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A Better Start in Life: Evaluation Results from an Early Childhood Development Program*

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ABSTRACT

Informed by a growing body of research showing that investments in early childhood health, nutrition, and cognitive and psychosocial development have immediate and long-term benefits on children, the Philippine government undertook a five-year pilot Early Childhood Development (ECD) Project. The project was implemented in Regions 6, 7, and 12 to improve the survival and developmental potential of children in the most vulnerable and disadvantaged areas, and thus to help them escape poverty and deprivation. This study evaluates the impact of this ECD Project based on selected indicators of (1) ECD service utilization and (2) child health, nutrition, and cognitive and psychosocial development. The study, which followed a sample of children over four years, uses difference-in-difference method of

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estimating impact, adjusted for duration of program exposure, which compared changes over time in the project areas of Regions 6 and 7, and in the control areas in Region 8. The sample included over 6,000 children of age 0–4 years at the start of the study. Results show mixed positive impact of the project over the period. Participation in the feeding program for underweight children, Vitamin A and iron supplementation, and the Parent Effectiveness Service (PES) Training had increased more in project areas than in control areas, but not so for participation in immunization and growth monitoring programs. There were significant reductions in the proportion of children who were thin or underweight, and Region 7 showed notable improvements in the indicators of children's cognitive and psychosocial development. However, the project failed to demonstrate an impact on stunting in the program regions and anemia in Region 6, at least within the duration of the evaluation. Future research could examine whether the positive gains are sustained as the children get older and whether, with time, positive gains also emerge for stunting and anemia.

INTRODUCTION

In recent years, programs to foster early childhood development (ECD) have expanded considerably in many countries. Interest has grown because poor education outcomes and poor health are being traced to malnutrition, disease, and neglect in infancy and during the early years of childhood.[1] These life-cycle links suggest that giving children a better start in life through policies that promote better nutrition and health, as well as development of cognitive, motor, and social skills, is an effective way to give them better life choices as adults and better means to escape poverty and deprivation. A study of preschoolers in the Philippines using panel data has found, for example, that a one-standard deviation increase in height among very young children raises their achievement test scores years later, an increase that is equivalent to completing eight more months of schooling and which implies a benefit-cost ratio of three or more (Glewwe et al. 2002). This result is consistent with empirical evidence in other countries, such as in South America and the Caribbean: An early childhood stimulation pilot intervention improves children's test performance in Jamaica (Grantham-McGregor et al. 1991, 1997; Walker et al. 2000); a daycare program has large positive effects on

[1] For the United States, see Behrman and Rosenzweig (2004), Currie and Thomas (1995, 1999), Karoly et al. (1998), Murnane et al. (1995), and Neal and Johnson (1996). For developing countries, see Alderman et al. (2001), Alderman et al. (2005), Behrman et al. (2004), Behrman, et al. (2003), Deutsch (1999), Glewwe et al. (2001), Glewwe and King (2001), Martorell (1995, 1999), Martorell et al. (1994), Myers (1995), and Young (1996).

motor skills, psychosocial skills, and language acquisition in Bolivia (Behrman et al. 2004); a preschool construction program in Argentina increased preschool enrollment rates, and later led to better performance on cognitive and behavioral outcomes in primary school (Berlinski and Galiani 2005); among preschool children in Ecuador, better nutrition, as measured by higher hemoglobin levels, improves a child's test performance, and this association between nutrition and cognitive development becomes more evident as children mature (Paxson and Schady 2007).

Motivated by a growing body of research showing that investments in early childhood health, nutrition, and psychosocial development have both immediate and long-term benefits on children,[2] the Philippine government undertook a five-year Early Childhood Development (ECD) Project in the late 1990s. The overarching goal of the ECD Project was to improve the survival and developmental potential of children, particularly the most vulnerable and disadvantaged, and thus help them escape poverty and deprivation. Its premise was that increasing the knowledge of parents and communities about child development and galvanizing their support, improving the attitude and capacity of service providers such as the daycare workers and rural health midwives, and ensuring adequate national and local resources for ECD programs would improve a range of indicators of child development. Indeed, the project had specific quantitative goals that included, among others, reducing the proportion of malnourished children and children with anemia; increasing the proportion of those fully immunized and the number attending daycare centers; and improving measures of children's motor, language, and cognitive skills.

In 1999, the ECD Project was implemented in three regions of the country, in part as a means to test the efficacy of a particular approach—Region 6 (Western Visayas), Region 7 (Central Visayas), and Region 12 (Central Mindanao). The Project was jointly implemented by different national departments, namely, the Department of Health (DOH), the Department of Education (DepEd), and the Department of Social Welfare and Development (DSWD) as lead agency. Given the devolved system of governance and service delivery in the country, local government units (LGUs) were expected to play a significant role. In 2002, the project became part of a broader governmental program, formally adopted through the Early Child Care and Development (ECCD) Act (Republic Act 8980).[3]

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[2] See, for example, Grantham-McGregor et al. (1991), Straus and Thomas (1998), Behrman (1996), Glewwe and King (2001), Glewwe et al. (2001), Alderman et al. (2001), Alderman et al. (2003), and Berhman et al. (2003), among others

[3] This Act reaffirmed the Council for the Welfare of Children (CWC) as the highest policymaking body governing children's concerns, and gave it the mandate to coordinate and monitor the enforcement of laws and the implementation of programs for children.

The ECD Project was by no means the government's first effort in investing in early child development. Municipalities were already operating several of the components in the project. However, the project was an attempt by the national government to strengthen and add to these existing programs by increasing their level of resources and by supporting the LGUs in implementation. Its innovations were to integrate existing programs based on a multisectoral approach to service delivery, reflecting the fact that child development has multiple dimensions (e.g., nutritional status, health, and psychosocial and cognitive development), and to intensify child surveillance and referral systems by providing a link between the home and center-based programs in the person of a Child Development Worker (CDW). The latter, an outreach feature of the project, was also meant to elicit community participation and local ownership of the project.[4]

This study was commissioned by the DSWD/CWC to the University of San Carlos Office of Population Studies Foundation (USC-OPS) and had supplementary support from the University of Pennsylvania and the World Bank.[5] Its purpose was to assess the impact of the project on a host of indicators of early childhood development. Since subscription into the program was not done on an experimental basis, the study used a nonexperimental evaluation method, the details of which are described later in the paper. Specifically, the study implemented an "intent-to-treat" difference-in-difference method to address the problem of endogenous program placement. It controlled for the possibility of differential impacts by age of children and duration of exposure to the project. Briefly, a significant improvement was found in the cognitive, social, motor, and language development, and in the short-term nutritional status of children who reside in the project areas compared with those in the nonproject areas.

