


# Process Evaluation of Nutrition Intervention Strategy in a Local Philippine Setting

Journal of Primary Care & Community Health  
Volume 11: 1–10  
© The Author(s) 2020  
Article reuse guidelines:  
sagepub.com/journals-permissions  
DOI: 10.1177/2150132720915407  
journals.sagepub.com/home/jpc  


Rowena V. Viajar<sup>1</sup> , Julieta B. Dorado<sup>1</sup>,  
Glenda P. Azaña<sup>1</sup>, Heidenhein A. Ibarra<sup>1</sup>,  
Eldridge B. Ferrer<sup>1</sup>, and Mario V. Capanzana<sup>1</sup>

## Abstract

**Aims:** Undernutrition among 0 to 5 years old children remains a public health problem in the Philippines. This process evaluation study documented and examined the implementation of an intervention strategy for young children. **Methods:** Complementary feeding of 6-month to 2-year-old children was implemented for 120 days by the municipalities of Plaridel and Pulilan in Bulacan, Philippines utilizing local-based food made of rice and mung bean along with nutrition education classes among mothers/caregivers using the developed nutrition modules. A total of 121 mother-/caregiver-child pairs were the program participants of the intervention. Pre-post design were used in the analysis of quantitative data. Qualitative data were encoded verbatim manually using emerging themes. Key informant interviews among community workers and municipal officials and focus group discussions among mothers/caregivers and community workers were conducted to gather the needed data. **Results:** The municipalities adhered to the program phases of planning, organizing, implementation, monitoring, and evaluation. At end-line, the weight of children participants increased in both municipalities and the mean nutrition knowledge scores of mothers/caregivers increased significantly ( $P < .05$ ). **Conclusions:** This process evaluation confirmed that the proposed nutrition intervention strategy for young children can be implemented at the local level. The strong support and active cooperation of the local program implementers and mothers/caregivers and adherence to program requirements were the key factors in the efficient implementation of the intervention. For sustainability, the passing of local ordinance for the adoption of intervention and budget support for implementation of the intervention is recommended.

## Keywords

complementary feeding, nutrition education, nutritional status, process evaluation

Date received: 11 November 2019; revised: 27 February 2020; accepted: 27 February 2020.

## Introduction

In the Philippines, undernutrition remains a public health problem among under-5-year-old children. Underweight prevalence has not significantly change between 2011 and 2018 as reported in the 2018 Expanded National Nutrition Survey.<sup>1</sup>

In 2011, a package of intervention strategy dubbed as DOST *PINOY* (where *PINOY* stands for Package of Intervention for the Improvement of Nutrition of Young children) has been developed by the Department of Science and Technology–Food and Nutrition Research Institute (DOST-FNRI) in response to the prevailing problem of malnutrition in the Philippines. The intervention has a component of complementary feeding among young children

and nutrition education of mothers/caregivers. This nutrition intervention strategy was initially field tested in 4 provinces in the Philippines covering 1000 children, which resulted in significant decrease in the prevalence of underweight among children in the intervention group after 120 feeding days (from 96.7% to 82.1%). Likewise, the mean scores on nutrition knowledge among mothers/caregivers in

<sup>1</sup>Department of Science and Technology, Food and Nutrition Research Institute, Taguig City, Philippines

### Corresponding Author:

Rowena V. Viajar, Department of Science and Technology, Food and Nutrition Research Institute, DOST Compound, General Santos Avenue, Bicutan, Taguig City, 1633, Philippines.  
Email: wenavelasco@yahoo.com



the intervention group increased significantly ( $P < .05$ ) from  $7.77 \pm 2.9$  to  $9.75 \pm 3.5$ .<sup>2</sup> It was then suggested that the DOST *PINOY* intervention strategy can be adopted and implemented as a program to address malnutrition by the local government units (LGUs) in the Philippines.

Thus, the present study explored the actual implementation of the intervention strategy on the grounds with the aim of examining how each of the program phases of planning, organizing, implementation, and monitoring and evaluation were carried out by the research municipalities. Through this study, necessary modifications and improvement can be done to enhance the effectiveness of program implementation. Results of the study can serve as basis for replication of the intervention in other areas.<sup>3,4</sup> According to Shah's view,<sup>5</sup> process documentation research is a tool to help development organization learn from their experiences. It is an open-ended, inductive process that explores the interface between an organization and the people it works with. It is a dynamic view of project implementation and helps make projects respond to context-specific requirements. Implementation research studies also referred to as formative evaluation, process evaluation, program monitoring and implementation assessment,<sup>3,6-9</sup> which systematically documented how the intervention is carried out.<sup>4</sup>

## Material and Methods

The study is a process documentation of a nutrition strategy as implemented by the LGUs. It documented and assessed the complementary feeding among infants and young children and nutrition education among mothers/caregivers specifically, on the procedures in planning, organizing, implementing, and monitoring. The study employed qualitative and quantitative methods in systematically documenting and assessing the implementation of the intervention.

### Study Areas

The study areas were selected based on its representation as a rural LGU or municipality and the willingness of the local chief executive to be part of the research. Thus, the study was conducted in 3 *barangays* in Pulilan and 2 *barangays* in Plaridel, Bulacan, a municipality and province north of Manila in the Philippines. A municipality is also known as town while the *barangay* or village is the basic administrative unit in the Philippines.

