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Sustainability of a Community-Based CHOICE Program to Improve the Health and Nutrition Status of Mothers and Infants in Indonesia

Clara Eder¹ · Lila Kumar Khatiwada² · Janine Schooley³

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Abstract

Objectives Few studies have been undertaken to determine whether and how project results are sustained. University of Notre Dame (ND) and Project Concern International conducted a Post-Project Sustainability Study (PSS) of a USAID-funded program (CHOICE), implemented in Indonesia, Banten province, between 2003 and 2007, in order to determine lasting effects and improve PSS methodologies. **Methods** Sustainability was measured through a comparison of data collected on mother–infant pairs in 2014 with final evaluation data from 2007; and through a comparison of 2014 data collected from the CHOICE villages and comparison villages. **Results** The analysis showed positive differences in multiple indicators in CHOICE villages between 2007 and 2014, including births attended by skilled personnel (Mean Difference 48.56, 95% CI 38.68 to 58.43) and treatment of diarrhea (MD 16.42, 95% CI –0.94 to 33.37). However, only one statistically significant difference between intervention and comparison groups in 2014 was observed, infants with diarrhea whose mothers sought advice or treatment (MD –5.48, 95% CI –9.55 to 1.39), showing more mothers in intervention group sought advice or treatment. Because contextual factors were not studied in detail and baseline data was not available for the comparison villages, it is difficult to determine the reasons for the results. Given that longitudinal data was not collected, it is also difficult to determine whether results fluctuated between 2007 and 2014. **Conclusions for practice** This PSS contributes to the limited body of knowledge in sustainability research. Lessons learned from this study will increase potential for sustainable impact of projects, as more rigorous measurement will lead to greater overall understanding of how sustainability actually “happens”.

Keywords Maternal and child health · Malnutrition · Public health intervention · Sustainability · Indonesia

Significance

While community-based maternal and child health programs aim to generate long-lasting, sustainable effects, published data on the long-term impact of such programs is limited. This study describes a post-project sustainability assessment, conducted in 2014, 7 years after the program ended. The program aimed to enhance maternal and child health and nutritional development. The program was implemented by PCI in Indonesia between 2003 and 2007. The article describes the methodology used in the study and presents results, challenges with this type of research, and makes recommendations for improving future programming and post-project sustainability studies.

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Introduction

Forty percent of development interventions are not sustained beyond the first few years after their closure (Asian Development Bank 2010; Bamberger and Cheema 1990). Post-project studies, examining the sustainability of projects, are often discussed but almost never implemented (Sarriot et al. 2008). Understanding sustainability, both conceptually and operationally, and intentionally engaging in sustainability enhancement efforts, have both strategic importance and practical application for donors, program implementers, participants, and other stakeholders.

University of Notre Dame (ND) and Project Concern International (PCI) conducted a Post-Sustainability Study (PSS) of the Child Health Opportunities Integrated with Community Empowerment (CHOICE) program, implemented by PCI in Indonesia between 2003 and 2007, to determine whether project interventions led to lasting improvements in maternal and children's health and nutritional development. CHOICE was designed to improve the health and nutrition status of children under the age of five, and the health status of pregnant and lactating women and mothers or caretakers of young children. Community health volunteers (*Kaders*) carried out health promotion activities such as family planning, referrals for curative care, immunizations, and nutrition surveillance services. The project reached 30 villages in five of the neediest sub-districts in Pandeglang, Indonesia (Fig. 1).

Sustainability was measured through a comparison of data from the 2007 CHOICE final evaluation and 2014 PPS and through a comparison of 2014 data from the CHOICE intervention villages and nearby villages that had not been part of the CHOICE program. CHOICE evaluation data (2007) and PSS data (2014) were collected

around the same time of the year, July of 2007 and June of 2014, due to seasonality effects on some indicators.

Methodology

Behaviors and health status were assessed through a mixed-methods approach: a quantitative household survey and qualitative focus group discussions (FGDs) and key informant interviews (KIIs). The study obtained ethical approval from the Institutional Review Boards (IRB) of the University of Notre Dame and PCI.

