Evaluating the Early Childhood Development Program in the Philippines*

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Abstract

Increasing attention and resources have been devoted in recent years to early childhood development (ECD) in low to middle income countries. Rigorous studies on the effectiveness of ECD-related programs for improving children's cognitive skills and nutritional status in the developing world are scant. We evaluate an important ECD initiative of the Philippine government using longitudinal data collected over three years on a cohort of 6,693 children age 0-4 at baseline in two "treatment" regions that received the ECD program and a "control" region that did not receive the intervention. The main method we use to estimate the program impact is to match children in the treatment and control regions with respect to a variety of observed characteristics measured at the municipality, barangay, household, and child level, and to then estimate the relative change in ECD across time in treatment compared to control regions (i.e. the "difference-in-difference" estimator). The results indicate that there has been a significant improvement in weight-for-height Z scores among children age 5 and above in the third survey round (age 3 and above at baseline). We also find evidence of substantial increases in cognitive, social, and motor development scores for children age 3 and below who reside in ECD program areas relative to those who do not. Finally, there is evidence of an important decline in the proportion of children below age 4 with worms in program compared to non-program areas.

In recent years, interest in early childhood development (ECD) in developed and low to middle-income developing countries has expanded considerably. High grade repetition, early dropout, and poor learning, as well as poor health of youths and adults, are being traced to malnutrition, disease, and neglect during early childhood. Accumulated evidence reveals associations between nutrition and health status and cognitive and psychosocial skills measured at young ages and later educational attainment, earnings, and employment outcomes.[1] These life-cycle links suggest that a potentially effective way of alleviating poverty and engendering economic development is through policies that promote better nutrition and health, as well as development of cognitive, motor, and social skills among young children. Accordingly, governments in a number of countries have introduced early childhood development (ECD) programs for improving nutrition, reducing disease, and enhancing the learning environments of preschool children. Much of the existing literature is from the developed world, and rigorous studies on the effectiveness of early childhood programs for improving children's cognitive skills or nutrition within the developing world are very few in number. And the literature from low-income countries concerned with health for all ages, including infants and young children, often examines utilization of health services rather than health outcomes.

In this paper we evaluate the impact of an important ECD initiative of the Philippine Department of Social Welfare and Development (DSWD) on health and other ECD outcomes among young children. The overall aim of the ECD program is to enable local governmental units (LGU's or municipalities) within three regions of the Philippines to deliver a broader and better set of health and ECD-related services to pregnant women and children under age seven. The evaluation of this program in these three regions provides an opportunity to test new policies as well as established approaches to ECD before they are scaled-up to other regions. The ECD program has two main components. The first is to provide program support to all provinces in the three project regions for services related to children's immunization, morbidity, micro-nutrient malnutrition, as well as parent effective seminars and Grade 1 modules designed to improve parent's and teachers' ECD-related skills and to disseminate food supplements, and iron and deworming drugs within schools. The second main component of the program is to target additional resources to LGU's in the program regions that are deemed to have the greatest number of needy and at-risk children below age seven. This aid is in the form of cost-sharing grants to invest in a series of service provider-specific packages that allow LGUs to purchase new equipment and supplies, hire new service providers, and provide additional ECD-related training to the new and existing service providers.

[1] See Behrman and Rosenzweig (2004), Currie and Thomas (1995, 1999), Karoly, *et al.* (1998), Murnane, Willett and Levy (1995) and Neal and Johnson (1996) for the United States; Alderman, *et al.* (2001), Alderman, Behrman and Hoddinott (2005), Behrman, Alderman and Hoddinott (2004), Behrman, *et al.* (2003), Deutsch (1999), Glewwe, Jacoby and King (2002), Glewwe and King (2000), Martorell (1995, 1999), Martorell, *et al.* (1994, 1999), Myers (1995) and Young (1995) for developing countries.

The main research question that we address in this paper is: *Did this ECD program have a positive effect on ECD in the form of better child health, nutrition, and cognitive, social and motor development?* We answer this question using a rich set of longitudinal data with three rounds over three years on 6,693 children in two "treatment" regions that received the ECD program in comparison with a "control" region that has not received the program. The main method we use to estimate the program impact is to match children in treatment and control regions on a set of observed characteristics measured at the municipality, barangay, household and child level.

Section 1 is a brief summary of the literatures about the benefits of better ECD on later human development and adult productivity and about the factors that have been found to contribute to ECD. Section 2 discusses the features of the Philippine ECD program. Section 3 describes our evaluation design and the survey data used in our analysis. Section 4 summarizes our estimates of program impacts on specific ECD indicators based on matching. Section 5 summarizes our results and conclusions.

1. Previous Studies on Getting a Better Start in Life in Developing Countries

Early childhood investments and subsequent schooling success and adult productivities in developing countries

An extensive literature has examined the relation between child malnutrition with subsequent school outcomes. The diets of young children in developing countries often are of low quality in terms of energy and nutrient concentrations; as a result, multiple nutrient deficiencies are common. Both as a result and cause of this malnutrition, young children are also very susceptible to infections. Several recent studies that use longitudinal data and other special features to identify causal effects find substantial support for a causal relation between poor pre-school nutrition on school achievement. [2] Glewwe, Jacoby and King (2001) find that malnourished children enter school later and perform more poorly on cognitive achievement tests.[3] Their results indicate that a one standard deviation increase in child health increases achievement test scores by about one-third of a standard deviation of that score. This is the equivalent of spending eight more months in school and implies a benefit-cost ratio of at least three. Glewwe and King (2001), using the same data, find that malnutrition in the first six months has less adverse effects on child cognitive development than at older ages because it can be reversed. Instead, they find that the second year of life is most critical once the

[2] Earlier studies using mostly cross-sectional non-experimental data tended to present positive associations between preschool nutritional status and school achievements, but did not present persuasive evidence regarding causality because they did not incorporate in the analysis that preschool nutrition reflected behavioral decisions in the presence of unobserved factors such as genetic endowments (a number of such studies are reviewed in Behrman and Deolalikar (1988), Pollitt (1990), Behrman (1996), and Strauss and Thomas (1995, 1998)).

[3] This study uses the Cebu Longitudinal Health and Nutrition Survey (CLHNS) for 1983-4, 1991-2 and 1994-5. It controls for unobserved family and community heterogeneity by using within-sibling estimates. The authors suggest that coefficient estimates of child height-for-age may be biased towards zero by measurement error in OLS regressions so for their preferred estimates they instrument the difference in heights between siblings using the older siblings' height-for-age (at birth, 12 months and 24 months).

estimation strategy controls for the behavioral determinants of child nutritional status at the start of each period of children's lives. Other studies (e.g. Alderman, *et al.* 2001; Alderman, Hoddinott, and Kinsey 2003; Behrman, *et al.* 2003) also find both delayed school initiation and fewer grades completed for malnourished children, as well as negative consequences for performance on cognitive tests in adulthood.

One channel through which early childhood development affects adult life is through schooling's impact on work productivity and incomes (see Psacharopoulos 1994 and Glewwe and Jacoby 2004 for reviews). Most studies treat schooling attainment as a given instead of being the result of the availability of schools, parental tastes and choice, household background, and whether children are able and ready to learn when they start school. There also have been a growing number of studies for developing countries that have examined the direct impact of health and nutrition on productivities in farm production and in labor markets.[4] Since Strauss's (1986) study on the impact of calorie consumption on agricultural productivity in Côte d'Ivoire, several studies have found significant and, in some cases, substantial effects of health and nutrition on economic productivities. Those studies that have examined much longer-run indicators of nutrition, namely height, also generally have found fairly substantial associations with adult productivity (though generally treating height as exogenous rather than reflecting earlier choices).[5]

Though some qualifications are necessary in interpreting these different studies, the current state of knowledge strongly suggests that early childhood human capital has important effects on adult productivities, both directly through health status over the life cycle and indirectly through schooling.

Determinants of early child development in developing countries

What produces good early child development? Numerous studies have found statistically significant positive associations between family background and parental schooling and child health (see Strauss and Thomas 1995, 1998 for reviews and Behrman and Skoufias 2004 for a symposium on a number of Latin American studies and references to other studies). Parents with more schooling tend to have greater access to public health and ECD-related facilities because they have better connections, are favored by the providers of such services, or are more informed in ways that permit them to exploit such services more efficiently. Some examples: In the Philippines, mothers' schooling appears to protect child health in communities without piped water or good sanitation and in those farther from health facilities—an effect larger than that of household income (Barrera, 1990). In Guatemala, women with more schooling are more likely to use childcare, particularly formal care, and to have their children immunized

[4] Deolalikar (1988) and Behrman and Deolalikar (1989b) on rural India; Sahn and Alderman (1988) on Sri Lanka; Pitt, Rosenzweig and Hassan (1990) on rural Bangladesh; Haddad and Bouis (1991) and Foster and Rosenzweig (1994) on the rural Philippines; Alderman, *et al.* (1996b), Behrman, Foster and Rosenzweig (1997) and Fafchamps and Quisumbing (1999) on rural Pakistan; Strauss and Thomas (1996) and Thomas and Strauss (1997) on urban Brazil; Schultz and Tansel (1997) on Côte d'Ivoire and Ghana; and Schultz (1999) on Brazil, Côte d'Ivoire, Ghana and Vietnam.

[5] In addition to the studies in the previous note, see, for example, Adair (1999), Adair and Guilkey (1997), Golden (1994), Martorell (1995, 1999), Martorell, *et al.* (1994).

completely (Pebley, Goldman, and Rodriguez, 1996). In urban Niger and Nigeria, mothers' schooling also is positively related to immunization (Gage, Sommerfelt, and Piani, 1997). A positive relationship between mothers' schooling and child immunization rates is observed broadly across world regions.. And families with higher wealth levels are more efficient in using information to improve young children's development, suggesting the double-disadvantage of poor parents with low schooling and little access to information and public services.[6]

We report similar patterns in the Philippines based on the baseline data alone for the data set that we use in this study (Ghuman, *et al*. 2005). Family background has a number of important positive associations with early child development: (1) between family physical assets and the hemoglobin levels, height-for-age, weight-for-height, and lower occurrence of worms among children; (2) between mother's height and children's height-for-age and the lower occurrence of worms; (3) between father's height and children's gross and fine motor skills and height-for-age; (4) between father's schooling and children's expressive language skills, hemoglobin levels, anthropometrics, and the lower occurrence of worms. In the case of worms, the magnitude of the association of father's schooling rivals that of the association with family's physical assets. While both mother's and father's height have large and significant positive associations with children's height-for-age, that the association with mother's height is significantly larger in magnitude suggests that this is more than a genetic and common family background effect. Mother's height also has significantly larger negative associations with children's propensity to have worms compared to father's height. But for children's gross motor skills, models that control for all community characteristics indicate that the association with father's height is significantly different from (and greater than) that that observed for mother's height. Beyond the main effect of family background on ECD, this study does not find evidence of widespread interactions between family background and health services for affecting ECD.[7] The results, finally, show that failure to account for community characteristics can give often substantially misleading indications of the probable associaton of family background with ECD.[8]

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[6] These studies, however, all tend to take parental schooling as given. Evidence presented by Behrman and Rosenzweig (2002) suggests that the estimated impact of parental schooling on child human capital (schooling in particular in their study) may be much different (i.e., less, and even opposite in sign for mothers in contexts in which more schooling elicits more time in the labor force and less time in child care) with control for intergenerationally-correlated endowments and assortative mating.

