

Early Childhood Development in Latin America and the Caribbean

Children in many developing countries suffer from profound deficits in nutrition, health, fine and gross motor skills, cognitive development, and socioemotional development. Early childhood development outcomes are important markers of children's welfare in their own right. In addition, the deleterious effects of inadequate development at early ages can be long lasting.

Children display large differences in cognitive and noncognitive skills or abilities at early ages. A well-established finding from the literature on the United States is that children in households with higher income and higher parental education levels perform better on a variety of cognitive tests and have fewer behavioral problems than their counterparts from low-income households.¹ Steep gradients between socioeconomic status and early childhood skills have also been found in Latin America.² Differences in test performance persist as these children age. Moreover, research from a number of developed countries suggests that low levels of cognitive development in childhood, as measured by tests administered as early as twenty-two months of age, are important predictors of wages.³ Others argue that noncognitive dimensions of development in early childhood are important determinants of future success.⁴

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1. On cognitive test results, see, for example, Smith, Brooks-Gunn, and Klebanov (1997); Blau (1999); Ruhm (2004); Taylor, Dearing, and McCartney (2004). On behavioral problems, see, for example, Berger, Paxson, and Waldfogel (2005).

2. See Halpern and others (1996) on Brazil; Paxson and Schady (2007) on Ecuador.

3. See, for example Connolly, Micklewright, and Nickell (1992); Currie and Thomas (1999); Feinstein (2003); Robertson and Symons (2003).

4. Carneiro and Heckman (2003); Cunha and others (2005).

Inadequate cognitive and noncognitive skills can therefore contribute to the transmission of poverty across generations.

A variety of interventions in early childhood have been shown to have large returns. In the United States, children who were randomly assigned to the Perry Preschool Project had higher test performance later on in life, lower incarceration rates, and median earnings that were more than one-third higher than those in the control group.⁵ Similarly impressive results are found in analyses of the pilot Carolina Abecedarian Project. There also appear to be substantial, if smaller, returns to the nationwide Head Start program. For example, Garces, Thomas, and Currie find that Head Start participants are more likely to attend college and have lower rates of delinquency and crime than nonparticipants.⁶ In Latin America and the Caribbean, Grantham-McGregor and her coauthors find large effects of an early childhood stimulation pilot intervention on test performance in Jamaica.⁷ Behrman, Cheng, and Todd report large effects of a daycare program on motor skills, psychosocial skills, and language acquisition in Bolivia.⁸ Attanasio and Vera-Hernández show improvements in child nutritional status of children participating in a community nursery program in Colombia.⁹ Berlinski and Galiani, as well as Berlinski, Galiani, and Gertler, show that a preschool construction program in Argentina increased preschool enrollment rates and led to better performance on cognitive and behavioral outcomes among preschool participants once they reached primary school.¹⁰

This paper discusses early childhood development in Latin America and the Caribbean. Explicit reference is not made to child health and nutrition per se, as this has been extensively studied in the region. The focus is on children's development of cognitive and noncognitive skills or abilities in the preschool years. A handful of recent papers suggest that Latin America faces very serious deficits in cognitive development among children.¹¹ Less is known about levels of noncognitive skills in the region.

The paper is organized as follows. The next section briefly considers the theoretical case for investments in early childhood. The paper then selectively reviews the literature on the impact of early childhood development programs

5. Schweinhart (2005); Currie (2001); Carneiro and Heckman (2003).

6. Garces, Thomas, and Currie (2002); Currie (2001).

7. Grantham-McGregor, Powell, and others (1991); Grantham-McGregor, Walker, and others (1997); Walker and others (2000); Powell and others (2004).

8. Behrman, Cheng, and Todd (2004).

9. Attanasio and Vera-Hernández (2004).

10. Berlinski and Galiani (2005); Berlinski, Galiani, and Gertler (2005).

11. See Fernald and others (2006) and Gertler and Fernald (2004) on Mexico; Halpern and others (1996) on Brazil; Paxson and Schady (2007) on Ecuador.

in the United States. A subsequent section focuses on Latin America and the Caribbean. Here, I discuss evidence on developmental deficits in the region; the relations among child development, household socioeconomic status, child health, and parenting practices; and the impact of specific programs and policies. Finally, the paper proposes directions for future research. An important message of this last section is that the knowledge base is still thin in Latin America. The returns to comparative descriptive analysis of early childhood development outcomes in the region, as well to careful evaluations of the impact of various programs and policies, are thus very high.

The Theoretical Case for Investments in Early Childhood

A number of authors make a strong economic case for public investments in early childhood. This section briefly summarizes the arguments made in a recent, influential article by Cunha and others.¹² The paper develops a model of human skill formation that builds on Becker; Becker and Tomes; and Ben-Porath.¹³ Their model has a number of important insights. First, abilities are multi-dimensional, rather than unidimensional in the sense of Griliches.¹⁴ Cognitive and noncognitive abilities affect both schooling and wages. Pure cognitive abilities include IQ; noncognitive abilities include things like patience, self-control, temperament, and time preference. Abilities are shaped by genetic components and environmental influences, and the influence of parents is particularly important. Second, ability formation is governed by a multistage technology. Some abilities can be produced most effectively at a given period in life; Cunha and others refer to these as sensitive periods. Other abilities can *only* be produced at a particular period; Cunha and others call these critical periods. The existence of sensitive and critical periods means that the remediation of some abilities not acquired in early childhood is impossible or prohibitively costly. In the extreme case of a Leontief technology, investments in skill formation during the school or postschool periods are only productive if a sufficiently high level of investment was made earlier on. Third, skill formation is characterized by self-productivity, in that skills acquired in one period persist into the next period, and skills acquired in one dimension (for example, self-control) may

12. Cunha and others (2005).

13. Becker (1964); Becker and Tomes (1979, 1986); Ben-Porath (1967).

14. Griliches (1977). Cunha and others (2005) use the words “skills” and “abilities” interchangeably.

make it easier for a person to acquire skills in another dimension (for example, cognitive learning). Fourth, skills are complementary, such that skills acquired in one period increase the productivity of investments at later ages. Finally, Cunha and others argue that as a result of self-productivity and complementarity, investments at early ages can have important multiplier effects.

If the model in Cunha and others is correct, why do parents not invest more in developing critical skills in their children at early ages? What is the market failure? One possibility is that parents are credit constrained. Two possible forms of credit constraints could affect investments in early childhood.¹⁵ First, the timing of income may matter. Some parents may have an expected lifetime income that would appear to be high enough for them to make adequate investments in early childhood, but the actual resources at their disposal when their children are young are insufficient to do so. If these parents are credit constrained, they may underinvest in skill formation in early childhood. Second, the lifetime income of some parents may be too low for them to borrow sufficiently against it; this, too, could result in inadequate investments in early childhood. Carneiro and Heckman and Cunha and others argue that the first kind of credit constraint is empirically unimportant in the United States, while the second appears to limit investments in early childhood.¹⁶ It is not clear, however, whether this empirical evidence can be applied to developing countries, including those in Latin America and the Caribbean.

Information failures may also cause parents to underinvest in early childhood skill formation. This may be a particularly important consideration in developing countries, where education levels are much lower than in the United States. It is generally believed, although hard to demonstrate empirically, that low parental education levels play a causal role explaining poor child health status in developing countries; this is likely to apply to other dimensions of skill formation in early childhood. To the extent that this is the case, inadequate knowledge by parents on the returns to investments in childhood, the benefits of specific policies or programs, and parenting practices may all contribute to low levels of investment in skill formation at early ages or to environments that do not promote children's acquisition of important cognitive or noncognitive abilities.