In the next section, the evaluation method is described, including the data used and the main findings. More detailed description of the study is provided in

[4] Specifically, the project had three components: (1) service delivery, which enhanced and supplemented LGU resources in the provision of the Expanded Program of Immunization (EPI), Integrated Management of Child Illnesses (IMCI) Program, Micronutrient Malnutrition Prevention and Control Program, Parent Effectiveness Service (PES) Program, and Grade 1 Early Child Experience/Early Child Development (ECE/ECD) Program; (2) support to service delivery, which provided assistance to LGUs in implementing their ECD investment packages through the development of a system for communication, planning, targeting, and formation of an ECD management information system and through capacity-building; and (3) research and development (R&D), which planned and financed R&D activities needed to increase the effectiveness in ECD project implementation (National ECD Project Infokit 1998).

[5] It provided for the conduct of an Indicators Study and an Evaluation Study. The Indicators Study collected and analyzed household and child data documenting the state of early childhood development at the onset (baseline) and after the completion (endline) of the project. The Evaluation Study assessed the impact of specific interventions and was based on longitudinal, rather than cross-sectional, data on children. This paper presents the design, methodology, and some of the results of the longitudinal study.

other published work by the project evaluation team (Ghuman et al. 2005; Armecin et al. 2006; Ghuman et al. 2006).

EVALUATION METHOD

The overarching objective of an impact evaluation is to estimate the impact of the program (P) on a measure of desired outcome (Y). In this study, Y is a vector of ECD indicators and is determined not only by the ECD project, if at all, but also by observed characteristics of the child and the child's family and community (X), and by unobserved variables at the level of the child, the family, and the community, (Z), and by a stochastic error term (e). A simple linear approximation of this estimation is:

$$Y_t = aP_t + bX_t + cZ_t + e_t, \qquad (1)$$

where each variable is a vector and coefficients are matrices.[6] By defining P as a dummy variable signifying whether the child lives in a program or a nonprogram barangay, the evaluation method estimates an "intent-to-treat" effect only.

Choosing a counterfactual

As with all other impact evaluations, the key methodological challenge of the study was to define an appropriate counterfactual. This means that to obtain a consistent estimate of the impact parameter "a" in equation (1), there is a need to compare an ECD measure of the average child who was residing in a program barangay (and thus had the ECD program option) with what would have happened to the same child had that child resided in a nonprogram barangay (and thus did not have the ECD program option). Such a comparison is clearly not possible because it is not possible to observe the same child during the same period t both with and without the program option. Note that this comparison is not the same as comparing an average child in a program barangay with an average child in a nonprogram barangay because there could be systematic differences in why one barangay is part of the program and why another is not and those systematic differences could be directly related to the differences in what happened to the average child in the program barangay and the average child in the nonprogram barangay. This is the problem of endogenous program placement mentioned above. In other words, an unbiased estimate of "a" cannot be obtained simply by comparing these mean values of Y with and without the program, or by using simple standard estimations methods such as ordinary least squares (OLS) because critical factors in X and Z are likely to differ between program and nonprogram areas.

[6] Each element in each vector is indexed by its level of aggregation (such as the child, household, or community) but for simplicity of exposition, the corresponding subscripts have been omitted here.

Various evaluation methods have been developed to account for the presence of such systematic differences. One is through randomly assigning barangays as program or nonprogram so that the distribution of children by their characteristics with the program option is the same as the distribution of the children without the program option. This was not the case in the ECD project that allocated the interventions according to a mixture of different factors, including LGU need, interest, and capacity to offer counterpart funds. Although the control region was chosen to be as similar as possible to the program regions using census data and the sample households in the regions were selected randomly, the study found the average characteristics of the sample households in the program and the nonprogram regions to differ significantly in several respects. The sample from the program areas were better-off in socioeconomic terms than their counterparts in the control region; more households in the program regions were residing in urban areas, had electricity and colored TV sets, had more rooms in their house, and had parents with higher levels of education.

Because of these significant differences between the program and control regions, simply comparing the differences in ECD indicators between program and nonprogram regions would not provide a measure of impact because observed differences in service utilization rates and in the ECD indicators could be due to differences in these community and household characteristics rather than due to program participation. Estimating the change in each ECD indicator between survey rounds for the program and control regions and then comparing the change in the program regions with the change in the control region allows one to control for these differences in characteristics. This is referred to as the difference-in-difference (or double-difference) approach:

Impact = (Change in ECD indicator between Time 1 and Time 2 in the Program Regions) – (Change in ECD indicator between Time 1 and Time 2 in the Control Region)

Time-invariant characteristics that differ between the program and nonprogram areas are swept away with this method, as are all time-invariant unobserved individual child (e.g., innate health), family (e.g., relevant aspects of home environment that affect ECD), and community variables (e.g., relevant aspects of the community that may affect ECD directly and the placement of ECD-related programs). Even time-variant observed and unobserved characteristics are dealt with as long as these characteristics exhibit secular changes that are *common* across program and nonprogram areas.