Quantitative Component

Sampling

The sample was drawn from the current population of the areas targeted (Table 1). Randomly selected pairs of mothers and babies/toddlers up to 2 years of age (hereafter "infants") were included to understand whether knowledge and practices had continued with a new generation of mothers. To ensure sufficient statistical power, a stratified and clustered sample approach was used. The sample was stratified by the original project catchment area (five districts targeted by CHOICE); the survey was conducted at the village level. According to the 2010 Census, the total population of the five districts was 163,535–25,578 from Angsana District, 27,242 from Patia District, 33,943 from Pagelaran District, 42,955 from Saketi District, and 33,817 from Sukaresmi District (Statistics Indonesia web). For the PPS, a sample of 935 mother–infant pairs were selected (427 intervention and 508 comparison), sufficient to measure changes of at least 10%, with 95% confidence and 80% power. The catchment area was selected as the Primary Sample Unit (PSU) and the mother–infant pairs as the Secondary Sample Unit (SSU).

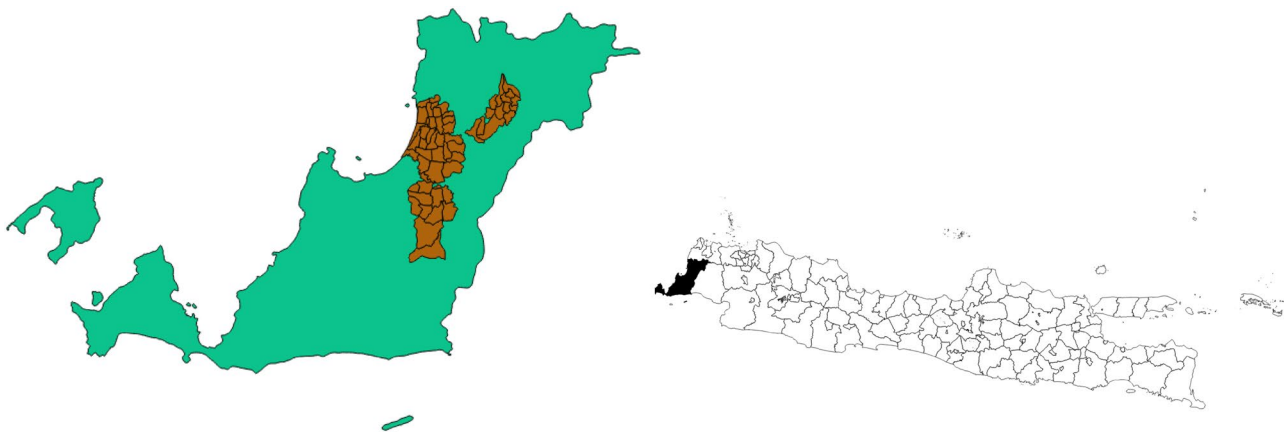


Fig. 1 Villages selected for the study in the Pandeglang Regency: Java Island, Indonesia

Table 1 Demographic characteristics

Characteristics	2007 survey	2014 intervention	2014 comparison
Average age	28 years	29 years	29 years
Education			
Primary (%)	66	50	64
Middle school (%)	24	32	20
High School (%)	6	14	12
University (%)	1	3	3
Number of respondents	450	508	427

The enumerators worked off a list of mother–infant pairs collected from each village for selecting sampled households. According to Demography and Health Survey (DHS) data on Banten Province, approximately 20% of households were expected to have a mother with children (Statistics Indonesia 2013).

In the 2007 CHOICE evaluation, a multi-staged cluster design was used to select 45 clusters of 10 respondents (mothers of infant aged 0–23 months). The clusters were randomly selected using probability proportional to size (PPS) methodology (Mize et al. 2007).

Data Collection

Type of Data Collected For the PPS, USAID's Knowledge, Practice, and Coverage (KPC) questionnaire was used. KPC is a rapid small population-based health survey with different modules that can be customized to specific technical areas (USAID 2009). Ten KPC modules were used during the survey: breastfeeding and infant and young child feeding, childhood immunization, diarrhea, growth monitoring, maternal anthropometry, child anthropometry, household water and sanitation, maternal and newborn care, respondent background information, and sick child.

