

Breastfeeding and later Psychosocial Development in the Philippines

Paulita Duazo^{1*}, Josephine Avila¹, and Christopher Kuzawa²

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¹Office of Population Studies
University of San Carlos, Talamban Campus
Cebu City 6000
Philippines
*corresponding author. Email: litlitduazo@yahoo.com

²Department of Anthropology and Institute for Policy Research
Northwestern University
Evanston, IL 60208
USA

Introduction

The health benefits of breastfeeding for child nutritional status and growth form a primary rationale for promoting breastfeeding in developing nation settings (Popkin et al 1990). Breastfeeding has also received attention for its demographic consequences as a suppressor of ovulation and protection against short interbirth interval. Although less often studied in these settings, there is increasing evidence that breastfeeding can have beneficial effects on offspring that linger into later life (Barker 1994; Gluckman and Hanson 2006; Palloni 2006). These longer-term impacts of breastfeeding include lower risk of chronic diseases like obesity or diabetes (Schack-Nielsen and Michaelsen 2006), and also include economically-relevant outcomes like psychosocial development, school readiness and educational performance (e.g. Palloni 2006). For instance, studies find that children exclusively breastfed or who were breastfed for longer score better in mid-childhood on tests of motor or cognitive development (Quinn et al 2001; Sacker et al 2006).

The broader social or economic impacts of breastfeeding could be highly relevant to the Philippines, where there is currently a strong push by the central government to promote breastfeeding (DOH website). One recent study in the Philippines found evidence for a beneficial effect of longer duration of breastfeeding on IQ score measured in mid and late childhood (Daniels and Adair 2005). These relationships were detected only after adjusting for strong negative effects on offspring IQ of the lower educational attainment and lower SES standing of women who breastfeed longer. Such findings reveal how the impact of breastfeeding may extend beyond traditional infant nutritional benefits to positively impact social capital. While these recent findings are important, this study used data collected more than 2 decades ago in urban and outlying areas of the country's second largest metropolitan area (Metro Cebu). Whether similar findings would obtain today, and in the predominantly rural areas where breast feeding is most common, remains to be evaluated.

In this paper, we evaluate the possible impact of breastfeeding on cognitive performance as indicated by a composite scale of psychosocial development measured when children were 5-7 years of age. Data come from a large, population-based longitudinal survey of child nutrition and growth that was recently conducted in central regions of the Philippines. Follow-up data on psychosocial development, used together with information on duration of breastfeeding and on a range of potential socioeconomic, educational and other confounding factors, provide a unique opportunity to evaluate the broader cognitive effects of breast feeding on psychosocial development and school readiness in an underserved subset of Philippine society.

Materials and Methods

This study uses data from the longitudinal evaluation study conducted by the Office of Population Studies, located at the University of San Carlos, Cebu City, Philippines of the Early Childhood Development (ECD) Project of the Philippine government. At baseline, the study enrolled 7,922 children aged 0 to 4 years of age living in and representative of project areas in administrative Region 6 (Aklan, Antique, Capiz, Guimaras, Iloilo, Negros Occidental), Region 7 (Cebu, Bohol, Negros Oriental, Siquijor) and Region 8 (Samar/Leyte). Follow-ups were conducted at yearly intervals with a total of 4 surveys completed by the end of the study in 2005. The study was designed to represent disadvantaged, predominantly rural populations in the Philippines. About 12% of participants had no access to electricity. The sample for the present study includes 4,218 5-7 year old children who were followed since baseline and who had all available data necessary for these analyses.

During the Year 4 survey, members of the baseline cohort ranged in age from 4 to 9 years of age. For the present analyses, we limited our sample to individuals who were 5-7 years of age at the time of psychosocial assessment. This corresponds to an age when psychosocial development begins to

stabilize (Ledesma pers.comm.), and also with the earliest years of schooling. Psychosocial development at 5-7 years of age was defined as a composite of seven underlying domains that included gross motor, fine motor, receptive language, expressive language, social-emotional, self help and cognitive function. This scale was developed for and validated for use in the Philippines (OPS 2002). Before analysis, the composite psychosocial development scores were converted into age-specific z-scores based upon a reference population composed of 10,915 children from six regions in the Philippines (OPS 2002).