### The Intervention Strategy

The intervention called DOST *PINOY* involved a 120-day complementary feeding among infants and young children using the complementary foods (described in the next section) and nutrition education among their mothers/caregivers using nutrition modules (described in the next section).

These intervention activities were carried out by the *Lingkod Lingap sa Nayon* (LLN) or local nutrition community workers in the areas covered. The LLNs are *barangay* volunteers who were trained prior to the implementation of the intervention in the study areas.

**Complementary Foods for Children.** The children were fed daily for 4 months or 120 days, including Saturdays and Sundays with local-based complementary foods (CF) made of rice and mung bean. Rice and mung bean (RM) curls and RM instant blend were processed through extrusion using high pressure and high temperature. The rice–mung bean–sesame (RMS) ready-to-cook blend was processed by mechanical or manual roasting.

The RM instant blend and curls and RMS ready-to-cook blend are packed in 30-g sachets. Children aged 1 to 2 years were fed with CF blends and curls. Based on a previous study,<sup>2</sup> the duration of 120 feeding days would yield significant weight improvement among undernourished children.

These CF blends and curls are rich in energy and protein based from product analysis. The RM blend contains 120 kcal and 4 g protein, while both RMS blend and RM curls provide 130 kcal and 4 g protein per 30-g sachet. Rice is considered a staple food in the Philippines while mung bean is indigenous food of the Filipinos. Mung bean is a good plant-based source of protein and with high nutritional value such as lysine.

**Nutrition Education of Mothers/Caregivers.** The nutrition education component of the intervention comprised of 20 sessions of mothers' classes utilizing 7 modules that tackled what mothers and caregivers should know specifically on (1) basic nutrition, (2) maternal nutrition, (3) breastfeeding, (4) complementary feeding, (5) meal planning, (6) safe food handling and preparation, and (7) backyard vegetable gardening. These modules were developed by the DOST-FNRI for use of community workers in the conduct of mothers' nutrition classes. The modules were written in simple words in the Filipino dialect with illustrations for easy understanding. Each module consists of individual and group learning activities as well as pre- and post-test. Prior to actual implementation of the intervention, the local community workers undergone a 2-day training on the use of the modules to capacitate them in the conduct of mother's nutrition classes in the *barangays* covered for this research.

### Study Participants

**Implementers of the Intervention.** Implementers interviewed comprised 29 Municipal Nutrition Action Officers (MNAOs), *Sangguniang Bayan* Chair on Health, Municipal Health Officers, Nutrition Office staff, *barangay* captains, *barangay* councilor on health, LLNs, *barangay* health workers (BHWs) and mother-leaders. *Sangguniang Bayan*

is the municipal-level lawmaking body in the Philippines.

Focus group discussions were conducted at the *barangay* level among 34 program implementers, including the Rural Health Midwives, LLNs, BHWs, and mother-leaders.

**Mothers/Caregivers.** Five focus group discussions (FGDs) were participated in by 51 (94%) mothers, grandmothers and a father.

**Infants and Young Children and their Mothers/Caregivers.** The identified 6-month- to 2-year-old children participants were obtained from the recent Operation *Timbang* data at the time of study. The Operation *Timbang* is the annual assessment of weight, length/height of 0- to 71-month-old children taken by the community health workers. A total of 158 of mother/caregiver child pairs (108 from Pulilan and 50 from Plaridel) were the participants at the start of intervention.

Toward the end of intervention, the participating mother-child pairs decreased to 121. The reasons for drop outs appeared to be personal to the respondents. The common reasons cited were change of residence (54.2%), refusal of mothers to continue participating in the program due to engagement in household chores and caring for the younger children, thus, no adult family member can accompany the respondent-child in going to the feeding venue, and simply the mothers were not interested to participate (39.8%), maternal employment (3.6%), and children's health condition (2.4%).

### Data Collection Procedure

Face-to-face interviews, actual observations, review of records, and key informant interviews among municipal and *barangay* implementers were conducted during the monitoring with focus on the intervention phases. Qualitative assessment of the intervention as expressed through their perceptions and insights were documented.

Focus group discussions were conducted at end-line by trained research team members to gather perceptions and experiences during the implementation of intervention. Each FGD comprised a facilitator and recorder and lasted between 45 and 90 minutes. The FGD participants were asked to sign a consent form and fill-up an attendance sheet containing some personal information prior to the discussion. The facilitator/moderator introduced the research team members, explain the objective and the topics for discussion. Each participant was requested to introduce themselves, encouraged them to express their opinions and experiences regarding the issues. They were assured that their sharing will be confidential. The topic guides were based on the objectives of the study. Each participant was given a chance to speak while the facilitator led the discussion. The FGD ended with the facilitator's summary of the

discussion and further validation and clarification from the group (if there were any).

In every *barangay*, a separate FGD among implementers and mothers/caregivers were conducted with an average of 7 to 10 participants, respectively. Participants in the FGDs were those implementers engaged in intervention and the mothers/caregivers of children participants.

