Buddhist nuns on the move: an innovative approach to improving breastfeeding practices in Cambodia

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Abstract

The benefits of initiating breastfeeding in the first hour of life and exclusively breastfeeding thereafter are well documented. However, little is known about how best to promote these practices. In this study, we assess the impact of Buddhist nuns and wat (pagoda) grannies on optimal breastfeeding behaviours in rural Cambodia. We did so by interviewing randomly selected mothers of infants less than 6 months of age. A total of 440 mothers in programme and control communities completed the baseline survey (before programme start-up), and 467 mothers responded 1 year later. Mothers' exposure to breastfeeding promotion activities was high. At follow-up, 76% of mothers in programme communities indicated that nuns had advised them about breastfeeding, 73% received a home visit and 72% reported attending an educational session. At baseline, mothers in programme communities were 11% more likely (RR = 1.11, CI: 0.74–1.68) than mothers in control communities to initiate breastfeeding in the first hour of life. At follow-up, they were 62% more likely (RR = 1.62, CI: 1.30–2.01) to do so. Similarly, at baseline, mothers in programme communities were 54% more likely (RR = 1.54, CI: 1.21–1.96) than mothers in control communities to breastfeed exclusively in the previous 24 h. At follow-up, they were 81% more likely (RR = 1.81, CI: 1.49–2.21) to do so. Programme planners may consider using community-based volunteers as one strategy to improve breastfeeding practices and child survival.

Keywords: breastfeeding, infant nutrition, social support.

Introduction

Breastfeeding is essential to the health of newborns and infants. Breastfed infants grow better, experience less sickness and have better survival rates than

infants who are not properly breastfed or who are not breastfed at all (Habicht *et al.* 1986; Victora *et al.* 1987; Brown *et al.* 1989; Cohen *et al.* 1994; Cesar *et al.* 1999; Black *et al.* 2003; Edmond *et al.* 2006).

Currently, Cambodia experiences exceptionally high rates of childhood malnutrition. According to the 2000 Demographic and Health Survey (DHS), a nationally representative survey of children less than 3 years of age, 40.0% of Cambodian children

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are underweight, 35.2% are stunted and 17.3% are wasted. The DHS also indicates that only 11.3% of Cambodian infants initiate breastfeeding in the first hour of life. Additionally, only 17.9% of infants less than 2 months of age were breastfed exclusively. Rates of breastfeeding exclusively for infants 2–3.9 and 4–5.9 months of age are 12.2% and 6.0%, respectively. The rate of breastfeeding exclusively for all children under 6 months of age is 11.0% (National Institute of Statistics 2001).

While a great deal is known about the benefits of breastfeeding early and exclusively, little is known about how to best promote such practices, both in Cambodia and globally. The Reproductive and Child Health Alliance (RACHA) in Cambodia and Brigham Young University have implemented and tested innovative behaviour change strategies designed to improve these practices. This study evaluates the impact of using Buddhist nuns and wat (pagoda) grannies as behaviour change agents. In particular, we examine the extent to which nuns and wat grannies influence Cambodian mothers' knowledge, attitudes and practices related to breastfeeding. We do so by comparing baseline data (before programme began) with follow-up data.

Materials and methods

This research uses a quasi-experimental pre-test/post-test group design. Specifically, we conducted two cross-sectional assessments that compared RACHA intervention sites where nuns and wat grannies were used to promote breastfeeding with control sites where the programme was not available.

Setting

Banteay Meanchey Province is located in Northwestern Cambodia and borders Thailand. The majority of the province (95%) is Khmer. The province contains three referral hospitals and 54 health centres (Ministry of Health 2002). There are three operational districts in the province, two of which served as programme and control districts (Preah Neth Preah and O'Chrov, respectively). This selection was a result of programme planning, conducted previously by

RACHA. The third operational district was not included in this study because of the potential confounding effect of comparing a large city with rural communities.

Intervention

The Reproductive and Child Health Alliance is a Cambodian non-governmental organization (NGO) that promotes child survival and reproductive health by engaging in information, education and communication (IEC) activities. RACHA is active in seven of Cambodia's 24 provinces.

In 2000, RACHA began using Buddhist nuns and wat grannies to promote and support improved breastfeeding practices. Nuns are typically older community-based women who participate in religious worship but who do not hold a specific religious position. Wat grannies are women who work at the pagoda and hold a religious position in the village. Nuns and wat grannies are the major component of RACHA's broader efforts in health promotion. These efforts include travelling theatrical groups and coordination with community clinics to reinforce health messages given by healthcare providers.

During the first years of the programme, RACHA relied on older nuns and wat grannies to promote breastfeeding. However, RACHA began training younger volunteers (25–35 years old and still referred to as nuns) because (1) older nuns were tired and unable to meet programme demands; (2) wat grannies were hesitant to speak about breastfeeding in pagodas; (3) older nuns had high rates of illiteracy; and (4) younger nuns were more familiar with mothers in each village. Thus, the intervention area for this study uses younger nuns with minimal participation from wat grannies.

Through a village vote, peers select two young Buddhist nuns per village to promote breastfeeding. Volunteers receive a small stipend for time spent in training, but receive no monetary compensation for teaching. Nuns receive a blue bag with breastfeeding pictures and the RACHA logo on it to help villagers identify them as health promoters.