Finally, public investment in early childhood may be merited based on equity considerations. Efforts to equalize initial endowments avoid many of the moral hazard problems inherent in programs that seek to equalize outcomes in adult-

15. Carneiro and Heckman (2002, 2003); Cunha and others (2005).

16. Carneiro and Heckman (2002, 2003); Cunha and others (2005).

hood. Young children do not reduce their effort in response to an early stimulation program, but adults may work less if they know they are eligible for unemployment benefits. It may be more effective to promote equality of opportunities (in early childhood) than equality of outcomes (in adulthood).¹⁷

Evidence on Returns to Investment in Early Childhood in the United States

If the theoretical case for investment in early childhood is sound, one would expect to see high returns to programs that effectively build skills early in the life cycle. This section briefly discusses the empirical evidence from the United States, focusing on findings from two randomized evaluations of pilot interventions, as well as on evaluations of the impact of the Head Start program.

The Perry Preschool Project is probably the most-studied preschool intervention in the United States. Between 1962 and 1967, a sample of 128 low-income African American children aged three or four who were assessed to be at high risk of school failure were randomly assigned into treatment and control groups. The treatment group received a half-day preschool session every weekday plus a weekly home visit—both for eight months of the year, for two years. Project staff collected data on both study groups from ages three to eleven, and again at ages fourteen, fifteen, nineteen, twenty-seven, and forty. Analysis of these data showed that the treatment group outperformed the control group on a variety of measures of educational attainment, including lower grade repetition, higher rates of high school graduation, and higher performance on various intellectual and language tests up to age seven, school achievement tests at ages nine, ten, and fourteen, and literacy tests at ages nineteen and twenty-seven. At age forty, those who received the preschool intervention had median earnings that were more than one-third higher than those who did not, were significantly more likely to be employed, had lower fractions of lifetime arrests, and were sentenced to significantly fewer months in prison.¹⁸

The Carolina Abecedarian Project provided a particularly intensive intervention. At birth, children were randomized into a treatment group that received “enriched center-based child care services emphasizing language development for eight hours per day, five days a week, fifty weeks per year, from birth to age five” and a control group.¹⁹ At school entry, the study children were again

17. World Bank (2005); see also Currie (2001).

18. Schweinhart (2005); see also Currie (2001); Carneiro and Heckman (2003).

19. Currie (2001).

randomized into two groups, one of which received no further intervention and another which received a so-called home-school resource teacher. At age fifteen, the children who had received the preschool intervention had higher scores on achievement tests and a lower incidence of grade retention and special education than the control group. (Children who are placed in a special education track are generally more likely to drop out of school in the future.) The effects of the home-school resource teacher were either small or insignificant. At age twenty-one, the children exposed to the Abecedarian intervention had higher average test scores than the control group, and they were twice as likely to still be in school or to have ever attended a four-year college.

The evaluations of the Perry Preschool Project and the Carolina Abecedarian Project provide “laboratory” evidence of the possible returns to investment in early childhood. However, these model interventions are typically funded at higher levels and are administered by staff who are more motivated and better trained than staff at large-scale programs. Moreover, as in many clinical trials, the sample sizes in these evaluations are very small—less than a hundred children in the treatment and control groups each. It is therefore important to complement these evaluations with an analysis of the impact of Head Start, the largest program for disadvantaged preschool children in the United States.

Head Start, created in 1965 as part of the Johnson administration’s so-called War on Poverty, provides disadvantaged children with (predominantly part-day) preschool programs. In 1999 the program covered 800,000 children, or almost 50 percent of eligible three- and four-year-old children, and received \$4.7 billion of federal funding.²⁰ A large-scale, randomized evaluation of Head Start has not been conducted, so evaluations rely on a variety of techniques to construct comparison groups—for example, comparing children who attended Head Start with others who did not, comparing siblings who attended Head Start with those who did not, or comparing children in schools that offered Head Start for two years with those that offered it for three years.²¹ These are serious attempts to correct for the potential endogeneity of participation in Head Start. The results may still be biased, however, if self-selection into Head Start on the basis of unobservables is important—for example, if parents are more likely to enroll children who have learning difficulties or, alternatively, enroll promising children they expect would benefit most from the program.²²

20. Currie (2001).

21. Lee and others (1990); Currie and Thomas (1995); Reynolds and Temple (1998).

22. See Todd and Wolpin (2003) for a general discussion of these issues.

With this caveat in mind, the studies that are methodologically most sound generally report significant effects of Head Start. Children who attended Head Start are less likely to be enrolled in special education when they reach school, more likely to make adequate grade progress, and less likely to drop out of high school than their counterparts who did not participate in the program, and they have significantly higher test scores. Long-term studies also find higher rates of college attendance (for whites) and lower rates of delinquency and crime (for blacks) among program participants.²³

A number of studies analyze the effect of Head Start on child socioemotional development. This is important because child attributes as basic as being able to sit still and pay attention are necessary for any reasonable amount of learning to take place in school. Children who are appropriately socialized tend to turn into better-adjusted adults, and the labor market returns to various noncognitive skills, including motivation, enthusiasm, cooperation, and teamwork, may be as large as or larger than the returns to intelligence and other dimensions of cognitive development.²⁴ Behavioral problems in early childhood have also been shown to be strong predictors of high school dropout and delinquency.

Some controversy surrounds the effects of center-based programs like Head Start on child socioemotional development. At what age, and under what circumstances, is it beneficial for young children to spend large amounts of time away from their mothers? The analyses of the Perry Preschool Project and the Carolina Abecedarian Project suggest that whatever the negative effects of the intervention may be on mother-child attachment and (possibly) child socioemotional development, these are offset by the positive effects on academic achievement, wages, and criminality—at least for the high-risk populations that participated in these model programs. That said, it is not clear how easy it is to extrapolate from such model programs to large, publicly funded or implemented programs like Head Start. Two recent papers are informative on this issue. A randomized evaluation of the Early Head Start program, which combines center-based preschool with parent-child group socialization activities and parent education (either center-based or during home visits), suggests that children participating in Early Head Start exhibit less aggressive behavior, less negative behavior toward parents, and are better able to pay sustained attention during play than nonparticipants.²⁵ This is consistent with earlier evidence that Head Start has positive effects on measures of children's social adjustment,

23. Garces, Thomas, and Currie (2002).

24. Carneiro and Heckman (2003); Heckman and Rubinstein (2001).

25. Blau and Currie (2004).

including impulse control.²⁶ On the other hand, research by Magnuson, Ruhm, and Waldfogel suggests that children in prekindergarten programs, as well as children participating in Head Start, were more likely to exhibit aggressive behavior and less able to exercise self-control.²⁷ The factors behind these differing findings are not clear. Part of the explanation may be that quality varies widely across different child care options and Head Start sites: By some estimates, as many as 40 percent of children in the United States are attending child care judged to be of low quality.²⁸

Head Start and similar center-based programs seek to improve school readiness by providing a nurturing learning environment in the preschool years. These programs focus on the child, rather than the parents. Parenting also matters for development in early childhood, however, and a number of programs have been designed to improve parenting behavior.

