Original Research Article

Breastfeeding and Later Psychosocial Development in the Philippines

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Objectives: Evaluate whether breastfeeding (BF) duration predicts later psychosocial development (PD) in a large low socioeconomic status (SES) sample in the Philippines.

Methods: The sample consists of 2,752 children aged 5–6 years who were measured in 2004 as part of the Philippine government's Early Childhood Development Project. Duration of any BF was the primary independent variable in regression models predicting a cumulative index of PD that has been shown previously to predict school readiness.

Results: In this sample, mothers who breastfed their children for longer tended to have lower educational attainment and to come from lower income households. Despite this, BF duration was a positive predictor of future PD measured in late childhood, but only after adjustment for SES and related confounders.

Conclusions: These findings add to growing evidence that BF could provide lasting economic and social benefits and underscore the importance of continuing current public health efforts to promote BF in the Philippines and across the globe. Am. J. Hum. Biol. 00:00–00, 2010.

The health benefits of breastfeeding (BF) for child nutritional status and growth are a primary rationale for promoting BF in developing nations (Popkin et al., 1990). BF has also received attention for its demographic consequences as a suppressor of ovulation and protection against short interbirth intervals (Labbok, 2008; Thapa et al., 1988). More recent attention has focused on the potential for improved early life nutrition, including BF, to lead to improvements in offspring health and economic performance that persist into adulthood (Barker, 1994; Gluckman and Hanson, 2006; Palloni, 2006; Stuebe, 2009). BF has been linked to lower rates of adult chronic diseases, including obesity and diabetes (Ip et al., 2007; Schack-Nielsen and Michaelsen, 2006). Studies also find that children exclusively breastfed or who were breastfed for longer score better in mid-childhood (Daniels and Adair, 2005; Kramer et al., 2008; Michaelsen et al., 2003; Quinn et al., 2001; Sacker et al., 2006) and in adulthood (Richards et al., 2002) on tests of motor or cognitive development.

In less-developed countries, children often fail to attain optimum cognitive development because of poverty, malnutrition, and poor health (Behrman, 1996; Grantham-McGregor et al., 2007). In this setting, women who are less educated or who have lower socioeconomic status (SES) may not be able to afford infant formula and may also have more time available to breastfeed compared to women with higher income or education (Negi and Kandpal, 2004; Skafida, 2009). Thus, BF may be most readily available as a strategy to improve offspring health and may also be most common, among the poorest mothers whose offspring are at highest risk for poor developmental outcomes.

The broader social and economic impacts of BF could be highly relevant in the Philippines, where the government currently has a policy of promoting BF (CWC, 2000; Philippines, 1992). Despite this, few studies have investigated the potential impacts of BF on offspring health and development in the country. One study in the Philippines reported a beneficial effect of longer duration of BF on IQ score measured in mid- and late childhood (Daniels and Adair, 2005). The apparent benefits of having been breastfed were detected only after adjusting for the lower educational attainment and lower socioeconomic standing that characterized women in the sample who breastfed longer. These findings, which used data collected from metropolitan Cebu City in the 1980s, suggest that the benefits of BF in the Philippines extend to child IQ, which is an important measure of human capital.

In this article, we build upon this finding and evaluate possible benefits of BF on child development among a predominantly rural poor population in the Philippines measured in 2005. The outcome that we investigate is a composite index of psychosocial development (PD) obtained when children were 5 or 6 years old. This scale reflects a child's performance across seven developmental domains that collectively index readiness to enter and succeed in primary school. Data come from a large, population-based longitudinal survey of child nutrition and growth that was recently conducted in central regions of the Philippines (Armecin et al., 2006). Follow-up data on PD, used together with data on duration of BF and on a range of potential socioeconomic, educational, and other confounding factors, provide a unique opportunity to evaluate the broader effects of BF on PD in a lower income, rural subset of Philippine society.