**Monitoring and Evaluation of the Implementation.** Monitoring was conducted monthly by the research team in the 2 municipalities to document the progress of implementation using a developed monitoring and evaluation tools and by reviewing the program's form such as attendance of mothers/caregivers in mothers' nutrition class, children's feeding attendance and consumption and monthly weighing record of the LLNs.

The LLNs assisted by the mother-leader volunteers conducted initial weighing of children participants using calibrated Salter weighing scale prior to the start of the complementary feeding. Follow-up monthly weighing thereafter was done until the end of the intervention.

Nutrition knowledge tests consisting of 20 items were administered by the LLNs among mothers/caregivers on the second (baseline) and fourth (end-line) month of implementation, respectively.

### Phases of the Intervention (DOST PINOY)

**Planning.** This phase covers the identification and discussion of intervention objectives, the people involved, target participants and areas of implementation. Schedule of capacity building, launching of the intervention, orientation of participants, weighing and deworming of children, purchase of cooking utensils and feeding paraphernalia, and storage of CF were decided in the planning phase.

**Organizing.** For the start of intervention, the people were organized to plan for the activities such as initial weighing and deworming of children participants, capacity building of the community workers on how to implement the intervention, cooking demonstration on CF blends and reproduction of monitoring forms and modules. Orientation meeting among the mothers/caregivers of prospective children-participants were conducted regarding the activities for the duration of intervention. A core group of mothers/caregivers should be formed during this phase so that the participants will have the feeling of ownership of the intervention.

**Implementation.** The planned and organized activities are carried out during the implementation phase to attain the objectives of the 120-day complementary feeding of young children and mothers' education through nutrition classes.

Mother's class was implemented on the second up to the fourth month of intervention using the developed nutrition modules. The schedule of nutrition classes depended on the

common time availability of the mothers/caregivers. The classes lasted for an hour twice a week. A prepared 3-month calendar served as guide for scheduling the nutrition classes.

**Monitoring and Evaluation.** The municipal and *barangay* implementers closely monitored the progress of feeding activities and nutrition classes.

The LLNs monitored the attendance and occurrence of illness/infection, CF consumption of children-participants and child's monthly weighing. End-line evaluation was conducted to assess the effectiveness of the intervention in terms of change in nutritional status of children and nutrition knowledge of mothers/caregivers.

### Data Processing and Analysis

Complete data set of 121 mother-/caregiver-child pairs obtained from the records was analyzed for this study. Descriptive statistics using means, frequencies and percentages were used to describe the respondents' profile. The knowledge level of the mothers/caregivers was evaluated using the scores obtained in the baseline and end-line tests. Paired *t* test was used to determine the difference within knowledge scores of mothers/caregivers for baseline and end-line collection.

Weight-for-age Z-scores were determined using the World Health Organization Anthro software.<sup>10</sup> Children with weight-for-age scores  $< -2SD$  were classified as underweight based on the World Health Organization Child Growth Standard [10].

FGDs were transcribed and encoded verbatim manually using emerging themes based on the guide questions which focused on program participation by phase, on feeding and nutrition education components of the program, their perceptions on the effect of the program and its sustainability. Transcripts of key informant interviews were organized and analyzed by phases of intervention implementation.

### Ethical Considerations

The research protocol was approved and cleared by the FNRI Institutional Ethics Review Committee (IERC) with code FIERC-2014-003 dated November 26, 2014 prior to project implementation. Signed consent forms were secured from the research participants. It was emphasized that their participation is voluntary and that their refusal to participate involved no penalty. They were assured on the confidentiality of information derived from them.

## Results

### Phases of the Implementation

**The Planning Phase as Conducted in the Municipality.** The planning at the municipality level started with the presentation and discussion of the intervention strategy by the MNAO

with the municipal nutrition committee members composed of the municipal officials and *barangay* implementers. The members supported the goal of the intervention, which is to rehabilitate the underweight infants and young children aged 6 months to 2 years and contributed in addressing the malnutrition problem in their area.

During this phase, decisions and agreements were made specifically on (1) the *barangays* and number of children participants to be covered based on the Operation *Timbang* data at the time of study, (2) the required budget, (3) schedule of deworming, (4) initial weighing, and (5) feeding venue. The distance of houses and the safety of children were considered in identifying the location of feeding venue. The plan for project launching, capacity building and procurement of supplies needed for complementary feeding and mother's class activities were also mapped out in this phase. Likewise, the commitments of municipal and *barangay* implementers were firmed up. Planning was done according to the guidelines of the implementation.

**The Organizing Phase as Conducted in the Municipality.** The planned activities were given form during the organizing phase. These were demonstrated by the provision of budget by both municipalities and *barangays* to support the intervention activities such as reproduction of nutrition modules, visual materials and printing of monitoring forms. Capacity building and launching activities were organized and conducted before the start of intervention in both municipalities. The 2-day capacity-building workshop on how to implement the intervention was attended by 82 LLNs and BHWs from the 2 municipalities, 2 months before the start of intervention.

After the capacity building workshop, a series of orientation meetings were conducted by the MNAOs among *barangay* officials, LLNs and mothers/caregivers of identified children participants in the targeted *barangays*. Their commitment to support the implementation of the intervention in their *barangays* was solicited.