Center-plus preschool programs combine preschool with regular discussions with parents. These programs have been shown to have positive effects on nurturance and, in some cases, reductions in spanking, increases in the use of reasoning as a disciplining device, and improvements in parents' abilities to assist in child problem-solving activities.²⁹ As with the regular preschool programs, center-plus programs also have positive effects on child cognitive development and school readiness. Disentangling the causality is hard: what fraction of the improvements in child outcomes are a result of the observed changes in parenting practices rather than the participation in the preschool component of the program? These difficulties notwithstanding, it appears that as much as half of the observed changes in child outcomes can be attributed to improvements in parenting.³⁰

The evidence on the effectiveness of home visiting programs is decidedly more mixed. Home visiting programs send trained staff into homes of families with young children to encourage changes in parenting practices. The exact nature of the intervention varies by program, but programs typically attempt to provide parents with social support, practical assistance, and education about parenting and child development. Gomby, Culross, and Behrman summarize evidence on the impact of six programs that included a randomized evaluation and that jointly covered as many as 550,000 children in the United States.³¹

26. Lee and others (1990), cited in Currie (2001).

27. Magnuson, Ruhm, and Waldfogel (2004).

28. Danziger and Waldfogel (2000); see also the discussion in Currie (2001).

29. Brooks-Gunn and Markham (2005).

30. *Ibid.*

31. Gomby, Culross, and Behrman (1999).

Most of the evaluations provide some evidence of improved parenting and home environment outcomes, although (worryingly) differences between treatment and control groups were more often found for parent-reported measures than for those assessed by enumerators. In some cases, participation was also associated with lower rates of child abuse, neglect, and other forms of child maltreatment. Results on changes in measures of children's behavior were mixed. No program effects were found on parent-reported child behavior for participants in the Comprehensive Child Development Program. In the Elvira Nurse Home Visitation Program, children who participated were revisited when they were fifteen years old, thirteen years after the end of the intervention. The treatment and control groups displayed no differences in measures such as acting out in school, suspensions, initiation of sexual intercourse, and major acts of delinquency, although children who had been exposed to the program reported fewer instances of running away, fewer arrests and convictions, fewer cigarettes smoked per day, fewer days having consumed alcohol in the last six months, and less lifetime promiscuity than the control group. None of the evaluations of home visiting programs found consistent evidence of improvement on a variety of child development and achievement tests.³²

A selective review of early childhood development programs in the United States holds a number of important lessons for Latin America. First, carefully designed and implemented pilot programs such as the Perry Preschool Project and the Carolina Abecedarian Project have had very large benefits for participants. One calculation of returns to enriched programs like these, targeted to high-risk disadvantaged minority male youth in the United States, suggests that the costs would more than pay for themselves in reduced incarceration rates alone.³³ Program evaluations bolster the theoretical case made by Carneiro and Heckman and Cunha and others that investments in skills in early childhood can have high returns.³⁴ These programs are very intensive, however, and they are run by highly motivated professional staff, so the estimated effects may not be fully replicable in nationwide programs. Evaluations of Head Start, the largest preschool program in the United States, also show improved outcomes among participants. The cost-benefit ratio of Head Start is uncertain, however, in part because the expected medium- and long-term benefits are hard to quantify.³⁵ Some authors argue that simple income transfers to poor households

32. Gomby, Culross, and Behrman (1999); Brooks-Gunn and Markham (2005).

33. Donohue and Siegelman (1998), cited in Carneiro and Heckman (2003).

34. Carneiro and Heckman (2003); Cunha and others (2005).

35. Currie (2001).

compare favorably with Head Start in terms of cost-benefit ratios.³⁶ This discussion suggests that there are high returns to experimenting with, and carefully evaluating the impact of, a variety of programs in Latin America and the Caribbean, both on a small-scale pilot basis and on a larger scale.

Second, interventions in early childhood in the United States have the largest impact on outcomes when they are carefully targeted to poor households and to households with the largest early childhood development deficits. Cunha and others stress this point when they argue that there is no trade-off between efficiency and equity for investments in early childhood.³⁷ In the Carolina Abecedarian Project, all of the children were judged to be at risk of mental retardation, but the positive effects of the program were twice as large for children from the poorest and least educated families as for other children.³⁸ The randomized evaluations of Early Head Start and the Infant Health and Development Program both suggest that improvements in parenting behaviors were larger among black mothers than among white mothers.³⁹ Improvements in a variety of early childhood development outcomes were also larger for children of mothers with high school education or less than for those with some college or more and (less clearly) for mothers with low psychological resources, including initially higher incidences of maternal depression.⁴⁰ Papers by Currie and by Currie and Thomas also argue that the early childhood development improvements associated with Head Start were concentrated among the participants who were most vulnerable.⁴¹ Finally, Currie and Thomas find that gains in test scores for Head Start participants are at least as large for Hispanic children as for non-Hispanic whites.⁴² The effects tended to be larger among children whose mothers were interviewed in Spanish, a result that Currie and Thomas attribute to the importance of exposure to the “mainstream” language. As I discuss below, performance on various early childhood development tests drops sharply with socioeconomic status in Latin America. This suggests that program designers need to carefully consider how best to ensure that poor households have access to interventions that improve children’s skills in the preschool years in Latin America and the Caribbean.

36. Taylor, Dearing, and McCartney (2004); Berger, Paxson, and Waldfogel (2005).

37. Cunha and others (2005).

38. Currie (2001).

39. Love and others (2002), cited in Brooks-Gunn and Markham (2005).

40. Brooks-Gunn and Markham (2005).

41. Currie (2001); Currie and Thomas (1999).

42. Currie and Thomas (1999).

Third, even when a given input into child development is important, the policy prescriptions may not be obvious. This is particularly apparent with interventions that try to improve parenting behavior. The results from the evaluations of home visiting programs in the United States are largely disappointing. Part of the problem appears to be that home visiting programs suffer seriously from attrition. Even among those parents who are initially willing to participate in home visiting programs, a large number (often more than half) drop out of the program, and those who stay generally receive many fewer visits than originally anticipated. Gomby, Culross, and Behrman make a compelling case that this is partly a result of program goals and design: programs often seek to convince parents to change behaviors that they themselves may not view as negative.⁴³ A further problem with home visiting programs in the United States is that they suffer from high staff turnover, which is particularly debilitating in interventions that rely on trust between home visitors and families. As discussed below, evidence from Ecuador shows that inadequate parenting practices are strongly associated with gaps in cognitive development at early ages, while evidence from Jamaica suggests that small-scale pilot programs focusing on parenting and early childhood stimulation can have high returns. As a review of studies from the United States indicates, however, it is important to design interventions that are attractive to the households they are intended to benefit.

Fourth, careful consideration must be given to the relation between investments in early childhood and the formation of skills at later ages. Cunha and others stress that it may be impossible or prohibitively costly to make up some deficits in skills at later ages, and that forming skills in early childhood makes it easier to acquire further skills later.⁴⁴ A related question is whether investments in later periods are necessary for the benefits of early childhood investments to be sustained. Analysis of Head Start is instructive here. Currie and Thomas find that the initial impact of the Head Start program on vocabulary and reading test scores is similar for whites and blacks, but the gains for Head Start participants quickly fade out in primary school for black children but not for white children.⁴⁵ Several factors could explain such differences in the impact of the program by race. One explanation is that the impact of Head Start itself varies; the program may not serve black children as well as white children. Another explanation is that children have different experiences after they leave Head Start: black

43. Gomby, Culross, and Behrman (1999).

44. Cunha and others (2005).

45. Currie and Thomas (1995).

children who attended Head Start may have family, neighborhood, or school environments that are less conducive to learning than other black children, whereas white children who attended Head Start are not disadvantaged relative to other white children. Currie and Thomas explore this question and conclude that the fade out of gains for black children stems from the lower-quality schools they attend after Head Start.⁴⁶ Fryer and Levitt similarly argue that the gap in test scores between black and white children increases after kindergarten because of differences in the quality of schooling.⁴⁷ Little is known for Latin America and the Caribbean about the interaction between investments in early childhood, on the one hand, and school quality and other dimensions of the environment later in a child's life, on the other.