MATERIALS AND METHODS

Study population

This study uses data from a longitudinal evaluation of the Early Childhood Development (ECD) intervention,

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which was part of the larger Baseline Indicators Study of the ECD Project initiated by the Philippine government. The program was initiated in three regions with a focus on relatively disadvantaged municipalities, measured by child and maternal characteristics (Ghuman et al., 2006). Communities included in the study were identified as either "at risk" or "in need" of additional services, as indicated by high rates of infant mortality, childhood wasting, and a high elementary school dropout rate. The goal of the ECD project was to improve the survival and developmental potential of at-risk children in predominantly rural regions of the country (Office of Population Studies, 2002). Rather than changing existing programs, it provided technical and financial support to local government units with the intent of enabling delivery of improved services for pregnant mothers and children.

The evaluation study collected information on program implementation and on the quantity and quality of service delivery in health and nonhealth services. It also collected household information, child-rearing behaviors, and maternal health and health care-seeking practices. Outcome measures included indices of child growth, health, and development. At baseline, the study enrolled 7,925 children representative of 0- to 4-year-old infants and children in project areas (see Fig. 1). Follow-ups were conducted at yearly intervals with a total of four surveys completed by the end of the study in 2005. During the Year 4 survey, members of the baseline cohort ranged in age from 4 to 9 years, with a sample size of 6,871. Attrition was due mainly to migration (9.3%), deaths (0.4%), and refusals and others (2.2%) (Armecin et al., 2006; Office of Population Studies, 2005).

For the present analyses, we limit our sample to children who were followed since baseline and who were 5–6 years of age during the psychosocial assessment conducted in Study Year 4. This corresponds to the age of primary school entry in this sample. In addition, children with physical and neurological abnormalities that could influence test performance, such as esotropia, autism, or cerebral palsy (57 or 2.1%), and those with incomplete data (32 or 1.2%) were also excluded from the analysis. The final analysis sample was 2,752. We evaluated whether the subsample differed significantly from the total sample with respect to key socioeconomic and other characteristics. Children in the analysis sample had mothers who were 10 months younger ($P < 0.05$) and were more likely to have their fathers present ($P < 0.05$). However, there were no significant differences in mother's or father's educational attainment, BF duration, birth weight, and child's health at 2 years.

Variables

Psychosocial development. PD was assessed using the Philippines Revised Early Childhood Development Checklist (REC) in which the skills listed were developmentally sequenced by age. The REC was designed primarily to emphasize specific strengths and weaknesses in the child's developmental stage and to aid caregivers and health providers in their assessment of the different stages of development among children aged 0–84 months (Bautista-de los Angeles and Reyes, 2001; Office of Population Studies, 2005). For older children, the tool was designed to measure the personal and social adjustment, literacy, and school readiness skills of children. It includes items that are important prerequisites for school readiness including emergent literacy skills and psychosocial attributes essential to adjust to school life. It covers seven developmental domains including gross motor, fine motor, receptive language, expressive language, social–emotional, self-help, and cognitive function. Overall PD was defined as a composite of the seven underlying domains (Cronbach's alpha = 0.86). Prior work has shown that it is a strong predictor of school readiness in this cohort of children ($r = 0.48$). Before analysis, each domain score and the composite PD scores were converted into age-specific norms based upon a reference population composed of 10,915 children from six regions in the Philippines (Office of Population Studies, 2002). The scaled scores for each domain and the composite scores were derived and used to classify developmental indices for each child in the study. The scaled score ranged from 1 to 19 with a standard deviation of 3; the composite score was reported as a standard score ranging from 35 to 150 with a standard deviation of 15 (Office of Population Studies, 2005).

The PD checklist was administered during the four surveys. During the administration of the checklist, children were observed by the tester as they performed the developmental tasks, whereas for other questions mothers or caretakers were asked whether children were able to perform each task. At the end of the Year 4 survey, children were 4–9 years of age. The composite score at age 5 years had a relatively large correlation (Pallant, 2000) with fine motor, self-help, expressive language, cognitive, and social–emotional domains ($r = 0.55$, 0.58, 0.53, 0.64, and 0.64, $P < 0.05$, respectively), with a comparable pattern observed at age 6. As expected, mean scores increased with age (108.6 at 6 years vs. 99.4 at 5 years, $P < 0.05$).