[7] A few exceptions are found in the case of occurrence of worms and hemoglobin levels among children. For worms, several interactions indicate substitutions between the presence of health or ECD-services and the mother's human assets, while for hemoglobin family background has complementary associations with health or ECD-services.

[8] In cases such as the association between the father's height and the fine motor skills or receptive language skills of children, or the association of mother's height with the hemoglobin levels of children, omitting controls for community characteristics results in overestimates of about 40 to 50 percent of the estimated coefficients. In other cases, such as the associations of each parent's schooling with anthropometrics, or the relation between maternal schooling and children's fine motor, language skills and worms, omitting controls for community characteristics leads to underestimates that range from 40 percent to over twice the size of the estimated coefficients in the case of worms.

Impacts of health and nutrition programs in general and ECD programs in particular

Several studies have concluded that health and nutrition programs in developing countries have beneficial effects on children. Children's participation in growth monitoring is a good predictor of weight gain in Northeastern Brazil (de Souza, *et al.* 1999). Supplementation programs that seek to address the nutritional needs of very young children have been shown to have important effects on early child development, particularly on educational performance and growth. Some studies (Southon, *et al.* 1993) reveal an improvement in non-verbal intelligence among school children after several months of micronutrient supplementation. A study on Jamaica reports that nutritional supplementation for undernourished children (who are likely to be from disadvantaged families) improved mental development (Grantham-McGregor, *et al.* 1991). In Indonesia, Vitamin A is related to improved linear growth of children but not among those with high prevalence of respiratory infections (Hadi, *et al.* 1999). Child fixed-effects estimates that control for unobserved heterogeneity that is correlated with access to the supplement indicate a significantly positive and fairly substantial program effect of the Mexican PROGRESA program nutritional supplements on children 12-36 months in rural communities (Behrman and Hoddinott 2005). They imply an increase of about a sixth in mean growth per year for these children and a lower probability of stunting, with somewhat larger effects for children from poorer communities but whose mothers are functionally literate. The long-term consequences of these improvements are non-trivial; its impact working through adult height alone could result in a 2.9% increase in lifetime earnings. Although these studies report promising results, some other studies do not. In Sudan, for example, intake of Vitamin A yielded no significant difference in height and weight gain among rural children aged 6-72 months (Fawzi, *et al.* 1997). Similarly, in Nepal, Vitamin A supplementation had no impact on annual weight gain or linear growth (West, *et al.* 1997).

To our knowledge, there have not been many systematic evaluations of ECD programs that use longitudinal data. The examples of which we are aware include four programs in the United States and one in Bolivia. All five of these provide program services in centralized settings, where children leave their homes to attend a preschool or a day-care center. In the United States, the Perry Preschool Program supplemented its center-based curriculum with weekly home visits. The Home Intervention Program for Preschool Youngsters (HIPPY) in contrast is an exclusively parent-focused program that aims to educate parents to be better educators of their children. Through HIPPY, para-professional trainers visit families weekly to give them teaching materials and parenting advice (Baker, Piotrkowski and Brooks-Gunn 1998). Evaluations have found positive impacts on cognitive test scores, at least over a two-to-three-year interval after the program. Long-term assessments of some of the programs find lasting effects in terms of higher educational attainment, higher earnings, lower welfare participation levels, lower arrest records, and lower out-of-wedlock births.

Bolivia's PIDI is an early childhood development program that provides 70% of children's nutrient inputs and systematic learning environments for poor children aged 6-72 months in urban areas. The original evaluation design included the collection of baseline data and then periodic follow-up surveys, but in fact the "baseline" survey was

not undertaken prior to initiation of the program. Information was collected on children (and their households) who were enrolled in PIDI, other children who lived in the same communities but who were not enrolled in PIDI, and others in communities in which PIDI was not available, both for 1995/6 and 1997/8. Behrman, Cheng and Todd (2004) compare children in the program for short (less than two months) and longer durations in the absence of satisfactory baseline and nonrandom treatment (partly due to household choices and partly due to PIDI center choices). They conclude that the program had positive effects on child growth and larger, more significant effects on children's psychosocial development. Projecting to adulthood, they estimate that these effects mean gains in lifetime earnings that suggest fairly high earnings-benefits to program-cost ratios of 1.7 to 3.7.

2. THE PHILIPPINES' EARLY CHILD CARE AND DEVELOPMENT PROGRAM

This paper examines the impact of an integrated program for early childhood development in the Philippines on different measures of child development. In 1999, the Philippine Government launched a five-year Early Child Development (ECD) Project in three southern regions encompassing thirteen provinces and about 2.2 million households —Region 6 (Western Visayas), Region 7 (Central Visayas), and Region 12 (Central Mindanao).[9] The project was viewed as a means to help to attain the country's human development goals and to reduce poverty; an instrument to meet the government's commitment to the international Convention on the Rights of Children of which the Philippines is a signatory; and a pilot effort for testing ECD structures and delivery systems. A few years later, in 2002, the project became part of a broader governmental program that was formally adopted through the Early Child Care and Development (ECCD) Act (Republic Act 8980). The legislation established governance structures and delivery systems that to affect children ages 0-6 years. Specifically, it created the Council for the Welfare of Children (CWC) as the highest policy-making body in the government for children's concerns. The law gave the CWC the mandate to formulate and evaluate policies, and to coordinate and monitor the implementation and enforcement of all laws and programs for children.[10]

Program goals

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[9] The project areas are divided into focus-targeted areas and self-targeted areas. The focus-targeted municipalities were expected to take advantage of the project by the year 2003 through a phased-in schedule of inscription into the project. The self-targeted municipalities were invited to participate at any time during the project's duration with the proviso that they meet DSWD-specified conditions about ECD services.

[10] The program is an interdepartmental partnership—indeed, according to the ECCD Act, a joint responsibility—of the Department of Education (DepEd), Department of Health (DOH), Department of Social Welfare and Development (DSWD), Department of Interior and Local Government (DILG), Department of Labor and Employment (DOLE), Department of Justice (DOJ), Department of Agriculture (DOA), the National Economic Development Authority (NEDA), and the National Nutrition Council, reflecting the program's multi-sectoral package of child and family-focused interventions. Each of these national agencies has been assigned functions, and representatives are members of a national ECCD Coordinating Council, which is also the function of the CWC. The Secretaries of DepEd, DOH, DSSD, and DILG serve as co-chairpersons of this Council.

The ECCD program's overarching goal is to improve the survival and developmental potential of children, particularly those who are most vulnerable and disadvantaged. It aims to achieve this by minimizing the health risks to very young children; by contributing to the knowledge of parents and the community about child development and encouraging their active involvement; by advocating for child-friendly policy and legislation; by improving the ability and attitude of child-related service providers; and by mobilizing resources and establishing viable financing mechanisms for ECCD projects. The program adopted specific quantitative goals for the ECD Project:[11]

- Reduce by 30% the under-five mortality rate from the baseline value which was estimated in 2000 at 53 per thousand in the program regions;
- Reduce by 40% the proportion of underweight children under six from the baseline value of 34% by one estimate or 28% by another;
- Increase to 90% the proportion of children aged 12-18 months fully immunized from the baseline value of about 80%;
- Establish a functioning Protein Energy Malnutrition program in 50% of municipalities or cities by 2003; in 2000, all the municipalities in the program areas already had weighing programs and 39% had feeding programs; 84% and 13% of children were estimated to be participating in weighing and feeding programs, respectively, at that time;
- Increase to 75% of children aged 3 to 5 attending daycare centers;
- Increase to 90% the primary school completion rate for children who enter Grade 1;
- Improve the combined index of child development (motor, language, and cognitive skills) among children under six.

Program instruments, innovations, and implementation

These are ambitious goals. To achieve them, the program spans a "full range of health, nutrition, early education and social services programs that provide for the basic holistic needs of young children" (ECCD Act). This includes various instruments, including a national child surveillance and referral system; investments in essential, child-focused services for parents, caregivers and service providers; expanded community participation and local ownership to ensure sustainability; and establishment of multi-departmental ECCD Coordinating Councils at all levels of government to monitor implementation.

The ECD program assignment to municipalities or LGUs was a process that had several steps. Municipalities that were deemed "high risk or needy" were identified on the basis of several indicators such as infant mortality rates, maternal mortality rates, low birth weight, child malnutrition, and schooling attainment among children and women. Municipality mayors and other local health officials (planning and development officers, health officers, barangay captains, NGO representatives) were then targeted with an ECD

[11] ECD objectives as specified in The National ECD Project Infokit produced by the Department of Education, Department of Health and Department of Social Welfare and Development (1998).

program advocacy campaign to inform them about the program and persuade them to enlist as project partners. The cooperation of and agreement to participate in the program by the mayor and barangay captains were key prerequisites for program initiation; these local officials also played important roles in deciding on the menu of ECD services that were implemented in each LGU. Accordingly, in our matching estimates we incorporate characteristics of barangay and LGU leaders at baseline.

Within the country's devolved governmental system, the implementation of this program is in the hands not only of the central government but also of local governmental units (LGUs)—municipalities and cities within the program regions. While policy-making is the primary task of the national Council, the ECCD Act places the principal responsibilities of providing and financing ECCD programs on LGUs.[12] LGUs have been assigned responsibility for providing basic ECCD services, supporting the organization of parent cooperatives to initiate ECCD programs, financing the salaries of ECCD service providers, and providing counterpart funds for the development of service providers and support of local ECCD Coordinating Councils. Cognizant of the broad public support for child-related programs, many mayors of these LGUs are active supporters of the ECCD programs.

The ECD project launched in 1999 was a pilot effort to assist LGUs in implementing a diverse investment program of essential local services aimed at young children, their parents, and service providers (Table 1). In many cases, these services were not new and the project was meant to upgrade or improve existing ECD-related services. The innovation was to adopt an integrated or multi-sectoral approach to delivering the services and to use a combination of center-based and home-based programs. Center-based programs include day-care services established under an earlier legislation (Republic Act 6972), preschools, community or church-based early childhood education programs initiated by NGOs, workplace-related child care and education programs, and health centers and stations. Home-based programs include family day-care programs, parent education, and home visiting programs. In addition, the project was designed to enhance the capacities of LGUs to plan, manage, and evaluate the ECD programs in their communities, and to make available a financing facility that would support their policies. This support for the implementation of the investment packages consisted of improvements in communication, planning, targeting, the build-up of a dedicated management information system, and training of personnel. Appendix A provides more detail on the components of the program.