The MNAO together with the LLNs conducted preparatory activities such as (1) trial preparations of CF blends with the corresponding add-on such as boiled squash, boiled sweet potato, and ripe banana; (2) review on filling-up of the monitoring forms; and (3) procurement of cooking utensils and other feeding paraphernalia.

Before the feeding activity, the children participants were dewormed by the rural health midwives, their initial weights were taken and recorded by the LLNs. The launching activity was conducted to create community awareness at the start of the intervention. The event was participated in by the mother and child participants, municipal, *barangay* implementers and officials.

Planned activities were administered except for deworming, which covered only 74% of children participants. The reasons were due to the beliefs and misconceptions of the parents on deworming.

*The Implementation Phase as Conducted in the Municipality.* The municipalities implemented the intervention through the LLNs and mother-leaders with the supervision of municipal and *barangay* officials. The CF supplies were distributed through the Municipal Nutrition Office and stored in the *barangay* hall or *barangay* health center. The complementary feeding was conducted daily from Monday to Friday at the agreed feeding time either in the *barangay* hall, day care center or houses of *barangay* officials. Mother-leaders, LLNs with assistance from BHWs and mothers/caregivers carried out the feeding activities from preparation, cooking and dishing out of CF, checking of attendance to monthly weighing of the children. Add-on ingredients such as 1 tablespoon per child of boiled sweet potato, boiled squash, and chocolate powder were used alternately to avoid taste fatigue among children participants.

The assigned community worker and mother-leaders recorded the daily attendance and food consumption of the children-participants noting specifically whether the ration was fully consumed or with leftover. Leftover food was measured using a teaspoon. Complementary foods for Saturday and Sunday's supplies were distributed during Fridays. Child's food intake during weekends was recalled on Mondays. One of the challenges in implementation, were the absences of children. In these cases, the food rations were delivered in the child's home by mother-leaders. The records of consumption and the reasons for absences were asked to the mothers/caregivers the following day.

For the nutrition education component, the baseline knowledge test was administered by the LLNs on the second month of the intervention. The nutrition education sessions had to be conducted in two batches because only half of them attended the initial sessions held. Thus, the solution was for the conduct of the second batch of nutrition classes for those mothers/caregivers who failed to attend in the initial sessions.

The mothers/caregivers actively participated in the nutrition sessions as reported by the LLNs. There were pre- and post-tests for every module to assess the knowledge of mothers/caregivers. The support of the municipality and *barangay* officials were demonstrated in terms of reproduction of nutrition education materials, providing snacks during the sessions and providing the *barangay* vehicle to ferry the mother-child participants in going to and from their houses to the venue.

*Monitoring and Evaluation Phase.* At the municipal level, the intervention was monitored by the MNAOs and nutrition staff at least once a month. Feeding activities were observed, record of attendance was checked, children's monthly weight records and LLNs diary were reviewed monthly by the research team. The implementers were reminded on the use of apron and hairnet and to remove their jewelry during food preparation. As the complementary foods were "new" to the children, leftover foods were recorded on the first few

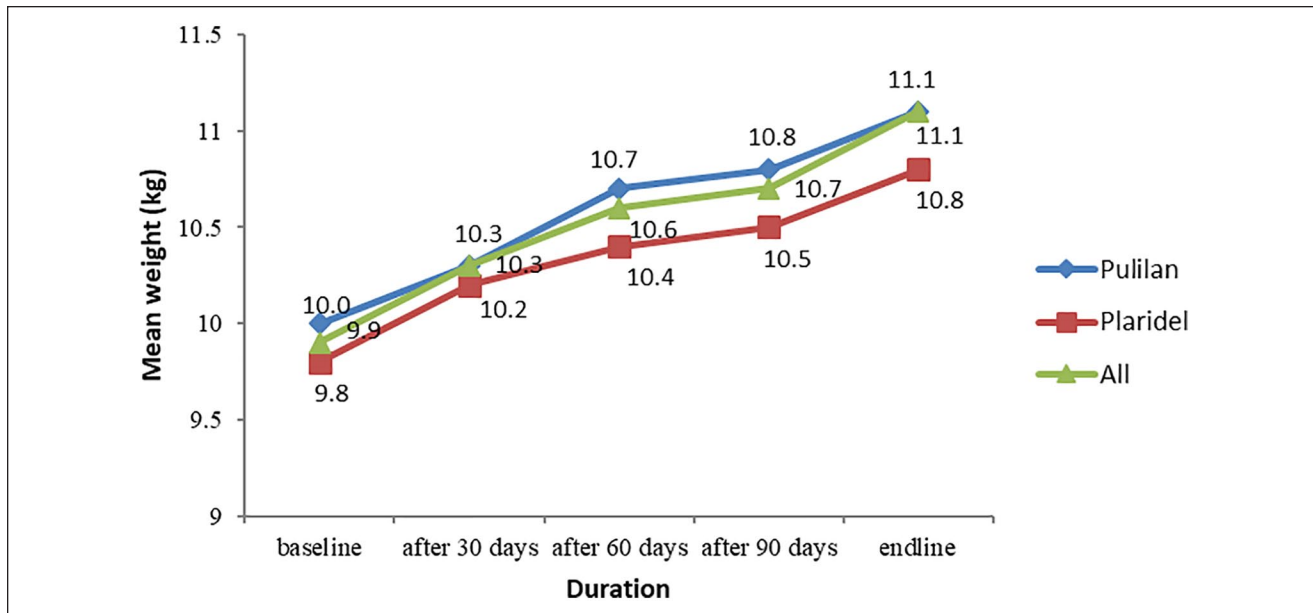
weeks of feeding. On the succeeding weeks, it was observed that the left-over CF had decreased an indication of the children's adjustments and acceptance of the taste of foods. Another challenge in implementation was the mothers/caregivers' notion that the CF was a replacement meal rather than a complement in the form of snacks. Thus, the mothers had to be always reminded that their child had to be fed with regular meals at home. Leakage in the form of sharing with siblings was another challenge in implementation. The mothers/caregivers had been regularly advised that the foods are intended solely for the children participants. Likewise, to minimize taste fatigue among children, the alternate feeding of RM and RMS blends was instructed to the community workers. They were also reminded to always have add-on ingredients such as boiled squash and boiled sweet potatoes. Toward the end of intervention, the children were able to finish their daily CF ration. Monitoring also covered checking the cleanliness of the feeding and storage area, cooking and eating paraphernalia and observing safe food handling', practices. The LLNs and mother-leaders were mainly in charged in the preparation and distributions of CF. There were times, however, when the mothers/caregivers voluntarily assisted in feeding activities.