Anthropometric measures were taken for mothers and infants. Maternal mid-upper-arm circumference (MUAC) was measured using Bhakti Husada standard 33 cm MUAC measuring tapes. MUAC is an indicator of a mother's nutritional health and is used as a predictor for birthing low-birth-weight babies and children's nutritional status (Tang et al. 2013). Infants were weighed using AND UC-300 portable scales with 50 g precision. To determine infant weight, the mother was first weighed alone, then with her infant, and then her weight was subtracted from their combined weight. Infants' heights were measured using GEA Medical WB-B horizontal 1-m measuring boards.

Comparison Group

Comparison villages were nearby villages chosen from the same sub-district and health offices; these villages did not participate in the CHOICE program.

Quality Control

The research team provided rigorous oversight at all stages of data collection. Statistical routines were developed for internal consistency, and data validation checks were carried out each day of field work.

Data Extraction and Analysis

The data uploaded to the server during the survey were downloaded as a CSV file and uploaded in STATA for cleaning and analysis. The respondents were grouped by villages, and multi-level analysis was used, as the villages were the units of intervention and households were the units of analysis. STATA® software was used for analysis.

USAID's required and project-specific indicators were analyzed for two types of comparisons: first, indicators from intervention villages were compared against their recorded level in PCI's final evaluation in 2007; second, indicators from intervention villages were contrasted to those of comparison villages. Indicators were tested using a *t* test, taking into account the design of the survey to adjust for standard errors. The results presented are not weighted. In addition, because the surveys were not intended to provide results at the village or community level, data are not disaggregated at those levels. All differences presented are statistically significant unless otherwise stated.

Qualitative Component

FGDs and KIIs were conducted in intervention villages only in 2014 PSS. Participants included health center staff, volunteer health workers, midwives, and birth attendants; they were chosen because they routinely deal with child and maternal health issues and are knowledgeable about local health services.

The key questions for the FGDs and KIIs were related to the current nutrition and health status of mothers and infants, sustainability of the project, and health services delivery

system. Five FGDs were conducted with 5–8 participants per group, and ten KIIs were conducted.

Quotes from FGD and KII were coded and analyzed to better understand the current status of various indicators, and themes that emerged from the quantitative analysis.

Results

Quantitative Results

Lasting Positive Results

One of the most striking improvements observed between 2007 and 2014 is the percentage of infants whose births were attended by skilled health personnel: 80% of births in intervention villages in 2014 compared to 32% in 2007 (mean difference (MD) 48.56, 95% CI 38.68 to 58.43) but about the same as in comparison villages in 2014 (77%) (Table 2). The findings also show that, compared to 2007, intervention villages had a significantly higher percentage of infants who were fed with a minimum of appropriate feeding practices (MD 9.66, 95% CI 0.80 to 18.43), and a lower percentage of infants were underweight in intervention villages in 2014 (16%) than in 2007 (25%) (MD – 8.99, 95% CI – 15.06 to 2.92). A higher percentage of infants with diarrhea received an oral rehydration solution (ORS) or recommended fluids in 2014 in intervention villages (35%) compared to 2007 (19%) (MD 16.42, 95% CI – 0.94 to 33.37). In addition, indications

that women's health had continued to improve were noted: the percentage of mothers with a mid-upper-arm circumference of < 22.5 cm was lower in 2014 intervention villages (4%) than in 2007 (7%) (MD – 3.37, 95% CI – 6.82 to 0.074).

Unsustained Results Some indicators show unsustained results overtime. The largest decrease is observed in vitamin A dose received by infants which fell to 71% in 2014, from 85% in 2007 (MD 13.47, 95% CI 5.91 to 21.02). The percentage of households that effectively treated their drinking water was also lower in 2014 (91%) than in 2007 (97%) (MD – 6.34, 95% CI – 12.93 to 0.25).