The Reproductive and Child Health Alliance trains nuns in basic breastfeeding promotion and support

activities, including lactation management and referral. RACHA also trains nuns on HIV/AIDS, control of diarrhoeal diseases, and acute respiratory infections. As part of this study, RACHA trained 132 nuns. Training is described in Appendix 1. Educational sessions normally include 6–10 mothers of reproductive age; however, nuns and wat grannies also counsel mothers one-on-one.

Nuns use counselling cards to teach about optimal breastfeeding. Nuns show pictures to mothers and ask: 'What is this mother doing?' Mothers respond and a discussion concerning that concept ensues. During the discussion, nuns answer mothers' questions and clarify issues that arise during discussions. Nuns frequently emphasize the advantages of optimal breastfeeding practices – including breastfeeding in the first hour of life and exclusively until about 6 months of age. At the end of the discussion, nuns share pamphlets that contain information discussed during the session. Nuns also display a large poster in the village to encourage optimal infant feeding.

According to project records, between baseline and follow-up, 9259 women attended one or more breastfeeding education sessions. Some of these women were interviewed as part of this study, as noted below. The women attending sessions represent nearly 60% (7144) of the households in the intervention area.

We refer to RACHA's efforts as breastfeeding support groups. Our use of the term is consistent with Green's definition, which includes groups that offer mother-to-mother support in initiating and sustaining breastfeeding. Green (1999) notes that historically these groups have focused on breastfeeding promotion and support but more recently have begun addressing other child survival topics as well.

As described later, the government sponsored an IEC campaign that included TV spots promoting exclusive breastfeeding and other optimal infant feeding behaviours. The IEC campaign reached programme and control sites and could have influenced breastfeeding knowledge, attitudes and practices.

Study design

This study uses a quasi-experimental pre-test/post-test design to examine the impact of nuns and wat

grannies on Cambodian mothers' knowledge, attitudes and practices related to breastfeeding. Data collection includes a baseline assessment (summer of 2004) and follow-up 1 year later.

All mothers in this study had a child less than 6 months of age. Because it was unlikely that mothers interviewed during baseline would also be interviewed during follow-up, we used independent, two-stage cluster sampling rather than matched sampling. We purposively selected programme and control districts from the Banteay Meanchey Province, while randomly choosing communities within each district and mothers within each community.

District health centres provided a list of all children under 6 months of age in each district. We assigned each child a number. We then randomly selected a number and identified the child on the list with that number and the child's corresponding community of residence. The selected community was then used as the cluster for second-stage sampling. Half of the mothers with children less than 6 months of age were randomly selected to be interviewed. We repeated this process until we reached a sample size of at least 200 mothers in each operational district. We determined that a sample size of 200 mothers per operational district was needed to detect a change in exclusive breastfeeding of 16% or greater (confidence = 95%, power = 80%). Actual sample sizes at baseline were 206 for programme communities and 234 for control communities. At follow-up, there were 222 mothers in programme communities and 245 mothers in control communities. No one refused to participate in the survey, but a few women were not home when interviewers were in the village. In these cases, sampling with replacement was used and a new mother was randomly selected.

It is important to describe similarities and differences between programme and control districts. In both districts, rice farming and silk production are the main occupations. However, the control district borders Thailand and is more likely to have migrant workers who pass through on their way to and from Thailand. Additionally, the control district has a large city (Poipet) that appears to be markedly different from rural villages in the control area and from the programme district (where there is no large commu-

nity). We did not include Poipet in our sample. In doing so, we most likely excluded the better-educated and affluent mothers in control sites.

We developed a data collection instrument based on the Cambodian DHS, which assesses breastfeeding knowledge, attitudes and practices. A range of individuals, including researchers; academicians; policymakers; and programme planners, implementers and evaluators from NGOs, use the Cambodian DHS, along with the Knowledge, Practices and Coverage (KPC) 2000+ survey. Consequently, results from this study are comparable with data from the Cambodian DHS and with the KPC 2000+, and have broad applicability to a variety of development professionals.

The Reproductive and Child Health Alliance (RACHA) staff members translated the data collection instrument, which was then back translated into English by one of the study's authors (D.D.S.) who is fluent in Khmer. RACHA also pre-tested the instrument prior to use in the field. The data collection instrument contains questions about socio-demographics, knowledge related to infant feeding (how soon after birth the baby should be put to the breast, how long the baby should be breastfed exclusively, and so on) and attitudes about feeding infants (whether infants who are breastfed exclusively for 6 months can be well nourished, whether mothers feel that they have sufficient milk, etc.). The instrument also contains questions about infant feeding practices (for example, when breastfeeding was initiated) and 24-h and 7-day recall to determine mothers' breastfeeding practices.

Six female interviewers collected baseline data. RACHA's monitoring and evaluation specialist and one of the authors (K.A.D.) trained interviewers for 4 days, which consisted of 2 days in the classroom and 2 days of practice in the field. During field visits, interviewers paired with trainers who observed and assisted when needed until interviewers felt comfortable conducting interviews on their own. Approximately 5% of respondents were randomly selected and re-interviewed to ensure overall quality of interviews. We used the same data collection instrument at follow-up. However, we did not use the same interviewers. Brigham Young University's Institutional Review Board granted approval for this study.