Evidence on Early Childhood Outcomes in Latin America and the Caribbean

Although the medical, sociological, and economic literature contains a wealth of data on the health and nutritional status of infants and young children in Latin America, relatively little is known about other dimensions of their welfare. This section discusses some recent research that focuses primarily on motor skills, cognitive development, and socioemotional development in early childhood. The discussion is grouped around three themes. First, what is known about aggregate, nationwide deficits in investment in early childhood in Latin America? Second, do particular countries or samples display evidence of a gradient between outcomes in early childhood and household socioeconomic status? To the extent that such a gradient exists, what are the channels through which income or other measures of household welfare affect outcomes in early childhood? Finally, what evidence is available on the impact of various policies or programs?

International Comparisons of Preschool Investments

Comparable international data on the development of cognitive and noncognitive skills among children of preschool age are sparse, especially in developing countries. The only measure for which information is available for a large number of countries is enrollment in preschool. This section therefore begins with an analysis of preschool enrollment rates in Latin America.

46. Currie and Thomas (2000).

47. Fryer and Levitt (2004).

TABLE 1. Gross Preprimary Enrollment Rates, 2000^a

Country	Gross preprimary enrollment (1)	GDP-adjusted gross preprimary enrollment (weighted) (2)	GDP-adjusted gross preprimary enrollment (unweighted) (3)
Argentina	60.4	-22.6***	-19.6***
Barbados	80.3	-7.7	-2.6
Bolivia	46.3	11.5***	14.9***
Brazil	61.5	7.1	4.5
Chile	77.5	12.3*	10.9**
Colombia	37.0	-6.5	-5.8**
Costa Rica	90.8	30.7***	29.5***
Cuba	108.7	n.a.	n.a.
Dominican Republic	35.1	-11.4**	-11.5***
Ecuador	69.6	32.4***	35.0***
El Salvador	43.9	-0.6	-0.2
Guatemala	51.1	10.2***	11.6***
Honduras	21.3	-12.1***	-9.3***
Jamaica	82.0	29.2**	29.9***
Mexico	75.3	4.9	3.4
Nicaragua	26.8	-5.9**	-1.9
Panama	45.2	-14.3**	-16.2***
Paraguay	28.9	-10.0	-8.2***
Peru	59.5	15.9***	16.3***
Venezuela	51.6	-14.5**	-15.8***
Latin America and the Caribbean	61.1	4.3	10.9

Source: World Bank databases.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

n.a. Not available.

a. The table presents the results from regressions with Huber-White-corrected standard errors. Sample size is 144 countries. The second and third columns are based on regressions of gross preprimary enrollment on a polynomial in per capita GDP, including GDP level, its square, cube, and quartic, and a dummy variable for a given country or region. In the second column, each country observation is weighted by its population, while the third column provides the results from unweighted regressions.

Table 1 presents statistics on the gross preprimary enrollment rate for individual countries in Latin America and the Caribbean, as well as averages for the region. Gross preprimary enrollment rates are defined as the number of children enrolled in preschool divided by the total number of children of preschool age. The table is based on country-specific data, as compiled by UNESCO and available from the World Bank.⁴⁸ Three figures are presented for each country or

48. Data are from World Bank databases that cover 144 countries in 2000. World Bank, Development Database Platform. Available online at www.worldbank.org/data/onlinebases/onlinebases.html (accessed October 1, 2005).

region: the gross preprimary enrollment rate; the unweighted GDP-adjusted gross preprimary enrollment rate deficit or surplus; and the population-weighted GDP-adjusted gross preprimary enrollment rate deficit or surplus. These figures therefore benchmark performance in a country or region by comparing it with other countries of similar income levels.

The results from these regressions are informative. Taken as a whole, Latin America and the Caribbean does not appear to have a deficit in preschool enrollment: the weighted average of the gross enrollment rate across countries in the region is 61.1 percent. This is above what would be expected for the income level of the region. Cross-country variation is considerable, however. A handful of countries are overperformers in terms of preprimary enrollment rates, including Bolivia, Costa Rica, Ecuador, Guatemala, Jamaica, and Peru. A number of other countries are underperformers, including Argentina, the Dominican Republic, Honduras, Panama, and Venezuela. Put differently, preprimary enrollment is essentially the same in Argentina and Peru, although Argentina's per capita GDP is roughly four times that of Peru; per capita GDP is higher in Venezuela than in Costa Rica, but preprimary enrollment is almost 40 percentage points higher in Costa Rica.

Simple comparisons of countries like those presented in table 1 have obvious limitations. The analysis of over- or underperformers may be misleading if enrollment in the average country is too low or too high. For example, if the returns to preprimary enrollment truly are high, and if most countries invest little in preschool, even some of the apparently overperforming countries may benefit from expansions in preschool coverage. Another problem with these comparisons is that they obviously abstract from differences across countries. Both the age range used for these calculations and the definition of preschool can vary across countries. The quality of preschool may also differ, so coverage may not be a good indication of the development of a given set of skills or competencies. Nonetheless, enrollment in preschool is often thought to have important benefits for participants, and the evidence for at least one country in Latin America, Argentina, suggests that children who enroll in preschool have superior learning outcomes later on. The results in table 1 are therefore an indication that many countries in the region could productively expand preschool coverage.

Evidence of Deficits in Early Childhood Outcomes and Socioeconomic Gradients

A handful of recent papers describe deficits in early childhood outcomes in Latin America and the Caribbean and make comparisons of households with

different levels of education, wealth, or income. For example, two papers present evidence of early childhood development shortfalls in Mexico. First, Fernald and others focus on the relation between deficits in child nutritional status and the mental development index (MDI) of the Bayley Scales of Infant Development, a test of memory, learning, problem solving, sensory-perceptual acuties, and receptive and expressive language development.⁴⁹ They find significant reductions in the Bayley MDI scales with the age of the child. At age thirteen to fourteen months, 14.4 percent of children are one standard deviation or more below the normed value for the test, and 3.0 percent are two standard deviations or more below. By age twenty-one to twenty-three months, almost half the children are one standard deviation below the norm, and 11.3 are more than two standard deviations below. These deficits in mental development are mirrored by an increasing fraction of children with low height for age: at age thirteen to fourteen months, 25.9 percent of the children are stunted, compared with 42.7 percent at age twenty-one to twenty-three months. Fernald and others find no association, however, between height for age and the Bayley MDI score once family and environmental variables are included in a multivariate regression framework. More surprisingly, none of the parental or socioeconomic factors for which they control, including income, employment, parental age, education, and whether the head of the household speaks an indigenous language, are significant predictors of performance on the Bayley MDI score.