Duration of any breastfeeding. Our main exposure was duration of any BF, which was evaluated through maternal recall at each of the yearly follow-up surveys. Maternal recall of BF duration has been shown to be accurate and reliable in validation studies, many of which have included a longer period between BF and recall than our yearly surveys (Gillespie et al., 2006; Kark et al., 1984; Promislow et al., 2005). Individuals were assigned to one of five categories representing duration of BF, corresponding to the recent study of Daniels and Adair (2005): 0–5 months (comparison group), 6–11, 12–17, 18–23, and 24+ months of BF. All analyses incorporated the "never breastfed" individuals into the 0–5 month group, as similar results were obtained when "never breastfed" individuals (~5% of the sample) were grouped together with the 0–5 month group and when "never breastfed" was modeled using a separate dichotomous variable.

Potential confounding variables. A range of potential confounders of any association between BF and later PD were identified *a priori* based upon similar published studies (Clark et al., 2006; Daniels and Adair, 2005; Sacker et al., 2006) and from associations within the data set. These included gender, age, daycare attendance, existence of offspring health problems at birth, prenatal care, mother's education, father's presence within the household, access to electricity, an assessment of household hygiene, household assets, and ECD program exposure. Exposure to program services has been shown to significantly improve

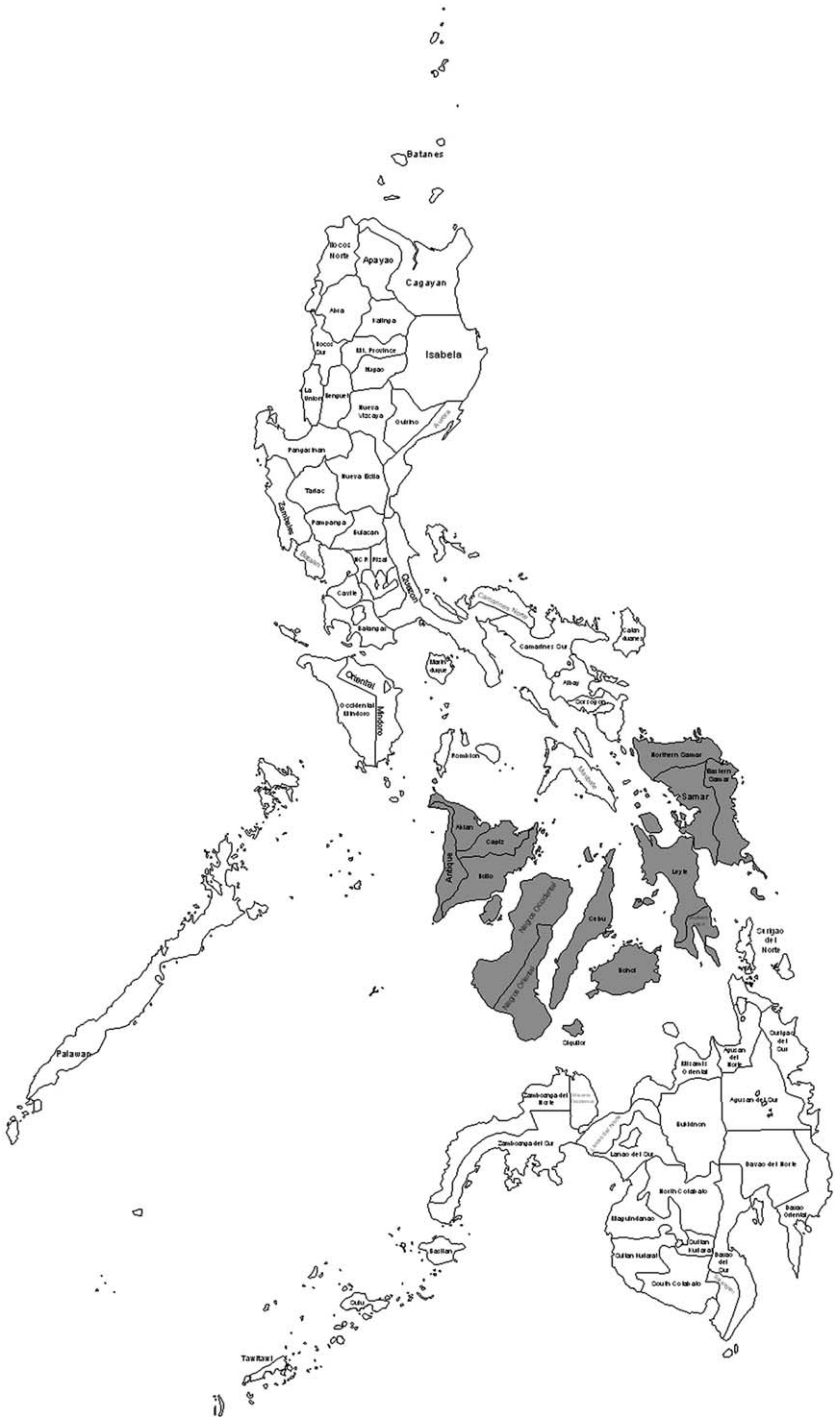

Fig. 1. Map of the Philippines. Project areas are presented in dark gray and include a total of 288 barangays (administrative units) located in 96 municipalities.

child psychosocial status (Ghuman et al., 2006). Household wealth or nonincome-producing assets were evaluated by tallying ownership of common household appliances. Hygiene status, with scores ranging from 0 to 12 (0 being poorly kept), reflected cleanliness inside the house, food storage, presence of excreta outside the house, and garbage and waste disposal.

Statistical analysis

All statistical analyses were conducted using STATA Version 10 (College Station, TX). Analysis began with consistency testing of the composite index derived from the seven domains of PD using Cronbach's alpha. To examine selectivity due to sample attrition of the children between

baseline and the Year 4 survey, a likelihood test of children participating in the Year 4 survey based on selected baseline characteristics was applied. Bivariate analyses were performed using simple descriptive statistics, with differences across levels of BF duration evaluated using chi-square and ANOVA. Unadjusted relationships between BF duration and of the composite development score in the final survey were evaluated using least squares regression. Finally, the relationship between duration of BF and PD was