Outcome measures

Because we were principally interested in how nuns and wat grannies might influence infant feeding practices, we focused on two behaviours: initiation of breastfeeding in the first hour of life and breastfeeding exclusively for the first 6 months. Our definitions of these behaviours are the same as those used by Labbok & Krasovec (1990), the World Health Organization (WHO), UNICEF, and governmental and non-governmental agencies. Specifically, initiation of breastfeeding in the first hour of life means that the mother puts the infant to the breast immediately after birth. Breastfeeding exclusively means that the infant receives only breastmilk with no other liquids or solids, with the exception of drops or syrups consisting of vitamins, minerals, supplements or medicines. Children who are breastfed exclusively in the previous 24 h have had nothing but breastmilk during that time period. Children exclusively breastfed in the previous 7 days received nothing else to eat or drink except breastmilk for all of the previous 7 days. Breastfeeding behaviours in the previous 24 h and 7 days were determined using recall. Specifically, mothers were asked what foods and liquids they had given their children. Both measures likely overestimate breastfeeding exclusively because infants often receive other substances as well.

Data management and analysis

We entered data using Microsoft Access (version Office 2003, Seattle, WA, USA) and analysed data using SAS statistical software (version 9.1, Cary, NC, USA). Our main interest was to determine whether women in programme sites were more likely than women in control areas to initiate breastfeeding in the first hour of life and breastfeed exclusively thereafter. We compared key breastfeeding behaviours in programme and control communities and examined changes from baseline to follow-up. We examined associations between programme exposure and breastfeeding behaviours using chi-squared (χ^2) tests. We looked at socio-demographic factors that might also influence whether mothers breastfed in the first hour of life and exclusively thereafter. We used logis-

tic regression models to identify factors most closely associated with the breastfeeding behaviours described above for data from baseline and follow-up, adjusting for time of data collection (baseline vs. follow-up), intervention status (control vs. programme) and cluster group. We included interaction terms and checked all models for overfitting (Hosmer & Lemeshow 2000).

When we ran logistic regression models, we adjusted for independent variables that showed some association with outcomes of interest. Specifically, we used a cut-off point of $P < 0.2$ to determine whether variables should be included in each model. Independent variables for early initiation were antenatal care, television in home, believing that a child will be healthy if receiving only breastmilk for the first 6 months of life, ever speaking to someone about breastfeeding, and attending a breastfeeding session with a nun. Independent variables for exclusive breastfeeding were antenatal care, television in home, mother's age, age of child, mother's education and believing that a child needs only breastmilk during the first 3 days of life. The independent variables used for exclusive breastfeeding in the past 7 days were the same as those used for exclusive breastfeeding in the past 24 h, with the addition of believing that a child will be healthy if receiving only breastmilk for the first 6 months of life.

We calculated the relative risk of initiating breastfeeding in the first hour of life and breastfeeding exclusively in the previous 24 h and 7 days. Relative risks compared programme and control sites at baseline and follow-up.

Results

Were programme participants different from controls?

Table 1 indicates that there were significant differences between programme and control communities both at baseline and at follow-up. Specifically, at follow-up, children in programme communities were significantly younger than those in the control group. Also, at baseline and at follow-up, women in programme communities were somewhat better educated and reported higher rates of antenatal care and

home births. At follow-up, women in control communities were less likely to speak Khmer. Additionally, mothers in programme communities were more likely to report correct knowledge concerning breastfeeding both at baseline and at follow-up. Lastly, at baseline and at follow-up, mothers in programme communities were much more likely to have spoken to someone about breastfeeding. In programme communities, women were encouraged to share what they had learned during each educational session with neighbours and relatives. It is unlikely that 'someone' in this context included representatives from infant formula companies as there is no record of company representatives visiting programme and control sites.

How many women had access to programmes?

At follow-up, about three-quarters of all mothers in programme sites reported some form of contact with nuns and wat grannies (Table 1). Rates of programme exposure are consistent with reports from nuns and wat grannies about counselling and teaching sessions in various intervention communities.

Did breastfeeding practices change?

Table 2 provides information about changes in breastfeeding practices from baseline to follow-up for programme and control communities. Results show that with the exception of whether or not the mother was currently breastfeeding (which was already high at baseline), both programme and control communities made improvements in each of the primary outcomes. At baseline, programme communities had higher breastfeeding rates than control sites; however, the magnitude of change in programme communities was much greater. For both communities, the largest changes were in breastfeeding initiation, which increased by 59.4% in programme communities and 22.5% in control communities.

Were breastfeeding practices better among mothers with professional support?

Table 3 compares the effects of exposure (popular, professional and no exposure) on breastfeeding prac-

Table 1. Characteristics of survey participants in programme and control communities at baseline and follow-up, study of breastfeeding, rural Cambodia, 2005