The second paper, by Gertler and Fernald, uses a large number of tests to assess developmental outcomes for a sample of poor children in Mexico.⁵⁰ These include the Woodcock-Johnson tests, a set of conormed tests that measure general intellectual ability, specific cognitive abilities, and scholastic aptitude which has been used in Latin America; the MacArthur Communicative Development Inventories; and the Spanish version of the Peabody Picture Vocabulary Recognition Test (PPVT, or TVIP in Spanish).⁵¹ The TVIP is a test of receptive language that is frequently used to evaluate Spanish-speaking preschool children.⁵² To evaluate the impact of *Oportunidades* (Mexico's conditional cash transfer program), Gertler and Fernald compare the cognitive development outcomes of the *Oportunidades* evaluation sample with the population that was used to norm a given test. Based on these comparisons, Gertler and Fernald

49. Fernald and others (2006).

50. Gertler and Fernald (2004).

51. On the Woodcock-Johnson tests, see Lozoff, Jimenez, and Wolf (1991); Rodríguez and Prewitt-Diaz (1990); Rosselli and others (2001).

52. Munoz and others (1989); Umbel and others (1992).

argue that children in the evaluation sample appear to have very serious cognitive deficits. On average, they place in the seventeenth percentile for vocabulary on the TVIP, the fifteenth percentile for long-term memory, the twenty-second percentile for short-term memory, and the seventh percentile for visual integration in the Woodcock-Johnson test. The results presented by Gertler and Fernald are not disaggregated by the child's age, so it is not clear whether the pattern observed by Fernald and others using the Bayley scores—that is, larger deficits for older children—also holds in this sample and with these outcomes.⁵³

For Brazil, Halpern and others use the Denver Test to analyze deficits in gross and fine motor skills, language development, and adequate socialization of a sample of children born in hospitals in Pelotas, Rio Grande do Sul.⁵⁴ The authors conclude that about one-third (34 percent) of children show developmental deficits. They find clear gradients by household income, which persist after corrections are made for birth weight. (Children born in households with lower socioeconomic status tend to have lower birth weights.) Moreover, the observed income gradients become larger with the age of the child.

Paxson and Schady use data on a sample of poor children in Ecuador to study the determinants of child cognitive development, as measured by performance on the TVIP.⁵⁵ They show that the age-normed TVIP score declines steadily between three and six years of age. This decline in the mean is accompanied by an increase in dispersion. Paxson and Schady graph the ninetieth, fiftieth, twenty-fifth, and tenth percentiles of the TVIP scores at each age. They show that the ninetieth percentile scores are relatively constant with age, and there are modest declines in the median; by contrast, scores for children at the twenty-fifth and tenth percentiles of the distribution decline sharply with age.

Paxson and Schady first use simple graphs to analyze the factors responsible for the increasing dispersion in test scores with age.⁵⁶ Figure 1, based on that paper, shows that the median TVIP score for children born to parents with low levels of education or low levels of household wealth falls dramatically with the age of the child. By contrast, the score remains roughly constant for children in wealthier households or with more educated parents. The effects of socioeconomic status on test performance are large: Paxson and Schady estimate that a child whose family falls at the ninetieth percentile for wealth, maternal education, and paternal education is predicted to have

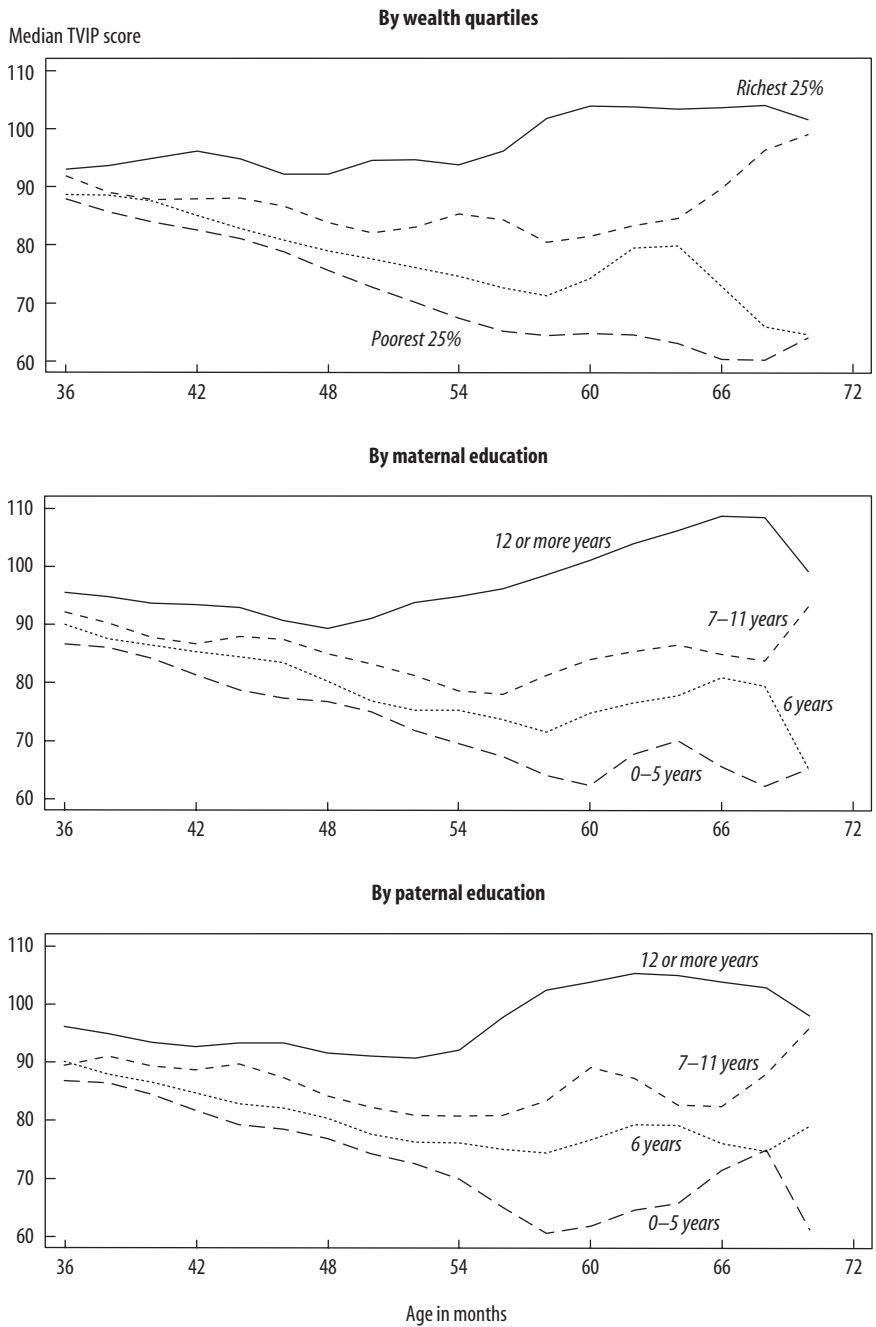
53. Fernald and others (2006).

54. Halpern and others (1996); see also Victora, Barros, and Vaughan (1989).

55. Paxson and Schady (2007).

56. *Ibid.*

FIGURE 1. Cognitive Development of Children Aged Thirty-Six to Seventy-Two Months in Ecuador^a



Source: Paxson and Schady (2007).

a. Median values of the TVIP by exact month of age were smoothed by estimating fan regressions of the median score on age (in months), using a bandwidth of three.

a score that is approximately two standard deviations higher than a child at the tenth percentile for each of these variables. Paxson and Schady also consider the relation between cognitive outcomes, socioeconomic status, and measures of child nutritional status. They show that nutritional status, particularly hemoglobin levels and height for age, is significantly associated with test performance. However, measures of nutritional status account for only a small fraction of the association between wealth, parental education, and TVIP scores.

