Effectiveness of peer counseling and membership in breastfeeding support groups in promoting optimal breastfeeding behaviors in the Philippines

Ofelia P Saniel (opsaniel@up.edu.ph)
University of the Philippines Manila https://orcid.org/0000-0001-7301-564X
Veincent Christian F Pepito
University of the Philippines Manila College of Public Health
Arianna Maever L Amit
University of the Philippines Manila College of Public Health https://orcid.org/0000-0003-4571-400X

Research

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Abstract

Background: The prevalence of early initiation of breastfeeding (EIBF)and exclusive breastfeeding (EBF) remain low in the Philippines. To help meet the 90% EIBF target and to improve infant and young child feeding practices in the Philippines, the Millennium Development Goals - Fund 2030 Joint Programme (JP) on Ensuring Food Security and Nutrition for Children 0-24 months old was implemented. We aimed to determine the effectiveness of visits by a peer counselor during pregnancy and after delivery, and membership in breastfeeding support groups in promoting these optimal breastfeeding practices. We also aimed to examine the interaction between these two activities to assess their joint effects on both EIBF and EBF.

Methods: We used data from the Endline Survey of the Joint Program , which collected socioeconomic data from the households of the mother-infant dyads, demographic characteristics of the mothers, and their particular infant and young child feeding practices. We used logistic regression methods for survey data to study these associations.

Results: Out of the 2,343 mother-infant dyads, only 1,500 (63.1%) practiced EIBF and only 624 (27.9%) practiced EBF. After controlling for confounders, those who were visited by a peer counselor during the prenatal period had 1.32 times greater odds of practicing EIBF (95%CI: 0.96, 1.80) and 0.91 times lower odds (aOR: 0.91; 95% CI: 0.68, 1.22) of practicing EBF compared to those who were not visited. The association between visits by a peer counselor and EIBF was weak and statistically insignificant. The odds of EBF was also 26% higher among those who were visited by peer counselors after delivery (aOR: 1.26; 95% CI: 0.90, 1.75), but this association was also weak and statistically not significant. Members of breastfeeding support groups had 1.49 times higher odds of EIBF (95% CI: 1.12, 1.98) and 1.59 times higher odds of EBF (95% CI: 1.21, 2.10) compared to those who were not members of breastfeeding support groups; both associations were statistically significant. However, there was no interaction between the different exposure variables on their effects on EIBF and EBF.

Conclusions: Breastfeeding support groups may be institutionalized to promote both EIBF and EBF in the Philippines. The role of peer counselors in promoting optimal breastfeeding behaviors should be further reviewed in light of the findings of this study.

Background

Early initiation of breastfeeding (EIBF), defined as breastfeeding within one hour after birth, and exclusive breastfeeding (EBF), defined as giving the infant breastmilk only, without supplementary food or water or medicines, during the first six months of life, are optimal breastfeeding behaviors that improve child health and survival (1–5). EIBF also stimulates the production of breastmilk, provides antibody protection, and reduces postpartum hemorrhage (6). Further, it is linked with successful practice of other optimal breastfeeding behaviors, such as exclusive breastfeeding for six months after birth, and continued breastfeeding for at least two years with complementary feeding after six months (5,7,8). Longer duration of EBF significantly improves motor and cognitive development (9,10), and prevents diarrhea, acute respiratory infections, and fever among infants. EBF also reduces the burden of undernutrition in the community (11). In addition to the direct benefits of EIBF and EBF among infants, breastfeeding also benefits mothers. In the short term, breastfeeding is found to reduce maternal bleeding and stress after delivery, facilitate positive metabolic changes and postpartum weight loss, and delay ovulation. In the long term, breastfeeding is found to increase postpartum weight loss, decrease visceral adiposity, and reduce risk of cardiovascular diseases, diabetes and breast and ovarian cancers (12).

Despite the benefits of EIBF and EBF, its prevalence is low in many countries, including the Philippines. The overall EIBF prevalence in 24 countries included in the World Health Organization (WHO) Global Survey on Maternal and Perinatal Health in 2004 to 2008 was only 57.6%. The same survey also reported that the Philippines ranked among the lowest, with an EIBF prevalence of only 39.9% (6). Meanwhile, there has been little progress in improving the practice of EBF. As of 2015, only 40% of children worldwide were exclusively breastfed (13). The Philippine National Demographic and Health Surveys reported that the prevalence of EIBF in the country were 54% in 2003 and 53.5% in 2008, while the prevalence of EBF in the country in the two surveys were 33.5% and 34%, respectively (8). However, the 2013 Philippine National Demographic and Health Survey reported that the prevalence of EIBF in the country further decreased to 49.0% (14). These figures are far from the 90% target for EIBF and the 70% target for EBF set by the Philippine Department of Health (DOH) by 2016 (8).

To help meet the 90% EIBF target and to improve infant and young child feeding (IYCF) practices in the Philippines, the WHO, the United Nations Children's Fund, the Food and Agriculture Organization, the International Labor Organization, and the World Food Program, in collaboration with the DOH, launched in 2009 the Millennium Development Goals - Fund 2030 Joint Programme (JP) on Ensuring Food Security and Nutrition for Children 0-24 months old in the Philippines. The overall aim of the JP was to accelerate the attainment of Millennium Development Goals 1 and 4, which focused on reducing undernutrition among children and decreasing child mortality, respectively. Other key outcomes of the JP were increased prevalence of EBF by 20% annually, reduced prevalence of undernutrition by 3%, and improved capacities of national and local government units and stakeholders to formulate, promote, and implement IYCF policies and programs. To attain these outcomes, several activities were implemented including the engagement and training of volunteer breastfeeding peer counselors and establishing breastfeeding support groups to encourage mothers to practice optimal breastfeeding behaviors during and after childbirth. After the implementation of the JP, an external agency conducted a cross-sectional study between 2012 to 2013 to assess the outcomes and impact of the Program. A 0.7% reduction in the prevalence of undernutrition and 7.7% increase in the prevalence of EBF were achieved after the implementation of the JP interventions; however, both figures were far from the targets. The same cross-sectional study also found that the prevalence of EIBF was 62.8% (15,16). While an impact evaluation has been conducted to assess the effectiveness of the Program, an assessment of the effectiveness of the JP-trained breastfeeding support groups and peer counselors in promoting EIBF and EBF has not yet been separately studied.

Previous studies showed that the determinants of EIBF include knowledge about optimal feeding practices (17,18), mother's age (17,19,20), mother's and partner's employment status (21–23), and exposure to breastfeeding information during pregnancy (17,24). Other factors associated with EIBF are place of delivery, birth attendant, mode of delivery (18,20,23), and knowledge about breastfeeding (18,25). A previous study in the Philippines reported that after adjusting for confounding variables, infants from mistimed pregnancies were breastfed much later than infants from planned pregnancies among households with low socio-economic status (26). A systematic review on the topic confirmed the role of the aforementioned determinants on EIBF. Other factors such as place of residence, educational attainment of the parents, socioeconomic status, and infant's gender were reported to be important determinants as well (27,28).

On the other hand, determinants of EBF include maternal marital status, mode of delivery (29,30), maternal HIV status, economic independence, maternal age, number of children, socio-economic status, and birth weight of infant (31,32). Having antenatal care, maternal education, and maternal employment were associated with lower odds of EBF (32). The same set of variables have also been found to be associated with EBF in two systematic reviews, in addition to place of residence, religion, rooming-in, prelacteal feeding, advice from relatives and peer-pressure, infant's sex, maternal smoking, and exposure to advertisements about breast milk substitutes (28,33).

Although some studies on the determinants of early initiation of breastfeeding and breastfeeding duration have been conducted in the Philippines (26,34), this is the first study in our knowledge, to explore the effectiveness of specific interventions to promote EIBF and EBF in the country. This paper aimed to examine the association of peer counseling and membership in breastfeeding support groups in promoting EIBF and EBF in the six JP sites. In addition, we explored whether there was an interaction (or synergy) between peer counseling and membership in breastfeeding support groups to assess their joint effects on levels of EIBF and EBF.

Methods

Research design and study population

The monitoring and impact evaluation of the JP utilized a 'before-and-after' non-experimental type of study design. A baseline survey was carried out in early 2011 to establish the baseline levels of child undernutrition and prevalence of optimal breastfeeding practices. After this, the interventions were implemented from April 2011 to September 2012, shortly after the Baseline Survey was conducted. The Endline Survey was conducted in late 2012 to assess the effectiveness of JP interventions in improving the prevalence of optimal breastfeeding practices and in reducing undernutrition among the target children. Both baseline and endline surveys for outcome and impact evaluation were conducted by one of the authors (OPS). To examine the association between the JP interventions, specifically exposure to peer counselors and mother's membership in breastfeeding support groups, and EIBF and EBF, data from the Endline Survey were used in this paper.