Breastfeeding and Child Feeding Practices

Lasting Positive Results Significantly more infants (> 6 months old) ate fortified food within the last 24 h prior to the survey in 2014 than in 2007 (MD 37.44, 95% CI 28.71 to 46.15); likewise more ate meat (MD 13.49, 95% CI 2.08 to 24.89), eggs (MD 30.34, 95% CI 20.29 to 40.37), dairy (MD 37.78, 95% CI 29.66 to 45.90), and other animal products (MD 15.72, 95% CI 4.32 to 27.12), vitamin A-rich yellow and orange vegetables (MD 38.96, 95% CI 29.41 to 48.50), dark green leafy vegetables (MD 18.84, 95% CI 10.06 to 27.62), and vitamin A-rich fruits (MD 39.26, 95% CI 29.92 to 48.59) (Table 3).

Unsustained Results The biggest drop in healthy feeding practices is observed in infants breastfed within 1 h of birth,

Table 2 Comparisons of means of Indicators between PCI 2007 and 2014 results and 2014 comparison and PCI villages

Indicators	End-line PCI 2007	PSS 2014		PCI 2014–PCI 2007		Comparison–PCI 2014	
		Comparison	PCI	Difference	95% CI	Difference	95% CI
Mothers of infants who received at least 2 tetanus toxoid injections	73.56	80.09	83.86	10.30**	0.37 to 20.23	– 3.77	– 13.79 to 6.26
Infants whose births were attended by skilled health personnel	31.85	77.35	80.41	48.56***	38.68 to 58.43	– 3.06	– 11.65 to 5.53
Infants under 6 months who were exclusively breastfed in the last 24 h	45.90	44.21	41.23	– 4.67	– 24.74 to 15.39	2.98	– 12.21 to 18.17
Infants fed to a minimum of appropriate feeding practices	61.95	71.07	71.61	9.66**	0.80 to 18.43	– 0.54	– 10.37 to 9.28
Infants who received a dose of vitamin A in the last 6 months	85.09	72.70	71.62	– 13.47***	– 21.02 to 5.91	1.08	– 7.96 to 10.12
Infants with diarrhea who received ORS or recommended fluids	19.00	24.39	35.42	16.42*	– 0.94 to 33.37	– 11.03	– 33.11 to 11.06
Households that treat water effectively	96.89	85.95	90.55	– 6.34*	– 12.93 to 0.25	– 4.6	– 14.76 to 5.55
Mothers who live in households with soap at the place for hand washing	78.67	77.28	80.71	2.04	– 5.97 to 10.05	– 3.43	– 12.64 to 5.79
Infants who are underweight by WHO standards	25.33	14.75	16.34	– 8.99***	– 15.06 to 2.92	– 1.59	– 5.80 to 2.63
Mothers with a mid-upper-arm circum. of < 22.5	7.33	5.41	3.96	– 3.37**	– 6.82–0.074	– 1.45	– 2.71 to 5.61

Significance level: ***= 1%; **= 5%; *=10%

Table 3 Comparisons of means of breastfeeding and child-feeding indicators between PCI 2007 and 2014 results and 2014 comparison and PCI villages

Indicators	End-line 2007	PSS 2014		PCI 2014–PCI 2007		Comparison–PCI 2014	
		Comparison	PCI	Difference	95% CI	Difference	95% CI
Infants ever breastfed	99.33	86.18	84.98	−14.35***	−18.83 to 9.86	1.20	−5.42 to 7.82
Infants put to the breast within 1 h of birth	28.00	4.92	12.01*	−15.99***	−22.89 to 9.08	−7.09	−14.45 to 0.27
Infants who had anything by bottle in the last 24 h	16.00	16.86	24.61**	8.61***	2.25 to 14.95	−7.75	−14.07 to 1.41
Infants who are still breastfeeding	92.48	89.13	90.06	−2.42	−9.08 to 4.24	−0.93	−9.29 to 7.42
Infants at least 6 months who ate vitamin A–rich foods in the last 24 h	81.97	81.76	79.69	−2.28	−9.01 to 4.45	2.07	−5.23 to 9.37
Infants at least 6 months who ate iron-rich foods in the last 24 h	80.60	72.33	71.09	−9.51**	−18.79 to 0.21	1.24	−8.54 to 11.01
Infants at least 6 months who ate fortified food in the last 24 h	18.03	48.74	55.47	37.44***	28.71 to 46.15	−6.73	−19.27 to 5.81
Infants at least 6 months who ate meat in the last 24 h	45.63	58.81	59.11	13.49**	2.08 to 24.89	−0.30	−12.17 to 11.55
Infants at least 6 months who ate eggs in the last 24 h	29.82	62.89	60.16	30.34***	20.29 to 40.37	2.73	−9.07 to 14.54
Infants at least 6 months who had dairy in the last 24 h	10.66	43.71	48.44	37.78***	29.66 to 45.90	−4.73	−14.11 to 4.66
Infants at least 6 months who ate any animal-source food in the last 24 h	59.02	76.73	74.74	15.72***	4.32 to 27.12	1.99	−7.21 to 11.19
Infants at least 6 months who ate vitamin A–rich vegetables in the last 24 h	18.85	60.06	57.81	38.96***	29.41 to 48.50	−2.25	−12.02 to 16.52
Infants at least 6 months who ate dark green leafy vegetables in the last 24 h	53.55	73.90	72.40	18.84***	10.06 to 27.62	1.5	−8.66 to 11.67
Infants at least 6 months who ate vitamin A–rich fruit in the last 24 h	23.50	62.26	62.76	39.26***	29.92 to 48.59	−0.5	14.09 to 13.10
Infants at least 6 months who ate any vitamin A–rich plant food last 24 h	73.22	78.30	77.86	4.64	−2.60 to 11.88	0.44	−9.04 to 9.92