An innovative feature of the data collected in Ecuador is the inclusion of information on parenting quality, including the Home Observation for Measurement of the Environment (HOME) scale, which has been widely used in research in the United States.⁵⁷ This scale is constructed from eleven items that are assessed by enumerators at the close of the interview; it measures punitiveness (for example, whether parents yelled at or hit their children during the interview) and responsiveness to children (for example, whether they responded to and encouraged their children in a positive way during the interview). Each item is scored as a dichotomous variable, and the final scale ranges from zero to eleven, with higher values corresponding to less responsive and harsher behavior. Paxson and Schady show that children whose parents have lower HOME scores, reflecting warmer and less punitive behavior, have significantly higher TVIP scores; children who are read to also perform better on the test.⁵⁸ These parenting measures account for a substantial fraction of the associations between socioeconomic status and cognitive development that are observed in the data.

A number of broad conclusions can be drawn from the papers on Mexico, Brazil, and Ecuador. First, a comparison of the performance of Latin American children with the reference populations that were used to norm the tests reveals large developmental deficits among the Latin American children. Second, there appear to be sharp gradients by socioeconomic status. Children from poorer households and children whose parents have lower education levels perform significantly worse than other children. Third, the gradient between socioeconomic status and child development appears to become stronger with age. This may be because the protective effect of socioeconomic status is cumulative, as Paxson and Schady speculate, which would be consistent with the model in Cunha and others.⁵⁹ It is also possible that some of the tests used are better suited for

57. Bradley (1993); Caldwell and Bradley (1984); Bradley and others (2001).

58. Paxson and Schady (2007).

59. *Ibid.*; Cunha and others (2005).

older children. It would not be appropriate to conclude from this evidence, however, that the older ages are critical for child development; rather, insults suffered early on may only manifest themselves somewhat later. Fourth, child nutritional status and measures of parenting status are both significantly associated with performance on a number of tests of early development.

Policies and Programs to Improve Skill Formation among Young Children

Recent analysis of the impact of programs on early childhood outcomes in Latin America and the Caribbean focuses on conditional cash transfers (Mexico), access to nursery or daycare programs (Bolivia and Colombia), preschool programs (Argentina), and food supplementation and early stimulation interventions (Jamaica). In Mexico, Gertler and Fernald analyze the impact of *Oportunidades*, the government's conditional cash transfer program, on a large set of early childhood development outcomes.⁶⁰ *Oportunidades* makes large cash transfers, approximately 20 percent of household income, conditional on the households making regular, monitored visits to health centers. During these visits, children are immunized, their growth is monitored, and they are given micronutrient supplements; parents receive education on health, nutrition, and hygiene.

To analyze the impact of *Oportunidades* on early childhood development outcomes, Gertler and Fernald focus on children between the ages of two and six at the time of the analysis. They make two comparisons.⁶¹ First, they compare children who received *Oportunidades* transfers with a comparison group of children who did not receive transfers. This comparison group was constructed with matching techniques: a group of communities that was not eligible for *Oportunidades* was selected, and matching and regression techniques were used to adjust for differences between households in the treatment and comparison groups. Second, they compare households in communities that received *Oportunidades* transfers for different amounts of time. These groups were constructed by random assignment: the evaluation design incorporated a lottery to assign communities into two groups, one of which received transfers for twelve to eighteen months longer than the other.

Using the treatment and matched comparison groups, Gertler and Fernald find significant differences in motor skills: on average, outcomes are 15 percent higher among boys and 10 percent higher among girls in the treated communities

60. Gertler and Fernald (2004).

61. Ibid.

than among similar children in the comparison communities.⁶² Children in the treated communities also appear to have fewer socioemotional problems, although the effect is only statistically significant for girls. There is no clear pattern of program effects on any of the measures of cognitive development. Finally, the authors find no evidence that the duration of program exposure, as measured by the difference between the two randomly assigned groups, has a significant impact on any outcome, including motor skills, socioemotional problems, and cognitive development.

Behrman, Parker, and Todd focus on school-aged children between the ages of six and fourteen at the time of the analysis, some of whom were exposed to *Oportunidades* during their preschool years.⁶³ Like Gertler and Fernald, Behrman, Parker, and Todd make two comparisons—first, between households that received *Oportunidades* transfers and the matched set of communities that never received transfers and, second, between communities that were randomly assigned to different amounts of program exposure. Behrman, Parker, and Todd show that relative to the comparison group, children who were exposed to *Oportunidades* were more likely to enter school at a slightly earlier age, progress on time, and have more years of completed schooling. As in Gertler and Fernald, program impacts are generally apparent in the comparisons between the treatment and matched comparison groups, but not in the comparisons between the two treatment groups that were randomly assigned to different amounts of program exposure.

Two recent papers analyze the effects of attendance at nursery or daycare programs in Bolivia and Colombia. Behrman, Cheng, and Todd use non-experimental data to evaluate the impact of a Bolivian daycare program, the *Proyecto Integral de Desarrollo Infantil* (PIDI).⁶⁴ The outcome measures include “a battery of tests of bulk motor skills, fine motor skills, language and auditory skills, and psychosocial skills.”⁶⁵ The PIDI program provides full-time daycare and nutritional and educational services to children between the ages of six and seventy-two months in the homes of mothers living in low-income areas. Behrman, Cheng, and Todd use propensity score matching to estimate program impacts. First, they compare program participants with a matched comparison group of nonparticipants; they refer to these results as average treatment impacts. Second, they compare participants with different

62. Gertler and Fernald (2004).

63. Behrman, Parker, and Todd (2004).

64. Ibid.

65. The authors do not provide details on the exact nature of the tests.

amounts of exposure to the program; they term these results marginal treatment impacts. The identifying assumption for the estimates of average treatment impacts is that unobservable characteristics of households or children do not determine selection into the program. This restriction is loosened somewhat in the estimates of marginal treatment impacts, although unobservables are still not allowed to determine the duration of exposure (conditional on program participation).

In their comparison of treated and untreated children, Behrman, Cheng, and Todd find some evidence of positive program impacts on bulk and fine motor skills, psychosocial skills, and language acquisition.⁶⁶ These impacts are concentrated among children aged thirty-seven months and older. For younger children (aged six to thirty-six months), the estimated program effects are generally insignificant and are as likely to be positive as negative. When the results are disaggregated by the length of exposure, effects are most clearly observed among children who have been exposed to the PIDI program for more than a year. Behrman, Cheng, and Todd also calculate cost-benefit ratios for the PIDI program. This is an important concern: at the time of the evaluation, the cost of the PIDI program was approximately \$43 per month, in a country with per capita annual GDP of \$800 in exchange-rate converted pesos and \$2,540 in purchasing power parity (PPP) terms. The PIDI program is estimated to have an impact on participating children's height, cognitive development, and schooling. Behrman, Cheng, and Todd heroically combine these estimated program impacts with data on wages from Bolivia and a number of other countries. They argue that PIDI has positive cost-benefit ratios under a variety of plausible assumptions and discount rates.

Attanasio and Vera-Hernández estimate the effect of participation in *Hogares Comunitarios de Bienestar Familiar*, a preschool nursery program in Colombia, on child nutritional status, school achievement, and female labor supply.⁶⁷ As in the PIDI program in Bolivia, participants in the *Hogares Comunitarios* receive daycare services and food at the house of a community mother. Attanasio and Vera-Hernández argue that participation in the *Hogares Comunitarios* is likely to depend on unobservable characteristics of children and their families. This could bias estimates of program effects based on ordinary least squares (OLS) regressions or propensity score matching. To address these concerns, Attanasio and Vera-Hernández use instrumental variables techniques, instrumenting

66. Behrman, Cheng, and Todd (2004).

67. Attanasio and Vera-Hernández (2004).

actual participation in the program with distance between a child's home and the *Hogar Comunitario*. This assumes that, conditional on a variety of child, household, and community controls, the government does not purposefully place the *Hogares Comunitarios*, and households do not move to take advantage of the program. The authors provide some evidence to support this identifying assumption.