There were six JP sites throughout the Philippines representing one highly urbanized city and one rural municipality for each major island group: the cities of Naga, Iloilo, and Zamboanga, and the municipalities of Ragay in Camarines Sur; Carles in Iloilo; and Aurora in Zamboanga del Sur. For both surveys, a stratified two-stage systematic random sampling was employed to select the study participants. Each JP site served as a stratum. In the first stage of sampling, *barangays* (i.e., Philippine term for a village) or contiguous small barangays with a minimum of 600 households were randomly selected and served as primary sampling units (PSUs). The 2010 Philippine Census was used as the sampling frame for the PSUs. The PSUs in each city/municipality were selected systematically with probability proportional to the PSU's population size. Prior to sampling for the Endline Survey, 44 barangays in Zamboanga City were excluded because of the deteriorating peace and order situation in the area. From each remaining PSU, children less than two years old were randomly selected, with equal probability, using the lists of eligible children in each barangay. The lists of eligible children from each barangay were collected from local health workers and validated and updated for completeness by a team of mappers/validators.

A pre-tested, structured, paper-based interview schedules were developed by the investigators. These interview schedules, which were originally designed in English, were translated to the local languages (e.g. Tagalog, Bicol, Hiligaynon, Bisaya, Chavacano, and Tausug) spoken in the different study sites. The data collectors were trained in administering the interview schedule. After obtaining informed consent, face-to-face interviews using the localized version of the interview schedules were conducted to collect socio-economic data from the sampled households, demographic characteristics of the mothers, and their IYCF practices for the index child.

For this survey, a sample size of 2,584 mother-infant dyads from all six JP sites was required to detect a 3% absolute decrease, from the baseline, in the prevalence of underweight for age, using a level of significance of 0.05, 80% power, a design effect of 1.2, and an allowance of 10% non-participation. The Endline Survey was similar with the Baseline Survey, but additional questions on whether the respondents had received JP interventions were included. For this paper, only mothers who were the actual caregivers of the target children were included in this analysis. Data from other child caregivers, such as fathers, were excluded in the analysis to minimize the effect of different quality of recall that may arise from having different types of child caregivers.

Operational definition of study variables and description of interventions of interest

The outcome variables in this study are EIBF and EBF. For EIBF, mothers were asked in the original interview schedule how long after birth was the index child first put to the mother's breast, and the responses were recorded in number of hours. For this analysis, we recoded this variable into late initiation (after one hour of birth) as the baseline, or early initiation (within one hour of birth) of breastfeeding. For EBF, mothers were asked at what age, in months, were solid foods or other liquids were first introduced to the infant. We dichotomized this variable into mothers who gave solid/liquid foods to the child six months after birth and mothers who did not.

The exposure variables in this study were home visit/s by a peer counselor during the prenatal period, home visit/s by a peer counselor after delivery, and membership of the mother in a breastfeeding support group during the index pregnancy. Being visited by a peer counselor during prenatal period and membership of the mother in BF support group during the index pregnancy were considered as exposure variables in the model for EIBF, while these two variables, together with home visit/s by a peer counselor after delivery were considered as exposure variables in the model for EBF. All three are dichotomous variables (either visited by a peer counselor or not, or member of a support group or not.) Mobilization of peer counselors and breastfeeding support groups were among the interventions implemented by the JP. Peer counselors were volunteers, often female local community workers, who were engaged and trained to educate mothers about EBF, correct positioning and attachment of the baby during breastfeeding, visit pregnant and post-partum mothers at home to advocate breastfeeding, orient pregnant mothers about the Milk Code which prohibits advertisements of breastmilk substitutes, and teach pregnant mothers how to prepare for their delivery. These peer counselors were trained for five days by the Program staff (three days to administer the interview schedule and two days of supervised mock interviews in the field) and asked to cover a number of households in a barangay (i.e., village) or part of a large barangay. They were expected to provide contact details of pregnant mothers or mothers who have recently delivered. Meanwhile, breastfeeding support groups were led by female influential community members who engaged target mothers in small group discussions about many topics related to breastfeeding including the benefits of breastmilk, advantages of breastfeeding, correct

breastfeeding techniques, proper diet of lactating mothers, and complementary feeding. Like the peer counselors, the leaders of breastfeeding support groups were likewise trained by local Program implementors.

The probable confounders in these associations of interest included place of residence, age of mother in years, total monthly household income, employment status of mother and partner, number of people living in household, number of living older siblings, mode of delivery of index child, birth attendant of index child, place of delivery, gender of child, maternal knowledge score, attendant during prenatal services, month when prenatal service was first availed, and membership in the Pantawid Pamilyang Pilipino Program (4Ps). The 4Ps program is a conditional cash transfer program implemented by the Philippine government which targets economically-disadvantaged Filipino families in return for complying with set conditions on children's education and the family's utilization of health services such as prenatal check-up and child vaccination (35). In the model for EBF, EIBF was also considered as a probable confounder.

Data management and analysis

Data quality checks, such as checks for duplicates and range checks were performed on the dataset prior to any analyses. Some quantitative variables, such as age and monthly income, were recoded to allow the assessment of possible linear trends in the association between these variables and the outcome (36). Some categorical variables were recoded to ensure that estimates for subsequent regression analyses would be stable. Other categorical exposures, such as place of residence, marital status, birth attendant, and mode of delivery, were recoded to ensure that each stratum would have sufficient number of observations. Maternal knowledge score was aggregated from seven yes-no questions. Incorrect answers or "don't know" answers were coded as incorrect and given a '0' score, and a score of '1' was given for each question answered correctly. Scores may range from 0 to 7, with higher scores implying better maternal knowledge. Lastly, variables that were thought to be correlated were combined, such as marital status of the mother and employment status of partner.

After the data management procedures described above, the dataset was declared as survey data. The sampling weights and strata (i.e., the six study sites) were also defined. All subsequent analyses, except for non-parametric tests, were weighted. However, the counts presented in the Results section were unweighted. No observations were deleted at any point in the analysis to ensure that standard errors can be computed correctly.

The distributions of continuous variables were presented using appropriate measures of central tendency. Frequencies and proportions were used to describe the distribution of categorical data. For descriptive statistics, weighted proportions were estimated; however, the counts were not weighted. The aforementioned exposure variables were cross-tabulated with each of the two outcome variables and the association of each of these exposures with each outcome variable were tested with Pearson's $\chi 2$ test for categorical exposures, the adjusted Wald test for normally-distributed continuous variables, or the Wilcoxon rank-sum test for skewed continuous variables. The distribution of missing data was shown for each variable, but they were not included in estimating the p-values. For each of these associations, crude odds ratios (cOR) were estimated using simple logistic regression for survey data. The cORs and the p-values for these cross-tabulations were noted.

As part of screening potential confounders, each probable confounder and the outcome variable were cross tabulated with each of the exposure variables using similar statistical tests as described above. Likewise, the cORs and the p-values for each of the cross-tabulations were noted. Probable confounders with strong evidence of association with the outcome, as well as with any of the exposures, but were not in the causal pathway of the other variables, were fitted into the final logistic model. At this point, observations with missing data for any of the variables of interest were excluded from the analysis.

In this paper, we ran two logistic regression models, one for each outcome variable. In building the final models, the main exposure variables were fitted first. Afterwards, variables meeting the operational definition of a confounder as described above, were fitted into the model, starting with the variables with the smallest p-value in the cross-tabulations with the outcome, and so on. After this, any variable deemed to be an important confounder based on the literature (even if they have not shown any strong association with the exposure or outcome in this dataset) was forced into the model starting with the variables with the smallest p-value in their respective cross-tabulations with the outcome, and so on. Any remaining variables were fitted into the model one by one, starting with the smallest p-value in their respective cross-tabulations with the outcome. If any of these variables changed the

estimate of the OR for any of the main exposure variables by >10%, then they were retained in the final model; otherwise, they were excluded.

Once grouped quantitative variables were fitted into the model, test for departure from the linearity assumption was carried out by observing the stratum specific odds ratios (OR), and by doing an adjusted Wald test. If the test for departure from the linearity assumption was statistically significant, or the stratum-specific ORs did not show evidence of a linear trend, stratum-specific ORs were presented. Otherwise, a common estimate for the linear effect of the exposure variable on the outcome was reported (36). After testing for departure from the linearity assumption of grouped quantitative variables, the interaction between the exposure variables were assessed (37). Any significant interaction parameters were shown, and linear combinations were used to estimate interaction parameters.