Characteristic	Baseline		<i>P</i> -value	Follow-up		<i>P</i> -value
	Programme	Control		Programme	Control	
	(<i>n</i> = 206)	(<i>n</i> = 234)		(<i>n</i> = 222)	(<i>n</i> = 245)	
	%	%		%	%	
<i>Socio-demographic</i>						
Child's age (months)						
0–1	41.3	35.5	0.24	36.5	38.4	0.01
2–3	30.6	38.0		36.0	23.7	
4–5	28.2	26.5		27.5	38.0	
Child's sex (male)	52.4	48.3	0.39	50.9	51.0	0.98
Mother's age (years)						
15–23	28.6	34.2	0.02	34.2	31.4	0.03
24–29	35.9	23.9		38.7	30.6	
≥30	35.4	41.9		27.0	38.0	
Mother's education						
None	26.8	36.3	0.05	16.7	25.7	0.05
1–3 years	28.3	27.8		32.4	34.3	
4–6 years	34.6	23.9		36.9	29.4	
7 years or more	10.2	12.0		14.0	10.6	
Language (Khmer)	99.5	99.2	0.64	100.0	95.9	0.00*
Water supply (dry season)						
Covered/piped/tubed	7.8	12.9	0.08	1.8	15.1	<0.001
Open	92.2	87.1		98.2	84.9	
Television in home (yes)	35.0	28.6	0.15	37.8	42.0	0.35
<i>Health system</i>						
Antenatal care (yes)	80.0	52.4	<0.001	82.4	68.2	<0.001
Child's place of birth						
Hospital/HC/private clinic	10.2	17.5	0.03	12.2	28.6	<0.001
At home	89.8	82.5		87.8	71.4	
<i>Work and child care</i>						
Mother works outside the home	8.3	10.7	0.39	21.7	16.3	0.14
<i>Knowledge</i>						
Believes that children will be healthy if they receive only breastmilk in first 6 months (yes)	89.1	79.1	0.01	96.4	81.9	<0.001
Believes that babies need only breastmilk during the first 3 days of life (yes)	84.5	47.4	<0.001	97.8	77.1	<0.001
<i>Social support</i>						
Someone ever spoken to mother about breastfeeding (yes)	39.3	11.1	<0.001	95.5	71.7	<0.001
<i>Programme exposure</i>						
Nun counselled mother on breastfeeding (yes)	3.9	0.0	<0.001	76.1	0.0	<0.001
Nun counselled mother at home concerning breastfeeding (yes)	2.4	0.0	<0.001	72.9	0.0	<0.001
Mother attended breastfeeding educational session with a nun (yes)	2.4	0.0	<0.001	72.1	0.0	<0.001

*Used Fisher's Exact Test. HC, health centre.

tices. We determined type of exposure by asking respondents to identify who had talked with them about breastfeeding. Popular modes included any combination of the following categories: mother,

mother-in-law, husband, traditional birth attendant, village chief, neighbour or relative. Professional modes included: healthcare personnel, health staff, nuns, wat grannies, village health support groups,

Table 2. Breastfeeding behaviours by community type at follow-up, study breastfeeding, Cambodia, 2005

Outcome	Programme	Control	<i>P</i> -value*	Change from baseline	
	(<i>n</i> = 222) %	(<i>n</i> = 245) %		Programme %	Control %
Primary					
Initiated breastfeeding in the first hour	84.2	40.0	<0.001	+59.4	+22.5
Exclusively breastfed for the past 24 h	85.6	42.0	<0.001	+19.1	+10.8
Exclusively breastfed for the past 7 days	81.5	33.5	<0.001	+21.8	+10.4
Exclusively breastfed since birth	72.5	14.7	<0.001	+35.6	+4.9
Secondary					
Not given a bottle in the past 24 h	93.2	74.3	<0.001	+6.8	−0.5
Ever breastfed	100.0	98.8	0.14 [†]	+0.0	+0.9
Currently breastfeeding	99.1	97.1	0.11 [†]	+0.6	−1.2

**P* values compare programme and control communities at follow-up. [†]Used Fisher's Exact Test.

Table 3. Types of exposures to breastfeeding information at follow-up, study of breastfeeding, rural Cambodia, 2005

Type of exposure	<i>n</i>	Initiated breastfeeding in the first hour %	Exclusively breastfed for past 24 h %	Exclusively breastfed for past 7 days %
Programme communities only				
No exposure	10	50.0* [‡]	80.0 [‡]	70.0 [‡]
Popular [§]	13	76.9	46.2	46.2
Professional [§]	181	85.6	88.4	85.6
Popular and professional	17	94.1	88.2	70.6
Control communities only				
No exposure	69	20.3 [†]	33.3*	21.7 [†]
Popular	55	32.7	32.7	27.3
Professional	88	53.4	54.6	46.6
Popular and professional	31	58.1	45.2	35.5
Programme and control communities				
No exposure	79	24.1 [†]	39.2 [†]	27.9 [†]
Popular	68	41.2	35.3	30.9
Professional	269	75.1	77.3	72.9
Popular and professional	48	70.8	60.4	47.9

Note: Chi-squared tests compare the breastfeeding behaviours of women who had no exposure to breastfeeding support as well as exposure to popular, professional and both types of support. Chi-squares are calculated separately for each breastfeeding behaviour. In addition, χ^2 tests examine differences separately for programme communities, control communities and both types of communities. **P* < 0.05. [†]*P* < 0.01. [‡]Used Fisher's Exact Test. [§]Popular includes: mother, mother-in-law, husband, traditional birth attendant, village chief, neighbour or relative. [§]Professional includes: health personnel, health staff, nun, wat granny, village health support group, NGO staff, radio and TV. NGO, non-governmental organization.

NGO staff, radio and TV. Results indicate that survey participants from both control and programme communities who received information from professional sources had higher rates of breastfeeding exclusively in the past 24 h than those who had heard messages

from popular sources or not at all. Additionally, there were differences between type of exposure, initiation of breastfeeding in the first hour of life and breastfeeding exclusively in the previous 24 h and 7 days.