[Table 1 here]

[12] With respect to funding, the national agencies are expected to provide counterpart resources for the establishment and expansion of ECCD programs in poor and disadvantaged communities (that is, the fourth, fifth, and sixth class municipalities, including the urban poor). These funds are supposed to be available through the Municipal Development Fund. The ECCD Act explicitly allows resource mobilization from intergovernmental donors and financial institutions for the support of poor areas. In fact, the 1999 ECD project, the first activity of the ECCD program, has been assisted by the Asian Development Bank and the World Bank. In addition, its monitoring and evaluation component has been implemented by a collaboration of local researchers and international experts, including the co-authors of this paper, with additional external funding as noted on the title page of this paper.

3. LEARNING ABOUT THE ECD PROGRAM'S IMPACT

Evaluation and survey design

Early in the implementation of the 1999 ECD Project, a joint team of local and international researchers including some of the co-authors of this paper developed a rich set of indicators of program effectiveness and survey instruments to measure various dimensions of child development. A Baseline Indicator Survey was conducted in 2001 in the project's three participating regions and also in a selected non-program region that has served as a comparison population. An Endline Indicator Survey is planned for 2005, upon the completion of the initial phase of the ECD project. In addition to these indicator surveys, the project launched an *evaluation study* –on which this paper is a report -- that is examining the project's impacts on the availability and quality of service delivery in the program areas, parental child-rearing behaviors, and ultimately, various dimensions of ECD.

The overall evaluation design includes a series of household and child surveys, beginning with a baseline survey that used both an indicator monitoring instrument as well as a richer evaluation instrument. Thus far, three surveys of the same sample of households, approximately 5,000, from two of the program regions, Western Visayas (Region 6) and Central Visayas (Region 7), and one non-program region (Region 8 which is Eastern Visayas) have been completed.[13] The evaluation design also includes longitudinal data collected by LGU and barangay officials and ECD service providers. All of the surveys were organized and implemented by the Office of Population Studies (OPS) at the University of San Carlos in Cebu City, in collaboration with Behrman and King (as well as others) on sample and questionnaire design.

The panel surveys allow us to compare changes in detailed health, nutrition, and anthropometric measures of children over time. As part of the study, an ECD Index that measures children's psycho-social and cognitive development was developed by child psychologists at the University of Philippines, Diliman (described below). The data were collected at the municipal, barangay, household, and individual levels. The barangays in each province were stratified into (1) pilot barangays that were supposed to have participated in pilot phase launched in 1998,[14] (2) program or target barangays in Phase 1 of the project, and (3) non-program barangays or non-targeted barangays in the (pilot and Phase 1) program LGUs and barangays in other LGUs in the region. This classification was based on a list of program barangays provided by the Project Management Office (PMO) and verified with the DSWD field offices in the respective areas. In each region, five pilot and five non-program barangays were randomly chosen, while the remaining barangays were drawn at random from the program barangays. In each sample barangay, an average of 24 eligible households (i.e. households with 0-6 year-old children or

[13] The baseline survey was conducted in April-August 2001; the first follow-up survey was fielded in September-November 2002, and the second follow-up in September –November 2003. One more follow-up survey of the evaluation sample is planned to be conducted in September –November 2005.

[14] Although the pilot barangays were supposed to have received initial ECD project inputs prior to the data collection phase of this study, these project inputs were delayed.

households with pregnant women) in Regions 6 and 7 and 14 households in Region 8 were selected.[15] The overall response rate for the survey was high at 96 percent. The resulting total number of children aged 0-4 years in the respondent households in the baseline survey is 7,925.[16]

Of the original cohort of 7,925 children age 0-4, 85 percent (or 6,774 children) were successfully followed up *in the same barangays* in both Rounds 2 and 3 (OPS, 2005). Of the remaining 1,151 children, we successfully collected child and household level data for a total of 414 because we tracked all respondents in households that out-migrated from sample barangays to another area within the same municipality. The remaining 737 children were lost to follow up, and the overall attrition rate by Round 3 is thus 9.3 percent (or 737/7925). This attrition rate is comparable to other longitudinal surveys in developing countries (e.g., Alderman, *et al.* 2001; Thomas, Frankenberg and Smith 2001; Thomas, *et al.* 2003). The children who left their Round 1 barangays but are still in the sample are not included in this analysis because generally they experienced changes in treatment status when they moved. Appendix Table B.1 gives estimates indicating whether the odds of not remaining in the same sample barangays for all three rounds of the survey are correlated with baseline ECD indicators with controls for family background and provinces. These estimates generally indicate no systematic relation between important ECD outcomes and subsequent attrition, a result that is similar if each ECD indicator is considered one at a time (not shown). Table 2 shows the sample sizes for children in program and non-program areas that remained in the same sample barangay for all three rounds and were not missing data on age. This group totals 6,693 children.

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[15] In the baseline cross-sectional survey children aged 0-6 were included. The subset aged 0-4 constituted Round 1 of the longitudinal evaluation sample used in this study. Children 5-6 at that time were not included in the evaluation sample because they were too old to be exposed to the program. The number of households screened in each barangay ranged from 20 to 70 to obtain the desired number of eligible households. The household lists from the 2000 Philippine Census originally were to be used as the sampling frame for the survey. But the Census lists were not available and there were no funds to conduct a complete household listing of sample barangays. Therefore households were chosen using the following systematic sampling scheme. The latest information on the total number of households in a barangay was first obtained from the barangay captain. This number was then divided by the number of households to be screened in that barangay to get the sampling interval. For example, if the total number of households was 320 and the number to be screened for eligibility was 20, then the sampling interval for that barangay was 16. To start the survey, the barangay was first divided into sections (sitios or puroks). The section from where the household screening was to start was then chosen at random. One household out of the first 16 in that section was randomly selected. Then every 16th household thereafter was interviewed.

[16] The following screening procedures were implemented for each of the visited households: (a) A responsible adult member of the household (preferably the household head) was asked if there were children or pregnant women in the household. If there were none, the interviewer went to the next household; (b) if the household had children, the age of the youngest child was first ascertained to ensure including children who were 0-6 years of age, and if there were no children under seven or if there were no pregnant women, the next household was visited; (c) the resident status of eligible children and pregnant women were then verified. Residents were defined as those adults who had stayed for at least six months in the barangay and children who were born to resident parents. If there were no permanent eligible child or pregnant women residents, the interviewer proceeded to the next household; and (d) if the household had permanent residents who were pregnant or who were under seven years old, it was included in the study.

[Table 2 about here]

Basic indicators of child development used in this study

1. Hemoglobin and percentage anemic: The study determined the hemoglobin levels from blood samples taken from children six months of age or older.[17] A hemoglobin level below the cut-off of 11.0 grams per 100 milliliters for children age 6 to 59 months of age is considered to be indicative of anemia (World Health Organization 2001). Anemia is hypothesized to have deleterious consequences for children's cognitive and psychomotor functioning and their ability to resist and successfully recover from infections (e.g. Grantham-McGregor and Ani 2001, Oppenheimer 2001).

2. Anthropometric indicators of nutrition and health status: Malnutrition in early childhood has been found to have negative consequences on physical and mental development that reduces schooling attainment and post-schooling cognitive skills in poor populations (see studies reviewed in Section 2). The project collected anthropometric information in the form of weight and height for all children.[18] These measures were used to calculate Z scores for height-for-age and weight-for-height (i.e., the number of standard deviations below or above the widely-used NCHS standard). Z scores that are more than two standard deviations below the reference population mean for height-for-age and weight-for-height, respectively, are considered to be indicative of stunting and wasting.

3. Cognitive, social and motor development: The project collected information on a Revised ECD Checklist (REC) developed by a team of experts at the Department of Psychology of the University of the Philippines, Diliman, lead by Drs. Lourdes Ledesma and Elizabeth Ventura. The REC was designed to measure child development in seven domains: gross and fine motor skills, receptive and expressive language, socio-emotional skills, cognitive skills, and self-help skills. Each domain contains between nine and 22 items that are developmentally sequenced to increase in the degree of difficulty of tasks. The REC was applied to all children except those with serious health problems (e.g., poorly controlled seizures), debilitating anomalies (e.g., meningocoeles and cerebral palsy) or those with special needs (e.g. autism). Within a domain, each item takes a value of one for presence of a skill and zero if not present. The sums of the raw scores are

[17] Children less than age six months are generally not included because among full term infants the risk of iron deficiency in this age range is relatively low due to adequate iron provisions from the perinatal period (World Health Organization 2001). Hemoglobin levels were determined by diluting blood samples with a cyanmethemglobin reagent in a spectrophotometer and using the proportional relationship of the absorbance of the reagent with the concentration of hemoglobin to determine the latter quantity. This method is one of two generally recommended as best for assessing hemoglobin levels in surveys (World Health Organization, 2001).

[18] Weight was measured using Detecto scales (a standard scale with a platform and sliding balance weights). For children over two years old, a microtoise (an L-shaped device with a pull-out metal measuring tape) was used to measure standing height. For children under two years old, recumbent length was measured using an infantometer (a flat device with a base, head, and movable foot board as well as a tape measure imbedded on the base board). Three measurement for height and weight respectively were taken and are highly correlated with one another (r =.995+ for both weight and height).

scaled within a series of age intervals to reflect a distribution with a mean of 10 and a standard deviation of three. The scores are normed, controlling for age and sex, by comparing them with the scores for a sample of 10,915 Filipino children age 0 to 6 years old drawn from regions 6, 7, 8 along with Regions 3 and 12 (Central Luzon and Central Mindanao).

Table 3 shows means for the ECD indicators in Rounds 1 and 3 by program or non-program status. About 45 percent of the children had readings below 11 grams per 100 milliliters in Round 1, with the mean level of hemoglobin for children in this round of 10.9. The mean Z scores in Table 4 indicate significant deficits in Round 1 below the reference population mean, that are on average, over one and a half standard deviations for height-for-age and about three-fifths of a standard deviation for weight-for-height. And the growth deficits in this sample are not restricted only to those who fall below these conventional cut-offs. About 38 percent and 5 percent of the children in the sample were stunted and wasted, respectively, in Round 1. The mean normed score for cognitive, social and motor development in Round 1 was around 98 (with a range of 37 to 150). Between 40 to nearly 60 percent of children were below the mean for the cognitive, social, and motor development score distribution across both survey rounds. About 28 percent of children had intestinal worms in Round 1. Children in program areas, on average, were significantly better with respect three of the four anthropometric measures and significantly less likely to have worms compared to those in non-program areas in Round 1.