Significance level: ***= 1%, **= 5%, *=10%

which decreased from 28 to 12% between 2007 and 2014 (MD −16, 95% CI −22.89 to 9.08) (Table 3). The practice of breastfeeding within 1 h of birth eroded over time, but it has not completely fallen to the level of the comparison villages (Table 3). While the percentage of 0–23-month-old infants ever breastfed was reduced from 99 to 85% (MD −14.35, 95% CI −18.83 to 9.86), the percent of 0–23-month-old infants who were fed by bottle within the 24 h prior to the interview increased between 2007 and 2014, from 16 to 25% (MD 8.61, 95% CI 2.25 to 14.95).

Immunization

Unsustained Results All immunization indicators decreased between 2007 and 2014 (Table 4).

Diarrhea

Lasting Positive Results Fewer infants in intervention villages had diarrheal episodes in 2014 than in 2007 (Table 5).

In 2007, about 22% of infants had had diarrhea within the 2 weeks prior to the survey, compare to only 11% in 2014 (MD −11.56, 95% CI −17.95 to −5.16). The drop in the incidence of diarrhea was accompanied by an increased practice of providing oral rehydration solution (ORS) in cases of diarrhea (Table 2).

Unsustained Results The percentage of mothers of children with diarrhea in intervention villages who sought outside care decreased between 2007 and 2014, although it remained higher than in comparison villages (MD −5.48, 95% CI −9.55 to −1.39).

Water, Sanitation, and Hygiene (WASH)

Lasting Positive Results The sanitation infrastructure improved from 2007 to 2014; a higher percentage of households had improved toilets and hand-washing supplies (Table 6). The percentage of households that reported using an improved toilet facility was 48% in 2014 versus 26% in

Table 4 Comparison of means of immunization indicators between PCI 2007 and 2014 results and 2014 comparison and PCI Villages