What factors were associated with optimal breastfeeding?

At follow-up, a variety of socio-demographic factors were associated with key breastfeeding behaviours (Table 4). Age of child was significantly associated with breastfeeding exclusively in the past 24 h. Additionally, in both programme and control communities, ever being counselled was significantly associated with initiation (but not breastfeeding exclusively). For control communities, having a television in the home was positively associated with both early initiation of breastfeeding and exclusive breastfeeding in the past 24 h. In programme communities, women who had spoken with a nun about breastfeeding were significantly more likely to initiate breastfeeding (87.6%) in the first hour than women who had not spoken to a nun (73.6%), but not significantly more likely to report breastfeeding exclusively in the previous 24 h.

Knowledge about breastfeeding was not consistently associated with optimal behaviours. Mothers in programme communities who believed that a child who was given only breastmilk could be healthy were significantly more likely to initiate breastfeeding within an hour of birth, but not more likely to breastfeed exclusively. In programme communities, women who believed that only breastmilk should be given in the first 3 days of life were nearly 25% more likely than women who believed that additional liquids should be given to initiate breastfeeding in the first hour. However, this difference was not statistically significant. In control communities, knowledge was not associated with breastfeeding practices.

Attending a breastfeeding educational session, being counselled by a nun in the home, ever being counselled by a nun, and speaking to someone about breastfeeding were all positively associated ($P < 0.0001$) with believing that a child needs only breastmilk during the first 3 days of life, as well as feeling that a child could be healthy if he or she receives only breastmilk during the first 6 months. For example, 97.5% of mothers who attended a breastfeeding educational session believed that a child needs only breastmilk during the first 3 days of life, while 81.4% of mothers who had not attended a ses-

sion shared the same belief. Furthermore, 97.6% of mothers who reported speaking to a nun about breastfeeding believed that a child could be healthy if he or she receives only breastmilk during the first 6 months of life. On the other hand, 83.8% of mothers who had not spoken to a nun believed that an exclusively breastfed child could be healthy.

What factors best predicted optimal breastfeeding?

We conducted multiple logistic regression analyses to determine factors associated with early initiation of breastfeeding (Table 5). Results indicate that factors associated with breastfeeding initiation include receiving antenatal care (OR = 1.4, 95% CI: 1.0–2.1), having a television in the home (OR = 1.6, 95% CI: 1.1–2.2), and attending an educational session with a nun (OR = 2.8, 95% CI: 1.3–5.7). Additionally, mothers who spoke to someone about breastfeeding as well as mothers who believed that a child who received only breastmilk during the first 6 months of life could be healthy were more likely to report early initiation of breastfeeding (OR = 2.1, 95% CI: 1.4–3.2 and OR = 1.8, 95% CI: 1.1–3.2, respectively).

Results from logistic regression models for breastfeeding exclusively in the past 24 h (Table 6) indicate that the age of the mother was significantly associated with exclusive breastfeeding. Young mothers (15–29 years of age) were more likely to breastfeed exclusively in the previous 24 h than mothers who were 30 years of age or older (OR for 15–23-year-olds = 1.8, 95% CI: 1.2–2.7; OR for 24–29-year-olds = 1.5, 95% CI: 1.0–2.2). Mothers with 1–6 years of education were significantly less likely than mothers with seven or more years of education to breastfeed exclusively in the past 24 h. Additional factors associated with exclusive breastfeeding include having a television in the home, receiving antenatal care and the belief that children need only breastmilk during the first 3 days of life (OR = 2.0, 1.5 and 2.4, respectively).

We also conducted logistic regression for breastfeeding exclusively in the past 7 days. The same factors that were associated with breastfeeding exclusively in the past 24 h were also present using 7-

Table 4. Prevalence of optimal breastfeeding behaviours by characteristics of survey participants, study of breastfeeding, rural Cambodia, 2005

Characteristic	Initiated breastfeeding in the first hour		Exclusively breastfed for past 24 h	
	Programme (<i>n</i> = 222) %	Control (<i>n</i> = 245) %	Programme (<i>n</i> = 222) %	Control (<i>n</i> = 245) %
Child's age (months)				
0–1	NA	NA	92.6**	57.5**
2–3	NA	NA	95.0	44.8
4–5	NA	NA	63.9	24.7
Child's sex				
Female	84.4	41.7	87.2	42.5
Male	84.1	38.4	84.1	41.6
Mother's age (years)				
15–23	82.9	46.8	85.5	50.7
24–29	88.4	41.3	89.5	44.0
≥30	80.0	33.3	80.0	33.3
Mother's education				
None	83.8	41.3	86.5	47.6
1–3 years	87.5	38.1	87.5	35.7
4–6 years	78.1	47.2	80.5	44.4
7 or more years	93.6	23.1	93.6	42.3
Water supply (dry season)				
Covered/piped/tubed	75.0	43.2	75.0	43.2
Open	84.4	39.4	85.8	41.8
Television in home				
Yes	85.7	49.5**	84.5	50.5*
No	83.3	33.1	86.2	35.9
Antenatal care				
Yes	85.8	44.9*	87.4	44.9
No	76.9	29.5	76.9	35.9
Child's place of birth				
Hospital/health centre/private clinic	66.7	35.7	88.9	52.9*
At home	86.7* [†]	41.7	85.1	37.1
Mother works outside the home				
Yes	81.3	42.5	77.1	25.0*
No	85.0	39.5	87.9	45.4
Believes that children will be healthy if they receive only breastmilk in the first 6 months				
Yes	86.3* [†]	43.7	86.3	43.7
No	50.0	28.6	87.5	33.3
Believes that babies need only breastmilk during the first 3 days of life				
Yes	84.8	40.7	86.2	45.0
No	60.0	37.5	60.0	32.1
Someone ever spoken to mother about breastfeeding				
Yes	85.9* [†]	47.4**	85.9	45.7
No	50.0	20.3	80.0	33.3
Nun spoke to mother about breastfeeding				
Yes	87.6*	NA	87.6	NA
No	73.6	NA	79.3	NA
Nun counselled mother at home about breastfeeding				
Yes	87.0	NA	82.0	NA
No	76.7	NA	69.0	NA
Mother attended breastfeeding session with a nun				
Yes	88.8*	NA	87.5	NA
No	72.6	NA	80.7	NA