[Table 3 about here]

Evaluation methodology

We want to estimate the impact of the program (P) on outcomes (Y) such as the quantitative goals of the ECD project. In general, Y is determined not only by the ECD program, if at all, but also by observed characteristics of the child and the child's family and community (X); by a host of factors, also pertaining to the child, the family and the community, that are unobserved (Z); and by a stochastic error term (e). In each period t, the household makes decisions that determine Y given the end-of-the previous period value of all capital stocks (including those for child human capital accumulation) and current and expected future prices, resources and local service options, all of which are included in X, and Z. The capital stocks are assumed to incorporate all the information on past prices, resources, and stochastic shocks. A linear approximation to this relation is:

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

where each variable is a vector and coefficients are matrices.[19]

(a) *Establishing a counterfactual for what would have happened if those who were treated had not been treated*

To obtain a consistent estimate of the parameter *a* in relation (1), we would like to compare what happened to a given child with the ECD program option in comparison

[19] 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.

with the *identical* child (in the *identical* family and the *identical* community) without the ECD program option. Such a comparison, however, is not possible because it is not possible to observe the same child at the same time both with and without the program option. A good experiment permits such a comparison, nevertheless, by randomly assigning children to treatment versus non-treatment so that the distribution of children with the program option is the same as the distribution of the children without the program option. In the absence of a good experiment, a good estimate of $\underline{a}$ 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 non-program areas.

Table 4, for example, compares select characteristics of municipalities, barangays, and households for those children in the ECD program regions compared to those not residing in ECD program regions. There are a number of significant differences. Municipality leaders in program areas are less likely to have more than a college education or belong to a civic group than those in non-program areas, though they are more likely to have been born in the sample municipality. Generally, municipalities with the ECD program have a lower available number of health personnel (per 1000 population) than non-program areas. Barangay leaders in program areas are more likely to be born in the sample barangay and have more schooling, though they are less likely to be involved in civic groups. The available number of health centers, day care centers and public elementary schools are lower, on the average, in program areas compared to non-program areas. But program barangays are more likely to have markets, piped water connections and paved roads. Children in program areas live in households that are better-off with respect to household income and several other household amenities such as the availability of electricity, piped water to the home, the number of rooms in the household, proximity to roads, and parents' schooling.

[Table 4 about here]

Table 4, thus, indicates that the pre-program samples of children that live in program and non-program areas respectively are not balanced with respect to many covariates that may be important determinants of ECD or participation in the ECD program. Our preferred estimates for establishing as well as possible, in the absence of a good experiment, a counterfactual group that is similar to the samples from the ECD program regions are difference-in-difference matching methods. We discuss the two components of this approach in turn.

Difference-in-difference methods control for all unobserved fixed 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 directly ECD and the placement of ECD-related programs[20]) that exhibit secular changes that are

[20] Program placement and program characteristics can be determined simultaneously such that the effective error in relation (1) (i.e., $cZ_t + e_t$) includes components that determine the presence of a program in the community, P, as well as determine Y. For example, if the Philippine government favored poorer areas in

common across program and non-program areas. Because we have baseline data as well as data subsequent to the program for both program (superscript "P") and non-program (superscript "NP") areas, equation (2) can be estimated:

$$(2)\ \Delta Y^{P} - \Delta Y^{NP} = a(\Delta P^{P} - \Delta P^{NP}) + b(\Delta X^{P} - \Delta X^{NP}) + c(\Delta Z^{P} - \Delta Z^{NP}) + (\Delta e^{P} - \Delta e^{NP}).$$

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 (2).

Matching utilizes information on the observed baseline characteristics X of children, their families and their communities to match treatment and control children on the elements of X. A central question of interest is: *What is the effect of the offer of ECD treatment for children who live in areas that received the ECD program inputs?* In our first set of matching estimates, we estimate the impact of offer of treatment (or the intent-to-treat) parameter for the subsample of children in program areas who have a match in the non-program areas. The non-program areas include: 1) children living in barangays in regions 6 and 7 that did not receive the ECD program by Round 3 and 2) all children who reside in region 8. As can be seen from Table 2, very few children in the sample residing in regions 6 and 7 were not living in ECD program barangays by Round 3. Thus, our measure of treatment is essentially (though not identical) to whether a child resided in regions 6 or 7 compared to 8. The variables used in the matching procedure are listed in Appendix Table B.2.

Our second set of matching estimates stem from the following question: *What is the effect of the ECD program for the subsample of children who received the ECD treatment?* The impact of "treatment-on-the-treated" is difficult to conceptualize and implement for the ECD program because it has so many components that span new services such as day care and child minding, upgrading existing services such as immunizations or growth monitoring, and providing home visits. Ideally, we would estimate the impact of each ECD treatment. However, for many of the new components of the program such as daycare, utilization rates are far too low to allow us to use them in the analysis. Several other program components such as receiving home visits from barangay health workers, immunization, or being weighed at the barangay health center are difficult to use because so few children did not receive these services.

For the purposes of obtaining preliminary estimates, we have taken as treatment whether the child had contact with the barangay health station, for any reason, in the year prior to the survey. We restrict these estimates to children living in program regions 6 and 7 only. We take the treatment variable as occurring in the survey round subsequent to the round after which the program began within a barangay. For example, if the program began after Round 1, we take the Round 2 value for whether the child went to the health center. Because the treatment indicator refers to the year before the survey, it is conceivable that its values could have occurred prior to the start of the program. Because we do not know the precise timing of when children visited the health center, we cannot

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its selection of the program areas as it stated it would, such areas are likely to be poorer in a number of unobserved dimensions that affect child development.

elucidate this issue further. But we do note that using Round 3 values of the treatment variable did not change the results appreciably. Table 5 shows the distribution of who got the treatment, as defined in this paragraph, across different classes of exposure to the program (see below for more detail). The variables used in the matching procedures for "treatment-on-the-treated" impacts are listed in the second column of Appendix Table B.2.

[Table 5 about here]

(b) *Varying implementation lags.* Discussions with the ECD project management office and field administrative data have indicated that there is substantial variance in the timing of the implementation of the project across municipalities and barangays, where implementation refers to procurement and receipt of material inputs and provider training related to the program. This implies differences in the duration of the program across program areas, and thus differences in the amount of time that the interventions could have had an impact. If program effects are estimated as if they begin before actual effectiveness at the barangay level, then it is probable that they will be underestimated. Many evaluations do not take into account this variation in the duration of program implementation, often because the program start is supposedly well-defined (though official starting dates often do not reflect start-up delays on the ground) but also often because such data on timing are not available.[21]

With the help of the central project implementation office, we are able to use administrative data to add another measure of the availability of the program. Appendix Figure B.1 shows the distribution of the length of exposure to the program. Table 6 shows the distribution of children by various categories of exposure to the ECD program, in months, as measured at Round 3. The mean length of exposure is about 14 months in both region 6 and 7 (with standard deviations of 4.5 and 7.5 respectively). We restrict the estimates to children who lived in barangays that had at least 4 months of exposure to the program at Round 3 because children with less than 4 months of exposure are unlikely to have had enough exposure to the program to have any measurable impact, particularly given initial start-up problems in modifying effectively existing programs or in introducing new ones. This involves losing 6 percent of children (N = 254). Only two barangays received the ECD program inputs before Round 1; we exclude these two barangays (N = 33 children) in which the program began about a year and a half before Round 1 because the matching variables (which are measured at baseline) are not exogenous to the program initiation in these cases.

[Table 6 about here]

[21] An exception that does take duration of exposure to the program (based on dates of enrollment of individual children into the program) into account is the analysis of the Bolivian PIDI pre-school program in Behrman, Cheng and Todd (2004) that is summarized above.

Because participation in the project that we are evaluating was determined at the beginning of the program (that is, the municipalities and barangays that eventually participated were known at the start), we assume that duration in the program is wholly due to administrative lags that have to do with central procurement rules and corresponding actions rather than due to preferences by the program areas. This assumption is justified by information from the central project implementation office that controls procurement and the release of funds. We use exposure rather than the simple difference between survey rounds or scheduled "batches" of program implementation in the analysis.

We implement the matching strategy using the nnmatch.ado routine found in STATA 8 (see Abadie, *et al.* 2004). This program calculates the sample average treatment effect (or the difference-in-difference estimator in our case) for a set of treatment and control observations obtained through nearest neighbor matching. We condition our estimates on the joint distribution of children's age (at Round 3) and a discrete measure of their duration of exposure to the program: 4-12 months, 13-18 months, and 19+ months. We also specify robust standard errors. An advantage of this strategy is that it allows us to uncover potentially valuable information about how children of different age groups respond to varying program exposure. Appendix Table B.3 shows the joint distribution of children's age (by years) and the three exposure categories and indicates that in general, there are sufficient numbers of children in age/duration combinations to estimate impacts within each class.

4. Impact Evaluation Results

In figure 1, we compare how program and non-program children fare with respect to mean levels of ECD (at round 3) across the age distribution. Children in program areas performed noticeably worse, on average, with respect to hemoglobin compared to those in non-program areas across the age distribution. There is no discernible pattern in terms of height, though for weight-for-height, the percentile ranks for children above age 3 in the ECD program areas are higher than their counterparts in the non-program areas. Children in program areas have higher cognitive, social, and motor development, particularly at younger ages, and are markedly less likely to have worms than children who live in areas without the ECD program.

[Figure 1 about here]

We next present alternative estimates of the program impacts, as indicated at the end of the previous section: (1) The difference-in-difference estimates of "intent-to-treat" with and without matching, conditioned on age at Round 3 and exposure classes and (2) the estimates of the impact of "treatment-on-the-treated" with and without matching, where both are again conditioned on age at Round 3 and exposure classes.[22] Table 7 shows the difference-in-difference estimates for the intent-to-treat impacts of the program first without any matching.

[22] Since the age at Round 3 is given, the exposure that is reported is the exposure for the indicated number of months before the Round 3 age.

[Table 7 about here]

These results indicate negative program impacts for hemoglobin, anemia and height-for-age Z scores. The difference-in-difference estimates for hemoglobin and anemia are generally statistically significant, and indicate that hemoglobin levels in program areas have generally fallen over time relative to non-program areas, while the proportion of children that are classified as anemic has increased. These estimates are congruent with Figure 1, which shows lower average hemoglobin levels in program areas across the entire age distribution. There is evidence of improvement in weight-for-height Z scores among older children (above age 4) in program relative to non-program areas across all program exposure classes. The estimates indicate a substantial improvement in cognitive, social and motor development scores in program areas relative to non-program areas, particularly for children less than age 4. There is also evidence of a decline in the proportion of children with worms in program compared to non-program areas that is statistically significant among children less than age 4.

Table 8 shows the estimated program impacts as calculated from nearest neighbor matching on the variables described in Appendix Table B.2. As in the crude difference-in-difference estimates that do not use matched samples, the results indicate a relative decline in hemoglobin (and a rise in the proportion with anemia) in the program areas compared to the non-program areas. Generally, the estimates for these two indicators are smaller in magnitude and less likely to be statistically significant compared to Table 7. These estimates also do not indicate any positive impacts on the height-for-age Z score or the proportion of children that are stunted. The results for these two indicators are negative and positive, respectively, indicating a relative decline in the Z scores and a relative increase in the proportion classified as stunted in program areas over time. However, these estimates are generally not statistically significant.