A level of significance of 0.05 was used in all analyses, and 95% Confidence Intervals (CIs) were reported. Data management and analyses were carried out in Stata 14.2 (38).

Results

A total of 2,542 parent-infant dyads were included in the original study, giving a 98.4% response rate. Of these, only 2,343 (93.1%) of the households had mothers who served as the infant caregiver and were thus included in the analyses. Most (77.6%) of the mothers were from urban areas. The mothers were between 15 and 50 years old, and most were married or living with their partners (92.2%). Most (92.3%) of them were employed. During their index pregnancy, some of them (23.5%) were visited by a peer counselor and/or were reported as members of a breastfeeding support group (33.4%). When they gave birth to the index child, most of them (67.0%) delivered in health facilities and were attended by skilled professional birth attendants (75.4%). Some of them (28.5%) were also visited by peer counselors after delivery. Lastly, only 63.1% of mothers have initiated breastfeeding within an hour of birth, but only 27.9% had exclusively breastfed their children for six months (Table 1).

The distribution of the mothers' age of gestation when they had their first prenatal checkup was right skewed as most mothers had their first visit during the first three months of pregnancy (median=3). The knowledge scores of the respondents ranged from 0 to 7 and these scores were left-skewed in distribution as most mothers had scores of 5 or higher (median=6). The number of older siblings of the infants in the study ranged from 0 to 13. The distribution of this variable was right- skewed as the infants generally had few older siblings (median=1). The household size of the respondents ranged from 2-25 members. This variable is also right-skewed, as the respondents lived in relatively smaller households (median=6).

<u>Associations with EIBF</u>

Without adjusting for confounding, visits by peer counselors during the prenatal period (cOR: 1.48; 95% CI: 1.16, 1.88) and membership in breastfeeding support groups (cOR: 1.56; 95% CI: 1.17, 2.08) were significantly associated with EIBF. Among the probable confounders being considered, place of residence, maternal age, monthly income, membership in 4Ps, mode of delivery, birth attendant, and place of delivery were all found to have strong evidence of association with EIBF. Maternal knowledge score and number of living older siblings were also found to be significantly associated with EIBF (Table 2).

Among the probable confounders, place of residence, maternal age, household size, number of older siblings alive, monthly income, mother's employment status, marital status, the combined variable of marital status and partner employment status, membership in 4Ps, birth attendant, and place of delivery were associated with visit by a peer counselor during the prenatal period (Additional File 1). Meanwhile, household size, number of older siblings alive, maternal age, and membership in 4Ps were all associated with membership in a breastfeeding support group (Additional File 2). Therefore, place of residence, maternal age, monthly income, membership in 4Ps, birth attendant, place of delivery, and number of living older siblings may confound the association between the exposure variables and EIBF. However, we forced other variables (e.g., maternal knowledge, mode of delivery, mother's employment status, and gender of child) into our regression model for EIBF because these variables were found to be important determinants of EIBF in the literature.

In building our final regression model, we used the combined variable for civil status and partner's employment status to minimize missing data. We also detected collinearity between place of delivery and birth attendant, so we combine place of delivery and birth

attendant, and used this combined variable in building our final regression model. To ensure that models were comparable during model-building, we excluded from the multivariable analyses some 316 observations with missing data in any of the remaining variables of interest. Thus, only 2,027 (87.5%) respondents were included in the final analysis.

In our final regression model for EIBF, there was a departure from the linearity assumption for maternal age (p=0.02) and monthly income (p<0.01). Stratum-specific aORs for these variables were presented in the tables. However, there was no evidence of interaction between prenatal visits by peer counselor and membership in breastfeeding in support groups on EIBF (p=0.20), thus we did not include interaction terms in our final models (Table 3). After adjusting for confounders, the odds of early initiation of breastfeeding is 1.32 (95% CI: 0.96, 1.80) times higher among mothers who were visited by a peer counselor during their prenatal period compared to those who were not visited. On the other hand, members of breastfeeding support groups have 49% greater odds (OR: 1.49; 95% CI: 1.12, 1.98) of initiating breastfeeding within one hour of child's birth compared to non-members of breastfeeding support groups. There was not enough evidence to show that visits by a peer counselor was associated with increased odds of EIBF, but there was strong evidence that membership in breastfeeding support groups was associated with EIBF.

Associations with EBF at six months

Without adjusting for confounding, visits by peer counselors during pregnancy increases the odds of EBF by 25% (cOR: 1.25; 95%CI: 0.08, 1.59), but the evidence for this association was not strong. Meanwhile, being a member of breastfeeding support groups (cOR: 1.74; 95% CI: 1.36, 2.24) and being visited by peer counselors after delivery (cOR: 1.38; 95% CI: 1.05, 1.82) is found to have strong evidence of association with EBF. Among the probable confounders considered, only birth attendant, household size, and EIBF were found to have strong evidence of association with EBF, while prenatal care provider was found to be borderline significant (Table 4).

Aside from the probable confounders that were identified to be associated with visits by a peer counselor during pregnancy, we also found the variables place of residence, prenatal care provider, and EIBF to be strongly associated with visits by a peer counselor after delivery (Additional File 3). Thus, birth attendant, household size, EIBF, and prenatal care provider satisfied the definition of a confounder and would thus be forced into the EBF model. Other known confounders from the literature, such as maternal civil status, mode of delivery, maternal age, number of older siblings, and monthly income, and employment status of mother, and sex of infant, were forced into the model as well. As with the modelling for EIBF, we use the combined variable of maternal marital status and employment of her partner, and the combined variable of place of delivery and birth attendant in modelling the association between receiving JP interventions and EBF. We also excluded from the regression analysis some 472 respondents with incomplete data in all the remaining variables of interest, thus our final sample for this analysis is 1,871 (80.6%).

In our final model for EBF, we note that there was no departure from the linearity assumption for age group (p=0.72) and monthly income (p=0.85); thus, only common odds ratios were reported. There was also no interaction between prenatal and postnatal peer counselor visits (p=0.46), as well as between prenatal peer counselor visits and membership in breastfeeding support groups (p=0.72), postnatal peer counselor visits and membership in breastfeeding support groups (p=0.73), and the three interventions (p=0.85) on EIBF. After adjusting for confounders, we report that there was no strong evidence that visits by peer counselors during pregnancy (aOR: 0.91; 95% CI: 0.68, 1.22) as well as visits after delivery (aOR: 1.26; 95% CI: 0.90, 1.75) were associated with EBF. However, being a member in breastfeeding support groups significantly increased the odds of EBF by 59% (aOR: 1.59; 95% CI: 1.21, 2.10) (Table 5).

Discussion

Our re-analysis of the Endline Survey data of the JP reveals that 63% of mothers breastfed within an hour after birth, and only 28% exclusively breastfed at six months, which are both below the DOH targets of 90% EIBF and 70% EBF. While there is no strong evidence that visits by a peer counselor during pregnancy and after delivery is associated with EIBF and EBF, there is strong evidence that membership in breastfeeding support groups is positively associated with both EIBF and EBF. Possible synergy (i.e., statistical interaction) between peer counselor visits and membership in BF support groups on EIBF and EBF are not detected. In other words, the effect of JP interventions on EIBF and EBF are probably independent of each other.

Home visits by a peer counselor are designed to encourage mothers to get adequate prenatal care and to advocate for them this early the positive effects of EIBF and EBF. The mothers are also coached by these peer counselors to continue breastfeeding exclusively up to six months after birth and to introduce quality complementary food only after six months and breastfeeding beyond two years after the child's birthday. Breastfeeding support groups, on the other hand, are organized in the communities to promote proper IYCF practices among the mothers with infants and children less than two years old. These support groups are supposed to encourage and support the mothers so they can initiate breastfeeding early, continue to breastfeed their infants exclusively until the baby is six months old. Together with proper complementary feeding, members of the support groups motivate each other to continue breastfeeding the babies up to two years and beyond, if possible, to maximize the positive effects of mothers' milk on young children.

From an implementation standpoint, one of the possible reasons for the lack of association between peer counselor visits and EIBF and/or EBF was the variability and inconsistency of how the peer counselors engaged with the mothers. This could be due to poor and/or inadequate training, and/or lack of clear guidelines on how to engage mothers enough to encourage them to initiate breastfeeding soon after birth and to exclusively breastfeed their infant for six months after birth. Notably, a fifth of the peer counselors mentioned that they have little or no knowledge on their roles and activities, while another one-third perceived themselves as having inadequate knowledge on what to do if a child is sick (15). In addition, only a small proportion of mothers, particularly those who were close to the peer counselors, had received more visits than other mothers in the community. These dynamics between peer counselors and mothers could explain in part why there was no strong association between peer counselor visits and EIBF or EBF.