During the key informant interviews among *barangay* implementers, they expressed satisfaction on the intervention saying that nutritious but affordable foods were provided to undernourished children. Some observed that the complementary feeding resulted to weight gain and good appetite among children and they became more active. Among mothers and caregivers, they developed camaraderie and good relationship with each other during the period of intervention. As the RM and RMS CF were given for free as snacks, the mothers saved some money.

The large number of absences among children participants was recorded on the second month of monitoring, because of common illnesses like colds, fever, and cough, which mothers associated to the cold weather, thus food ration was delivered at home by the LLNs.

At the end of the intervention, 95% of mothers/caregivers observed positive changes on their children. Their children did not get sick (48.7%), became healthy as they gained weight (43.8%), and became cheerful (53.9%) and playful (37.4%). About 68.7% of the mothers/caregivers perceived that their children became taller, heavier and had increased appetite (89.6%). The intervention was considered as a big help to their children because of the nutritious CF (32.2%). Around 39% of mothers/caregivers were hopeful that the intervention will be continuously implemented, while 14% thought that similar intervention be implemented in other municipalities. The mothers/caregivers recognized the monthly weighing as important in monitoring their children's weight.

The mothers/caregivers were encouraged to attend the mothers' classes to learn about health and nutrition. The LLNs were also reminded to adhere on the protocol of



**Figure 1.** Mean monthly weights of children participants at end-line.

fairness in administering the nutrition knowledge test. Compiled narrative reports with pictures, scores of the mothers/caregivers in quizzes also served as the monitoring tool for the intervention. The conduct of nutrition education was fully documented by *barangay* implementers particularly in the municipality of Pulilan, Bulacan.

Based on the monitoring, 38% of the mothers/caregivers attended 7 to 8 sessions of nutrition classes. More than half (56.2%) attended the mothers' classes. The nutrition education sessions were perceived as the venue for mothers/caregivers to learn about proper care and feeding of their children.

The mothers/caregivers perceived the importance of nutrition education sessions because they learned a lot about nutrition/proper feeding of children (71.1%), which they applied at home. Participation in nutrition classes enabled them to interact and bond with other mothers.

### Profile of the Study Participants

More than 70% of the participants in the FGDs among implementers were mother-leaders in each municipality having the mean age of 46 years.

Majority of the mother/caregiver participants of the group discussion in Pulilan were high school graduates (42.9%), while in Plaridel, mostly were college graduates (25%). About 43.8% to 54.3% of them were in the age bracket of 21 to 30 years.

Majority (93.7%) of the respondents in both municipalities were the mothers of children-participants. Mean age of respondents was 31 years old with more than 40% who reached some high school education. Almost 91% of the

households had 1 to 2 children aged 0 to 5 years old. Majority (38.6%) of the household heads worked as laborers or unskilled workers.

The mean age of the children participants was 21 months in both municipalities with almost equal sex distribution. Almost 85% of the children were taking multivitamins. Prior to feeding, the mean weight of children was 9.81 kg ( $\pm 1.83$  SD) with 84.8% having normal weight-for-age and 15.2% underweight-for-age.

### Nutritional Status of Children Participants

Figure 1 shows an increasing trend in the mean monthly weights of children in both municipalities. The mean weight increased from baseline to end-line at 1.2 kg. Children in both municipalities showed significant increase in the mean weight from baseline to end-line. The mean weight-for-age score for both municipalities were significantly higher at end-line compared with baseline ( $P < .05$ ) (Table 1). At baseline, there was a higher mean weight to those children who had been dewormed and taken multivitamins compared with those who were not dewormed or were not taking multivitamins at all.