[Table 8 about here]

The results are more encouraging for several other ECD indicators. There are significant and positive program impacts on the weight-for-height Z score among older children (i.e. those age 5 and above). Among children who have been exposed to the program for 19+ months, the significant positive impacts found without matching are not evident with matching, which may be due to imprecision in these estimates. The cognitive, social, and motor development scores show a significant improvement in program areas for children below age 4. For 2 year-olds, the matched estimates are larger than the raw program impacts shown in Table 7, while for 3 year-olds the estimates are smaller in magnitude. There is a significant decline in the proportion of children who have intestinal worms in program relative to non-program areas that is slightly smaller than the raw difference-in-differences shown in Table 7 for durations less than 19 months, but is larger for durations 19 months or longer. As in Table 7, the improvements are concentrated among 2 and 3 year-old children. For indicators that display a positive impact in Table 8, there is some evidence that the trends increase with duration class. For weight-for-height Z scores, the impacts are slightly larger among children with 13 to 18 months of exposure compared to 4 to 12 months of exposure to the ECD program. For

worms, among 3 year-olds, the impacts increase in magnitude with longer exposure. A similar pattern is found among 2 year-olds for cognitive, social, and motor development, though for 3 year-olds, the estimates for 19+ months of exposures are lower than for 13-18 months of exposure.

Table 9 shows the difference-in-difference for the ECD outcomes for the subsample who received the ECD treatment compared to those who did not receive the treatment. For all indicators, there is no evidence that there is a statistically significant impact, and the sign and magnitude of the estimates tend to vary erratically across age within duration class. The estimates with nearest neighbor matching are not appreciably different. Though a few cases indicate positive impacts (e.g. for cognitive, social, and motor development among older children in duration class 19+ months, or proportion with worms among 4 year-olds), they occur infrequently and not appreciably higher than what would be expected by chance. We will further explore better ways to operationalize the ECD treatment variable, as this is likely to have a substantial impact on the treatment-on-the-treated results that we obtain.

[Table 9 and 10 about here]

5. SUMMING UP

The ECD Program is a major initiative by the Philippine government to coordinate various investment programs that are meant to lessen risks to children from poor and disadvantaged populations and to promote the development of children. It harnesses public interest in child-related policies and programs and musters the political commitment of local governments and national agencies to these policies and programs. Local officials, service providers, communities, NGOs, and international donors have been generally enthusiastic about ECD programs and have been willing to provide support to these programs. The package of services delivered by the ECD program is generally not new, but the program has changed the country's approach to ECD by linking sectoral policies that affect young children and by integrating multi-sectoral interventions in center-based and home-based programs. The strategy laid out by the ECCD Act is meant to be consistent with a decentralized system of government. It accords the greatest responsibility for policy-making to a council of national agencies and for the implementation and financing of interventions to local government. At the same time, the legislation explicitly recognizes the importance of the central government in protecting the interests of the poor and disadvantaged populations by charging the central government with mobilizing counterpart funds to ensure programs for these populations. This it has done through the donor-financed ECD Project that was launched in 1999.

The evaluation results that we present in this paper are unavoidably subject to qualifications. The Philippine ECD project is not yet fully implemented and the evaluation itself is still ongoing. Round 4 of the longitudinal evaluation survey is scheduled to begin in September 2005. In addition, while the project was launched in a few of the municipalities more than a year and a half before the last available data

(Round 3 in September 2003-Janaury 2004), in most project municipalities, full project implementation has been much more recent. Thus, for some of the program municipalities, the project may not have had time to take root even by survey Round 3, and so the results presented here are likely to be partial. Our efforts to estimate treatment-on-the-treated impacts, moreover, are highly qualified by the problems with a program that in many respects provides additional resources to pre-existing programs. With the available information in the data, it is difficult to define the treated children– which may underlie the general lack of significant results that we have obtained in our effort to estimate these treatment-on-the-treated impacts. Our estimates of the intent-to-treat impacts, further, are insignificant in a number of indicator-age-duration cells, and significantly negative in some others (e.g., hemoglobin counts and proportion anemic, anthropometric indicators for the younger ages). These results may suggest the need to rethink and modify some dimensions of the program.

Nonetheless, the findings suggest that the program is benefiting children in the program areas in some important respects. They suggest significant positive intent-to-treat impacts on selected child outcomes for some age ranges. The incorporation of information about the variation of program exposure and child age is valuable because the ECD program impacts are concentrated among particular age ranges of children. Our preferred estimates are difference-in-difference matching estimates in which children in program barangay are matched with children in non-program barangay along a rich array of observed municipality, barangay, household and child characteristics. These estimates indicate significant and positive increases in weight-for-height Z scores among children age 5-7 years old at the time of Round 3. We find evidence that cognitive, social, and motor development among children below age 4 has improved significantly in program areas relative to non-program areas. And the program appears to be related to significant declines in the propensity for children to have worms, particularly below age 4. For selected age ranges, we find that the impacts for cognitive, social, and motor development and worms tend to be larger among children who have had longer exposure to the ECD program.

There are several components of the program that are likely to have contributed to these estimated positive impacts for cognitive, social, and motor development, weight-for-height and the prevalence of worms. The program is funding the construction of additional day-care centers, upgrading of existing ones, and an increase in the supplies available to these centers in the program regions. The program is providing Child Development Workers more supplies and equipment for their work. It also supports a range of services that enhance parental involvement in child care and development and that teach parents more efficient ways of childrearing and what the children need for their physical and mental development. The Child Development Worker conducts workshops on these services. More in-depth analysis of our data on these service providers is planned for the future in hopes of identifying the factors that might explain the larger improvement in weight-for-height, the prevalence of worms, and the cognitive, language, and motor development of children in the ECD program regions.

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Table 1. ECD Services: Project Components

Expanded program of Immunization (EPI)
Integrated Maternal and Child Health (IMCI)
Micronutrient Malnutrition Control
Parent Effectiveness Service (PES)
Grade 1 Early Childhood Education (8-Week Curriculum)
ECD Service Providers: Rural Health Midwife, Day Care Worker, Child Development Worker, Day Care Mom

Note: See Appendix A for a description of these programs.

Table 2. Sample Sizes for Program and Non-Program Children

Region/Program or Non-program	**N**
Program Areas	
Region 6	1682
Region 7	2458
Total	4140
Non-program Areas	
Region 6	145
Region 7	49
Total	194
Region 8	2359
Total	6,693

Note: for children interviewed in all three rounds who remained in their Round 1 sample barangay.

Table 3. Means and Standard Deviations in Rounds 1 and 3 for Selected ECD Indicators

	Round 1			Round 3		
Indicator/Region	**Program**	**Non-program**	**Total**	**Program**	**Non-program**	**Total**
1. Hemoglobin (gms/deciliter)	11.0	10.9	10.9	11.5	11.8	11.6
	[1.29]	[1.37]	[1.32]	[1.12]	[1.16]	[1.14]
Percentage anemic	44.2	47.2	45.4	36.1	26.2	32.2
	[49.6]	[49.9]	[49.7]	[48.0]	[44.0]	[46.7]
2. Anthropometrics						
Height-for-Age Z	-1.62	-1.72	-1.66	-1.83	-1.91	-1.86
	[1.13]	[1.16]	[1.14]	[.979]	[1.04]	[1.01]
Weight-for-Height Z	-0.596	-0.625	-0.608	-0.418	-0.541	-0.467
	[1.11]	[1.15]	[1.13]	[0.883]	[0.840]	[0.868]
Percentage stunted	37.0	40.4	38.3	44.0	47.3	45.3
	[48.2]	[49.1]	[48.6]	[49.6]	[50.0]	[49.7]
Percentage wasted	5.6	5.4	5.4	1.7	2.1	1.9
	[23.0]	[22.5]	[22.7]	[13.1]	[14.4]	[13.6]
3. Cognitive, Social and Motor Development	97.6	98.7	98.0	105.2	101.4	103.7
	[15.5]	[17.8]	[16.4]	[13.6]	[15.8]	[14.7]
Percentage below average on cognitive, social, and motor development	44.4	42.8	43.8	56.8	46.5	52.6
	[49.6]	[49.5]	[49.6]	[49.5]	[49.8]	[50.0]
4. Worms	22.1	36.8	27.8	23.3	42.8	31.1
	[41.4]	[48.2]	[44.7]	[42.3]	[49.4]	[46.2]

Standard deviations are in brackets. All means are significantly different between program and non-program areas per survey round with the exception of percentage below age on cognitive, social and motor development and weight-for-height Z scores at Round 1. Children in barangays with <four months exposure to the program are excluded from this table.

Table 4. Characteristics for Program and Non-Program Samples at Baseline, ECD

	Program	Non-program
Municipality		
Municipality in poorest income class	73.4	72.0
Municipality Mayor:		
Has completed college+ level of schooling	24.5	40.0*
Born in sample municipality	86.6	69.2*
Belongs to civic or political group	86.7	95.7*
ECD and Health Services per 1000 population		
Doctor	.028	.036*
Nurse	.068	.071*
Midwife	.251	.25
Barangay health workers	3.03	4.46*
Barangay		
Barangay Captain		
Years of schooling (mean)	11.0	10.5*
Born in sample barangay	72.4	59.1*
Belong to civic or political group	77.3	84.1*
ECD and Health Services per 1000 population		
Health Centers	.475	.75*
Public Hospitals	.033	.012*
Private Hospitals	.031	.012*
Day care Centers	.858	1.53*
Public Elementary Schools	.486	.758*
Other Infrastructure in barangay:		
Market	17.0	3.64*
Piped water connection	42.0	32.3*
Paved Roads	33.2	29.0*
Household		
Piped Water	37.8	34.4*
Flush or water seal toilet	56.1	68.0*
Mean Income (SD)	59560 (71277)	59752 (113626)*
Number of rooms	2.84	2.69*
Electricity available	56.2	45.8*

Minutes to nearest road	6.8	7.8
Own color television	24.1	22.1
Father's Schooling	7.64	7.03*
Mother's Schooling	8.41	8.05*

Note: *mean is significantly different between program and non-program samples at the .05 level.

Table 5. Distribution of Children Defined as "Treated" by Exposure Class at Round 3, ECD Study

Exposure Class	Region 6	Region 7	Total
4 to 12 months	47.5	44.4	45.6
13 to 18 months	53.0	61.0	57.1
19 months or higher	42.3	61.0	53.5
Total	49.1	54.2	52.0
N	1,682	2,206	3,888

Note: excludes children living in barangays with <4 months of exposure to the program (N = 252).