Indicators	End-line 2007	PPSS 2014		PCI 2014–PCI 2007		Comparison–PCI 2014	
		Comparison	PCI	Difference	95% CI	Difference	95% CI
Infants who have a vaccination card	93.11	94.61	91.14	-1.97	-7.09 to 3.15	3.47	1.43 to 8.37
Infants older than 12 months who received measles vaccine	36.21	20.83	21.95	-14.26*	-28.27 to 2.32	-1.12	-14.63 to 12.39
Infants older than 12 months who received DTP1	78.02	28.57	30.24	-47.77***	-62.14 to -3.39	1.67	16.49 to 3.14
Infants older than 12 months who received DTP3	41.81	25.00	27.32	-14.49**	-28.98 to -0.00	-2.32	-16.45 to 11.82
Infants who received a DTP1 but did not receive a DTP3 vaccination	38.46	13.64	9.09	-29.37***	-42.46 to -6.27	4.55	-9.10 to 18.19
Infants who received BCG before they reached 12 months	51.67	7.71	6.33	-45.34***	-54.96 to 5.72	1.38	-3.97 to 6.74
Infants who received polio1 before they reached 12 months	49.00	6.75	5.31	-43.69***	-53.88 to -3.49	1.44	-3.75 to 6.63
Infants who received polio2 before they reached 12 months	37.64	0.96	2.24	-35.39***	-45.24 to -5.54	-1.28	-3.23 to 0.67
Infants who received polio3 before they reached 12 months	29.18	0.96	1.02	-28.16***	-36.11 to -0.19	-0.06	-1.40 to 1.29
Infants who received DTP1 before they reached 12 months	44.54	0.96	1.22	-43.32***	-52.91 to -3.72	-0.26	-1.70 to -1.18
Infants who received DTP2 before they reached 12 months	32.52	1.45	1.02	-31.50***	-40.02 to -2.96	0.43	-0.90 to 1.75
Infants who received DTP3 before they reached 12 months	22.27	1.20	1.02	-21.25***	-28.71 to -3.78	0.18	-1.09 to 1.46
Infants who received HepB1 before they reached 12 months	43.88	2.17	2.04	-41.83***	-50.33 to -3.32	0.13	-1.88 to 2.13
Infants who received HepB2 before they reached 12 months	30.96	0.24	0.41	-30.55***	-37.80 to -23.29	-0.17	-0.90 to 0.56
Infants who received HepB3 before they reached 12 months	22.27	0.24	0.41	-21.86***	-28.81 to -4.90	-0.17	-0.89 to 0.56
Infants who received measles before they reached 12 months	25.61	0.72	0.61	-25.00***	(-31.17 to -8.82)	0.11	0.92 to 1.14

Significance level: ***= 1%; **= 5%; *=10%

Table 5 Comparison of means of diarrhea indicators between PCI 2007 and 2014 results and 2014 comparison and PCI villages

Indicators	End-line 2007	PSS 2014		PCI 2014–PCI 2007		Comparison–PCI 2014	
		Comparison	PCI	Difference	95% CI	Difference	95% CI
Infants who had diarrhea in the last 2 weeks	22.32	10.49	10.76	-11.56***	-17.95 to -5.16	-0.27	-5.38 to 4.82
Infants with diarrhea in the last 2 weeks who were offered more fluids other than ORS	66.00	39.02	41.67	-24.33**	-45.98 to -2.68	2.65	-26.90 to 1.62
Infants with diarrhea who were treated with zinc supplements	39.00	33.33	36.96	-2.04	-20.95 to 16.86	-3.63	-24.50 to 7.25
Infants with diarrhea whose mothers sought outside advice or treatment	14.89	5.15	10.63	-4.26	-9.14 to 0.63	-5.48**	-9.55 to -1.39

Significance level: ***= 1%; **= 5%; *=10%

2007 (MD 22, 95% CI 9.84 to 34.61) and also higher in intervention than in comparison villages in 2014 (MD -12, 95% CI -25.83 to 1.97). All other WASH indicators were slightly higher in intervention than in comparison villages.

A significantly higher percentage of households in intervention villages had more essential hand-washing supplies readily available in 2014 than in 2007, 53 versus 10% (MD 43.77, 95% CI 36.80 to 50.72). The percentage of house-

Table 6 Comparison of means of WASH indicators between PCI 2007 and 2014 results and 2014 comparison and PCI villages

Indicators	End-line 2007	PPSS 2014		PCI 2014–PCI 2007		Comparison–PCI 2014	
		Comparison	PCI	Difference	95% CI	Difference	95% CI
Households with all essential hand-washing supplies readily available	9.78	52.46	53.54	43.77***	36.80 to 50.72	−1.08	−12.68 to 10.51
Households that safely disposed of their child's feces the last time the child passed stool	24.00	52.22	58.46	34.46***	25.62 to 43.30	−6.24	−15.89 to 3.41
Households using an improved toilet facility	26.00	36.30	48.23*	22.23***	9.84 to 34.61	−11.93	−25.83 to 1.97
Households with soap whose members used it for washing hands at least at 2 critical times	93.03	26.95	39.37*	−53.66***	−63.34 to 43.97	−12.42	−25.66 to 0.82
Households storing drinking water that stored water safely	98.58	21.93	27.83	−70.75***	−76.74 to 64.75	−5.90	−16.03 to 4.23

Significance level: ***= 1%; **= 5%; *=10%

holds that safely disposed of their child's faces was also higher in 2014, at 58 versus 24% (MD 34.46, 95% CI 25.62 to 43.30).