Put simply, and for purposes of the exposition that follows below,

$$\text{Impact} = \Delta Y^{P} - \Delta Y^{NP} = (Y_{Pt} - Y_{Pt-1}) - (Y_{NPt} - Y_{NPt-1}). \qquad (2)$$

$$\Delta Y^{P} - \Delta Y^{NP} = a(\Delta P^{P} - \Delta P^{NP}) + b(\Delta X^{P} - \Delta X^{NP}) + c(\Delta Z^{P} - \Delta Z^{NP}) + (\Delta e^{P} - \Delta e^{NP}), \quad (3)$$

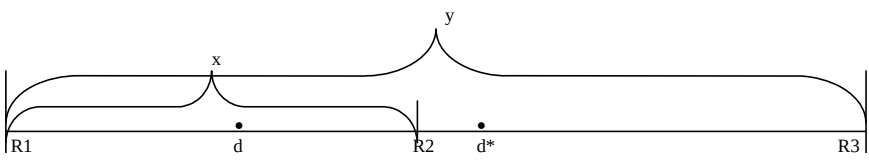
where the superscripts "P" and "NP" stand for program and nonprogram areas, respectively. For all fixed unobserved variables, $\Delta Z^{P} = \Delta Z^{NP} = 0$, so they do not bias the estimates of the parameter "a." For time-varying unobserved variables that are common across observations such as macroeconomic trends, $(\Delta Z^{P} - \Delta Z^{NP}) = 0$, again not causing bias in the estimate of "a" from relation (3).

Adjusting for duration of program exposure

The difference-in-difference approach above assumes that the program areas were equally exposed to the interventions for "x" months from the start of the project. In fact, the study team found wide variation across barangays in the timing of program implementation. In most cases, the project was implemented at both the LGU and barangay levels with some delay, sometimes because of delays in procurement processes or availability of local counterpart funds. Thus, the evaluation took implementation lags into account. A child who is exposed to the program for only half of the time that other children are exposed is less likely to benefit from the project. Timing is also critically important because the window for significant growth for very young children is quite limited; for example, because stunting that persists beyond the second year of life is difficult to reverse, an implementation lag of just one year could have significant repercussions on a very young child.

Figure 1 illustrates how the study measured program impact given the implementation lags that have produced variation in the duration of program exposure among the potential beneficiaries. Supposing that "d" months is the extent of the delay, the study measured program impact only during x-d months of program exposure instead of the entire "x" months from the start of the project (R1 or the baseline survey). For the barangays that began implementing the project only after the second survey (R2), there was no program exposure between R1 and R2. Instead, the period from baseline to our third survey (R3) is designated as "y" months, and implementation date denoted as "d*," and so the duration of exposure is estimated to be y-d* months.

Figure 1. Accounting for implementation lags in measuring program exposure



To establish the duration of program exposure in each barangay, two dates were used: (1) the date when the barangay official interview took place in each survey, and (2) the date of program implementation in the barangay obtained from project administrative data and computed as the average of the dates of procurement of various program materials and equipment and the date of training of service providers. Program exposure is measured at the barangay level and averaged (aggregated) across all barangays in the program regions. As illustrated below, it is an adjustment made to ΔY^P or $(Y_{Pt}\text{-}Y_{Pt-1})$ of the impact estimation.

The time intervals between the surveys were not exactly 12 months apart and were not identical. Further, the beginning and end dates of the surveys varied considerably by region, so an additional adjustment was made to standardize the length of the interval between R1 and R2 and between R2 and R3 to 12 months, and between R1 and R3 to 24 months. With these two adjustments, the impact over a "one-year" period, for instance, between R1 and R2 can be estimated as:

$$\hat{I}_{12} = \frac{1}{b_{P_{12}}} \sum_{i}^{b_{P_{12}}} \left[\left(\frac{12}{x_{Pi}} \right) \left(\frac{x_{Pi}}{x_{Pi} - d_{Pi}} \right) (Y_{P2i} - Y_{P1i}) \right] - \frac{1}{b_{NP}} \sum_{i}^{b_{NP}} \left[\left(\frac{12}{x_{NPi}} \right) (Y_{NP2i} - Y_{NP1i}) \right] \quad (4)$$

and between R2 and R3 as: (5)

$$\hat{I}_{23} = \frac{1}{b_{P_{23}}} \sum_{i}^{b_{P_{23}}} \left[\left(\frac{12}{y_{Pi} - x_{Pi}} \right) \left(\frac{y_{Pi} - x_{Pi}}{y_{Pi} - x_{Pi} - d^{*}_{Pi}} \right) (Y_{P3i} - Y_{P2i}) \right] - \frac{1}{b_{NP}} \sum_{i}^{b_{NP}} \left[\left(\frac{12}{y_{NPi} - x_{NPi}} \right) (Y_{NP2i} - Y_{NP1i}) \right]$$

where b_P and b_{NP} are the number of program and control barangays, respectively. To improve precision of the one-year impact estimate, a weighted average of $\hat{I}_{12}$ and $\hat{I}_{23}$ was computed, choosing the weight that yields the smallest variance, that is,

$$\hat{I}_w = a\hat{I}_{23} + (1-a)\hat{I}_{12}, \quad 0 < a < 1. \quad (6)$$

The value of a that minimizes the sampling variance of $\hat{I}_w$ is

$$a = \frac{s^2(\hat{I}_{12})}{s^2(\hat{I}_{12}) + s^2(\hat{I}_{23})} \quad (7)$$

Over a "two-year" period, impact is:

$$\hat{I}_{13} = \frac{1}{b_{P_{13}}} \sum_{i}^{b_{P_{13}}} \left[\left(\frac{24}{y_{Pi}} \right) \left(\frac{y_{Pi}}{y_{Pi} - d_{Pi}} \right) (Y_{P3i} - Y_{P1i}) \right] - \frac{1}{b_{NP}} \sum_{i}^{b_{NP}} \left[\left(\frac{24}{y_{NPi}} \right) (Y_{NP3i} - Y_{NP1i}) \right] \quad (8)$$

A final word on these adjustments is that only program barangays with exposure to the program of at least three months were included in the impact evaluation. Program barangays with less than three months of exposure were excluded on the assumption that program effects at this stage, if any, would not have been evident or measurable.