Note: Chi-squared tests compare the background characteristics of mothers in programme and control communities who practised optimal breastfeeding behaviours (early initiation and exclusive breastfeeding). For example, the child's age was significantly associated with exclusive breastfeeding in both programme and control communities. * $P < 0.05$. ** $P < 0.01$. [†]Used Fisher's Exact Test. NA, not applicable.

day recall, with similar odds ratios and confidence intervals (data not reported).

Were mothers in programme sites really more likely to practise optimal breastfeeding?

Table 7 compares relative risks of practising each breastfeeding behaviour for programme and control communities, adjusting for other factors found to be significant in bivariate analyses. It is important to

note that, in this case, women with a higher relative risk are *more* likely to practise optimal breastfeeding behaviours. Results indicate that the relative risk of

Table 5. Logistic regression results, factors associated with early initiation of breastfeeding for women in both districts, study of breastfeeding, rural Cambodia, 2005*

Characteristic	Initiated breast-feeding within 1 h	
	Odds ratio	95% CI
Television in home		
Yes	1.6	(1.1, 2.2)
Antenatal care		
Yes	1.4	(1.0, 2.1)
Believes that children will be healthy if they receive only breastmilk in first 6 months		
Yes	1.8	(1.1, 3.1)
Someone ever spoken to mother about breastfeeding		
Yes	2.1	(1.4, 3.2)
Mother attended breastfeeding educational session with a nun		
Yes	2.8	(1.3, 5.7)

Note: Both baseline and follow-up data are used while controlling for time, intervention status and cluster group. *Hosmer and Lemeshow goodness-of-fit test, chi-square = 7.3, $P = 0.507$.

Table 6. Logistic regression results, factors associated with exclusive breastfeeding for the past 24 h, study of breastfeeding, rural Cambodia, 2005*

Characteristic	Exclusive breastfeeding in the past 24 h	
	Odds ratio	95% CI
Mother's age (years)		
15–23	1.8	(1.2, 2.7)
24–29	1.5	(1.0, 2.2)
≥30	1.0 [†]	
Child's age (months)		
0–1	8.3	(5.4, 12.7)
2–3	5.1	(3.3, 7.8)
4–5	1.0 [†]	
Mother's education		
None	0.6	(0.3, 1.1)
1–3 years	0.4	(0.2, 0.8)
4–6 years	0.4	(0.2, 0.7)
7 or more years	1.0 [†]	
Believes that babies need only breastmilk during the first 3 days of life		
Yes	2.4	(1.6, 3.5)
Television in home		
Yes	2.0	(1.4, 2.8)
Antenatal care		
Yes	1.5	(1.0, 2.1)

Note: Both baseline and follow-up data are used while controlling for time, intervention status and cluster group. *Hosmer and Lemeshow goodness-of-fit test, chi-square = 10.6, $P = 0.226$. [†]The last category for each variable represents the reference category; no odds ratios are calculated for reference categories.

Table 7. Relative risk (RR) of practising breastfeeding behaviours for programme compared with control communities, study of breastfeeding, rural Cambodia, 2005

When data were collected	Initiated breastfeeding in the first hour		Exclusively breastfed for the past 24 h		Exclusively breastfed for the past 7 days	
	RR	95% CI	RR	95% CI	RR	95% CI
Baseline	1.11	(0.74, 1.68)	1.54	(1.21, 1.96)	1.59	(1.17, 2.16)
Follow-up	1.62	(1.30, 2.01)	1.81	(1.49, 2.21)	1.76	(1.42, 2.19)

Note: Independent variables adjusted for early initiation were antenatal care, television in home, believing that a child will be healthy if receiving only breastmilk for the first 6 months of life, ever speaking to someone about breastfeeding, and attending a breastfeeding session with a nun. Independent variables adjusted for exclusive breastfeeding in the past 24 h and the past 7 days were antenatal care, television in home, mother's age, age of child, mother's education and believing that a child needs only breastmilk during the first 3 days of life.

practising each breastfeeding behaviour increased from baseline to follow-up. For example, at follow-up, mothers in programme communities were 62% (RR = 1.62, CI: 1.30–2.01) more likely than mothers in control communities to initiate breastfeeding in the first hour of life, up from 11% at baseline (RR = 1.11, CI: 0.74–1.68). Additionally, at baseline, mothers in programme communities were 54% (RR = 1.54, CI: 1.21–1.96) more likely than mothers in control communities to breastfeed exclusively in the previous 24 h. This increased to 81% (RR = 1.81, CI: 1.49–2.21) at follow-up.