### Knowledge on Health and Nutrition of Mothers/Caregivers

Table 2 presents the mean knowledge scores of mothers/caregivers on health and nutrition classes at baseline and end-line. The mean knowledge scores of mothers/caregivers in both municipalities increased significantly from baseline (12.83) to end-line (16.76) ( $P < .05$ ). Some mothers have 2 children

**Table 1.** Nutritional Profile of Children Participants at Baseline and End-line.

Variables	Municipality		All (n = 121)
	Pulilan (n = 89)	Plaridel (n = 32)	
Weight, kg, mean $\pm$ SD			
Baseline	9.97 $\pm$ 1.83	9.81 $\pm$ 2.04	9.93 $\pm$ 1.88
End-line	11.16 $\pm$ 1.88	10.77 $\pm$ 1.89	11.05 $\pm$ 1.88
Difference	-1.18	-0.96	-1.12
$p^a$	<.0001	<.0001	<.0001
Weight-for-age, mean $\pm$ SD			
Baseline	-0.98 $\pm$ 1.15	-1.32 $\pm$ 0.77	-1.07 $\pm$ 1.07
End-line	-0.63 $\pm$ 1.16	-1.04 $\pm$ 0.76	-0.74 $\pm$ 1.08
Difference	-0.35	-0.28	-0.33
$p^a$	<.0001	.0003	<.0001

<sup>a</sup>Using paired *t* test.

included in the study. Mean WAZ improved compared with baseline, expected normal growth may have retained mean WAZ. Effect of the intervention was cited in another study<sup>2</sup>.

At baseline, the commonly known concepts by 51% to 60% mothers/caregivers were related to food safety, breast-feeding, complementary feeding and basic nutrition. The concepts least known by 20% of the mothers/caregivers at baseline were on meal planning, backyard gardening, and basic nutrition, specifically and the importance of meal planning. The respondents were not familiar with some vegetables such as horseradish, Malabar nightshade, sweet potato leaves, water spinach, and pechay and what food group is rich in vitamins and minerals.

At end-line, the concepts related to backyard gardening and meal planning were added to the mostly known concepts. The participation of mothers in the nutrition classes has contributed to their nutrition knowledge, specifically on concepts related to food safety, breastfeeding, complementary feeding and basic nutrition, and the concepts on backyard gardening and meal planning, which were least known at the start of nutrition classes.

## Discussion

Process documentation involves monitoring a process of change and development in a program. It focuses on “how” of the implementation process rather than “what” of process impact.<sup>11</sup> This study presents the “how” in each phase of the intervention.

As the LGU implementation was closely examined, the data showed that the municipal implementers followed the implementing guidelines (as study protocol) in planning the intervention. Preliminary meetings at the municipal level were initiated with the municipal key officials together with *barangay* captains and LLNs in the project areas. The implementers had a clear understanding of the goal of the intervention.

**Table 2.** Mean Knowledge Scores (Mean  $\pm$  SD) of Mothers/ Caregivers by Study Area.

Period	Municipality		All (n = 110)
	Pulilan (n = 82)	Plaridel (n = 28)	
Baseline	12.61 $\pm$ 2.57	13.46 $\pm$ 3.92	12.83 $\pm$ 2.98
End-line	16.87 $\pm$ 1.93	16.46 $\pm$ 3.88	16.76 $\pm$ 2.56
$p^*$	<.001	.0061	<.001

\*Using paired *t* test.

In both municipalities, the role of the MNAO and municipal nutrition staff was significant in leading the conduct of preparatory activities such as series of meetings and orientations among mothers/caregivers. While there was no mother’s core group formed in both municipalities, the activities were properly implemented with the assistance of mother-leader volunteers in the *barangays*.

Not all children older than 1 year were dewormed despite the LLNs and BHWs’ explanation to the mothers on its importance because of their beliefs, misconceptions and previous negative experiences on deworming. Similar findings were observed among parents of preschoolers in a study in Kenya.<sup>12</sup> It is suggested to have a longer time for the implementers to organize planned activities. The mothers/caregivers should first accept ownership of the program to solicit their full support and cooperation. In the study among primary care professionals, more time, motivation to reach out and work with the community in health promotion were needed.<sup>13</sup>

Complementary feeding activities for 120 days were properly coordinated and implemented. The feeding schedule for the 2 municipalities differed: In Pulilan, the time was agreed upon by the mothers/caregivers, while in Plaridel, the LLN decided the time because the mothers/caregivers could not agree on a common time.

Nutrition education classes among mothers/caregivers per *barangay* were taught 2 weeks for 2 batches of classes. The strategy did not affect the implementation, although in the [study's] implementing guidelines, the recommendation was to teach the modules in 3 months in time for the culmination of the feeding component.

Monitoring done by the implementers was consistent with the guidelines. Data and records on the prescribed forms were reviewed for compliance and completeness. During the monthly monitoring by the research team, encountered issues and concerns were raised and discussed to the MNAO, LLNs, or *barangay* officials for necessary actions. On the first month monitoring, some of the observations were on filling-up of the monitoring forms and preparation of CF specifically on improper ratio of water and food blends. The suggestion was for the nutrition staff to assist the LLNs in filling-up the forms particularly the attendance and stock forms of CF commodities. Other suggestions were the addition of fruits and vegetables as add-ons to the CF blends for variation of taste. The LLNs were also advised to teach mothers/caregivers on how to prepare food blends at home, be more persistent in encouraging mothers/caregivers to participate, and conduct cluster feeding for those participants living far from the feeding center. The accomplishment of forms and the preparation of CF have both improved during the second month.