DATA

The evaluation was based on data collected from a randomly selected sample of households with children 0–4 years old and those with pregnant women in the program regions (Region 6 and Region 7) and a control region (Region 8). The baseline survey was fielded in 2001, the second survey was conducted in 2002–2003, and the third in 2003–2004.[7] The study focused on children aged 0–4 years at the baseline because these were the children who would have had ample exposure to the programs—at least two years prior to impact evaluation. At baseline, there were 5,324 households with 7,922 children 0–4 years old in Regions 6, 7, and 8. By the second survey, 7,358 children (93% follow-up rate) were left, and by the third survey, just 6,110 children (77.1%) due to various sources of sample attrition (Table 1):[8] (1) nonprogram barangays in the program Regions 6 and 7 decreased after more barangays than originally intended joined the program so the remaining sample of children in nonprogram barangays were dropped; (2) outmigration from the baseline barangays into nonsample barangays; and (3) missing or incomplete information on core variables in all three survey rounds. Overall, the most important source was outmigration; refusals and failure to locate a sample household or respondent were minimal.

To examine if sample attrition had changed the characteristics of the samples from the program and nonprogram areas, the study applied a likelihood test of children being included in the third survey and in the analysis, based on selected

[7] The sample households were selected using a stratified two-stage sampling design. The baseline survey covered 96 barangays in each region. The barangays in each province of the program regions were stratified into: (1) pilot barangays that participated in the project's pilot phase, (2) program or target barangays in Phase 1 of the project, and (3) nonprogram or nontargeted barangays in the program regions. In the control region, Region 8, sample barangays were selected proportionate to the number of barangays in each province. In each sample barangay, an average of 24 eligible households in Regions 6 and 7, and 14 households in Region 8 were selected using systematic random sampling. To limit cost, the study team did not refresh the sample of pregnant women and newborns from among all pregnant women and newborns in the sample barangays. Because of this, the newborns in subsequent surveys are not a representative sample.

[8] The study's primary unit of analysis is the "child." Mothers and households were followed up only if a sample child was living with them. There were households and mothers who had more than one eligible child under their care, but there were also eligible children who did not live with their mother but with a caretaker instead. These patterns are reflected in Table 1, and help explain the relatively lower follow-up rates for mothers than for children.

Table 1. Sample sized in program and control regions, by sampling unit and survey round

Sample	Program Areas						Control Area			Total		
	Region 6			Region 7			Region 8					
	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
Cities/Municipalities	24	24	24	14	14	14	57	57	57	95	95	95
Barangays	96	96	96	96	96	96	96	96	96	288	288	288
Households	1,456	1,392	1,381	1,959	1,887	1,909	1,909	1,756	1,789	5,324	5,035	5,079
Mothers	1,366	1,270	1,210	1,858	1,743	1,742	1,779	1,611	1,596	5,003	4,624	4,548
Children 0–4 yrs	2,115	1,999	1,945	2,913	2,780	2,767	2,894	2,661	2,646	7,922	7,440	7,358
Pregnant Women*	181	118	102	260	161	174	268	170	165	709	449	441
Newborn Children**		338	177		481	268		398	292		1217	737

* Includes all pregnant women in R1 without children aged 0–4 as well as all pregnant sample mothers in R1, R2, and R3 with children aged 0–4.

** Includes all children born to pregnant women who were without children aged 0–4 in R1, and newborn children of sample mothers with children 0–4 in R1.

child and household indicators observed at baseline (Table 2).[9] The results were partly encouraging because they showed that follow-up status was generally uncorrelated with key ECD indicators (measured at baseline). However, attrition appeared to be correlated with a number of parental and household characteristics. For example, mothers of attrited children were likely to be younger and unemployed at baseline; they did not own the house they lived in and had more household members and children under age five living with them.

The study collected a wide spectrum of data about children, mothers, households, service providers, barangays, and LGUs (cities or municipalities).

Table 2. Odds of children being in survey round 3 and of being included in the analysis sample

Indicators	Followed up in R3 (N=7,922)			Included in analysis (N=7,104)*		
	Odds Ratio	Coefficient	P value	Odds Ratio	Coefficient	P value
Child						
Age	1.00	0.0031	0.94	1.02	0.0234	0.56
Worms	1.09	0.0868	0.38	0.97	-0.0322	0.75
Hemoglobin Level	1.01	0.0092	0.55	1.01	0.0092	0.54
Height-for-age Z score	.96	-0.0362	0.44	0.92	-0.0837	0.07
Weight-for-height Z score	1.03	0.0348	0.47	1.05	0.0527	0.27
REC standard score	1.00	-0.0013	0.66	1.00	-0.0011	0.70
Household (HH)						
Father's age	1.02	0.0208	0.03	1.01	0.0138	0.13
Father's education	0.99	-0.0139	0.36	0.97	-0.0269	0.07
Mother's age	1.05	0.0450	0.00	1.05	0.0511	0.00
Mother's education	1.00	0.0039	0.81	1.01	0.0094	0.56
Mother's employment	1.39	0.3307	0.00	1.29	0.2522	0.01
Ownership of house	1.91	0.6473	0.00	1.97	0.6780	0.00
No. of persons in HH	0.96	-0.0424	0.07	0.95	-0.0497	0.04
No. of children <5 yrs old in HH	0.84	-0.1777	0.01	0.85	-0.1612	0.01
Residing in program barangay	1.58	0.4585	0.00	NA	NA	NA

* Represents only the total number of children residing in program and control barangays at baseline (R1).

[9] The study used sample weights in the analysis. The baseline weights accounted only for the sampling probability of households in each sampling stratum. These were revised subsequently for the later rounds of data to take into account: (1) the attrition rate of the different sampling units (households, mothers, and children) in each stratum over time, (2) shifts and/or misclassification of barangays from nonprogram to program (or vice versa) based on an updated listing from the Project Management Office in DSWD, and (3) updated sampling probabilities based on distributions from the 2000 Census that became available only after the baseline survey. Details of the sampling design and weighting procedure are found in OPS (2002, 2005). Coefficients of variation for pertinent ECD indicators, based on the sampling and weighting methodologies employed, are also found in the Appendix of OPS (2005).