Discussion

Findings from this study indicate that women living in communities with breastfeeding promotion and support groups were more likely than women from communities with no intervention to practise optimal breastfeeding behaviours. For example, at follow-up, mothers from programme communities were more likely than mothers from control sites to practise each of the three breastfeeding behaviours described here. For initiation of breastfeeding in the first hour of life, this 'risk' increased from 11% to 62% among mothers in programme communities. Rates for breastfeeding exclusively in the previous 24 h and 7 days were 54% to 81% and 59% to 76%, respectively. Additionally, women who were knowledgeable about the importance of breastfeeding exclusively in the first 6 months of life, women who spoke to someone about breastfeeding, and women who attended an educational session were more likely to initiate breastfeeding in the first hour after birth. Women who were knowledgeable about initiating early were more likely to have breastfed exclusively in the previous 24 h. Attending an educational session or speaking to someone about breastfeeding was not associated with breastfeeding exclusively in the previous 24 h.

The intent of the Buddhist nuns and wat grannies programme was to utilize a vast network of local, well-respected women to promote optimal breastfeeding and other health-related behaviours. Although reliance on this religious infrastructure has lessened over time, the essence of the programme – using women from within the community to promote

health – has not changed. Results from our study suggest that there is an association between access to community volunteers and breastfeeding knowledge and behaviours.

This study has several limitations. First, breastfeeding behaviours were self-reported and as such, could not be substantiated through direct observation. However, others have found that in subsamples of women, self-reports and observation of breastfeeding behaviours yield similar results (Haider *et al.* 2000). As noted previously, programme and control communities at baseline and follow-up were different with respect to key socio-demographic variables. At baseline, discrepancies in socio-demographic factors may explain some of the differences in breastfeeding behaviours. However, we adjusted for these disparities in logistic regression models and in calculations of relative risk.

It is possible that differences in breastfeeding behaviours can be explained by the existence of clusters. Mothers in a given cluster may be similar to each other, may speak to each other about breastfeeding and may be influenced by other common factors. These similarities are likely to be the most pronounced when clusters are large. It is unlikely that cluster size influenced results reported here. For example, we sampled 58 villages at baseline and 70 villages at follow-up: cluster sizes were small (on average, 7.6 women per village at baseline and 6.7 women at follow-up). Additionally, we controlled for clusters in multivariate analyses and found no significant association regardless of the behaviour examined (initiation of breastfeeding in the first hour of life and breastfeeding exclusively in the previous 24 h and 7 days). Consequently, we removed the cluster variable from final relative risk calculations.

There may be other socio-demographic influences not measured in this study that influenced breastfeeding knowledge, attitudes and behaviours. Differences in baseline breastfeeding rates may be due in part to work carried out by Medecins Sans Frontiers, HealthNet International and CARE in the years prior to the study. Between 1993 and 2000, HealthNet International and Medecins Sans Frontiers promoted breastfeeding and worked to improve service delivery at the Preah Neth Phreah referral hospital.

In nine of 12 health centres in Preah Neth Preah, CARE implemented a safe motherhood programme (1996–2002), which included the use of traditional birth attendants to promote early and exclusive breastfeeding.

Similar to our study's findings, other research suggests an association between the use of peer counselors and improved breastfeeding behaviours. For example, two randomized controlled studies – one in Mexico (Morrow *et al.* 1999) and the other in Bangladesh (Haider *et al.* 2000) – used paid peer counselors to promote breastfeeding. In both interventions, peer counsellors maintained early and repeated contacts with mothers. And in both cases, programme communities where peer counsellors had been used were significantly more likely than control communities to report breastfeeding exclusively.

In a study on the impact of mother-to-mother support groups in Guatemala, Dearden *et al.* (2002a) found that there was no association between living in a community with local *monitoras* (women who promoted breastfeeding) and key breastfeeding behaviours. However, breastfeeding promotion and support did appear to improve breastfeeding practices among those who had direct contact with La Leche League (Dearden *et al.* 2002b).

In Ghana, Freedom from Hunger used Credit with Education (microcredit and health education) to improve breastfeeding behaviours (McNelly & Dunford 1998). Results from an assessment of the impact of Credit with Education suggest that the intervention was positively associated with initiating breastfeeding early. Further, mothers who participated in Credit with Education were more likely than mothers from control communities to breastfeed exclusively. These findings are consistent with the nuns and wat grannies study, and may support the use of group education to promote health practices at the community level.

This study raises several important questions. First, in control communities, why is it that there were significant increases in the percentage of women who talked to someone about breastfeeding? Second, why did breastfeeding rates improve so noticeably in control communities? Third, why are breastfeeding rates in programme and control communities so much

higher than those reported in the 2000 Demographic and Health Survey?

Increases in the percentage of women in control communities who reported talking to someone about breastfeeding may be influenced by government-sponsored media campaigns. The government uses TV and radio to regularly air public service announcements about breastfeeding. In particular, government messages stressed the importance of giving only breastmilk to babies during the first 6 months of life. TV spots featured mothers, babies and grandmothers.