Based on their instrumental variables regressions, Attanasio and Vera-Hernández estimate that current attendance at an *Hogar Comunitario* increases child height by 0.45 deviations of a z score, which is equivalent to approximately 2.4 centimeters for a child aged seventy-two months. Because the *Hogares Comunitarios* program has been in effect for a long time, Attanasio and Vera-Hernández can also assess whether participation in the program when a child was of preschool age affects future schooling outcomes. They conclude that a child who participated in the program is 20 percentage points more likely to be enrolled in school when he or she is thirteen to seventeen years old. Finally, Attanasio and Vera-Hernández estimate that the *Hogares Comunitarios* program increased the female labor supply by 37 percentage points. One unresolved question from their analysis is whether the program effects on child height and schooling result from the food that is provided or from any additional household income generated by the added labor market participation of women.

Two papers analyze the effects of a large program to construct preschool facilities in Argentina in the 1990s on a variety of outcomes.⁶⁸ Berlinski and Galiani consider the effects of the program on preprimary school attendance and maternal labor supply.⁶⁹ The intensity of the program varied by region, and Berlinski and Galiani use a difference-in-difference framework to identify program impact. The estimation also includes cohort and regional dummies to control for nationwide trends and level differences across regions. The identifying assumption is therefore that regions that received more preschool facilities would not have had different growth rates in enrollment in the absence of the construction program.⁷⁰ Berlinski and Galiani conclude that the program had a large, positive impact on preschool enrollment. Indeed, they cannot reject the null hypothesis that all new preprimary school slots were taken up by children who would otherwise not have been in school. The authors take this as strong evidence for a supply constraint on preschool enrollment in Argentina.

68. Berlinski and Galiani (2005); Berlinski, Galiani, and Gertler (2005).

69. Berlinski and Galiani (2005).

70. Berlinski and Galiani provide evidence that this is a reasonable assumption.

Berlinski and Galiani also find that the preschool construction program increased women's labor market participation.

A follow-up study by Berlinski, Galiani, and Gertler assesses the impact of the preschool construction program on test performance in Spanish and mathematics in third grade.⁷¹ The analysis provides compelling evidence of significant program impacts. Intent-to-treat estimates show that children in cohorts and regions exposed to the construction program have significantly higher test scores than nonparticipants. Preschool participants also appear to perform better on noncognitive dimensions of development, including paying attention in class, being disciplined, and participating, as reported by their third-grade teachers. The authors provide convincing evidence from a placebo experiment that children in these same schools in other cohorts that were not affected by the preschool construction program do not appear to have higher test performance; this exercise serves as an important check on their identification strategy.

Various papers by Grantham-McGregor and her co-authors use data from Jamaica to analyze the short- and medium-term impact of interventions in early childhood. In one study, a lottery was used to divide a sample of stunted children aged nine to twenty-four months into four groups: The first study group received a weekly food supplement of 1 kilo of milk-based formula; a second study group received early childhood stimulation, specifically weekly home visits by social workers who demonstrated play with homemade toys and discussed parenting issues with mothers; the third study group received both the supplement and the stimulation; the fourth group served as a control group.⁷² Data were also collected on a sample of nonstunted children. Children in all of the study groups were then followed over time. Results after two years suggested that both the stimulation and nutritional supplement interventions had positive impacts on child development as measured by the Griffiths Mental Development Scales. The largest effects were found in the group that had received both interventions. After two years, these children had caught up with the matched group of nonstunted children.

The children in the original study were revisited at ages seven to eight years and again at eleven to twelve years.⁷³ Disappointingly, the study group that received only nutritional supplements did not have better outcomes than the control group on a variety of cognitive development tests. By contrast, the groups

71. Berlinski, Galiani, and Gertler (2005).

72. Grantham-McGregor, Powell, and others (1991).

73. Grantham-McGregor, Walker, and others (1997); Walker and others (2000).

that had either received stimulation only or both interventions performed better than the control group on nine of the eleven tests that were applied, and they performed significantly better on three. In a related study, undernourished children aged nine to thirty months and their mothers were randomly assigned to a treatment group that received stimulation, including weekly home visits by community health aides, and a control group.⁷⁴ After one year, the children who received the stimulation intervention had significantly better outcomes on three of four subscales from the Griffiths Mental Development Scales. Mothers in the intervention group also had better knowledge of child-rearing and childbearing practices.

A number of conclusions can be drawn from these papers, although they must all be tentative given the small number of studies. First, the evidence for *Oportunidades* presented by Gertler and Fernald suggests that, on their own, the potential for conditional cash transfer programs to improve outcomes in early childhood may be limited.⁷⁵ It may be necessary to combine cash transfers with other interventions to achieve large developmental impacts for young children. Second, the evidence from Argentina, Bolivia, and Colombia suggests that the returns to center-based care, whether daycare or preschool, may be large. In all three cases, children who participated in the intervention had significantly better cognitive and noncognitive outcomes. Third, the studies by Grantham-McGregor and her co-authors for Jamaica suggest that programs to increase early childhood stimulation and improve parenting can be an effective way of closing developmental gaps. By contrast, food transfers did little to improve the outcomes of the Jamaican children in the study sample. Many countries in Latin America spend large amounts of public resources on feeding programs. Evidence shows that nutrition programs can have positive long-term impacts, especially when they target pregnant mothers and continue through the first three years of a child's life.⁷⁶ Many government feeding programs do not meet these criteria, however. In Peru, for example, the Glass of Milk Program is the largest social transfer, reaching 44 percent of households with children aged three to eleven years, yet it appears to have no impact on nutritional outcomes.⁷⁷ Nevertheless, it has yet to be determined whether the results from Jamaica could be replicated on a larger scale.

74. Powell and others (2004).

75. Gertler and Fernald (2004).

76. See, for example, Martorell (1999) on a well-known study in Guatemala.

77. Stifel and Alderman (2006).

Directions for Policy and Future Research

Economic theory suggests that investments in early childhood can have very high returns. The costs of making up deficits in cognitive and noncognitive development later in life are often prohibitive, and the returns to many investments in skill formation in adulthood, such as job training programs, are often disappointingly low.⁷⁸ By contrast, research from the United States shows that carefully administered, intensive preschool programs can have very high returns. Evidence on the effectiveness of large-scale interventions like Head Start is more mixed, although generally positive. In Latin America and the Caribbean, the knowledge base is still disappointingly thin with regard to developmental shortfalls; the relation between deficits in early childhood and household socioeconomic status, child health, and parenting practices; and the relative effectiveness of programs and policies. Preliminary evidence suggests, however, that the economic costs of poor outcomes in early childhood in the region may be as large as or larger than those estimated for the United States. Careful analytical work is needed to establish the basic facts about early childhood development outcomes and deficits in the region, as well as to understand the causal pathways whereby a given characteristic of households, parents, or children determines outcomes in early childhood. A combination of economic theory, experimentation, and careful evaluation is needed to identify specific policies and programs that are effective.