Questionnaires were designed to address data needs in conformity with those stipulated by the National Steering Committee (NSC) and the Project Management Office (PMO) of the ECD Project. The surveys generated information for different units of analysis and levels of aggregation:

- Individual questionnaires were designed to solicit information on eligible children and their mothers or caretakers. Data collected included anthropometry (weight and height measurements), hemoglobin count, and the Revised ECD Checklist (REC) that was developed for this study to measure a child's development in several domains-gross and fine motor skills, receptive and expressive language, socioemotional skills, cognitive skills, and self-help skills.[10]
- Household questionnaires asked about parental background and behaviors related to ECD, household composition, environmental and housing conditions, household income, assets and expenditures, and distance to ECD services and service utilization.
- LGU questionnaires were administered to the city/municipal mayor or his/her representative, the barangay captain, and the different line agencies and the ECD Action Team responsible for project implementation. Questions were asked about the location and kinds of ECD services provided prior to the Project, and the selection, expenditures, and funding sources of ECD programs.
- Service provider questionnaires were developed for different ECD service providers, namely, the rural health midwife; barangay health worker and nutrition scholar; day care worker, day care mother, and child development worker; and the grade one teacher. Information was collected on types of services provided and target beneficiaries, resources and expenditures, prices, location, quality and utilization of services, and capacity of service providers and their knowledge and attitudes about ECD practices and programs.

RESULTS

It is useful to begin this section with a brief profile of the study population. As targeted by the project, the sample consists mainly of lower to middle socioeconomic status households. For example, about one-third of the sample households had no electricity; one or two in every 10 households did not have a toilet; only

[10] The REC was developed by a team of experts from the Department of Psychology of the University of the Philippines, Diliman (Drs. Lourdes Ledesma and Elizabeth Ventura). For each domain, the raw scores were scaled to reflect each child's development level relative to others of the same age and sex (i.e., the scores were compared with those for a sample of 10,915 children 0–6 years old from Regions 3, 6, 7, 8, and 12.

four to six in every 10 had a television set; and only about one-third owned a refrigerator. As mentioned earlier, the sample households in the program regions were better off compared with those in the control region; furthermore, the program regions differed from each other. For example, Region 6 had the largest proportion of urban households (48%), while Region 8 had the smallest (20%); almost three out of every 10 heads of household in Region 6 had a college education compared to two in 10 in Region 7, and even lower in Region 8; and 49 percent of the households in Region 6 had houses of strong materials compared with 46 percent in Region 7 and 38 percent in Region 8. Mothers were 31–32 years old on average at baseline and approximately three years older by R3. More than half of the sample mothers had at least some high school education; 32 percent of mothers in Region 6 had a college education compared with 26 percent in Region 7 and 22 percent in Region 8.

At the LGU level, at the time of the surveys, majority of the mayors and barangay captains in the program areas were males and above 50 years of age. In the control region, they were mostly under 50 years of age. A large majority had been in their respective posts since the baseline survey, and less than half of the barangay captains belonged to the same political party as their mayor. In Philippine politics, the amount of support and cooperation a barangay captain gets from the mayor for his projects is often influenced by party affiliations.

Program development: service delivery

Between 2001 and 2004, several ECD-related programs were being implemented in the sample municipalities and had been in existence prior to the project. Except for child feeding and daycare mother services, practically all programs of ECD (EPI, IMCI, IMCH, Vitamin A, iron and iodine supplementation, growth monitoring, early childhood education, daycare services, and training on parenting) were already in place by 2004 in the program regions. Many of these programs were also being implemented in the control region, although iodine supplementation, child feeding, parenting support, and daycare mother services were not as prevalent in the control region as in the program regions. The value added of the ECD project was to link the programs better and to integrate them across the three implementing health, social welfare, and education agencies (DoH, DSWD, and DepEd) although it would appear that there were no clear guidelines for the proper and effective integration of the various programs by the different agencies (Table 3). [11]

[11] At the LGU level, integration of the functions of these agencies was to be spearheaded by the ECD Action Team consisting of officers from different line agencies of government. Activities of the ECD Teams had increased considerably between the first and last survey rounds. By 2004, however, the Teams' activities had focused primarily on monitoring and supervision as well as report writing.

Table 3. Number of program municipalities, by type of activities geared toward integration of ECD programs in R3 and region

Integration activities	Region 6 (N=23)	Region 7 (N=13)
Constant communication, regular meetings of the ECD team	4	3
Harmonious working relationship with the other implementing agencies	6	6
Team building efforts like the referral system that link one implementing agency to the other	13	3
Close coordination, knowing what the other implementing agencies like DSWD, DOH, and DepEd are doing	15	7
Coordination with barangay officials/local officials	1	0
Coordination with barangay residents/recipients	1	0
Close supervision of service providers	1	0

Project impact on ECD service utilization

The quantitative goals and targets of the ECD Project were both numerous and ambitious (OPS 2005). The services provided in the ECD Project were intended to offer a holistic approach to child development and a correspondingly integrated service delivery. In this section, the impact evaluation results for a selected set of indicators with immediate links to child health and development are presented. Project outcomes or impacts considered are: (1) service utilization rates, and (2) measures of the child's physical, psychosocial, language, and cognitive development. For impact on service utilization, the study employed for each program a cross-section analysis pertinent to the age group or beneficiary category that was the program target. For impact on ECD outcomes, it took into account changes in outcome measures over the evaluation period, by age of the child. The impact estimates are presented in Tables 4–7. A negative value *always* means a disadvantage or worsening of condition in the program areas relative to the control region, while a positive value *always* means a benefit or improvement in the program areas relative to the control region.

To begin, the study found an overall decrease in the utilization of public health facilities such as government hospitals, health centers, and barangay health stations for consultation purposes by households in the 12 months prior to each survey (Table 4). This was true for both public and private health facilities although there was a clear preference by households to visit public rather than private health care providers. According to the majority of households that did not consult government health providers for illnesses of their members in the last 12 months, they had not done so because they preferred to monitor and observe the illness or condition of their sick household members and to provide home remedies for them. This seemingly paradoxical impact might be explained by the fact

Table 4. Impact on service utilization, by region and duration of exposure

	% households consulting a public health facility in the past 12 months		% children 1–2 years old fully immunized		% underweight children 0–4 years in feeding program		% children 0–4 years in growth monitoring program	
Region	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years
6	-18.3*	-31.7*	2.6	2.9	20.8*	41.0*	-7.0	-32.2*
7	-9.9*	-36.0*	-0.7	-6.2	5.0	16.0*	-31.0*	-21.7*
Both	-14.9*	-33.8*	0.6	-1.6	12.3*	28.4*	-16.3*	-27.0*

	% children 6–59 months taking Vitamin A supplements		% children 0–4 years taking iron supplements in past year		% mothers aware of Parent Effectiveness Service (PES)	
Region	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years
6	2.6	5.7*	6.1*	25.6*	14.6*	43.7*
7	7.3	10.4*	27.9*	51.1*	6.6	21.4*
Both	8.9*	8.0*	19.5*	38.1*	11.9*	32.8

*Significant at $p \leq 0.05$

that the study team was following the same children for more than two years and that during the course of the study, with children 0–4 years old at baseline growing up, there was less need for the ECD services.