considered after adjusting for factors that might confound or mask the association between BF duration and later psychosocial maturity using multiple regression models. Backward elimination using the change-in-estimate approach was used to determine which *a priori* potential confounding factors significantly influenced the models, and thus, which were retained in the final model. If exclusion of the variable in the model substantially (>10%) changed the BF duration effect estimate, the variable was retained in the model. Because prior research in the Philippines has shown a diminishing effect of BF on IQ with increasing age/time elapsed since BF (Daniels and Adair, 2005), we stratified all models by age during the final survey when PD was evaluated.

RESULTS

Children were breastfed for an average of 14 months. The majority had mothers who sought prenatal care during pregnancy and for whom birth complications were not a problem. At baseline, less than one-fourth of the children were given multivitamin supplementations. At the time of psychosocial evaluation, more than half of the children in the sample had attended daycare. More than half of the children lived in ECD program barangays, which provided greater access to the ECD interventions. Maternal age was 32 years on average and about 94% were legally married (Table 1).

In bivariate analysis, children of mothers with lower educational attainment tended to be breastfed longer ($P < 0.01$). They had fathers with fewer years of education and lived in households with lower levels of material assets and wealth (Table 2). In unadjusted models, there were no trends apparent between duration of BF and the PD scores of children at any age. However, after adjusting for measures of maternal education, presence of father in home, daycare attendance, and a range of wealth and status measures, a relatively consistent relationship between BF duration and PD emerged (Table 3). When compared with children who were breastfed 5 months or less (reference group), those who were breastfed longer tended to have higher psychosocial scores. Positive associations between BF and PD peaked sometime during the second year of life and then declined. This pattern was strongest in those individuals who were youngest at the age of psychosocial assessment (5 years of age). The regression coefficients declined by 6 years of age but retained the same general pattern (see Fig. 2).

TABLE 1. Sample characteristics

	Value[a]
Child	
Male (%)	53.6
Breastfeeding duration (months)	13.7 ± 8
Had prenatal care (%)	92.4
Birth complications (%)	3.2
Received multivitamin (%)	23.8
Attendance in daycare (%)	58.7
Family	
Maternal age (years)	31.9 ± 8.2
Father present (%)	90.2
Paternal education (years)	7.4 ± 3.4
Maternal education (years)	8.2 ± 3.7
Legally married (%)	94.4
Electricity in home (%)	71.2
Owns television (%)	29.5
Lives in ECD program barangay (%)	60.6

[a]Means ± SD unless marked otherwise.

