains in child development with subsequent gains for educational attainment and expected benefits for adult employment. Thus, ensuring that young children have quality caregiver-child interactions and stimulation is likely to reduce inequalities in attainment through benefits for individuals and contribute to national development.

Several approaches have been used to reach the birth to age three group. These have varying impacts and differ in the investments that are required to deliver the programs, as summarized in table 4.8. In moving toward expanding the numbers of children reached, the choice of strategies would need to be based on the likelihood and size of immediate and sustainable
benefits and the investments required to achieve these gains. The investments will depend on personnel required and the availability of an existing infrastructure with which early childhood interventions can be integrated. Personnel to implement the program are in most cases the largest cost, which is influenced by the level of persons required and the numbers of

<table>
<thead>
<tr>
<th>Type of program</th>
<th>Evidence for benefits to development</th>
<th>Required investments</th>
<th>Numbers of children reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home visits</td>
<td>9 efficacy studies: All showed benefits for development, usually medium to large effect, evidence for long-term gains</td>
<td>Personnel: Paraprofessional home visitors, Training and supervision, Materials for simple toys and picture books</td>
<td>15–20/visitor if fully assigned to home visits; 4–5/visitor if employed in health sector with other duties</td>
</tr>
<tr>
<td>Individual counseling</td>
<td>3 studies: All showed benefits for development, effects small to medium</td>
<td>Personnel: Health professionals conducted counseling in studies reviewed. Unclear whether these could be done by paraprofessionals with training and supervision. Training for counselors, Materials: counseling cards, materials for demonstration</td>
<td>Potential to reach large numbers of children, but feasibility not established, and impact of short counseling sessions not demonstrated</td>
</tr>
<tr>
<td>Parent training</td>
<td>3 studies: 1 benefit for motor development (mental development not reported), 1 benefit for mental development (motor not reported), 1 benefit for parent knowledge and stimulation, no child benefits</td>
<td>Personnel: Group leaders not professionals but generally with more education (at least some secondary) than home visitors. Training and supervision. Materials for demonstration</td>
<td>15–20 parents/ workshop, number reached depends on how many workshops each parent would need to attend and how many workshops one group leader could conduct per week</td>
</tr>
<tr>
<td>Home day care</td>
<td>2 evaluations of large-scale programs: Significant benefits but generally small, 1 showed benefit-cost ratio of 1.4–3.7, 1 showed gains in primary school</td>
<td>Personnel: Day care mothers and assistants; training and supervision. Upgrading of homes to ensure suitable for day care. Meals and play materials</td>
<td>15 children/center</td>
</tr>
</tbody>
</table>

*Source: Author’s compilation.*
children who can be reached per staff member. These are compared for different approaches with delivery in Table 4.8. In addition to staff who will deliver the program, a need is seen for training and supervision. This will require investment of the time of nurses or other health staff if the program is nested within the health service or the hiring of additional personnel.

Choice of strategy will also depend on the existing national and community infrastructure with which ECD programs could be integrated. Integration may require different approaches in urban and rural areas, but successful interventions in rural areas suggest the feasibility of training people within villages (Hamadani and others 2006) or building on community programs (Pearson and others 2008). Several of the interventions evaluated have been implemented as additions to existing programs (Hamadani and others 2006) or have been based within health services (Potterton and others 2009; Powell and Grantham-McGregor 1989), although few have been fully integrated with the existing services (the Philippines integrated ECD program is probably the only example; Armecin and others 2006).

**Home Visits**
The study by Powell and others (2004) examined the feasibility of training CHWs already employed in health centers to conduct home visits, which would be done in addition to their regular duties. The program was successful, and it was estimated that each CHW could visit about four or five children each week. Thus, the feasibility and sustainability of home-visits programs will be greater where health services already employ CHWs or a similar cadre of workers. Even where this is the case, there is a cost to other services that the CHWs may have provided. Sustainability of programs will require ownership by the health services and acceptance that promotion of ECD is a health sector activity.

**Individual Parent Counseling**
Evidence suggests that individual counseling of caregivers when they attend health services for regular care can benefit development and that receiving all services at one location is attractive to mothers (Potterton and others 2009). The WHO/UNICEF Care for Development program is intended to be included as a part of the health services for young children. The same issues apply, as for home-visits programs, with regard to ownership by the health sector because health staff will be expected to learn new skills and conduct counseling (5–10 minutes at each visit) in addition to ongoing activities in clinics, which are often overcrowded and where staff have limited time for each patient.