For breastfeeding support groups, mothers probably perceived these get-togethers as time for recreation and socialization with other mothers in the community. In addition, mothers also looked forward to regular small group sessions where they can learn more about breastfeeding from their peers, which they could then share to their other friends in the community. Such enthusiastic responses may imply that support groups enjoyed greater acceptance than one-on-one sessions by peer counselors, which could be perceived as less interesting, even daunting for young and first-time mothers. This could explain why membership in breastfeeding support groups was effective in promoting both EIBF and EBF, while peer counselors only have marginal effectiveness. Notwithstanding the strong evidence of positive association with both EIBF and EBF, there were also some issues with the breastfeeding support groups as an intervention, such as implementation delays, issues in training and engagement, and non-mandatory participation. Unlike in peer counseling, where mothers were visited by trained peer counselor/s at home which mothers probably found hard to refuse, mothers were not required to actively participate during discussions in the breastfeeding support groups.

The importance of family- or community-based interventions to improve neonatal and child health cannot be overemphasized. Community-based interventions are shown to reduce all-cause neonatal mortality by 10-50% (39). However, studies assessing the effectiveness of these interventions are quite few and the findings often conflict with each other. A study in Vietnam did not find support groups effective in promoting optimal infant and young child feeding practices (40). Another study in India found that peer counselling sessions of mother support groups are effective in promoting both EIBF and EBF (41). A Cochrane review reported that there is no strong evidence to conclude that non-healthcare professional-led interventions, which include support groups and peer counsellors, have an effect in promoting EIBF (42), similar to what this study has found. The findings of both the Cochrane review and this study suggest that promoting EIBF could benefit from other ways of integrating non-healthcare professionals, such as peer counselors and breastfeeding support groups, within the system. This problem is not new; a 2005 review posited the following gaps in operations research for community-based interventions to promote child health: [a] how health workers, including non-healthcare professionals, could most effectively deliver the needed services for newborns and children at the community; [b] scope of service of community health workers; [c] ways to link community health workers with referral facilities to provide care for mothers and children; and [d] how community-based interventions can be managed sustainably (43). On the other hand, another review reported that interventions conducted by lay people, especially those providing emotional support and counseling, including services that are given during pregnancy and continued post-partum, have been reported to be associated with greater odds of EBF (44). The review concludes that effective interventions to promote EBF should have multiple components, should have a clear training protocol to engage both professionals and non-professionals health care providers, and should have continuity of service between the health facility and the community (44).

Among the main exposures of the study, it may be argued that the effect of prenatal visits by peer counselors on EIBF and the effect of peer counselor visits after delivery on EBF is of borderline significance, and the weak insignificant association could be due to low statistical power of the study. However, this is unlikely as the study had enough number of respondents considering that there was a sufficient number of respondents with the outcome of interest, according to the 'rule-of-10' (45). This is further evidenced by the narrow confidence intervals of the aORs of the main associations of interest. However, the same cannot be said for tests of statistical interactions, which are notorious for having low statistical power (46). This partly explains the absence of a statistically significant effect of the hypothesized interaction between the various JP interventions on either EIBF or EBF .

In measuring the effectiveness of community interventions, such as the effect of visits by a peer counselor or membership in breastfeeding support groups on EIBF, a cluster randomized trial would be a better design to use (47). However, since the main objective of the Joint Program was to decrease the prevalence of undernutrition and improve the prevalence of optimal breastfeeding practices, and not to assess the effectiveness of interventions, a before-and-after evaluation design using a series of two cross-sectional studies was used. As a result, reverse causality may adversely affect the internal validity of this analysis, which is inherent in cross-sectional study designs (48). While this may not a problem in assessing the relationship of peer counselors and EIBF, the same cannot be said of the association between membership in BF support groups and EBF since each one can affect the other. There were problems in measuring the confounders since some of them, like level of maternal knowledge, may change with time.

Selection bias is also a threat to the internal validity of this study. At the design stage, we excluded some 44 barangays in Zamboanga City for security reasons. If there were systematic differences in the mother-infant dyads in these areas relative to the mother-infant pairs included in the study, there could be a selection bias. We also excluded some 10-20% of observations due to missing data, which could also be a source of selection bias. In addition, this analysis utilized self-reported data, thus the findings of the study are only as good as the reports of the mothers who took part in the study. Mothers of relatively older infants may be less likely to provide accurate recall as compared to mothers of younger infants and/or newborns (49).

Another limitation of this study is residual confounding. The Endline Survey did not have any data on the educational status of the mother and opinion of other family members, which were shown to be important determinants of EIBF (27). We also did not have data on some maternal variables such as HIV status, smoking status, and religion, which were also reported to be associated with EBF (28–33). In addition, the Endline Survey did not have data on the number of visits of peer counselors, as well as the number of sessions held by the breastfeeding support groups, which prevented us from describing more accurately what exactly goes on during peer counseling visits and during BF support group meetings. This information gap also prevented us from exploring possible dose-response relationships between the JP interventions and the outcome variables. Despite this, we controlled for the effect of other important confounders like mode of delivery, maternal age, number of living older siblings, place of delivery and birth attendant. In the cross-tabulations, the two exposures of interest were initially strongly associated with EIBF but were later found to be weakly associated with the outcome after adjusting for confounding. Other variables, such as place of residence, were important determinants of EIBF in the literature (27), and from the results of the cross-tabulations, they were observed to confound the associations of interest. In the final model, however, their confounding effects on the outcome were already controlled. This implies that there could be context-specific determinants of EIBF, which our data failed to capture (18,50).

Recommendations

There is strong evidence that membership in breastfeeding support groups is strongly associated with EIBF and EBF. Thus, local governments and communities should consider improving its implementation in order to reach EIBF and EBF targets. Having a good training design for community volunteers and having regular sessions may make BF support groups more effective in increasing the practice of EIBF and EBF throughout the Philippines. Meanwhile, the role of peer counselors in promoting EIBF and EBF remains unclear. However, we believe they still have a significant role to play in promoting EIBF and EBF among mothers. We recommend that peer counselors should have clear messages to deliver to target mothers - that is, to encourage pregnant mothers to see trained healthcare professionals like midwives and nurses, who were reported to be more effective in promoting EIBF and EBF (42,44). In doing so, they are also encouraging the mothers to have antenatal care visits, which would result to better outcomes for both the mother and the child (51). Setting performance targets coupled with close supervision, salaries or incentives are necessary to institutionalize grassroots-level interventions to promote optimal breastfeeding practices. Introduction of such

interventions should be supported by political will on the side of government, financing, partnerships between local and external stakeholders, and logistic support to further ensure smooth implementation (52).

The suggestion to integrate non-healthcare professionals in efforts to promote EIBF and EBF could be tested further in future intervention studies. Operations research can address various information gaps on child health which could be addressed by doing community trials (53). This has been emphasized by the Cochrane review which concluded that current evidence on the effectiveness of non-healthcare professional-led interventions on EIBF are few and of very poor quality (42). Thus, methodologically-sound studies to assess the effectiveness of peer counselors and/or support groups in promoting optimal breastfeeding behaviors are still needed. The need for more research on this topic to influence policies and programs is demonstrated by the low EIBF and EBF rates worldwide, including the Philippines (6).

Conclusions

After adjusting for confounders, we find that being visited by a peer counselor during pregnancy is not associated with EIBF. We also find that visits by peer counselors during pregnancy and postpartum is not associated with EBF at six months. However, we find that membership in breastfeeding support groups are associated with both EIBF and EBF. This study potentially demonstrates how we can improve the prevalence of EIBF and EBF in the country to meet targets. These findings suggest the institutionalization of breastfeeding support groups in local communities to promote EIBF and EBF in the country. The role peer counselors play in promoting EIBF and EBF can be reviewed so as to make them more effective in promoting the desired behaviors among target mothers in the community.

List Of Abbreviations

EIBF – Early initiation of breastfeeding

EBF – Exclusive breastfeeding at six months of age

IYCF – Infant and young child feeding

JP – Millennium Development Goals Achievement Fund – Joint Programme on Ensuring Food Security and Nutrition for Children 0-24 months old in the Philippines

DOH – Department of Health (Philippines)

OR – Odds Ratio

cOR – crude odds ratio

aOR – adjusted odds ratio

WHO – World Health Organization

Declarations

Ethics approval and consent to participate

The study received ethical approval from the research ethics committees of the three institutions: Bicol Medical Center, Western Visayas Health Research and Development Consortium, and the Zamboanga Consortium for Health Research and Development.