DISCUSSION

In this large, representative sample of rural Filipinos, we find evidence suggestive of a beneficial effect of BF on the PD of children. Our findings are consistent with the results of other studies documenting benefits of BF in both developed and developing nations, which have found that, compared with formula-fed infants, breastfed infants have better growth status (Sacker et al., 2006), cognitive skills and school performance (Angelsen et al., 2001; Horwood and Fergusson, 1998; Horwood et al., 2001; Michaelsen et al., 2003; Oddy et al., 2004; Quinn et al., 2001), and emotional development (Woodward and Liberty, 2005). The psychosocial scale used in our study is a predictor of abilities related to language acquisition, cognition, and psychosocial maturity deemed essential for primary school entrance and is also correlated with school readiness itself. Thus, our findings extend prior work to suggest that there may be benefits of BF to the domains of cognitive and psychosocial maturity that allow successful adjustment to school life in the primary grade levels. Importantly, these benefits were present in a large predominantly rural sample of Filipinos, among whom poverty is more common. Our findings thus underscore the

TABLE 2. Means and standard deviations of parental and household characteristics

	Duration of breastfeeding (months)					
	0–5	6–11	12–17	18–23	24+	P[a]
Mother's education (years)	9.6 ± 3.9	8.4 ± 3.8	7.7 ± 3.5	8.0 ± 3.4	7.8 ± 3.5	0.001
Father's education (years)	8.8 ± 4.3	8.1 ± 4.0	6.9 ± 3.6	6.9 ± 3.7	6.9 ± 3.6	0.001
Mother's age (years)	34.2 ± 10.4	31.0 ± 8.7	30.7 ± 7.4	31.2 ± 7.4	32.5 ± 6.9	0.001
Father's age (years)	36.6 ± 10.2	33.6 ± 8.7	33.9 ± 8.2	34.4 ± 8.7	36.2 ± 8.3	0.001
Asset scale (0–20)	2.7 ± 3.0	1.8 ± 2.5	1.2 ± 1.9	1.1 ± 2.0	1.0 ± 1.9	0.001
Hygiene scale (0–12)	6.8 ± 2.1	6.2 ± 2.2	6.1 ± 2.2	6.1 ± 2.2	5.9 ± 2.3	0.001
Electricity in home (%)	82.2	74.6	68.6	68.4	65.0	0.001
n	551	334	832	395	640	

[a]P-values based on one-way ANOVA or Pearson's χ^2.

TABLE 3. Regression models relating duration of breastfeeding to psychosocial test score measured at 5 and 6 years of age[a]

Breastfeeding duration (months)	5 years (n = 1,405)		6 years (n = 1,347)	
	Crude	Adjusted[b]	Crude	Adjusted[b]
0–5	0.0	0.0	0.0	0.0
6–11	0.31 (−2.11, 2.73)	1.62 (−0.75, 3.99)	0.44 (−2.07, 2.95)	1.72 (−0.72, 4.16)
12–17	−0.62 (−2.55, 1.30)	2.05 (0.08, 4.02)**	0.70 (−1.26, 2.67)	1.92 (−0.01, 3.86)*
18–23	0.83 (−1.61, 3.28)	3.21 (0.78, 5.65)**	0.53 (−1.73, 2.80)	1.37 (−0.85, 3.60)
24+	−1.0 (−3.0, 1.0)	1.54 (−0.49, 3.57)	−1.17 (−3.32, 0.98)	−0.15 (−2.27, 1.96)
R^2	0.00	0.08	0.00	0.09

[a]β(95% CI),
[b]Adjusted for gender of child, daycare attendance, maternal education, father's presence at home, hygiene, and nonincome-producing assets.
*$P < 0.1$, **$P < 0.05$.