Immunization

One target of the ECD project was to increase the proportion of children 12–18 months old who are fully immunized. However, the percentages were already much higher in the program regions than in the control region to begin with (already nearly 90% vs. 79%), and these proportions hardly changed over time, regardless of duration of exposure to the program. None of the impact estimates were statistically significant.

Feeding program

The ECD Project aimed to prevent and reduce malnutrition among children 0–4 years old. Table 4 shows a statistically significant increase in the participation of underweight children in the feeding program in health centers (also known as "wet feeding") in the program areas relative to control areas, with this impact being considerably larger in Region 6 than in Region 7. With just a year of program exposure, about 21 percent more of underweight children in Region 6 compared to those of Region 8 had participated in the feeding program; with two years of exposure, 41 percent more of underweight children had participated. The same positive impact is observed for Region 7 but to a lesser degree. At baseline, program participation in the control region was low and at about the same level as in Region 6 but showed no similar increase as in the program regions.

Growth monitoring

Growth monitoring was meant to detect growth faltering and monitor the timely provision of appropriate interventions to prevent malnutrition and health problems among very young children. The Philippine Department of Health recommends monthly weight monitoring in the first two years of life and quarterly monitoring thereafter. At baseline, about 80 percent of children 0–4 years were being monitored in Region 6 and in the control region; monitoring was notably higher at 90 percent in Region 7. In the program and control regions, a decline was observed in children's participation in the growth-monitoring program from baseline to the second survey, and a further decline in Region 6 through the third survey. In Region 6, as compared to the control region, the decline after the first year was not significant but the drop after the second year was large and statistically significant. In Region 7, the decline after the first year was larger than the decline after the second year relative to the control region, with both estimates being statistically significant. One explanation of the observed decline in the second year could be that the

recommended interval between growth visits lengthens after a child reaches two, thus affecting the relative frequency of children in the program regions at older ages. However, this does not explain the relative decline in Region 7 even after the first year. Another explanation could be that center-based growth monitoring was being replaced by the outreach or home-based services of the barangay health worker (BHW) and the child development worker (CDW) in the program regions.

Vitamin A supplementation

The recommended dose of Vitamin A for children less than one year old is usually 100,000 i.u., and for children one year and older, 200,000 i.u. In all three regions and survey rounds, data revealed that more of the older children (12–59 months old) than the younger ones (6–11 months old) had taken Vitamin A supplements in the previous year. Regardless of age, however, the proportion of children taking vitamin A—already high at baseline at 76–82 percent in the three regions—increased, and significantly higher in the program regions than in the control region. These proportions declined somewhat after the second survey but the percentages taking the supplements during the third survey were still significantly higher than at baseline level.

For Region 6 and Region 7 separately, this positive impact was evident only after two years of program exposure: relative to Region 8, 6 percent more children in Region 6 and 10 percent more in Region 7 had taken Vitamin A supplements. With just one year of program exposure, no significant impact was observed for either region albeit a positive impact was evident for the program regions combined.

Iron supplementation

Compared to Vitamin A supplementation, iron supplementation was low at 6–16 percent of children 0–4 years old in the three study regions. In the program regions combined, despite a decline in Region 6 at the second survey, this percentage increased significantly relative to the control region after one year of the program, driven primarily by a tripling of iron supplementation in Region 7 between baseline and the second survey. After two years of program exposure, relative to children in the control region, 25 percent more children in Region 6 and 51 percent more in Region 7 had taken iron supplements.

Parent effectiveness service

The ECD project aimed to integrate and enhance other programs that address parental role in children's physical, cognitive, and psychosocial development through the Parent Effectiveness Service (PES), which consisted mainly of an outreach worker, the child development worker (CDW), being responsible for com-

munity-based parental education on childrearing. In practice, especially in Region 6, the study found that not only the CDW but also the rural health midwife (RHM) and the daycare worker (DCW) were trained under the PES. Given the higher level of education of these providers relative to the CDW, their longer exposure to ECD programs and their greater work experience in their respective communities, it is quite likely that their participation served the program well.

Table 4 shows an increase in mothers' awareness and participation in the PES. Only 12 percent of mothers in the program regions, compared to 7 percent in the control region, were aware of PES at baseline. After one year of exposure, 15 percent more mothers in Region 6 than in the control region had gained awareness of the PES, but after two years, 44 percent more mothers in Region 6 and 21 percent more mothers in Region 7, relative to mothers in Region 8, had become aware of the PES. Among mothers who were aware of the PES in the program regions, participation in a PES training workshop had almost doubled from baseline to the third survey, though still at less than one-half of mothers.[12] The results indicate that PES awareness did not guarantee participation. Nonetheless, this study's measure of impact showed that after a year, the program succeeded in motivating an additional one-third of mothers (for every 100 mothers who were aware of the PES in Region 8) to attend the workshop. After exposure to the program for two years, more than half of the mothers, compared to those in Region 8, opted to attend the PES workshop. In the third survey, mothers cited time constraint as the most common reason for not attending the PES workshop; other reasons included shortcomings of the program in disseminating information about the schedule of the workshops.

The ECD program also encouraged fathers' participation in the PES, but father's participation remained extremely low. By the second survey, only less than 10 percent of husbands whose wives attended the PES workshop had attended it as well. This percentage dropped to 5 percent by the third survey.