Table 6. Distribution of Children across Program Exposure Classes at Round 3, ECD Study

Exposure Class	Region 6	Region 7	Total
<4 months	0	10.2	6.0
4 to 12 months	33.9	37.0	35.7
13 to 18 months	46.3	32.7	38.2
19 months or higher	19.8	20.1	20.0
Total	100	100	100
Mean months of exposure (SD)	14.4 (4.5)	13.6 (7.5)	14.0 (6.5)
N	1,682	2,458	4,140

Note: for children interviewed in all three rounds who remained in their Round 1 sample barangay.

Table 7. Unadjusted Intent-to-treat Impacts by Age in Years (at Round 3) and Duration Class, ECD (Standard Errors in Parentheses)

Duration of exposure (months)	4 to 12	13 to 18	19+
Hemoglobin			
2	-.413 (.222)~	-.353 (.197)~	-.384 (.289)
3	-.527 (.132)*	-.226 (.126)~	-.618 (.140)*
4	-.487 (.131)*	-.314 (.132)+	-.239 (.148)
5	-.372 (.117)*	-.380 (.121)*	-.360 (.129)*
6+	-.369 (.102)*	-.231 (.102)+	-.380 (.119)*
Proportion Anemic			
2	.113 (.082)	.136 (.073)~	.155 (.105)
3	.150 (.048)*	.086 (.046)~	.188 (.052)*
4	.159 (.049)*	.128 (.047)*	.118 (.053)+
5	.106 (.044)+	.105 (.045)+	.103 (.049)+
6+	.143 (.043)*	.104 (.043)+	.198 (.056)*
Height-for-Age Z Score			
2	-.092 (.141)	.043 (.128)	-.102 (.167)
3	-.174 (.116)	-.184 (.111)~	-.141 (.121)
4	-.038 (.115)	.054 (.116)	-.035 (.124)
5	-.025 (.103)	-.077 (.109)	-.019 (.121)
6+	-.028 (.097)	-.025 (.091)	-.048 (.113)
Proportion Stunted			
2	.049 (.054)	-.005 (.048)	-.0002 (.062)
3	.064 (.053)	-.080 (.051)	.074 (.056)
4	.028 (.054)	-.010 (.052)	.012 (.059)
5	-.024 (.051)	.016 (.052)	.053 (.057)
6+	.02 (.046)	.006 (.046)	-.0009 (.054)
Weight-for-Height Z Score			
2	-.154 (.182)	-.168 (.158)	-.091 (.204)
3	-.10 (.109)	.071 (.100)	.041 (.106)
4	.145 (.097)	.133 (.096)	.146 (.103)
5	.215 (.082)*	.248 (.081)*	.209 (.089)+
6+	.193 (.086)+	.141 (.082)~	.244 (.097)+
Proportion Wasted			
2	.034 (.024)	.049 (.023)+	.026 (.027)
3	-.043 (.026)	.0009 (.023)	-.023 (.027)
4	-.019 (.021)	-.031 (.020)	-.056 (.023)+
5	-.013 (.015)	.006 (.013)	-.004 (.016)
6+	-.002 (.012)	-.006 (.013)	.0009 (.016)
Cognitive, Social, Motor Development Score			

Duration of exposure (months)	4 to 12	13 to 18	19+
2	12.8 (2.03)*	17.0 (1.82)*	15.2 (2.24)*
3	7.7 (1.91)*	9.27 (1.81)*	9.85 (1.98)*
4	-1.48 (1.70)	.456 (1.58)	1.74 (1.79)
5	3.53 (1.71)+	2.33 (1.71)	4.71 (1.89)+
6+	.436 (1.65)	-1.12 (1.53)	.938 (1.91)
Proportion with Worms			
2	-.198 (.043)*	-.204 (.039)*	-.130 (.051)+
3	-.082 (.046)~	-.117 (.044)*	-.122 (.049)+
4	.009 (.052)	.0005 (.050)	.031 (.057)
5	-.054 (.048)	.062 (.051)	-.091 (.055)~
6+	-.026 (.044)	-.034 (.043)	-.011 (.051)

Note: The table contains the difference-in-difference for various ECD outcomes defined as: $(Y_{p3}-Y_{p1})-(Y_{np3}-Y_{np1})$, where p refers to program, np to non-program areas, and the subscripts 3 and 1 index survey round. The standard errors are in parentheses.
~p<.10 +p<.05 *p<.01.

Table 8. Intent-to-treat Impacts by Age in Years (at Round 3) and Duration class among Nearest Neighbor Matched Samples, ECD (Standard Errors in Parentheses)

Duration of exposure (months)	4 to 12	13 to 18	19+
Hemoglobin			
2	-.762 (.332)+	-.293 (.320)	-.337 (.538)
3	-.506 (.141)*	-.033 (.134)	-.407 (.169)+
4	-.401 (.135)+	-.223 (.130)~	-.271 (.165)
5	-.293 (.117)+	-.204 (.119)~	-.520 (.134)*
6+	-.314 (.111)*	-.135 (.107)	-.129 (.142)
Proportion Anemic			
2	.312 (.145)+	.071 (.114)	-.031 (.184)
3	.168 (.056)*	.056 (.052)	.121 (.068)~
4	.132 (.063)+	.101 (.052)~	.098 (.074)
5	.058 (.050)	.065 (.051)	.193 (.064)*
6+	.112 (.052)+	.094 (.048)~	.093 (.071)
Height-for-Age Z Score			
2	-.329 (.147)+	-.007 (.121)	-.363 (.190)~
3	-.144 (.069)+	-.140 (.069)+	-.159 (.093)
4	-.027 (.053)	.050 (.058)	-.036 (.075)
5	-.002 (.042)	-.062 (.041)	-.026 (.057)
6+	-.020 (.034)	-.041 (.034)	-.009 (.043)
Proportion Stunted			
2	.082 (.063)	.045 (.035)	-.091(.081)
3	.114 (.041)*	-.031 (.029)	.126 (.056)+
4	.034 (.037)	.016 (.038)	-.013 (.051)
5	-.029 (.033)	-.007 (.036)	-.017 (.045)
6+	.080 (.034)+	.044 (.033)	-.045 (.044)
Weight-for-Height Z Score			
2	-.283 (.167)~	-.387 (.140)*	-.108 (.191)
3	.008 (.083)	.103 (.089)	-.002 (.099)
4	.126 (.071)~	.224 (.063)*	.015 (.087)
5	.203 (.053)*	.243 (.053)*	-.023 (.071)
6+	.225 (.054)*	.236 (.050)*	.083 (.061)
Proportion Wasted			
2	.023 (.024)	.045 (.035)	-.023 (.052)
3	-.074 (.030)+	-.031 (.029)	-.044 (.039)
4	-.013 (.028)	-.036 (.023)	-.093 (.036)+
5	-.015 (.018)	.016 (.013)	.025 (.026)
6+	-.015 (.012)	-.021 (.015)	.003 (.013)
Cognitive, Social, Motor Development Score			
2	14.5 (2.4)*	18.9 (2.55)*	20.2 (3.09)*
3	5.29 (1.76)*	8.87 (1.82)*	7.36 (2.19)*

Duration of exposure (months)	**4 to 12**	**13 to 18**	**19+**
4	-1.52 (1.57)	-.667 (1.65)	2.78 (2.28)
5	1.45 (1.59)	2.82 (1.65)~	6.18 (2.27)*
6+	.891 (1.69)	-.355 (1.65)	4.76 (2.57)~
Proportion with Worms			
2	-.177 (.056)*	-.196 (.055)*	-.148 (.078)~
3	-.088 (.049)~	-.134 (.048)*	-.199 (.062)*
4	.031 (.055)	.018 (.054)	.100 (.074)
5	-.022 (.051)	.082 (.056)	-.056 (.068)
6+	-.018 (.055)	-.056 (.053)	-.061 (.066)

Note: The table contains the difference-in-difference for various ECD outcomes defined as: $(Y_{p3}-Y_{p1})-(Y_{np3}-Y_{np1})$, where p refers to program, np to non-program areas, and the subscripts 3 and 1 index survey round. The standard errors are in parentheses.
~p<.10 +p<.05 *p<.01.

Table 9. Unadjusted Impacts of Treatment-on-the-Treated by Age in Years (at Round 3) and Duration Classes, ECD (Standard Errors in Parentheses)

Duration of exposure (months)	4 to 12	13 to 18	19+
Hemoglobin			
2	.045 (.343)	-.084 (.314)	.698 (.531)
3	-.053 (.207)	.371 (.197)~	-.057 (.257)
4	.036 (.198)	.193 (.211)	-.292 (.272)
5	-.231 (.179)	-.272 (.191)	-.463 (.218)+
6+	-.074 (.145)	-.119 (.144)	-.092 (.194)
Proportion Anemic			
2	.014 (.147)	-.034 (.129)	-.200 (.243)
3	-.024 (.080)	-.096 (.075)	-.079 (.101)
4	-.055 (.084)	.088 (.078)	.120 (.107)
5	.080 (.071)	.168 (.075)+	.108 (.094)
6+	.115 (.066)~	.025 (.065)	.014 (.096)
Height-for-Age Z Score			
2	-.015 (.206)	-.220 (.199)	-.003 (.331)
3	-.004 (.176)	-.045 (.172)	.006 (.213)
4	.138 (.174)	-.130 (.187)	.042 (.233)
5	.036 (.156)	-.100 (.173(	-.035 (.235)
6+	-.020 (.147)	.015 (.122)	-.036 (.212)
Proportion Stunted			
2	-.023 (.084)	.067 (.078)	.093 (.122)
3	.013 (.081)	-.013 (.079)	-.096 (.103)
4	-.020 (.087)	.029 (.082)	-.017 (.112)
5	.046 (.078)	.071 (.083)	.017 (.103)
6+	-.013 (.072)	.012 (.068)	-.029 (.102)
Weight-for-Height Z Score			
2	.035 (.296)	-.367 (.238)	.169 (.402)
3	-.225 (.194)	.012 (.172)	-.251 (.194)
4	.011 (.154)	.051 (.157)	-.172 (.179)
5	-.012 (.138)	.006 (.132)	-.093 (.184)
6+	-.003 (.134)	.086 (.119)	.009 (.171)
Proportion Wasted			
2	-.010 (.041)	-.007 (.043)	.065 (.061)
3	-.021 (.043)	-.029 (.035)	.091 (.054)~
4	.00008 (.034)	.005 (.029)	-.045 (.041)
5	.002 (.027)	-.013 (.019)	.068 (.031)+
6+	-.010 (.017)	.005 (.019)	.011 (.034)
Cognitive, Social, Motor Development Score			
2	.723 (3.36)	-1.19 (2.94)	-2.66 (3.74)

Duration of exposure (months)	4 to 12	13 to 18	19+
3	-.582 (2.60)	-3.02 (2.41)	.108 (2.87)
4	-.073 (2.51)	-.376 (2.14)	1.04 (3.03)
5	2.82 (2.44)	.048 (2.30)	5.15 (2.89)
6+	-.998 (2.52)	3.97 (2.04)~	4.54 (3.39)
Proportion with Worms			
2	-.029 (.059)	-.059 (.055)	.056 (.093)
3	.016 (.061)	-.019 (.060)	-.123 (.078)
4	.036 (.077)	-.069 (.072)	-.036 (.104)
5	.087 (.068)	-.010 (.075)	.065 (.089)
6+	-.015 (.063)	.007 (.060)	-.079 (.087)

Note: The table contains the difference-in-difference for various ECD outcomes defined as: $(Y_{p3}-Y_{p1})-(Y_{np3}-Y_{np1})$, where p refers to program, np to non-program areas, and the subscripts 3 and 1 index survey round. The standard errors are in parentheses.
~p<.10 +p<.05 *p<.01.