Consent for publication

The participants consented to the publication and dissemination of study findings.

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author (opsaniel@up.edu.ph) on reasonable request.

Competing interests

The authors have no competing interests to declare.

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Author's contributions

OPS conceptualized the study with the project's senior investigators and acquired funding. OPS, with the assistance of the entire project staff, carried out the investigation and supervision of the entire study. VCFP, and AMLA were responsible for data curation, validation, and data analyses. VCFP and AMLA wrote the first draft of the paper. OPS reviewed and edited the manuscript. All authors approved the final version of the manuscript.

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References

1. Victora CG, Bahl R, Barros AJ, França GV, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387(10017):475–490.
2. Smith ER, Hurt L, Chowdhury R, Sinha B, Fawzi W, Edmond KM, et al. Delayed breastfeeding initiation and infant survival: A systematic review and meta-analysis. PLOS ONE. 2017 Jul 26;12(7):e0180722.
3. Khan J, Vesel L, Bahl R, Martines JC. Timing of breastfeeding initiation and exclusivity of breastfeeding during the first month of life: effects on neonatal mortality and morbidity–a systematic review and meta-analysis. Matern Child Health J. 2015 Mar;19(3):468–79.
4. UNICEF, WHO. Capture the moment: early initiation of breastfeeding: The best start for every newborn. 2018 [cited 2020 Apr 26]. Available from: https://www.unicef.org/publications/index_102949.html
5. Edmond KM, Zandoh C, Quigley MA, Amenga-Etego S, Owusu-Agyei S, Kirkwood BR. Delayed breastfeeding initiation increases risk of neonatal mortality. Pediatrics. 2006 Mar;117(3):e380-386.
6. Takahashi K, Ganchimeg T, Ota E, Vogel JP, Souza JP, Laopaiboon M, et al. Prevalence of early initiation of breastfeeding and determinants of delayed initiation of breastfeeding: secondary analysis of the WHO Global Survey. Sci Rep. 2017 Mar 21 [cited 2019 Apr 26];7. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5359598/
7. Matanda DJ, Mittelmark MB, Urke HB, Amugsi DA. Reliability of demographic and socioeconomic variables in predicting early initiation of breastfeeding: a replication analysis using the Kenya Demographic and Health Survey data. BMJ Open. 2014 Jun 17 [cited 2020 Apr 25];4(6). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4067828/
8. World Health Organization - Western Pacific Region, Department of Health (Philippines). Breastfeeding in the Philippines: A critical review 2013. 2015. Available from: https://apps.who.int/iris/rest/bitstreams/1147683/retrieve
9. Dewey KG, Cohen RJ, Brown KH, Rivera LL. Effects of Exclusive Breastfeeding for Four versus Six Months on Maternal Nutritional Status and Infant Motor Development: Results of Two Randomized Trials in Honduras. J Nutr. 2001 Feb 1;131(2):262–7.

10. Jedrychowski W, Perera F, Jankowski J, Butscher M, Mroz E, Flak E, et al. Effect of exclusive breastfeeding on the development of children's cognitive function in the Krakow Prospective Birth Cohort Study. Eur J Pediatr. 2012 Jan;171(1):151–8.
11. Nigatu D, Azage M, Motbainor A. Effect of exclusive breastfeeding cessation time on childhood morbidity and adverse nutritional outcomes in Ethiopia: Analysis of the demographic and health surveys. PLOS ONE. 2019 Oct 2;14(10):e0223379.
12. Dieterich CM, Felice JP, O'Sullivan E, Rasmussen KM. Breastfeeding and Health Outcomes for the Mother-Infant Dyad. Pediatr Clin North Am. 2013 Feb;60(1):31–48.
13. UNICEF. From the first hour of life - Making the case for improved infant and young child feeding everywhere. 2016. Available from: https://www.unicef.org/publications/index_93027.html
14. Philippine Statistics Authority [Philippines], ICF International. National Demographic and Health Survey (Philippines) 2013. 2014. Available from: https://dhsprogram.com/pubs/pdf/fr294/fr294.pdf
15. Chiwara R, Villate E. Final Evaluation of the Joint Programme: Ensuring Food Security and Nutrition for Children 0-24 Months in the Philippines (MDG-F 2030). 2013 [cited 2020 Nov 8]. Available from: https://www.unicef.org/evaldatabase/files/Philippines_2013-001_Final_report__MDGF_2030__22072013.pdf
16. Pastores MC, Sanguyo JD, Garg A, Parreno M, Kitong J, Vega ML. Ensuring food security and nutrition for children 0-24 months old in the Philippines. 2015. Available from: http://www.unscn.org/files/UNSCN_Meeting_Bangkok_2015/DAY_2_Morning_Philippines_Joint_Nutrition_Programming_MDG-F_Maria_Cecilia_Pastores.pdf
17. Adugna DT. Women's perception and risk factors for delayed initiation of breastfeeding in Arba Minch Zuria, Southern Ethiopia. Int Breastfeed J. 2014;9:8.
18. Ahmed AE, Salih OA. Determinants of the early initiation of breastfeeding in the Kingdom of Saudi Arabia. Int Breastfeed J. 2019;14:13.
19. Adhikari M, Khanal V, Karkee R, Gavidia T. Factors associated with early initiation of breastfeeding among Nepalese mothers: further analysis of Nepal Demographic and Health Survey, 2011. Int Breastfeed J. 2014;9:21.
20. Victor R, Baines SK, Agho KE, Dibley MJ. Determinants of breastfeeding indicators among children less than 24 months of age in Tanzania: a secondary analysis of the 2010 Tanzania Demographic and Health Survey. BMJ Open. 2013;3(1):e001529.
21. Heck KE, Braveman P, Cubbin C, Chávez GF, Kiely JL. Socioeconomic Status and Breastfeeding Initiation Among California Mothers. Public Health Rep. 2006;121(1):51–9.
22. Lindberg LD. Women's Decisions about Breastfeeding and Maternal Employment. J Marriage Fam. 1996;58(1):239–51.
23. Khan GN, Ariff S, Khan U, Habib A, Umer M, Suhag Z, et al. Determinants of infant and young child feeding practices by mothers in two rural districts of Sindh, Pakistan: a cross-sectional survey. Int Breastfeed J. 2017;12:40.
24. Kornides M, Kitsantas P. Evaluation of breastfeeding promotion, support, and knowledge of benefits on breastfeeding outcomes. J Child Health Care. 2013 Sep;17(3):264–73.
25. Yılmaz E, Doğa Öcal F, Vural Yılmaz Z, Ceyhan M, Kara OF, Küçüközkan T. Early initiation and exclusive breastfeeding: Factors influencing the attitudes of mothers who gave birth in a baby-friendly hospital. Turk J Obstet Gynecol. 2017 Mar;14(1):1–9.
26. Ulep VGT, Borja MP. Association between pregnancy intention and optimal breastfeeding practices in the Philippines: a cross-sectional study. BMC Pregnancy Childbirth. 2012;12:69.
27. Sharma IK, Byrne A. Early initiation of breastfeeding: a systematic literature review of factors and barriers in South Asia. Int Breastfeed J. 2016 Jun 18 [cited 2019 Apr 26];11. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4912741/
28. Alzaheb RA. A Review of the Factors Associated With the Timely Initiation of Breastfeeding and Exclusive Breastfeeding in the Middle East: Clin Med Insights Pediatr. 2017 Dec 17 [cited 2020 Nov 2]; Available from: https://journals.sagepub.com/doi/10.1177/1179556517748912?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed
29. Elyas L, Mekasha A, Admasie A, Assefa E. Exclusive Breastfeeding Practice and Associated Factors among Mothers Attending Private Pediatric and Child Clinics, Addis Ababa, Ethiopia: A Cross-Sectional Study. Int J Pediatr. 2017 [cited 2020 Nov 2];2017. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5733181/