Our main exposure was duration of any breastfeeding, which was evaluated through maternal recall at each of the yearly follow up surveys. Maternal recall has been shown to be accurate and reliable in validation studies, many with longer delays between breastfeeding and recall (Gillespie et al 2006). Individuals were assigned to one of five categories representing duration of breast feeding, with categories corresponding to the recent Philippine study of Daniels and Adair (2005): 0 - 5 months (comparison group), 6-11, 12-17, 18-23 and 24 and over. Similar results were obtained when ‘never breastfed’ individuals (~5% of the sample) were grouped with the 0-5 month group or modeled using a separate dichotomous variable. Therefore, for simplicity, all analyses include the “never breastfed” individuals in the 0-5 month group. A range of potential confounders of associations between breast feeding and later psychosocial development were considered, including gender, age, daycare attendance, parental education, presence of father within the household, presence of electricity in the community, and various measures of household wealth or material lifestyle that could be directly or indirectly related to child development (non-income producing assets, hygiene, household size, and type of material from which the house is constructed).

Statistical analysis

First, analyses began with simple descriptive statistics, with differences across level of breastfeeding duration evaluated using chi-square and ANOVA. Next, crude relationships between breastfeeding duration and psychosocial development score at the final, Year 4 follow up survey were evaluated using least squares regression. Finally, the relationship between duration of breastfeeding and psychosocial development was considered after adjusting for factors that might confound or mask the association between breastfeeding duration and later psychosocial maturity using multivariate models. Because prior research in the Philippines has shown a diminishing effect of breastfeeding on IQ with increasing age/time elapsed since breastfeeding (Daniels and Adair 2005), we stratified all models by age (year) during the final survey when psychosocial development was evaluated.

Results

- Women who breastfed their offspring for longer tended to have lower educational attainment. They also married men with fewer years of education, and lived in households with lower levels of material assets and wealth (**Table 1**).
- In unlinear models, there were no trends apparent between duration of breastfeeding and offspring psychosocial development at any age (**Table 2**).
- However, after adjusting for measures of maternal education, day care attendance, and a range of wealth and status measures, a relatively consistent relationship between breastfeeding duration and psychosocial development emerged (**Table 2**): when compared to the reference group (0-5 months of breast feeding) individuals who were breastfed for longer tended to have higher psychosocial scores. This benefit peaked sometime during the second year of life and then declined, with 24 months or more of breastfeeding accruing less of a benefit over the control group at all ages.

- This pattern was strongest in those individuals who were youngest at the age of psychosocial assessment (5 years of age). The regression coefficients declined slightly by 6 years of age and declined further (but retained the same general pattern) when models were run among 7 year olds.

Discussion and conclusion

In this sample, breast feeding was more common among women living in rural, lower income households and communities, and who had lower educational attainment. Despite the negative effect of such factors on offspring cognitive performance, we found evidence for a protective effect of breastfeeding on later psychosocial development when these effects were adjusted in multivariate models. With improved control of confounders, or measures of additional SES or related factors, the relationship between breastfeeding and offspring psychosocial development would likely have been strengthened further. These findings point to the broader benefits of breastfeeding on psychological outcomes of relevance to measures of social capital like school performance.

The relationships documented here broadly confirm prior findings in the Philippines by Daniels and Adair (2005) who used 1983-1986 infant feeding data to predict IQ in a population-based sample living in Metro Cebu. In this sample, Daniels and Adair found that longer periods of breastfeeding predicted higher later IQ, with benefits peaking during the second year of breastfeeding, and with periods of breastfeeding beyond 2 years providing less benefit. Also consistent with what we find here, these relationships at Cebu were only detectable after adjusting for strong negative confounding factors that tend to be correlated with breastfeeding duration and that have negative impacts on offspring psychosocial development. Thus, our analyses help validate this finding by showing that a similar pattern of benefits are detectable in a contemporary sample characteristic of the rural regions of the country where breast feeding is most common. It is also notable that in both the Cebu study of Daniels and Adair and the present study based upon ECD data, the apparent benefit of breast feeding was strongest at younger ages, perhaps indicating that part of any effect of breastfeeding is transient, and is less detectable after longer durations have elapsed since cessation of breastfeeding.