**Parent Groups**
Training of parents in group sessions has received only limited evaluation but has the potential to reach large numbers of families. Sessions could be linked with community infrastructure, such as community centers and
schools. However, further evidence is necessary for benefits for child development and the essential components of training before large-scale expansion of this approach.

**Day Care**

Home day care centers utilize existing community homes that may require upgrading to be suitable. The programs also require funds to pay the day care mother and provide meals and play materials for the children. Some level of cost sharing with parents may be possible. This type of intervention has been found to be more suited to urban areas where working mothers are less likely to have other family members to rely on for child care. Unlike other strategies, examples are found of large-scale programs that have been shown to benefit child development.

**Research Needs for Program Expansion**

Making choices for which strategy or a combination of strategies will best serve the needs of families and children in a country or region can begin to be made based on the evidence available. Additional information would facilitate this process (box 4.1). Probably the most urgent is the identification of the modifications to programs that are necessary for scaling up and evaluation of the effect of these changes on program impact. Limited evidence is available on the benefits of improving parenting through individual parent counseling or parent groups. Further evaluations of these approaches and others that can be implemented at scale are urgently needed.

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**BOX 4.1**

**Research Needs for Expansion of ECD Programs for Children Less than Three Years Old**

- Modification of programs to facilitate large-scale implementation and evaluation of programs at scale.
- Evaluation of health systems to identify any changes needed to ensure capacity to accommodate ECD programs.
- Routine collection within efficacy trials of information needed to inform scaling up.
- Further evidence of sustainability of benefits and factors that influence sustainability.
- Assessment of cost-benefit ratio.
Programs are more likely to be sustainable if they are integrated with an existing infrastructure. This presents challenges where staff employed are expected to conduct additional activities in situations where human resources are already stretched. Understanding of the health system (or other service with which ECD could be integrated) will be essential to determine the barriers to scaling up and identify solutions to facilitate successful integration of ECD. For example, evaluation of the acceptability of Care for Development for health center staff and the fidelity with which it is implemented will be critical to successful expansion.

The conclusions that could be reached from existing research would be greater if information needed to inform scaling up was routinely included. Efforts to encourage researchers to report data, such as qualifications of personnel, training and supervision given, numbers of parents and children reached per staff member, and other materials and supplies needed, would facilitate the evaluation of the cost and feasibility of programs and their potential for scaling up.

Evidence for long-term benefits of intervention comes from relatively few studies, most of which were conducted in Jamaica. Further follow-up studies would enable stronger conclusions on the minimum duration and intensity of intervention necessary for long-term gains. In the Jamaican study of stunted children, benefits in early childhood were large and medium in late adolescence. Additional information is needed on whether the size of impact in early childhood predicts long-term gains.

Although the types of investments needed were summarized in table 4.8, few assessments are available of the ratio of benefits to costs, which would facilitate both advocacy and decision making for programs to be used.

**Conclusions**

Promoting optimal development among children from birth to three years of age requires attention to nutrition, health, and ensuring quality caregiver-child interaction and stimulation. Early stimulation interventions prevent the loss in developmental potential experienced by large numbers of children in LAMI countries; the evidence for benefits is strongest for strategies that provide parental enrichment through home visits. Sustained benefits for cognitive and psychological functioning and educational achievement have been demonstrated. These are likely to benefit adult earning, functioning in society, and parenting of the next generation and thus promote equity.

A need is seen for agreement on strategies or sets of strategies, based on this evidence and on the investments required, so that consistent recommendations can be given to governments and other agencies. A clear
strategy or set of strategies needs to be developed to provide comprehensive ECD programs for children between birth and age three. This is likely to require investment in evaluations of the effectiveness of a variety of approaches to delivery that can be implemented at scale.

A critical need is also seen for continued advocacy for expansion of early stimulation programs for children between birth and age three. Opportunities for integrating stimulation with existing services for children need to be identified, and provision of stimulation needs to be included as part of the core set of services provided for children under three years of age.

References