30. Kandeel WA, Rabah TM, Zeid DA, El-Din EMS, Metwally AM, Shaalan A, et al. Determinants of Exclusive Breastfeeding in a Sample of Egyptian Infants. Open Access Maced J Med Sci. 2018 Oct 2;6(10):1818–23.
31. Mundagowa PT, Chadambuka EM, Chimberengwa PT, Mukora-Mutseyekwa F. Determinants of exclusive breastfeeding among mothers of infants aged 6 to 12 months in Gwanda District, Zimbabwe. Int Breastfeed J. 2019;14:30.
32. Rahman MA, Khan MN, Akter S, Rahman A, Alam MM, Khan MA, et al. Determinants of exclusive breastfeeding practice in Bangladesh: Evidence from nationally representative survey data. PLOS ONE. 2020 Jul 15;15(7):e0236080.
33. Balogun OO, Dagvadorj A, Anigo KM, Ota E, Sasaki S. Factors influencing breastfeeding exclusivity during the first 6 months of life in developing countries: a quantitative and qualitative systematic review. Matern Child Nutr. 2015;11(4):433–51.
34. Abada TSJ, Trovato F, Lalu N. Determinants of breastfeeding in the Philippines: a survival analysis. Soc Sci Med. 2001 Jan;52(1):71–81.
35. Pantawid Pamilya. 2019 [cited 2019 Apr 29]. Available from: https://pantawid.dswd.gov.ph/
36. Clayton D, Hills M. Statistical Models in Epidemiology. 1st ed. Oxford University Press; 1993.
37. UCLA Statistical Consulting Group. Survey Data Analysis with Stata 15. [cited 2019 Apr 29]. Available from: https://stats.idre.ucla.edu/stata/seminars/survey-data-analysis-with-stata-15/
38. Stata/IC. College Station, TX: StataCorp; 2015.
39. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L, et al. Evidence-based, cost-effective interventions: how many newborn babies can we save? Lancet. 2005 Mar 12;365(9463):977–88.
40. Rana MM, Ngoc HNV and TN. Effectiveness of a community-based infant and young child feeding support group programme among ethnic minorities in Vietnam. Field Exchange 58. 2018 Jan 9;71.
41. Kushwaha KP, Sankar J, Sankar MJ, Gupta A, Dadhich JP, Gupta YP, et al. Effect of Peer Counselling by Mother Support Groups on Infant and Young Child Feeding Practices: The Lalitpur Experience. PLoS One. 2014 Nov 4 [cited 2020 Nov 9];9(11). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4219670/
42. Balogun OO, O'Sullivan EJ, McFadden A, Ota E, Gavine A, Garner CD, et al. Interventions for promoting the initiation of breastfeeding. Cochrane Database Syst Rev. 2016 09;11:CD001688.
43. Bhutta ZA, Darmstadt GL, Hasan BS, Haws RA. Community-Based Interventions for Improving Perinatal and Neonatal Health Outcomes in Developing Countries: A Review of the Evidence. Pediatrics. 2005 Feb 1;115(Supplement 2):519–617.
44. Kim SK, Park S, Oh J, Kim J, Ahn S. Interventions promoting exclusive breastfeeding up to six months after birth: A systematic review and meta-analysis of randomized controlled trials. Int J Nurs Stud. 2018 Apr;80:94–105.
45. Vittinghoff E, McCulloch CE. Relaxing the Rule of Ten Events per Variable in Logistic and Cox Regression. Am J Epidemiol. 2007 Mar 15;165(6):710–8.
46. Marshall SW. Power for tests of interaction: effect of raising the Type I error rate. Epidemiol Perspect Innov. 2007 Jun 19;4:4.
47. Stoney CM, Johnson LL. Chapter 18 - Design of Clinical Trials and Studies. In: Gallin JI, Ognibene FP, Johnson LL, editors. Principles and Practice of Clinical Research (Fourth Edition). Boston: Academic Press; 2018 [cited 2019 Apr 30]. p. 249–68. Available from: http://www.sciencedirect.com/science/article/pii/B9780128499054000186
48. Marquis G, Habicht J, Lanata C, Black R, Rasmussen K. Association of breastfeeding and stunting in Peruvian toddlers: an example of reverse causality. Int J Epidemiol. 1997 Apr 1;26(2):349–56.
49. Agampodi SB, Fernando S, Dharmaratne SD, Agampodi TC. Duration of exclusive breastfeeding; validity of retrospective assessment at nine months of age. BMC Pediatr. 2011 Sep 14;11:80.
50. Exavery A, Kanté AM, Hingora A, Phillips JF. Determinants of early initiation of breastfeeding in rural Tanzania. Int Breastfeed J. 2015 Sep 25 [cited 2019 Apr 30];10. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4582933/
51. Kuhnt J, Vollmer S. Antenatal care services and its implications for vital and health outcomes of children: evidence from 193 surveys in 69 low-income and middle-income countries. BMJ Open. 2017 Nov 15 [cited 2019 Jun 8];7(11). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5695442/
52. Sanghvi T, Martin L, Hajeebhoy N, Abrha TH, Abebe Y, Haque R, et al. Strengthening Systems to Support Mothers in Infant and Young Child Feeding at Scale. Food Nutr Bull. 2013 Sep 1;34(3_suppl2):S156–68.

53. Schiffman J, Darmstadt GL, Agarwal S, Baqui AH. Community-based intervention packages for improving perinatal health in developing countries: a review of the evidence. Semin Perinatol. 2010 Dec;34(6):462–76.

Tables

Table 1. Characteristics of the study participants (n=2,343).

Variable/Category	Frequency (%)
Visit by a peer counselor during prenatal period	
No	1,817 (75.5)
Yes	502 (23.5)
Missing	24 (1.0)
Visit by a peer counselor after delivery	
No	1,797 (71.1)
Yes	532 (28.5)
Missing	14 (0.4)
Membership in breastfeeding support groups	
No	1,683 (66.3)
Yes	650 (33.4)
Missing	10 (0.3)
Place of residence	
Urban area	2,091 (77.6)
Rural area	252 (22.4)
Age of mother in years	
15-19	179 (7.2)
20-24	634 (26.8)
25-29	634 (25.3)
30-34	521 (23.9)
35-39	246 (10.9)
40-50	120 (5.6)
Missing	9 (0.4)
Monthly income (PhP)	
0 – 3,800	469 (21.3)
3,801 – 5,999	411 (16.6)
6,000 – 8,999	524 (21.0)

9,000 – 15,999	480 (20.8)
16,000+	459 (20.4)
Employment status of mother	
Employed	2,167 (92.3)
Unemployed	176 (7.7)
Employment status of partner	
Employed	2,096 (88.7)
Unemployed	85 (3.8)
Missing/Not applicable	162 (7.5)
Marital status	
Married/Living together	2,176 (92.2)
Never married/separated/divorced/widowed	163 (7.6)
Missing	4 (0.2)
Combined variable for marital status and employment status of partner	
Single mother	163 (7.6)
Has employed partner/spouse	2,090 (88.4)
Has unemployed partner/spouse	85 (3.8)
Missing	5 (0.2)
Membership in a conditional cash incentive program of the government (4Ps)	
No	1,853 (76.8)
Yes	487 (23.1)
Missing	3 (0.1)
Prenatal care provider	
Doctor/Nurse/Midwife	2,271 (96.3)
None/Traditional Birth Attendant	61 (3.5)
Missing	11 (0.3)
Mode of delivery	
Normal	2,139 (90.8)

Caesarean/other	195 (8.6)
Missing	9 (0.7)
Birth attendant	
Skilled	1,805 (75.4)
Traditional birth attendant/none/self/relatives/underboard midwife	512 (23.7)
Missing	26 (0.9)
Place of delivery	
Home-based	667 (32.2)
Government healthcare facility	1,434 (57.4)
Private healthcare facility	225 (9.6)
Missing	17 (0.8)
Gender of child	
Boy	1,182 (51.5)
Girl	1,161 (48.5)
Initiation of breastfeeding	
Late	763 (35.2)
Early	1,500 (63.1)
Missing	80 (1.7)
Exclusive breastfeeding	
Less than or more than six months	1,475 (63.2)
For six months	624 (27.9)
Missing	244 (9.0)

Table 2. Cross-tabulations and crude odds ratios of exposure and probable confounding variables with initiation of breastfeeding.