The LLNs were responsible and committed with their functions. Monitoring forms were updated and properly filled up. Activities were documented and kept on file in the *barangay* hall office like the quizzes of the mothers/caregivers during nutrition education classes, and compiled pictures and narrative reports per module particularly in the municipality of Pulilan.

Implementation of the intervention was supported and coordinated with municipal and *barangay* implementers and intervention participants. Some of the problems identified in the implementation despite the concerted efforts and support of the implementers were transfer of residence, distance of feeding venue from the house, absence of adult family member to bring the child to the venue and simply uninterested mothers. These problems were immediately addressed by the implementers through the following: (1) the MNAO requested the mothers/caregivers for possible delay in the transfer of residence until the intervention is completed, (2) continuous encouragement of the mothers/caregivers to participate in the intervention, (3) put up additional feeding venue near the houses of participants, (4) provision of *barangay* vehicle service to ferry the participants from their houses to the feeding venue, and (5) delivery of CF rations to the children participants' home.

According to the implementers, the intervention was different from previous feeding interventions implemented in the area in terms of target group, capacity building among

community workers, feeding duration, food preparation, and inclusion of monitoring and evaluation component. The interventions previously implemented have shorter feeding period targeting older children, without capacity building of community workers and without monitoring and evaluation.

Absences of mothers/caregivers during daily intervention activities were due to household chores, job-related activities, and the feeding time coinciding with the sleeping time of their children. However, these mothers/caregivers devised ways to participate in the intervention by taking a break from their laundry and/or asked their husbands to take care of their children. Similar findings were observed from the qualitative study of Nankumbi and Muliira<sup>14</sup> among caregivers, which showed proper child feeding practices were not applied because of their lack of knowledge about complementary feeding, influence of culture, and burden of other responsibilities in the household. Likewise, the choice of food and limited time of mothers for child care were due to being burdened with other tasks within the household.<sup>15</sup>

From the age of 6 months, the need for energy and nutrients of infant starts to exceed what is provided by breast milk, thus, complementary feeding becomes necessary to fill the energy and nutrient gap.<sup>16</sup> Feeding and nutrition education have been the most common strategies used to improve the nutrition of young children particularly in underprivileged populations.<sup>17</sup> Deworming and multivitamins intake cannot be associated with the weight improvement of the children. Study among preschool children did not find a consistent relationship between deworming and improved weight.<sup>18</sup>

In the present study, there was a significant increase in the mean weight and mean weight-for-age of children in both municipalities at end-line. Also, mothers/caregivers observed positive changes in terms of health, physical activities, physical features, and eating habits of their children during the intervention. The evidence that the complementary feeding can improve the nutritional status can be a result of a number of related variables such as environmental factors, food consumption patterns, health and illness, and hygiene practices.<sup>19</sup>

Mothers/caregivers' mean knowledge scores on health and nutrition in the 2 municipalities increased significantly from baseline to end-line. In a similar study,<sup>20</sup> significant differences between the baseline and end-line knowledge test scores of the mothers in the 11-session nutrition education program were obtained. The same findings were observed in a study in Malaysia,<sup>21</sup> where nutrition education of students demonstrated improvement in the awareness at postintervention using multimedia nutrition education intervention as compared with nonnutrition education intervention. In this study, the mothers/caregivers gained knowledge on nutrition through lectures, nutrition games, and individual and group activities, which they apply at home.



## Conclusion

The feasibility of implementing the intervention at the municipal and *barangay* levels depended on the adherence of the implementers on the activities involved in planning, organizing, implementation, monitoring, and evaluation phases. Both municipalities have supportive municipal and *barangay* officials, committed community workers, and active mother-leaders who are committed to improve the nutrition of children in the area. The success of the program is strengthened by the commitment of all stakeholders especially the implementers involved in policy making and funding.

The intervention strategy contributed in the weight increase of children-participants and in the significant improvement in mothers'/caregivers' knowledge on nutrition, food, and health. Strong support, cooperation, and adherence of the local implementers and mothers/caregivers on the (proposed) required steps to implement the intervention were the key factors in its efficient implementation.

A strong social preparation prior to implementation of the intervention by the municipalities is recommended. The community workers and the parents of children-participants should understand the significance of the intervention to ensure their full support and commitment to the intervention.

Monitoring and evaluation by the implementers should be given importance in the implementation of a community-based intervention like the DOST *PINOY*. Passing a local ordinance or resolution for the adoption and provision of funds is recommended to sustain the intervention. Likewise, the sustainability of this strategy could be ensured as the CF are available and accessible in the nearest CF production facilities in the LGU.

## Acknowledgments

We would like to acknowledge the LGUs of Pulilan and Plaridel, Bulacan, Philippines, the officials of the covered *barangays*, health and nutrition community workers for their full cooperation to the project and the child-mother participants for providing the data for this research; Ms Emily O. Rongavilla and Ms Georgina S. Caraig for assisting in the field data collection and the DOST-PCHRD for monitoring the progress of the study.