Recent research from a number of Latin American countries has applied internationally normed tests of motor skills, cognitive development, and socio-emotional development. In theory, norming the test instruments could have several advantages. Many of the tests have been shown to be correlated with various biological outcomes, as well as with economic measures such as school performance and wage outcomes in later life. For example, the TVIP vocabulary recognition test used by Gertler and Fernald and by Paxson and Schady is the Spanish version of the PPVT, and performance on the PPVT at early ages has been shown to be a strong predictor of schooling and income in Great Britain and the United States.⁷⁹ Also, because the tests are generally normed by comparing results with those of a reference population, the scores are arguably meaningful measures of a particular dimension of child welfare in some absolute sense. That is, the score on a given test can be used to provide

78. Heckman, LaLonde, and Smith (1999).

79. Gertler and Fernald (2004); Paxson and Schady (2007).

answers to a question such as whether the children in the sample are at the appropriate level for their age and whether children of higher socioeconomic status in the sample perform better than those of lower socioeconomic status.⁸⁰ Finally, a number of the tests are age normed, so that meaningful comparisons of developmental shortfalls can also be made across children of different age groups.

The appeal of standardized, age-normed tests like many of those discussed above is similar to the appeal of using z scores as measures of nutritional status, cut-offs for hemoglobin levels to establish anemia, or the fraction of households living below a dollar a day as an international measure of poverty. Such tests are likely to be an improvement on ad hoc, country-specific tests. Like the measures of nutritional status and poverty, however, they depend crucially on the extent to which the norming has been done appropriately. The samples of children on whom the test was normed are often small, and they may not provide a meaningful comparator for the population for which the test is used. For example, the TVIP was normed on 1,219 Mexican children and 1,488 Puerto Rican children.⁸¹ More research is needed to assess the extent to which the reference populations and age norms are appropriate. Testing and child development specialists could help make meaningful contributions in this area.

Once analysts have a better understanding of the various tests, they need to describe the basic facts about early childhood outcomes in Latin America and the Caribbean. What is the magnitude of the deficits (if any) in cognitive development, socioemotional development, and motor development for population-based samples of young children in the region? How do these vary with household characteristics? The literature on health has established the existence of a gradient between socioeconomic status and health: households of lower socioeconomic status, as measured by income, consumption, or education, have higher levels of mortality and morbidity.⁸² Similar findings are often reported in the literature on early childhood in the United States.⁸³ Little about this is known for countries in Latin America and the Caribbean, although the

80. The latter question does not require reference populations for norming.

81. See www.agsnet.com/assessments/technical/tvip.asp for details.

82. For reviews on developing countries, see Behrman and Deolalikar (1988); Strauss and Thomas (1998).

83. Smith, Brooks-Gunn, and Klebanov (1997); Blau (1999); Guo and Harris (2000); Waldfogel, Han, and Brooks-Gunn (2002); Aughinbaugh and Gittleman (2003); Baum (2003); Ruhm (2004); Taylor, Dearing, and McCartney (2004); Brooks-Gunn and Markham (2005); Berger, Paxson, and Waldfogel (2005).

results for Mexico, Brazil, and Ecuador suggest that socioeconomic gradients are likely to be important in the region. A clear understanding of what population groups are most vulnerable to shortfalls in child development in Latin America and the Caribbean is clearly indispensable for the appropriate targeting of programs.

Careful analysis is needed to establish whether there are periods at which faltering occurs in a particular dimension of early childhood development. For example, in most Latin American populations, the incidence of stunting, defined as height for age more than two standard deviations below that of a reference population, increases dramatically from about the age of six months to twenty-four months, and it stabilizes (but does not recover) thereafter.⁸⁴ Do other dimensions of child well-being display comparable patterns? Do specific health insults, inadequate resources, or low levels of stimulation have especially large negative effects on outcomes if they occur at a particular age in the life of a child? What deficits can be made up later in life? These are hard questions to answer with a single cross-section of data, both because it is not possible to disentangle age and cohort effects and because a variety of child outcomes tend to be correlated over time. The collection of panel data that span children's lives from birth onwards therefore offers important benefits. Indeed, because in utero conditions are likely to have an effect on subsequent child development, panels would ideally begin during a mother's pregnancy.

Descriptive work is a critical building block for more ambitious attempts to combine economic theory and empirical analysis to discover the causal pathways whereby characteristics of households or children affect a given dimension of development in early childhood. The literature on the United States features considerable controversy about how low incomes lead to poor outcomes in early childhood. Low income is often associated with a lack of resources that can affect child development—for example, toys or reading material that stimulate cognitive development, or high-quality day care. Children in low-income households also tend to have worse health and nutritional status, and their parents generally have lower levels of education. In addition, lower incomes are associated with higher levels of maternal depression and home environments that are less nurturing, both of which are believed to have direct causal effects on outcomes. If there is a gradient between socioeconomic status and the formation of skills in early childhood in Latin America and the

84. Shrimpton and others (2001).

Caribbean, as seems likely, careful descriptive work informed by sound economic theory about how (and why) households make choices about childhood investments will be required to disentangle causal effects. Rich data sets with long histories and detailed information on household resources, maternal and child characteristics, parenting environments, and access to social programs are particularly important in this regard.

Experimental evidence may also help recover structural parameters with a causal interpretation. The evaluation of *Oportunidades* in Mexico is a good case in point. For the first years of the program, households were randomly assigned into a treatment group that received cash transfers and a control group. The program has had positive effects on enrollment and attendance in school.⁸⁵ If the increase in child enrollment and attendance translates into higher school attainment as adults, it should eventually be possible to collect data on the outcomes of children born to the (randomly selected) Progresa treatment and control groups. This would help analysts identify the causal effect of parental education on skill formation in early childhood. There are likely to be other cases in which exogenous sources of variation, either from naturally occurring “experiments” or from deliberate program design, can be put to good use.

The careful implementation of a variety of interventions and the rigorous evaluation of their impact can generate very high returns. Seemingly unusual combinations of programs may have the potential to produce the largest impact. For example, Gertler and Fernald’s research suggests that, on their own, conditional cash transfer programs like *Oportunidades* may not lead to significant improvements in child cognitive development.⁸⁶ This might argue for an intervention that focuses on parenting skills. The descriptive evidence in Paxson and Schady for Ecuador and the small-scale experimental evidence from Jamaica both suggest that there could be very high returns to interventions that effectively improve parenting and the home environment.⁸⁷ However, the high rate of attrition in many programs that seek to improve parenting in the United States, in particular home visiting programs, argues for innovative combinations of parenting programs with interventions that households are keen on participating in—such as conditional cash transfers or feeding programs.

85. Schultz (2004); Behrman, Sengupta, and Todd (2005).

86. Gertler and Fernald (2004).

87. Paxson and Schady (2007); Grantham-McGregor and others (1991); Powell and others (2004); Walker and others (2000).

Existing interventions need to be carefully evaluated. The literature on early skill formation in the United States shows that the estimates of program effects based on experimental and nonexperimental methods can vary widely, and that it is hard to sign the direction of the bias *ex ante*.⁸⁸ In Latin America and the Caribbean, the strongest evidence on the impact of conditional cash transfer programs is based on carefully designed, experimental evaluations. A similar emphasis on innovative program design, careful implementation, and rigorous evaluation would build up the knowledge base on early childhood development in Latin America and the Caribbean. This would help identify programs and policies that ensure that children in the region can go on to have healthy and productive lives.

88. Currie (2001); Gomby, Culross, and Behrman (1999).