There is currently much interest in the lasting influence of early environments on later health and well-being (Gluckman and Hanson 2006). While much of this research has focused on the role of nutrition as an influence on later chronic disease (e.g. Barker 1994), the impact of similar processes of developmental sensitivity on economically-relevant outcomes, such as cognitive or school performance, is gaining increasing attention (e.g. Palloni 2006). Our findings add to this research by suggesting that early environments could have beneficial effects on psychosocial development, which is itself a predictor of school readiness in this population. In work under way we are exploring how robust these results are to alternative assumptions (e.g., if breastfeeding is treated as endogenous by using instrumental variable methods with community characteristics among the instruments) and whether they vary by gender and by domain. Additional work will be necessary to clarify the mechanisms linking breastfeeding with improved developmental outcomes, and the broader economic impacts of infant feeding decisions in transitional populations like those in the Philippines.

Table 1. Baseline characteristics

| | Duration of breastfeeding (months) | | | | | | p-value ¹ |
|--------------------------|------------------------------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| | Total | 0 to5 | 6 to 11 | 12 to 17 | 18 to 23 | 24+ | |
| Mother's education (yrs) | 8.9± 4.8 | 10± 3.7 | 8.4± 3.6 | 8.0± 3.3 | 7.8± 3.3 | 7.7± 3.4 | <0.001 |
| Father's education (yrs) | 8.2± 5.0 | 9.4± 3.9 | 8.1± 3.8 | 7.1± 3.6 | 7.1± 3.4 | 7.1± 3.7 | <0.001 |
| Mother's age (yrs) | 35.3± 6.9 | 35.0± 7.0 | 33.7± 6.6 | 34.7± 6.6 | 35.0± 6.7 | 37.2± 6.9 | <0.001 |
| Father's age (yrs) | 38.5± 7.7 | 38.2± 7.6 | 37.1± 7.5 | 37.9± 7.2 | 38.2± 7.8 | 40.5± 7.9 | <0.001 |
| Asset scale (0-20) | 3.8± 3.2 | 4.4± 3.6 | 3.2± 3.0 | 2.6± 2.4 | 2.5± 2.3 | 2.6± 2.5 | <0.001 |
| Hygiene scale (0-12) | 6.5± 2.3 | 6.8± 2.1 | 6.2± 2.4 | 6.1± 2.2 | 6.0± 2.2 | 6.1± 2.3 | <0.001 |
| Male (%) | 52.8 | 57.1 | 51.2 | 53.0 | 49.8 | 51.7 | <0.001 |
| Toilet in home (%) | 25.1 | 39.2 | 28.1 | 20.5 | 19.7 | 21.6 | <0.001 |
| Electricity in home (%) | 83.7 | 89.7 | 85.0 | 82.3 | 83.0 | 80.3 | <0.001 |
| n | 4218 | 807 | 492 | 1,348 | 617 | 954 | |

¹p-values based on Kruskal-Wallis test statistics, one-way ANOVA or Pearson's χ^2 .

Table 2. Regression models relating duration of breastfeeding to later psychosocial test score¹

| Duration of breastfeeding (months) | 5 years | | 6 years | | 7 years | |
|------------------------------------|---------------|-----------------------|----------------|----------------|----------------|----------------|
| | crude | adjusted ² | crude | adjusted | crude | adjusted |
| 0-5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.38 | 1.83 | 0.33 | 1.33 | 0.10 | 0.70 |
| 6-11 | (-2.04-2.80) | (-.55- 4.20) | (-2.17- 2.83) | (-1.10 - 3.77) | (-1.68 - 1.88) | (-1.07 - 2.46) |
| | -0.91 | 1.90 | 1.05 | 2.43* | 0.51 | 1.33 |
| 12-17 | (-2.82-1.00) | (-.05- 3.84) | (-.93 - 3.02) | (.46 - 4.39) | (-.84 - 1.86) | (-.05 - 2.70) |
| | 0.28 | 3.03* | 0.38 | 1.34 | 0.06 | 0.86 |
| 18-23 | (-2.14- 2.69) | (.61- 5.45) | (-1.86 - 2.62) | (-.88 - 3.56) | (-1.58 - 1.70) | (-.80 - 2.52) |
| | -1.35 | 1.46 | -0.51 | 0.70 | -0.03 | 0.60 |
| 24+ | (-3.40- .69) | (-.63- 3.55) | (-2.66 - 1.63) | (-1.43 - 2.82) | (-1.48 - 1.41) | (-.85 - 2.05) |
| n | 1,412 | | 1,352 | | 1,462 | |

¹ β (95% CI).

²Adjusted for gender of child, daycare attendance, maternal education, father's presence at home, household size, hygiene, non-income producing assets, type of housing material and presence of electricity in the neighborhood

* p<0.05

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