Variable/Category	Initiation of breastfeeding			p-value	Crude OR (95% CI)	p-value of crude OR
Visit by a peer counselor during prenatal period	Late	Early	Missing	<0.01		
No	611 (37.3)	1,138 (60.8)	68 (1.9)		1 (baseline)	
Yes	147 (29.1)	346 (70.1)	9 (0.1)		1.48 (1.16, 1.88)	<0.01
Missing	5 (21.6)	16 (76.2)	3 (2.1)			
Membership in breastfeeding support groups				<0.01		
No	580 (38.4)	1,032 (59.6)	71 (2.0)		1 (baseline)	
Yes	181 (29.0)	463 (70.1)	6 (0.9)		1.56 (1.17, 2.08)	<0.01
Missing	2 (17.0)	5 (74.9)	3 (8.10)			
Place of residence				0.03		
Urban area	707 (38.1)	1,304 (59.8)	80 (2.1)		1 (baseline)	
Rural area	56 (25.3)	196 (74.8)	0 (0.0)		1.89 (1.06, 3.35)	0.03
Age of mothers in years				<0.01		
15-19	52 (32.3)	119 (65.2)	8 (2.5)		1 (baseline)	

20-24	214 (37.0)	402 (61.5)	18 (1.5)		0.82 (0.58, 1.16)	0.26
25-29	193 (33.3)	426 (65.9)	15 (0.7)		0.98 (0.68, 1.40)	0.91
30-34	197 (41.8)	303 (56.2)	21 (2.0)		0.67 (0.46, 0.95)	0.03
35-39	65 (24.2)	170 (72.8)	11 (2.9)		1.49 (0.96, 2.32)	0.08
40-50	40 (32.9)	75 (65.8)	5 (1.3)		0.99 (0.58, 1.69)	0.97
Missing	2 (22.9)	5 (73.9)	2 (3.2)			
Monthly income (PhP)				<0.01		
0 – 3,800	129 (30.6)	322 (67.4)	18 (2.0)		1 (baseline)	
3,801 – 5,999	110 (27.1)	287 (72.0)	14 (0.9)		1.21 (0.76, 1.92)	0.42
6,000 – 8,999	185 (39.4)	322 (58.8)	17 (1.8)		0.68 (0.47, 0.97)	0.04
9,000 – 15,999	152 (34.4)	311 (64.1)	17 (1.6)		0.85 (0.59, 1.21)	0.36
16,000+	187 (43.2)	258 (55.0)	14 (1.8)		0.58	<0.01

					(0.40, 0.84)	
Employment status of mother				0.97		
Employed	701 (35.2)	1,392 (63.1)	74 (1.7)		1 (baseline)	
Unemployed	62 (35.3)	108 (63.6)	6 (1.1)		1.01 (0.70, 1.44)	0.97
Employment status of partner				0.46		
Employed	681 (35.6)	1,343 (62.8)	72 (1.7)		1 (baseline)	
Unemployed	33 (40.4)	50 (58.7)	2 (0.9)		0.82 (0.48, 1.40)	0.46
Missing/Not applicable	49 (29.0)	107 (69.1)	6 (1.9)			
Marital status				0.20		
Married/Living together	712 (35.7)	1,390 (62.6)	74 (1.6)		1 (baseline)	
Never married/ separated/divorced/ widowed	50 (29.7)	107 (68.5)	6 (1.8)		1.31 (0.86, 2.01)	0.20
Missing	1 (2.7)	3 (97.3)	0 (0.0)			
Combined variable for civil status and employment status of partner				0.32		
Single mother	50 (29.7)	107 (68.5)	6 (1.8)		1 (baseline)	
Has employed partner/ spouse	679 (35.6)	1,339 (62.8)	72 (1.7)		0.77	0.21

					(0.51, 1.16)	
Has unemployed partner/spouse	33 (40.4)	50 (58.7)	2 (0.9)		0.63 (0.29, 1.36)	0.23
Missing	1 (2.1)	4 (97.9)	0 (0.0)			
Membership in 4Ps				0.04		
No	614 (36.7)	1,171 (61.5)	68 (1.9)		1 (baseline)	
Yes	148 (30.2)	327 (68.9)	12 (1.0)		1.36 (1.00, 1.84)	0.05
Missing	1 (58.6)	2 (41.4)	0 (0.0)			
Prenatal care provider				0.75		
Doctor/Nurse/Midwife	741 (35.4)	1,457 (63.1)	73 (1.6)		1 (baseline)	
None/Traditional Birth Attendant	20 (32.3)	37 (63.7)	4 (4.0)		1.11 (0.60, 2.04)	0.75
Missing	2 (16.0)	6 (76.4)	3 (7.6)			
Mode of delivery				<0.01		
Normal	627 (32.0)	1,446 (66.7)	66 (1.4)		1 (baseline)	
Caesarean/other	132 (68.9)	49 (26.8)	14 (4.3)		0.19 (0.12, 0.28)	<0.01
Missing	4	5	0			

	(42.2)	(57.8)	(0.0)			
Birth attendant				0.02		
Skilled	606 (37.1)	1,137 (61.0)	62 (1.9)		1 (baseline)	
Traditional birth attendant/none/self/ relatives/underboard midwife	149 (29.1)	348 (69.9)	15 (0.9)		1.46 (1.07, 1.99)	0.02
Missing	8 (37.8)	15 (59.9)	3 (2.3)			
Place of delivery				<0.01		
Home-based	192 (28.5)	456 (70.6)	19 (1.0)		1 (baseline)	
Government healthcare facility	462 (36.7)	926 (61.8)	46 (1.6)		0.68 (0.51, 0.91)	<0.01
Private healthcare facility	103 (47.9)	110 (57.9)	12 (4.3)		0.40 (0.27, 0.60)	<0.01
Missing	6 (51.2)	8 (46.4)	3 (2.4)			
Gender of child				0.72		
Boy	381 (34.7)	763 (63.6)	38 (1.8)		1.00 (baseline)	
Girl	382 (35.8)	737 (62.7)	42 (1.5)		0.96 (0.75, 1.22)	0.71
Month when prenatal care was first availed				0.70[a]	1.05[b]	0.17

					(0.98, 1.13)	
Maternal knowledge score				<0.01[a]	1.33[b] (1.19, 1.48)	<0.01
Number of older siblings				0.01[a]	1.07[b] (1.01, 1.15)	0.03
Household size				0.99[a]	1.00[b] (0.97, 1.04)	0.82

[a] p-value from Wilcoxon rank-sum test

[b] common odds ratio showing increase in odds per unit increase in level of the variable.

Table 3. Association of peer counselor visits during prenatal period and membership in breastfeeding support groups with early initiation of breastfeeding, adjusting for confounding (n=2,027).

Variable/Category	aOR and 95% CI	p-value
Visit by a peer counselor during pre-natal period		
No	1 (baseline)	
Yes	1.32 (0.96, 1.80)	0.08
Membership in breastfeeding support groups		
No	1 (baseline)	
Yes	1.49 (1.12, 1.98)	<0.01
Age group		
15-19	1 (baseline)	
20-24	0.85 (0.55, 1.30)	0.44
25-29	1.08 (0.66, 1.77)	0.74
30-34	0.71 (0.41, 1.24)	0.23
35-39	1.23 (0.68, 2.24)	0.48
40-50	0.81 (0.39, 1.68)	0.22
Monthly income		
0 – 3,800	1 (baseline)	
3,801 – 5,999	1.41 (0.89-, 2.23)	0.14
6,000 – 8,999	0.83 (0.60, -1.15)	0.26
9,000 – 15,999	1.16 (0.78, -1.72)	0.46
16,000+	0.83 (0.61, -1.13)	0.22
Combined variable for place of delivery and birth attendant		
Home birth; skilled birth attendant	1 (baseline)	
Home birth; unskilled birth attendant	0.73 (0.40, 1.34)	0.31
Government healthcare facility birth; skilled birth attendant	0.84 (0.51, 1.38)	0.49
Private healthcare facility birth; skilled birth attendant	0.61 (0.30, 1.24)	0.17
Number of living older siblings of the index child (common odds ratio)	1.04 (0.95, 1.13)	0.40
Maternal knowledge score (common odds ratio)	1.30 (1.13, 1.49)	<0.01
Mode of delivery		

Normal	1 (baseline)	
Caesarean/other	0.20 (0.13, 0.32)	<0.01
Place of residence		
Urban	1 (baseline)	
Rural	1.54 (0.90, 2.62)	0.11
Employment status of mother		
Employment	1 (baseline)	
Unemployment	0.97 (0.68,1.38)	0.86
Sex of child		
Boy	1 (baseline)	
Girl	1.07 (0.82, 1.39)	0.63

Table 4. Cross-tabulations and crude odds ratios of exposure and probable confounding variables with exclusive breastfeeding at six months.