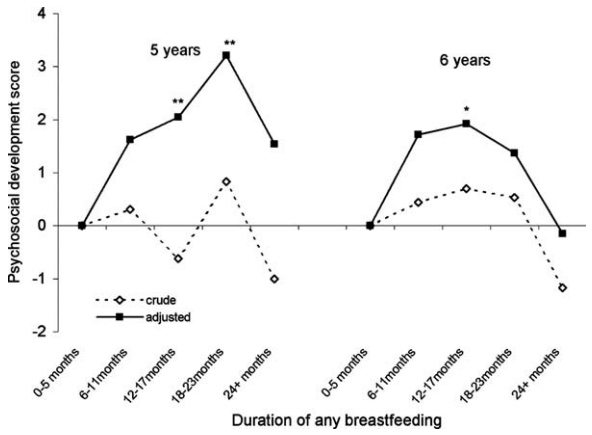

Fig. 2. Association between duration of breastfeeding and psychosocial development score of 5- and 6-year-old children (from multiple regression, value is β adjusted for gender of child, daycare attendance, maternal education, father's presence at home, hygiene, and nonincome-producing assets). *$P < 0.1$, **$P < 0.05$.

utility of BF as a means to improve child development among populations with limited resources.

Women who breastfed longest in this sample tended to be rural, to have attained a lower level of education, and to come from households with lower SES. Despite the negative effect of such factors on offspring developmental outcomes (Clark et al., 2006), we found evidence for a protective effect of BF on later PD but only after adjusting for socioeconomic indicators. In the 5-year-old age group, the psychosocial score among children breastfed 12 months or more was 2 to 3 points higher compared with peers who were breastfed for less than 6 months. However, for those breastfed for more than 2 years, the apparent protective effect of BF was diminished. Although in theory this could indicate that BF for longer durations has declining benefits, we feel that residual confounding is a more likely explanation for this finding. In this sample, infants who were breastfed longest come from the lowest income households and were born to mothers of low educational attainment. Thus, it seems likely that our ability to adjust adequately for the negative impacts on development that poverty and its related exposures have in the long BF duration subgroup would be constrained by our imperfect measures of these confounding influences. An intervention study would be necessary to establish whether the apparent declining benefit associated with the longest BF durations is real or an artifact of such residual confounding. Although these details remain to be clarified, our findings suggest that, compared with children who were not breastfed or breastfed for a shorter duration, BF has important benefits for developmental outcomes of relevance to education and human capital.

The relationships documented here are consistent with and complement prior findings in the Philippines reported by Daniels and Adair (2005) who used 1983–1986 infant feeding data to predict IQ in a sample living in Metropolitan Cebu City. In their sample, longer periods of BF predicted higher childhood IQ, with benefits of BF peaking during the second year of BF. Similar to our findings, the relationships that they documented were only detectable after adjusting for strong negative confounders that tend to be correlated with BF duration and that have negative impacts on offspring PD. Our analysis reveals a similar pattern of benefits to psychosocial characteristics that predict school readiness in a contemporary sample representing rural regions of the country where BF is common.

The tendency for highly educated women to breastfed their offspring for less time in the sample studied here is consistent with observations in similar populations elsewhere (Negi and Kandpal, 2004; Skafida, 2009) and likely reflects the limitations imposed upon BF among working women. Although women who have higher education are more likely to recognize the benefits of BF, they are also more likely to be in the labor force, which may limit their opportunities for BF. In the Philippines, working women, especially nonprofessional, low-income mothers, are rarely able to negotiate a "breastfeeding-friendly" work environment while maintaining employment. Our findings suggest that policies to promote such opportunities for mothers of infants and young children would have developmental and perhaps long-term economic benefits for the offspring generation.

There is currently much interest in the lasting influence of early environments on later health and well-being (Gluckman and Hanson, 2006). Although much research has focused on the influence of nutrition on later chronic disease (e.g., Barker, 1994), including in the Philippines (Adair et al., 2001; Kuzawa and Adair, 2003), the impact of similar developmental processes on economically relevant outcomes, such as cognitive or school performance, is gaining increasing attention (e.g., Palloni, 2006). The present findings add to this body of knowledge by suggesting that BF could have beneficial effects on PD, which is a significant predictor of school readiness in this sample. These longer term benefits are in addition to the better-established reductions in infant morbidity and mortality among breastfed infants (Popkin et al., 1990)and are de-

tectable despite the fact that women who breastfeed in the sample tend to have lower educational attainment and come from poorer households. We conclude that BF is a potentially effective strategy available to Filipino mothers to improve child developmental outcomes even in contexts of rural poverty and limited resources. These results underscore the importance of continuing current public health efforts to promote BF in the Philippines and across the globe.

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