Unsustained Results In 2014 fewer households with water storage facilities in intervention villages were storing drinking water in a safe place (28%), compared to 2007 (99%) (MD −70.75, 95% CI −70.75 to 64.75). Also, a significant drop was noted in households that reported using soap during at least two critical times in 2014 (MD −54, 95% CI −63.34 to 43.97).

Qualitative Results

Qualitative data from FGDs and KIIs, were aggregated into domains and themes around births attended by skilled midwives, breastfeeding practices, immunizations, and WASH.

Higher Acceptance to Births Attended by Skilled Midwives

The sub-district health offices have always encouraged pregnant women to have their births attended by skilled midwives, people in the intervention villages become more receptive to the idea, as a result of CHOICE.

The PCI program helped midwives a lot. The program made their work easier. (FGD, Pagelaran)

Breastfeeding Promotion Continued

According to midwives and *Kaders*, breastfeeding is still encouraged:

The promotion of exclusive breastfeeding still continues; it's done when midwives visit the villages for KN1 and KN2 [a midwife's visits after the delivery]. The promotion is also given in the Posyandu to a group

of *Kaders* and to the community during a community meeting. (FGD, Sukaresmi)

However, key informants and FGD participants felt that infant nutrition had suffered after PCI left, government response to malnourished children had slowed down, and frequency of ration provision had decreased:

PCI provided children with food 3 days a week... When the PCI programs were ended, so was the food supplement. (FGD, Sukaresmi)

Higher Acceptance of Immunizations

Although, quantitative data show notable reduction in immunizations in 2014 compared to 2007, the participants of FGDs spoke about a higher acceptance of immunization in the communities:

Now, both villages with PCI and without PCI don't think of [immunization] as taboo any longer, because of the health promotion by PCI. (FGD, Patia)

Community-Led Total Sanitation (CLTS) Program Continued

The CLTS program continued after PCI left the area. The local NGO (Lembaga Amil Zakat Harapan Duafa–HARFA), the government, and private individuals continued the work of improving latrines:

The CLTS program still continues. After the PCI program on CLTS, the local government launched the same program. (FGD, Pagelaran)

In terms of understanding the consequences of open defecation and treatment of feces, the community is now aware of the importance of proper management:

Like CLTS [said], the community did not know that their feces are dangerous to them. After CLTS was

run they understood that's not good for their health, so they change the way they pass stools. (KII, Saketi)

Discussion

The PSS aimed to evaluate the lasting effects of CHOICE, 7 years after the program had ended. The study found positive changes between 2007 and 2014 in many indicators related to infant health but a decrease in indicators related to health behavior.

The study also aimed to improve methodologies for conducting post-project studies. Post-project studies are not nearly as common as they should be, and this study reinforces the need of carrying out PSS, using rigorous methodology, that incorporates planning from the startup of a project's life cycle.

Contributors to Lasting Positive Results

Although difficult to say with certainty, the limited differences between intervention and comparison groups indicate that contextual factors likely played a role in achieving the 2014 results for both intervention and comparison groups. The government and local NGOs have continued to provide infrastructure support to the community, which may explain the increased use of toilet facilities and of births attended by skilled personnel.

One of the most significant improvements observed between 2007 and 2014 is the percentage of infants whose births were attended by skilled health personnel: 80% of births in intervention villages in 2014 compared to 32% in 2007 but about the same as in comparison villages in 2014 (77%). In the qualitative interviews, people explained that although the sub-district health offices have always encouraged pregnant women to have their births attended by skilled midwives, people in the intervention villages identified this as a learning from the CHOICE program.