Impact on child health and development

This part looks at some indicators of child development, examining whether these indicators showed improvements that can be attributed to the ECD project. To repeat, since the project was not assigned in any randomized way to the program areas, this attribution is based on a difference-in-difference estimation method.

Nutrition indicators

The evaluation study measured nutritional status of a cohort of children who

[12] Although it is not certain whether Region 8 also had PES workshops (or something similar), there were a few mothers in the region who reported attending such workshop but their proportion had decreased over time.

were 0–4 years old at baseline and were followed up in two subsequent surveys using the following nutrition indices: weight-for-age, height-for-age, and weight-for-height. These indices were assessed using the WHO/NCHS international reference standards and –2 and +2 standard deviations as the lower and upper limits of normality.

- Malnutrition, particularly undernutrition, was quite pronounced and persistent among children in the program and control regions. Between a quarter and one-third of the sample children were underweight at one point or another during the study (Table 5). Underweight children were generally larger in proportion in the control region than in the program regions.
- The percentage of children underheight or stunted was high in the three study areas, implying chronic malnutrition in these regions. Especially in the control region, a large proportion of children were short for their age. At the third survey, nearly one-half of the children in Region 8, compared to only about one-third in the program regions, were underheight.
- Weight-for-height or thinness is a measure of *current* rather than past nutrition of children. In the three regions, the proportion of children considered thin by this measure declined. Region 6 saw the largest drop in this proportion, while Region 7 displayed the lowest prevalence of thinness across all three regions and survey rounds.

An assessment of the impact of the ECD project on these nutrition indicators yielded mixed results. The project appears to have been beneficial in Region 6 after two years of program exposure, especially in reducing the proportion of underweight children (Table 6). This program region also showed significant improvement in children's weight-for-height status or thinness, regardless of length of program exposure. However, there were no gains in both program regions with respect to controlling chronic malnutrition or stunting. In fact, with longer exposure to the program (two years), there was a relative worsening in the program regions compared to the control region, a finding that the study was not able to explain.

Anemia

The study assessed the anemia status of children using the WHO cut-off value of 11g/dL hemoglobin value for normality.[13] Based on FAO/WHO standards, the epidemiological criteria for assessing severity of nutritional anemia in the popula-

[13] A detailed description of the blood collection and hemoglobin test is provided in the ECD Final Report, Appendix F (OPS 2005).

Table 5. Percent distribution and mean Z scores of children, by weight-for-age, height-for-age, and weight-for-height status, region and survey round

Nutrition Indicator	Program Regions			Control Region
	Region 6	Region 7	Both	Region 8
Weight-for-Age				
Round 1				
Underweight	30.2 [-2.7]	25.5 [-2.5]	29.2 [-2.6]	36.2 [-2.6]
Normal	67.7 [-1.1]	73.7 [-0.9]	69.0 [-1.0]	62.9 [-1.0]
Overweight	2.1 [3.2]	0.8 [2.7]	1.8 [2.9]	0.9 [3.1]
Round 2				
Underweight	36.4 [-2.6]	24.2 [-2.5]	33.8 [-2.5]	34.0 [-2.5]
Normal	61.8 [-1.1]	75.6 [-1.1]	64.7 [-1.1]	65.1 [-1.2]
Overweight	1.8 [2.8]	0.2 [3.2]	1.5 [3.0]	0.9 [3.5]
Round 3				
Underweight	25.3 [-2.5]	24.5 [-2.4]	25.2 [-2.5]	34.0 [-2.5]
Normal	71.1 [-1.0]	74.7 [-1.1]	71.9 [-1.1]	65.0 [-1.2]
Overweight	3.5 [3.4]	0.8 [3.4]	2.9 [3.4]	1.0 [3.2]
Height-for-Age				
Round 1				
Underheight	31.7 [-2.8]	30.1 [-2.7]	31.3 [-2.7]	41.4 [-2.8]
Normal	68.2 [-1.0]	69.9 [-1.0]	68.6 [-1.0]	58.2 [-1.0]
Tall	0.1 [3.8]	0.1 [3.1]	0.1 [3.5]	0.4 [2.7]
Round 2				
Underheight	36.4 [-2.8]	35.2 [-2.7]	36.2 [-2.7]	48.8 [-2.8]
Normal	63.5 [-1.2]	64.8 [-1.1]	63.8 [-1.1]	51.2 [-1.2]
Tall	0.0 [2.3]	0.0 [2.4]	0.0 [2.4]	0.0 [2.4]
Round 3				
Underheight	35.4 [-2.7]	36.6 [-2.6]	35.7 [-2.7]	48.0 [-2.8]
Normal	64.6 [-1.2]	63.4 [-1.1]	64.3 [-1.1]	52.0 [-1.1]
Tall	-	0.1 [2.1]	0.0 [2.1]	0.1 [2.7]
Weight-for-Height				
Round 1				
Thin	8.6 [-2.6]	3.8 [-2.4]	7.5 [-2.6]	5.6 [-2.6]
Normal	88.4 [-0.7]	95.1 [-0.4]	89.9 [-0.5]	92.6 [-0.6]
Overweight	3.0 [3.9]	1.1 [4.1]	2.6 [4.0]	1.8 [5.1]
Round 2				
Thin	5.1 [-2.4]	2.2 [-2.5]	4.5 [-2.5]	3.7 [-2.4]
Normal	92.6 [-0.7]	97.0 [-0.5]	93.5 [-0.6]	95.1 [-0.6]
Overweight	2.3 [3.2]	0.9 [3.3]	2.0 [3.2]	1.3 [4.0]
Round 3				
Thin	3.0 [-2.6]	1.9 [-2.4]	2.8 [-2.5]	2.7 [-2.4]
Normal	92.9 [-0.3]	97.0 [-0.5]	93.8 [-0.5]	96.0 [-0.6]
Overweight	4.1 [3.3]	1.1 [4.0]	3.5 [3.6]	1.3 [3.5]

Note: Figures in [ ] are mean Z scores based on International Reference Standard (IRS), NCHS/WHO Reference Data of 1978.