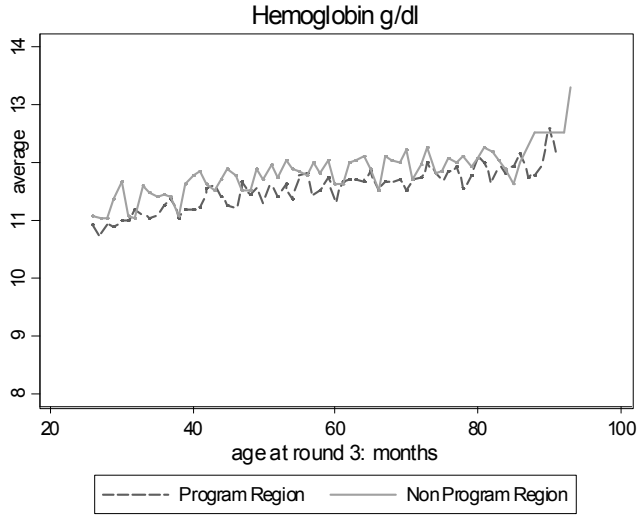
Table 10. Treatment-on-the-Treated Impacts by Age in Years (at Round 3) and Duration Class for Nearest Neighbor Matched Samples, ECD (Standard Errors in Parentheses)

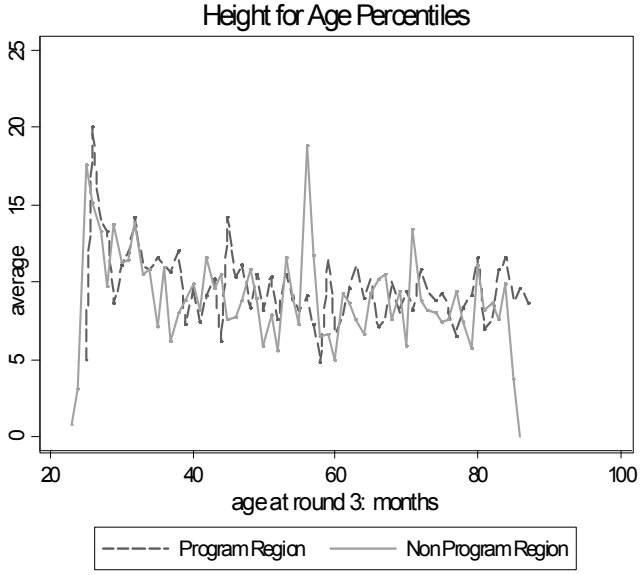
Duration of exposure (months)	4 to 12	13 to 18	19+
Hemoglobin			
2	.319 (.437)	-.086 (.338)	n.a.
3	-.009 (.221)	.351 (.227)	.065 (.346)
4	.052 (.228)	.081 (.208)	-.097 (.270)
5	-.463 (.207)+	-.257 (.188)	-.203 (.273)
6+	-.268 (.135)+	-.340 (.136)+	-.012 (.199)
Proportion Anemic			
2	.078 (.235)	.212 (.179)	n.a.
3	-.004 (.093)	-.016 (.083)	-.157 (.133)
4	-.069 (.101)	.129 (.086)	.091 (.130)
5	.190 (.098)~	.208 (.082)	-.034 (.132)
6+	.236 (.081)	.092 (.069)	-.03 1(.121)
Height-for-Age Z Score			
2	.099 (.153)	-.206 (.195)	.354 (.545)
3	.107 (.101)	.087 (.123)	.127 (.159)
4	.160 (.109)	.127 (.094)	.051 (.131)
5	.054 (.065)	-.052 (.071)	.031 (.102)
6+	-.005 (.049)	.004 (.054)	.042 (.070)
Proportion Stunted			
2	-.007 (.089)	.109 (.095)	.089 (.180)
3	-.067 (.069)	.063 (.082)	-.190 (.112)
4	-.013 (.072)	.063 (.064)	.079 (.097)
5	.010 (.059)	.037 (.053)	-.065 (.095)
6+	.015 (.043)	.054 (.046)	-.076 (.061)
Weight-for-Height Z Score			
2	.031 (.246)	-.112 (.216)	-.074 (.466)
3	-.031 (.141)	-.019 (.200)	-.089 (.158)
4	.052 (.122)	-.028 (.114)	-.227 (.167)
5	-.025 (.091)	-.077 (.102)	-.060 (.141)
6+	.087 (.082)	.052 (.085)	.010 (.088)
Proportion Wasted			
2	-.020 (.045)	.011 (.037)	.119 (.124)
3	-.055 (.044)	-.067 (.044)	.032 (.057)
4	-.041 (.051)	.004 (.036)	-.069 (.053)
5	.032 (.038)	-.012 (.017)	.065 (.045)
6+	-.003 (.020)	.023 (.025)	n.a.
Cognitive, Social, Motor Development Score			
2	.760 (4.16)	-1.53 (3.78)	-6.55 (4.89)
3	-.342 (2.72)	-3.64 (3.09)	2.92 (3.92)

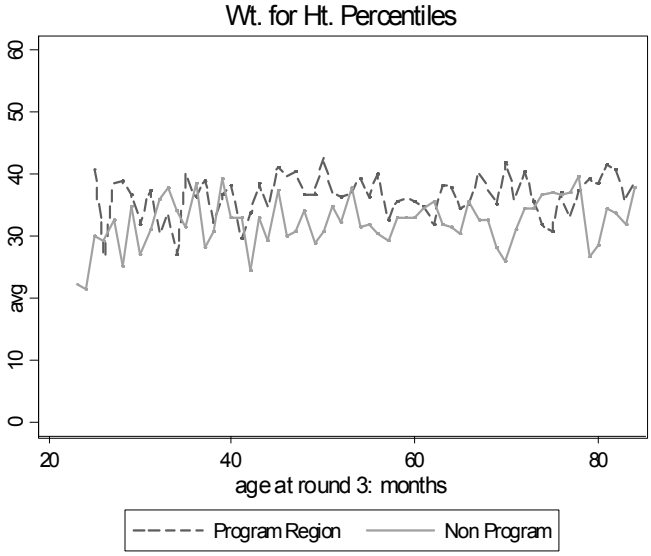
Duration of exposure (months)	4 to 12	13 to 18	19+
4	-2.01 (2.40)	-4.20 (2.57)	-3.89 (4.01)
5	3.36 (2.41)	1.32 (2.25)	6.66 (3.60)~
6+	-.701 (3.02)	6.11 (2.62)+	14.2 (4.53)*
Proportion with Worms			
2	-.013 (.074)	-.101 (.097)	.134 (.146)
3	-.016 (.067)	-.015 (.078)	-.078 (.098)
4	-.035 (.079)	-.144 (.079)	-.352 (.124)*
5	.061 (.078)	.054 (.082)	.042 (.123)
6+	.036 (.071)	.121 (.075)	

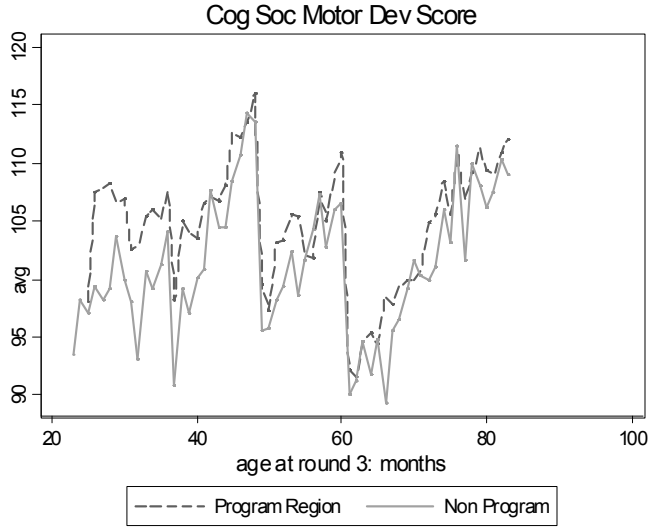
Note: The table contains the difference-in-difference for various ECD outcomes defined as: $(Y_{p3}-Y_{p1})-(Y_{np3}-Y_{np1})$, where p refers to program, np to non-program areas, and the subscripts 3 and 1 index survey round. The standard errors are in parentheses.
~p<.10 +p<.05 *p<.01.
n.a. not enough cases to generate an estimate.

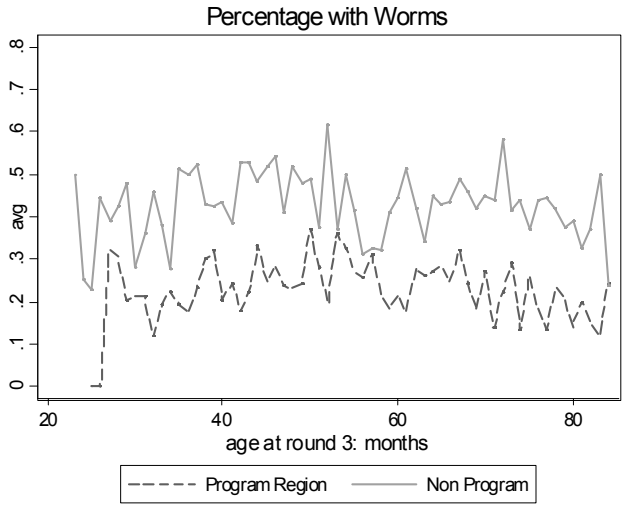
Figure 1. Comparison of Group Mean Outcomes (at Round 3)






Wt. for Ht. Percentiles
0
10
30
40
50
60
avg
20
40
60
80
age at round 3: months
Program Region
Non Program


Cog Soc Motor Dev Score
90
95
105
110
115
120
avg
20
40
60
80
100
age at round 3: months
Program Region
Non Program


Percentage with Worms
0
.1
.2
.3
avg
.5
.6
.7
.8
20
40
60
80
age at round 3: months
Program Region
Non Program