Globally, television is often used to share information and change norms about breastfeeding. In control communities, about half of all women (46.9%) reported receiving information about breastfeeding and hearing or seeing a breastfeeding spot on TV or on the radio. In comparison, only about a quarter (23.6%) of women from programme communities reported hearing about breastfeeding from the same sources. In control communities, mothers with televisions were considerably more likely than mothers without them to practise early and exclusive breastfeeding. This was not the case for mothers in programme communities. While the content and language RACHA used to promote breastfeeding in programme sites were designed to be consistent with government-sponsored public service announcements, it is likely that other NGOs also developed breastfeeding messages that supported government efforts. Women from control communities were also much more likely to learn about breastfeeding from a family member or close relative. Thus, it is possible that government efforts to promote breastfeeding encouraged family members and close relatives to speak to mothers about breastfeeding.

In addition to the potential impact of media on breastfeeding knowledge, attitudes and practices, household ownership of a television is often used as a proxy for socio-economic status. At both baseline and follow-up, programme participants and controls were equally likely to own a television.

The DHS reports that 11.3% of Cambodians practise early initiation of breastfeeding, while 11.0% breastfeed exclusively. In comparison, we found that in programme and control communities combined, 20.9% and 47.6% initiate breastfeeding in the first

hour of life and breastfeed exclusively in the previous 24 h, respectively. Although the national rate for initiation cited by the DHS is lower than our baseline rate, our findings are consistent with the DHS's province-specific rates (26.0%) for Banteay Meanchey (National Institute of Statistics 2001).

While province-specific rates help explain initial discrepancies in initiation, there are no province-specific rates for breastfeeding exclusively in the previous 24 h. Discrepancies between rates of exclusive breastfeeding reported in the DHS and here may be due to differences in the years data were collected (2000 and 2004). Using DHS data, Haggerty & Rutstein (1999) report that globally, rates of exclusive breastfeeding are on the rise – although data for their study were also collected before 2004. As noted previously, between 2000 and 2004, the Cambodian government launched a national media campaign and various NGOs carried out community-based efforts to promote optimal infant feeding. It is quite possible that combined government and NGO efforts contributed to improvements in breastfeeding exclusively.

Findings reported by Green (1999) and Fairbank *et al.* (2000) suggest that packages of breastfeeding interventions – including breastfeeding promotion and counselling, national policy changes, support groups and mass media campaigns – change breastfeeding behaviours. This appears to be the case with nuns and wat grannies, where a package of interventions – including a government media campaign, information given at local health clinics, travelling theatrical groups, and nuns and wat grannies – are associated with a dramatic increase in optimal breastfeeding practices.

It is important to note the potential impact of the marketing of breastmilk substitutes, bottles and other products and how such efforts might discourage optimal breastfeeding practices. In Cambodia, formula companies frequently market breastmilk substitutes and hire staff from the Ministry of Health and elsewhere to promote their products at national and provincial hospitals, pharmacies and drug stores. However, such promotion rarely occurs at the level of health centres. While Cambodia supports the WHO Code of Marketing of Breastmilk Substitutes, oversight of the Code has been uneven: historically,

there have been few government rules and regulations supporting the Code.

In rural Cambodia, Buddhist nuns and wat grannies appear to have positively affected infant feeding behaviours, including early and exclusive breastfeeding. It is difficult to determine precisely how this programme contributed to changes in breastfeeding knowledge, attitudes and behaviours; however, several factors may have influenced the programme's success. First, nuns and wat grannies are community-based: most mothers know them well. Second, because of their religious affiliation, nuns and wat grannies enjoy widespread respect and support. Third, exposure to breastfeeding promotion was high. Lastly, multiple programme strategies – including educational sessions, home visits, government-sponsored media spots and theatrical presentations – may have had a greater impact than efforts utilizing a single behaviour change approach, although it is difficult to determine this in the absence of operations research. In Cambodia, policymakers and programme planners should consider using similar strategies to improve breastfeeding practices on a larger scale. For those working outside Cambodia, the use of well-respected community-based women may complement other efforts to improve infant feeding and ultimately child survival.

Acknowledgements

We acknowledge financial support from Brigham Young University and the US Agency for International Development (USAID). We also thank the Ministry of Health of Cambodia, especially His Excellency Professor Eng Huot, Secretary of State of the Ministry of Health; Professor Koum Kanal, Director of the National Maternal and Child Health Center; and Dr Chhum Vanarith, Provincial Health Department Director of Banteay Meanchey. We sincerely appreciate RACHA staff and interviewers. We are also grateful to mothers, nuns and wat grannies who willingly gave of their time for this study.

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Appendix I. Training for Buddhist nuns and wat grannies, study of breastfeeding, rural Cambodia, 2005

Length and place of training	Content	Training participants	Method of training
Day 1: adult learning theory and health promotion	Optimal infant feeding behaviours including early initiation of breastfeeding, frequent feeding, exclusive breastfeeding for 6 months, breastfeeding for at least 2 years, continued breastfeeding during childhood illnesses, and the appropriate introduction of complementary foods	Nuns and wat grannies	Information-sharing
Day 2: practice in the field using health education strategies discussed during day 1 (use of leaflets, visual aids and home visits)		Community-based monks	Skills development through practice with other nuns and wat grannies
Training took place at pagodas, elementary schools and health centres	Use of oral rehydration salts		