Table 6. Impact on children's physical development and nutritional status

	% children underweight		% children stunted or underheight		% children who are thin		% children anemic	
Region	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years
6	3.7	15.2*	-0.8	-4.9*	3.3*	8.7*	-21.3*	-17.8*
7	-0.8	-3.3	-4.6*	-7.4*	0.0	1.7	8.2*	6.2
Both	1.5	6.1*	-3.0*	-6.0*	1.5	5.3*	-8.0*	-6.0

*Significant at $p \leq 0.05$.

tion specify prevalence of 40 percent and over as high, 10–39 percent as moderate, and 1–9 percent as low. The prevalence of anemia in the study areas was remarkably high (at baseline, 42% in the program regions and 46% in the control region). Except in Region 7, these rates were even higher at the second survey. By the third survey, despite the higher iron supplementation rates in the program regions, anemia prevalence remained severe in Region 6 but had declined to moderate levels in Regions 7 and 8.

The impact assessment yielded large negative results for Region 6 but the opposite for Region 7. With adjustments for duration of program exposure, Region 7 exhibited significant positive impact for one year of exposure but not for two years. The study, however, has not been able to identify specific exogenous circumstances or programmatic differences that occurred in Region 6 that might explain the results for that region.

Psychosocial development

As mentioned above, psychosocial and cognitive development of children 0–4 years was assessed using a diagnostic instrument called Revised Early Childhood Development Checklist (REC). This instrument covered seven domains of skills, namely, gross motor, fine motor, self-help, receptive language, expressive language, cognitive, and social-emotional domains. The gross motor domain measures the child's skill in locomotion and in coordinating movements of different body parts, while the fine motor domain measures finger dexterity and the ability of the child to grasp and hold objects. The self-help domain examines the child's survival skills and the ability to perform activities independently, such as feeding, dressing, toilet use, and bathing. The receptive language domain assesses the child's ability to understand what others are communicating, while the expressive language domain measures the child's ability to make other people understand what he/she feels or wants. The cognitive domain measures reading and math readiness skills, and the social-emotional domain assesses the child's emotional maturity through skills such as recognizing people close to the child, among the very young children, and delaying gratification, showing respect, cooperation and care for younger peers or siblings, among the older children. The score for each domain is a scaled score ranging from 1 to 19 with a standard deviation of ±3, while the sum of scaled scores is reported as a standard score ranging from 35 to 150 with a standard deviation of ±15. A child is classified as below average if the standard score is below –1 standard deviation from the mean.[14]

[14] For a description of this assessment tool, see Appendix G of OPS (2005).

Averaging across all seven domains, there was a decline in the proportion of children with below average *overall* psychosocial development, especially by the third survey round. Although improvements were evident in all the three regions, the control region exhibited the highest proportion of children with delayed development from the first to the last survey round. After two years of the program, 7 percent of children in Region 6 and 11 percent in Region 7 did better on this score relative to children in the control region (Table 7).

The study also assessed program impact for each of the domains of psychosocial and cognitive development. Table 7 shows that the psychosocial impact was evident mainly in Region 7 and for four developmental domains: gross and fine motor, receptive language, and social-emotional development. Moreover, these gains were perceptible mostly after two years of program exposure. In Region 6, the overall positive impact on children's psychosocial development was largely due to a significantly positive program impact on gross motor skills after two years of the program, since other domains showed no significant positive impact or a negative one.

DISCUSSION

This study found evidence of mixed impact of the ECD project. Using a difference-in-difference estimation technique, with adjustments for duration of program exposure, the study found that the project increased participation in several program components, namely, the feeding program for underweight children, Vitamin A and iron supplementation, and the PES training. However, the project did not improve participation in immunization and growth monitoring, two programs that had already been in place in the study areas prior to the project and had high participation rates of 80–90 percent when the baseline survey was conducted. Instead, the study found a decline in growth monitoring that might have been due to a substitution away from the center-based growth monitoring program and toward the project's outreach services offered by the barangay health worker and the child development worker.

Although the study cannot ascertain which particular program components were the most effective, the project did improve several measures of children's nutritional status and psychosocial development. Region 6 showed significant reductions in the proportion of children who were underweight (as measured by weight-for-age) and thin (as measured by weight-for-height), while Region 7 showed notable improvements in indicators of children's psychosocial development. These successes notwithstanding, the percentage of children stunted (as measured by height-for-age) worsened relative to the program regions, and in Region 6, anemia prevalence remained a problem among children despite increases in the uptake of iron supplements and participation in the feeding program.

Table 7. Impact on children's psychosocial, motor, language, and cognitive development

	Overall psychosocial development		Gross motor skills		Fine motor skills		Self-help skills	
Region	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years
6	2.2	6.8*	2.0	7.8*	-0.6	-0.3	-1.4	1.5
7	4.1	10.7*	5.5*	9.3*	-0.6	2.0*	-0.1	-0.4
Both	2.2	8.7*	4.6*	8.5*	-0.2	0.8	-0.7	0.6
	Receptive language skills		Expressive language skills		Cognitive skills		Social-emotional skills	
Region	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years	After 1 year	After 2 years
6	0.2	-3.6*	0.8	0.7	1.4	-1.4	-1.0	-1.5*
7	3.5	5.2*	-0.7	1.0	0.6	0.6	-0.7	4.3*
Both	1.5	0.7	-0.1	0.8	1.0	-0.4	-0.7	1.4

*Significant at $p \leq 0.05$.

This study has its limitations. It did not address the question pertaining to the pathways through which service delivery and utilization influence the various ECD indicators. For example, it ignored the effect of variations in the quality of program delivery across study areas. The study team has reason to believe that such variation exists; from the service provider and mother interviews, the team learned that supply problems such as delays weakened implementation. Also, this study assessed impact after two years of the program, a period that arguably may be too short to detect program effects especially if those effects work through changes in parental or provider attitudes, behaviors, and life style. Other studies have explored the effects of family background and service providers on ECD (e.g., Ghuman et al. 2005), but analysis of the impact on provider behavior has yet to be undertaken. The study team has also implemented alternative estimation strategies such as propensity score matching and fixed effects estimation (e.g., Armecin et al. 2006) and these yielded similar qualitative results to those discussed in this study. A fourth survey now completed will soon permit the assessment of longer-term effects of the project.

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