Contributors to Unsustained Results

Most of the indicators related to vaccination showed fewer children vaccinated in 2014 than 2007. The qualitative data reveal that after CHOICE ended, many components, such as *Kaders'* training, supervisor monitoring, and the engagement of the *Posyandus*, were abandoned altogether. Deficiencies in these components hinder the transmission of knowledge between generations of both *Kaders* and new mothers and lower the community's capacity to support itself.

Intervention Versus Comparison Villages

For only one case the intervention villages fared better as compared to the comparison villages. A higher percentage of mothers in intervention villages sought outside help in cases of diarrhea.

For most indicators, no statistically significant differences between intervention and comparison villages were noted. Health and nutritional outcomes seem to have kept pace with the neighboring villages. The intervention villages were selected for participation in CHOICE in 2007 based on demonstrated need, so it is possible that health indicators were worse in intervention villages compared to comparison villages in 2007. Lack of difference between intervention and comparison villages indicates that PCI villages have kept pace with the neighboring villages.

Limitations

As with any research conducted outside of a controlled environment, study limitations should be noted. These lessons learned may prove to be useful in designing similar post-project sustainability studies in the future and therefore contribute to the overall state of the art in post-project sustainability measurement.

The fact that there appear to be significant improvement from 2007 to 2014 but no significant differences between intervention and comparison groups underscores just how complex and challenging it is to design and implement rigorous and impactful studies of sustainable impact. It is clear that without understanding context or longitudinal changes, conclusions from findings can be limited at best.

While positive indicators of sustainability were identified, the lack of a broader analysis of environmental factors and longitudinal assessment of changes within the communities precludes having evidence that it was exclusively due to the CHOICE project. While it is possible that CHOICE contributed to improving the health of participants long-term, other social forces and temporal factors may have also affected some of the observed changes in both intervention and comparison groups.

Limitations affecting direct attribution of results to the project also included the lack of comparison village data from the CHOICE project period of implementation and, because original records were not available, the inability to determine whether the population in 2014 was socioeconomically similar to 2007.

Lack of information about who participated in or was part of the CHOICE program may have reduced the effects observed. Our study did not ask participants whether they had been part of the original project, mainly because of recall problems that undermine the reliability of the information obtained.

Thus, detailed records of participants should be kept during implementation.

The comparison villages should have been selected on the basis of conditions prior to the implementation of the CHOICE project, but such information was not available at the village level, so the selected villages may not provide an adequate comparison.

Recommendations

Sustainability planning and testing, must be integrated at every stage of the project cycle, including an effective phase-out or phase over plan. Advanced planning for sustainability strategies and integration at every stage of the project cycle, will facilitate the study and identification of factors that influence positively and negatively, the sustainability of a project's results.

Sustaining program activities and their positive outcomes is the goal of all interventions, and strategies for post-project sustainability should be included in project planning. The potential for sustainability can be supported by including key stakeholders (government counterparts, local NGOs, elected bodies, etc.) during the program planning, implementation and evaluation. Stakeholders need to develop a strong sense of ownership of the programs, in order to sustain them appropriately (Sarriot et al. 2008). During the intervention, a sustainability plan should be prepared in close consultation with the stakeholders who will be responsible for continuing the activities.

Qualitative methods should be used to support, expand and confirm results of the quantitative measures. During our study, we collected qualitative data at the same time as the quantitative data. In the future, it would be more effective to collect qualitative data after completing and analyzing the surveys, in order to dig deeper and better understand findings.

Most of the participants in the qualitative portion were giving their opinions from the perspective of health care providers—health center staff, volunteer health workers, midwives, and birth attendants. Although valuable, we recommend also including the views of health care recipients in the intervention communities, in order to capture beneficiaries' perspectives on programs.

Adequate documentation and access to baseline, midterm and endline data are key requirements for conducting quality post-project studies.

Conclusions

This PSS contributes to the limited body of knowledge in sustainability research. Perhaps the most important conclusion of this study is the recognition of how challenging it is

to successfully undertake PSS. It is hoped that the lessons learned from this study will increase potential for sustainable impact of projects, as more rigorous measurement will lead to greater overall understanding of how sustainability actually “happens”.

This study underscores the fact that more rigorous measures of sustainable impact must be undertaken if we are to know how best to invest limited health and development project resources most appropriately for real and lasting change.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest.

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