Variable/Category	Exclusive breastfeeding at six months			p-value	Crude OR (95% CI)	p-value of crude OR
Visit by a peer counselor during prenatal period	No	Yes	Missing	0.07		
No	1,153 (64.1)	472 (27.0)	192 (8.9)		1 (baseline)	
Yes	306 (59.5)	148 (31.3)	48 (9.2)		1.25 (0.98, 1.59)	0.07
Missing	16 (75.6)	4 (14.8)	4 (9.6)			
Membership in breastfeeding support groups				<0.01		
No	1,093 (67.3)	412 (24.5)	178 (8.3)		1 (baseline)	
Yes	376 (54.9)	211 (34.7)	63 (10.4)		1.74 (1.36, 2.24)	<0.01
Missing	6 (75.1)	1 (16.8)	3 (8.1)			
Visited by a peer counselor after delivery				0.02		
No	1,154 (65.2)	458 (26.2)	185 (8.6)		1 (baseline)	
Yes	313 (58.0)	164 (32.2)	55 (9.8)		1.38 (1.05, 1.82)	0.02
Missing	8 (72.7)	2 (11.3)	4 (16.0)			
Place of residence				0.08		
Urban area	1,346 (65.4)	534 (26.2)	211 (8.4)		1 (baseline)	
Rural area	129	90	33		1.51	0.08

	(55.3)	(33.5)	(11.2)		(0.95, 2.40)	
Age of mothers in years				0.58		
15-19	124 (69.6)	38 (22.5)	17 (8.0)		1 (baseline)	
20-24	389 (62.7)	171 (27.6)	74 (9.8)		1.36 (0.82, 2.26)	0.22
25-29	409 (63.4)	169 (28.8)	56 (7.8)		1.41 (0.84, 2.37)	0.20
30-34	321 (61.5)	144 (28.9)	56 (9.6)		1.45 (0.86-, 2.47)	0.16
35-39	144 (59.1)	73 (30.2)	29 (10.6)		1.58 (0.91,- 2.75)	0.10
40-50	82 (69.8)	28 (24.1)	10 (6.2)		1.07 (0.59, -1.95)	0.82
Missing	6 (83.3)	1 (13.5)	2 (3.2)			
Monthly income (PhP)				0.11		
0 – 3,800	283 (59.9)	133 (30.9)	53 (9.1)		1 (baseline)	
3,801 – 5,999	238 (59.4)	125 (30.2)	48 (10.4)		0.98 (0.72, 1.35)	0.92
6,000 – 8,999	331 (62.7)	149 (30.4)	44 (6.8)		0.94 (0.64, 1.38)	0.75
9,000 – 15,999	314 (65.8)	117 (24.0)	49 (10.2)		0.71 (0.52, 0.97)	0.03
16,000+	309 (67.3)	100 (24.1)	50 (8.6)		0.70 (0.45, 1.07)	0.10

Employment status of mother				0.91		
Employed	1,362 (63.1)	581 (27.8)	224 (9.0)		1 (baseline)	
Unemployed	113 (63.2)	43 (28.5)	20 (8.2)		1.02 (0.69, 1.52)	0.91
Employment status of partner				0.51		
Employed	1,316 (62.8)	559 (27.9)	221 (9.3)		1 (baseline)	
Unemployed	52 (60.4)	25 (32.2)	8 (7.4)		1.20 (0.69, 2.09)	0.51
Missing/Not applicable	107 (68.3)	40 (25.3)	15 (6.5)			
Marital status				0.27		
Married/Living together	1,364 (62.7)	583 (28.1)	229 (9.2)		1 (baseline)	
Never married/ separated/divorced/ widowed	108 (68.9)	40 (24.7)	15 (6.4)		0.80 (0.54, 1.19)	0.27
Missing	3 (52.1)	1 (47.9)	0 (0.0)			
Combined variable for civil status and employment status of partner				0.76		
Single mother	108 (68.9)	40 (24.7)	15 (6.4)		1 (baseline)	
Has employed partner/ spouse	1,311 (62.8)	558 (27.9)	221 (9.3)		1.24 (0.83, 1.84)	0.28
Has unemployed partner/spouse	52 (60.4)	25 (32.2)	8 (7.4)		1.49 (0.77, 2.88)	0.24
Missing	4	1	0			

	(63.7)	(36.3)	(0.0)			
Membership in 4Ps				0.22		
No	1,191 (64.1)	472 (27.1)	190 (8.7)		1 (baseline)	
Yes	283 (60.2)	151 (30.3)	53 (9.5)		1.19 (0.90, 1.58)	0.22
Missing	1 (14.7)	1 (26.7)	1 (58.6)			
Prenatal care provider				0.05		
Doctor/Nurse/Midwife	1,424 (62.7)	614 (28.4)	233 (9.0)		1 (baseline)	
None/Traditional Birth Attendant	44 (76.1)	9 (15.0)	8 (8.9)		0.44 (0.19, =1.00)	0.05
Missing	7 (76.5)	1 (15.8)	3 (7.6)			
Mode of delivery				0.29		
Normal	1,340 (62.8)	578 (28.3)	221 (9.0)		1 (baseline)	
Caesarean/other	129 (66.6)	43 (23.7)	23 (9.6)		0.79 (0.51, 1.23)	0.29
Missing	6 (72.8)	3 (27.2)	0 (0.0)			
Birth attendant				0.01		
Skilled	1,146 (64.7)	471 (26.2)	188 (9.2)		1 (baseline)	
Traditional birth attendant/none/self/ relatives/underboard	314 (58.2)	147 (33.4)	51 (8.4)		1.42 (1.08, 1.87)	0.01

midwife						
Missing	15 (68.2)	8 (25.8)	5 (6.0)			
Place of delivery				0.43		
Home-based	415 (61.6)	187 (30.4)	65 (8.1)		1 (baseline)	
Government healthcare facility	899 (64.1)	386 (26.8)	149 (9.1)		0.85 (0.63, 1.14)	0.27
Private healthcare facility	151 (63.1)	47 (25.0)	27 (11.9)		0.80 (0.51-, 1.27)	0.34
Missing	10 (63.2)	4 (37.8)	3 (2.4)			
Gender of child				0.58		
Boy	750 (63.1)	308 (26.9)	124 (10.1)		1 (baseline)	
Girl	725 (63.3)	316 (28.9)	120 (7.9)		1.07 (0.84, 1.37)	0.58
Early initiation of breastfeeding				<0.01		
Late	562 (73.5)	153 (20.7)	48 (5.9)		1 (baseline)	
Early	912 (59.0)	471 (32.6)	117 (8.4)		1.97 (1.41, 2.75)	<0.01
Missing	1 (2.5)	0 (0.0)	79 (97.5)			
Month when prenatal care was first availed				0.14	0.96 (0.89-, 1.04)	0.32
Maternal knowledge score				0.25	1.08 (0.96, 1.21)	0.18

Number of older siblings				0.19	1.02 (0.96, 1.09)	0.50
Household size				0.04	0.94 (0.90, 0.99)	0.03

[a] p-value from Wilcoxon rank-sum test

[b] common odds ratio showing increase in odds per unit increase in level of the variable.

Table 5. Association of peer counselor visits during prenatal period, membership in breastfeeding support groups, and peer counselor visits after delivery with exclusive breastfeeding at six months, adjusting for confounding (n=1,871).

Variable/Category	aOR and 95% CI	p-value
Visit by a peer counselor during pre-natal period		
No	1 (baseline)	
Yes	0.91 (0.68, 1.22)	0.53
Membership in breastfeeding support groups		
No	1 (baseline)	
Yes	1.59 (1.21, 2.20)	<0.01
Visit by a peer counselor after delivery		
No	1 (baseline)	
Yes	1.26 (0.90, 1.75)	0.17
Initiation of breastfeeding		
Late	1 (baseline)	
Early	2.12 (1.55, 2.91)	<0.01
Combined variable for place of delivery and birth attendant		
Home birth; skilled birth attendant	1 (baseline)	
Home birth; unskilled birth attendant	1.50 (0.93, 2.43)	0.10
Government healthcare facility birth; skilled birth attendant	1.19 (0.74, 1.92)	0.46
Private healthcare facility birth; skilled birth attendant	1.22 (0.68, 2.20)	0.51
Household size (common odds ratio)	0.92 (0.86, 0.99)	0.03
Prenatal care provider		
Doctor/Nurse/Midwife	1 (baseline)	
None/Traditional Birth Attendant	0.87 (0.13, 5.84)	0.89
Number of siblings (common odds ratio)	1.03 (0.94, 1.14)	0.50
Mode of delivery		
Normal	1 (baseline)	
Caesarean/other	1.12 (0.71, 1.78)	0.61
Age group (common odds ratio)	0.99 (0.97, 1.02)	0.66
Sex of child		

Boy	1 (baseline)	
Girl	1.16 (0.92, 1.47)	0.21
Combined variable for civil status and employment status of partner		
Single mother	1 (baseline)	
Has employed partner/spouse	1.13 (0.62, 2.04)	0.69
Has unemployed partner/spouse	1.43 (0.70, 2.95)	0.33
Monthly income (common odds ratio)	1.00 (1.00, 1.00)	0.85
Employment status of mother		
Employed	1 (baseline)	
Unemployed	1.18 (0.60, 2.32)	0.63

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