## Author Contributions

JBD, RVV, and MVC conceptualized and designed the study. RVV and HAI coordinated study activities. JBD, RVV and GPA collected the data. EBF, JBD, RVV, GPA, and HAI analyzed and interpreted the data. RVV, JBD, GPA, and EBF drafted the manuscript. RVV, JBD, and EBF revised the manuscript. All the authors read and approved the final manuscript.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by the Department of Science and Technology-Grants-In-Aid (DOST-GIA) (TECHNICOM).

## ORCID iD

Rowena V. Viajar  <https://orcid.org/0000-0002-9111-186X>

## References

1. Department of Science and Technology, Food and Nutrition Research Institute. 2018 Expanded National Nutrition Survey. <http://enutrition.fnri.dost.gov.ph/site/presentation.php?year=2018>. Accessed January 30, 2020.
2. Dorado JB, Magsadia CR, Viajar RV, Patalen CF, Azaña GP, Capanzana MV. Field testing of complementary feeding and nutrition education intervention in selected Philippine villages. *J Nutr Educ Behav*. 2018;50(7 suppl):S159-S160.
3. Patton M. *Utilization-Focused Evaluation*. Thousand Oaks, CA: Sage; 1997.
4. Goldenhar LM, LaMontagne AD, Katz T, Heaney C, Landsbergis P. The intervention research process in occupational safety and health: an overview from the National Occupational Research Agenda Intervention Effectiveness Research Team. *J Occup Environ Med*. 2001;43:616-622.
5. Shah A. Process documentation research. <https://pubs.iied.org/pdfs/G01672.pdf?>. Accessed March 17, 2020.
6. Weiss CH. Understanding the program. In: *Evaluation: Methods for Studying Programs and Policies*. Upper Saddle River, NJ: Simon & Schuster; 1998;46-71.
7. Weiss CH. Planning the evaluation. In: *Evaluation: Methods for Studying Programs and Policies*. Upper Saddle River, NJ: Simon & Schuster; 1998;72-96.
8. Weiss CH. Qualitative methods. In: *Evaluation: Methods for Studying Programs and Policies*. Upper Saddle River, NJ: Simon & Schuster; 1998;252-270.
9. Lipsey MW, Codray DS. Evaluation methods for social intervention. *Annu Rev Psychol*. 2000;51:345-375.
10. World Health Organization. WHO AnthroPlus for personal computers, version 3, 2009: software for assessing growth and development of the world's children. [https://www.who.int/growthref/tools/who\\_anthroplus\\_manual.pdf](https://www.who.int/growthref/tools/who_anthroplus_manual.pdf). Accessed March 17, 2020.
11. Moriarty P, Batchelor C, Abd-Alhadi F, Laban P, Fahmy H; INWRDAM, editors. *The EMPOWERS Approach to Water Governance: Guidelines, Methods and Tools*. Amman, Jordan: Inter-Islamic Network on Water Resources Development and Management (INWRDAM); 2007. <http://www.sswm.info/humanitarian-crisis/prolonged-encampments/planning-process-tools-ensuring-sustainability/process-documentation>. Accessed April 8, 2015.
12. Masaku J, Mwendu F, Odhiambo G, et al. Knowledge, practices and perceptions of geo-helminthes infection among parents of pre-school age children of coastal region, Kenya. *PLoS Negl Trop Dis*. 2017;11:e0005514.
13. Cabeza E, March S, Cabezas C, Segura A. Healthcare promotion in primary care: if Hippocrates were alive today . . . [in Spanish]. *Gac Sanit*. 2016;30(suppl 1):81-86.

14. Nankumbi J, Muliira JK. Barriers to infant and child-feeding practices: a qualitative study of primary caregivers in Rural Uganda. *J Health Popul Nutr.* 2015;33:106-116.
15. Nousiainen S. *Mothers' Perceptions of Complementary Feeding and the Influence of Context on Child Feeding Practices—Qualitative Study in Rural Area of Southern Benin* [master's thesis]. Helsinki, Finland: University of Helsinki; 2014. <https://helda.helsinki.fi/bitstream/handle/10138/152828/mothersp.pdf?sequence=1>. Accessed August 11, 2016.
16. Dewey KG, Brown KH. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food Nutr Bull.* 2003;24:5-28.
17. Dirongawan PSB. Health education on complimentary feeding for mothers with undernourished children age 6-48 months: an interventional research project. <http://som.adzu.edu.ph/research/abstract.php?id=559>. Accessed October 17, 2014.
18. Lo NC, Snyder J, Addiss DG, Heft-Neal S, Andrews JR, Bendavid E. Deworming in pre-school age children: a global empirical analysis of health outcomes. *PLoS Negl Trop Dis.* 2018;12:e0006500. doi:10.1371/journal.pntd.0006500
19. Mokori A. Nutritional status, complementary feeding practices and feasible strategies to promote nutrition in returnee children aged 6-23 months in Northern Uganda. *S Afr J Clin Nutr.* 2012;25:173-179.
20. Novick JS. *Effects of a Nutrition Education Program on the Related Knowledge and Behaviors of Family Practice Residents* [master's thesis]. Terre Haute, IN: Indiana State University; 2001.
21. Yusoff H, Wan Daud WN, Ahmad Z. Effectiveness of nutrition education vs non-nutrition intervention in improving awareness pertaining iron deficiency among anemic adolescents. *Iran J Public Health.* 2013;42:467-471.