Appendix A. Glossary of Components of ECD Program in the Philippines

Expanded Program on Immunization	Refers to the provision of immunization services to infants and young children to protect them from immunizable diseases (tuberculosis, diptheria, pertussis, tetanus, hepatitis B, measles and polio). Also included in this program is the immunization of pregnant mothers with tetanus toxoid to prevent tetanus neonatorum. In the ECD project, this refers to the provision of additional inputs to the EPI Program in all provinces of the program regions including replacement of cold chain equipment (as necessary), training of cold chain technicians in cold chain management, maintenance and repair, training of primary health care staff in EPI skills and reproduction of EPI information, education communication materials and monitoring charts.
Integrated Management of Childhood Illnesses (IMCI) Program	Refers to a range of services focused on the accurate diagnosis, management and treatment of illnesses among children in outpatient settings. This program seeks the improved management of childhood illnesses (like respiratory infections, pneumonia, diarrhea) with aspects of nutrition, immunization and other factors influencing child health including maternal health. In the ECD project, this refers to the improvement in diagnosis, management and treatment of common childhood diseases and malnutrition with the training for health providers, supply of delivery and diet kits to improve case management conditions affecting the newborn.
Integrated Maternal and Child Health (IMCH) Program	Refers to a range of services that seek to protect the health of mothers and children like endemic diseases, nutritional disorders, risks and illnesses brought about by pregnancy and childbirth. This program caters to mothers, infants and young children (0-4years old). In relation to child health, the IMCH program is concerned with prenatal, natal and postnatal services, under five clinic and promotion of breastfeeding.
Protein Energy Malnutrition (PEM) Program	Refers to services that seek to address the protein energy malnutrition problem with the provision of growth monitoring and infant feeding programs among others.
Growth Monitoring Program	Refers to services that provide monitoring of the growth of children under six years old.
Infant Feeding Program	Refers to services that provide food supplements to children who are diagnosed as malnourished.
Micronutrient Malnutrition Prevention and Control Program	Refers to the provision of services that address protein energy malnutrition (PEM), and micronutrient deficiencies. At the ECD level, this refers to the prevention, management and control of major micronutrient deficiencies (iron, iodine and vitamin A) in preschoolers through mix of direct supplementation, food fortification and deworming of children, provision of weighing scales for infants to identify low birth weight babies requiring iron supplements, deworming tablets and social marketing to promote comprehensive food fortification.

Vitamin A Supplementation Program	Refers to a range of services that seeks to address the vitamin A deficiency of children and mothers. Included in the services is the provision of free vitamin A capsules.
Iron Supplementation Program	Refers to a range of services that seeks to address the iron deficiency in the population particularly of children and mothers. Included in this program is the provision of free iron syrup, tablets/capsules.
Iodine Supplementation Program	Refers to a range of services that seeks to address the iodine deficiency in the population. Included in this program is the provision of free iodized capsules and iodized salt.
Early Child Education Program	Refers to the administration of an 8 week enriched early child experience (ECE) curriculum that helps children bridge the gap between home and school and improve their readiness for formal education. In the ECD project, this refers to the improvement of the child readiness through an eight-week curriculum module in Grade 1 that incorporates innovative and participatory approaches and complementary health and nutrition inputs (iron supplementation and deworming) to first graders. This program includes the review and improvement of the ECE curriculum, support for training of teachers in the new Grade 1 curriculum, the reproduction and distribution of teaching materials, training of trainers and teachers and the distribution of iron supplements and deworming tablets for Grade 1 entrants. Managed by the Department of Education.
Day Care Program	Refers to a range of services that seeks to provide early education to children aged 3-5 years, including the provision of day care centers.
Parent Effectiveness Services Program	Refers to the range of services that enhance parental involvement in child care and development and teach parents more efficient ways of childrearing and what the children need for their physical and mental development. The child development worker conducts workshops on these services. In the ECD project, this refers to the upgrading of the PES program with the provision of the mother and child book (that records the child growth from birth to age six) and distributing the parents' ECD manual. In the context of the LGU, the PES includes the training of the child development worker as the key PES provider and responsible for community based parent education. Managed by the DSWD in coordination with the Department of Education (incorporated into the Teacher Child Parent Program) and the DOH (incorporated into the health education programs).
Day Care Mom Program	Refers to the range of services and support provided by day care moms to provide child-minding services to children under three years old.

Appendix B. Additional Tables and Figures

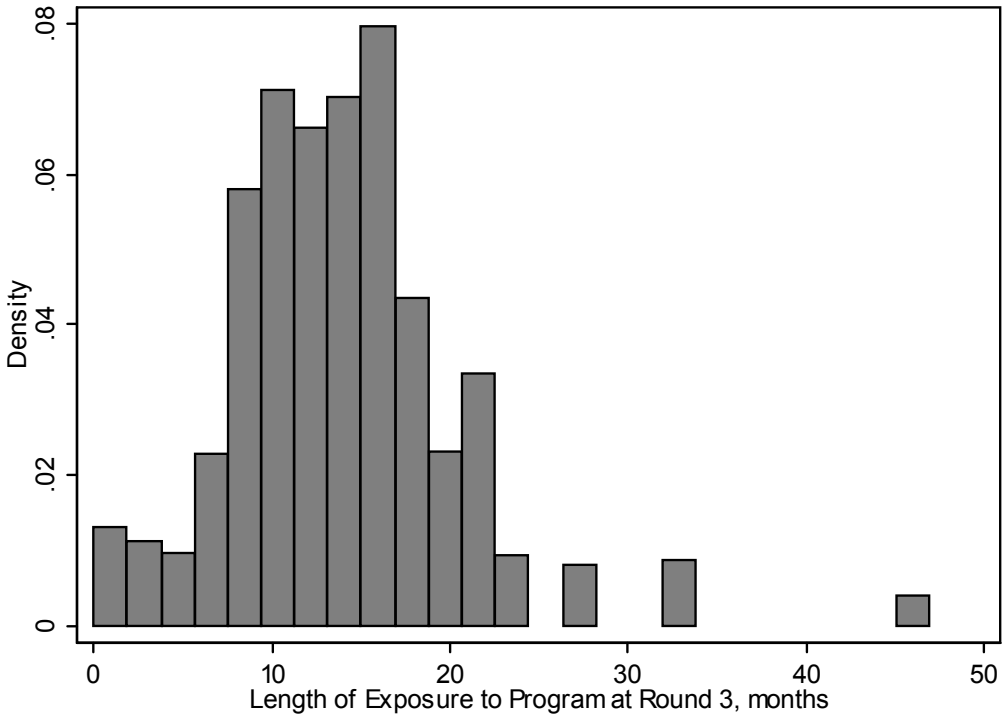
Table B.1. Baseline Predictors of Attrition from Round 1, ECD Study (Odds Ratios)

Child	.996
Age	1.01
Hemoglobin level	1.00
Has worms	1.07
Ht-for-Age Z score	.973
Wt-for-Ht Z Score	1.00
Cog, Soc Motor Dev. Score	
Family Background/Household	
Father's Schooling	1.01
Father's Age	.997
Mother's Schooling	.971~
Mother's Age	.933*
Asset Index	1.07+
Own house	.523*
Number of Persons	1.03
Number of Children <5	1.10
Mother employed	.810+
ECD program area	.618~
Province Fixed Effects	Yes
R square	.07

~p<.10 +p<.05 *p<.01

Note: asset index includes ownership of select goods such as a TV, car, furniture, fridge and fan. N = 5,049. Chi-square for joint test of province dummies is significant at the .01 level. The coefficients predict the odds of not remaining in the same sample barangay for all three rounds.

Figure B.1. Distribution of Length of Exposure to ECD Program (Months at Round 3)



Mean: 14.0
Standard Deviation: 6.5

Table B.2. List of Variables Used in Nearest Neighbor Matching Estimates

Variable Name	Variable Description	
Used in:	**Intent-to-treat**	**Treatment-on-the-Treated**
Child		
Worms1	Child had worms in six months prior to survey	
Nstunted1	Child was stunted	X
Std1bave	Child had below average cognitive, social, and motor development	
Numbsib	Has 0, 1 or 2+ siblings	
Sex	Child's sex (1 = female, 0 = male)	X
Household		
Gradecom1	Mother's schooling (years)	X
Deduc1	Father's schooling (years)	X
Age1	Mother's age	X
Dage1	Father's age	X
Numbperhh	Number of persons living in household (4-11)	X
Worknow1	Mother currently employed	X
Fwtoilet1	Flush or water sealed toilet present	X
Numbrmhh	Number of rooms in the house (1-5+)	X
Hhelec	Household has electricity	X
Pipewat1	Household has piped water connection from local water district	X
Owntv	Own a television set	X
Ownhouse1	Own the home in which household members are currently living	X
Ownvehc	Household owns any vehicle (e.g. car, jeep)	X
Livinset	Household owns living room furniture	X
Ownbed	Household owns a bed	X
Ownfan	Household owns an electric fan	X
Minuroad5	Nearest road is less than 5 minutes away	X
Disthlth	Distance to health center	X*
Hinc1	Household income in lowest quartile (0-25%)	X
Hinc2	Household income in second quartile (26-50%)	X
Hinc3	Household income in third quartile (51-75%)	X
Hinc4	Household income in highest quartile	X
Barangay		
Higrade	Barangay captain's schooling (years)	
Bornbgy	Barangay captain born in barangay	
Bhc51p	Barangay captain is 50+ years old	
Bhealthc	Health center in barangay	X
Daycare	Number of daycares	
Bpubelm	Public elementary school in barangay	X
Bpubhis	Public secondary school in barangay	
Bhroad	Barangay has cement roads	X
Bpark	Plaza or park in barangay	X
Bpipewat	Barangay has piped water supply	X
Municipality		
Mudoctor	Number of doctors per 1000 population	X
Muhlth	Number of health centers per 1000 population	X

Variable Name	Variable Description	
Used in:	**Intent-to-treat**	**Treatment-on-the-Treated**
Mubhws	Number of barangay health workers per 1000 population	X
Income3	Municipality in lowest income class	
Muelec	Proportion of households with electricity	X
Mypwtr	Proportion of households with piped water	X
Mvoices2	Citizens can set up meetings with mayor or municipal officials to voice concerns	
Mayored	Mayor has more than college education	
Muage51p	Mayor is 50+ years old	
Muorg	Mayor belongs to civic or political group	
Mupop	Population	

*used only in treatment-on-the-treated estimates.

Table B.3 Percentage Distribution of Children by Exposure to Program Across Age, ECD Study

	Exposure Duration Class			
Age in years (Round 3)	**4-12 months**	**13-18 months**	**19+ months**	**Total**
	12.1	15.0	12.4	13.3
2	(180)	(236)	(103)	(519)
	19.7	20.9	23.0	20.9
3	(291)	(330)	(190)	(811)
	18.0	18.7	19.1	18.5
4	(264)	(296)	(158)	(718)
	23.0	18.6	22.2	21.0
5	(339)	(294)	(184)	(817)
	27.3	27.0	23.3	26.3
6+	(404)	(426)	(193)	(1,023)
	100.0	100.0	100.0	100.0
Total	1,478	1,582	828	3,888

Note: cell counts in parentheses. Column totals are not exactly 100 percent due to rounding. For children in program regions only.