

A quality improvement model for stunting prevention through community healthcare workers training and home-based growth monitoring

Adriana Viola Miranda^{1,2}, Ryan Rachmad Nugraha^{2,3}, Trio Sirmareza², Maritta Rastuti², Rindang Asmara², Sri Puji Astuti², Safarah Risvie Nasytha², Zack Petersen²

Abstract

Background Over 1.5 million community healthcare workers (CHWs) work in pos pelayanan terpadu (*posyandu*) in Indonesia. They are in charge of growth monitoring and counseling, as part of a community-based stunting prevention program. Recent literature suggests that the program requires quality improvements to maximize its potential.

Objective To understand the impacts of a quality improvement model comprising capacity building for CHWs and home-based growth monitoring using smart charts on *posyandu* performance, particularly related on its stunting prevention components.

Methods This cross-sectional study was conducted in two rural villages in Lombok, Indonesia, in May 2023. We interviewed 130 CHWs and 317 mothers with children under-five with a pre-validated questionnaire on *posyandu* performance that was developed using an input-process-output framework. We evaluated the CHWs dan mothers performances in the height measurement and counseling process.

Results Both CHWs and mothers perceived performance improvements in the height measurement and counseling processes, with statistically significant differences between pre- and post-intervention performance scores for height measurement [mean differences of 0.38 points; 95%CI 0.188 to 0.566; $P < 0.000$ for CHWs, and 0.276 points; 95%CI 0.469 to 0.846; $P < 0.000$ for mothers]; for counseling [mean differences of 0.285 points; 95%CI 0.149 to 0.42; $P < 0.001$ for CHWs, and 0.142 points; 95%CI 0.098 to 0.186; $P < 0.000$ for mothers]. Performance improvements were also found across all *posyandu* components, including those related to stunting.

Conclusion Capacity building for CHWs and home-based growth monitoring using smart charts are beneficial in improving community-based stunting prevention programs. [Paediatr Indones. 2024;64:490-500; DOI: <https://doi.org/10.14238/pi64.6.2024.490-500>].

Keywords: community healthcare workers; stunting; quality improvement

Childhood stunting, or being too short for one's age, is a significant global health problem that affects approximately 148.1 million (22.3%) children under 5-year-old.¹ Stunting causes long-term consequences for individuals and societies, it leads to cognitive and physical development problems, reduced productivity, and an increased risk of infectious and degenerative diseases at a later age.² Stunting is a prioritized health issue in Indonesia, which its prevalence in 2022 was slightly lower compared to the global prevalence (21.6%). The country aims to eradicate stunting by 2030, with a mid-term goal of reducing its prevalence to 14% in 2024.²⁻⁴ This highlights the need to improve the stunting prevention program in Indonesia.

Behavioral intervention is one of the main areas of the Indonesian stunting program. At its frontline, the program relies on community health workers (CHWs). In a monthly program called *pos pelayanan terpadu* (*posyandu*/integrated health post), CHWs have been

From Global Health Focus Asia, Bandung, West Java, Indonesia¹, Center for Population, Family and Health/Department of Family Medicine and Population Health, University of Antwerp, Antwerp, Belgium², 1000 Days Fund, Jakarta, Indonesia.³

Corresponding author: Adriana Viola Miranda. 1000 Days Fund. Graha Merdeka, Jl. Merdeka, Kel. Sumerta Kelod, Kec. Denpasar Timur, Kota Denpasar Bali 80239. Email: adriana@1000daysfund.org.

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requested to conduct growth monitoring of children under-five and provide nutrition-related counseling to their mothers.⁵ The CHWs are also request to conduct home visits as needed. The program has been conducted since the 1970s and currently has a network of 1.5 million CHWs across the country.^{5,6} Over the years, the program has improved child nutrition status in Indonesia. Two studies in rural and suburban areas of Indonesia showed that the prevalence of underweight and stunted children was lower among children who routinely visited the *posyandu*.^{7,8} Despite the CHWs' important roles and impact, they received limited training and supervision, particularly those focusing on quality improvement.^{9,10} As such, there is potential room for improvement for the *posyandu* program, as various studies reported that Indonesian CHWs are keen to receive training and supervision to improve their service quality.^{9,11}

To further improve the stunting prevention program, it may be beneficial to promote in-home growth monitoring by disseminating tailored growth charts. A study in Pakistan reported that the combination of CHW-led home visits and growth chart dissemination for growth monitoring was associated with higher gains of height-for-age Z-score (HAZ).¹² In Zambia, although home-based growth monitoring with growth charts did not significantly increase HAZ, stunted children experienced modest positive effects.¹³ Building upon these observations, we conducted an intervention program comprising CHWs training and supervision, as well as home-based growth monitoring with the aim of building a quality improvement model for the Indonesian stunting prevention program.

Methods

This quality improvement study was conducted in Senaru and Bayan, two rural villages in Lombok, Indonesia. As in other parts of Indonesia, the CHWs conduct monthly growth monitoring in the *posyandu* in these two villages. Our intervention program (CHWs training and height monitoring smart chart dissemination) started in August 2022. Post-intervention data collection was conducted in May 2023 (10 months after the start of the intervention) to assess the outcomes of our intervention program.

In collaboration with local stakeholders (village offices and government-owned primary care clinic or *puskesmas*), we conducted:

1. Home-based, height monitoring smart chart. We trained CHWs to perform home visits and counsel pregnant women and caregivers of children under-two using our pre-designed *Smart Chart*. These charts contain easy-to-digest information on stunting prevention and height scale to help with growth monitoring. The charts were then left in the houses of pregnant women and children under-two to serve as daily reminders of stunting prevention and growth monitoring.
2. Capacity building programs for CHWs. We conducted training and supervision for CHWs in the *posyandu*. The training module was developed by referencing the stunting prevention recommendations from the *World Health Organization*¹³⁻¹⁵ and the national strategy for acceleration of stunting prevention.¹⁶ It covered information about quality height measurement and monitoring as well as nutrition- and stunting-related counseling. The counseling module was designed to enable CHWs to provide specific and targeted counseling based on height measurement results in the *posyandu*. We included all CHWs in the two villages in our program.

Furthermore, our field officers conducted routine supervision and technical assistance during home visit period and the *posyandu* program. We supervised the CHWs' height measurement and monitoring practices, as well as the overall implementation and management of the program. Suggestions and recommendations were provided to the CHWs at the end of each *posyandu* session which is part of stunting prevention program.

This study follows the input-process-output (IPO) framework for assessing the quality improvements. Input is defined as the health facility/program readiness, while process is defined as processes of care and output comprises of the results of care.¹⁷ Based on these definitions, we developed the general domains of *posyandu* performance indicators from a literature search. For the input component of the framework, the domains were (a) tools and consumables and (b) human resources. For the process component, the domains corresponded to the *posyandu*-related activities conducted by CHWs: (a) preparation (b)

weight and height measurement (c) counseling (d) nutrition intervention and (e) sweeping. The output component included reporting. Then, building upon these domains, we created a list of indicators based on previous studies on *posyandu* and interviews with local stakeholders. A table of commonly used definitions is shown in **Appendix 1**. While our intervention program mainly targeted two *posyandu*-related processes (height monitoring and counseling), we also studied other *posyandu* components, such as weight monitoring, to measure the potential indirect effects of our intervention.

We developed two impact assessment questionnaires in the local language (Bahasa): one for CHWs and the other for mothers. The questionnaires contained questions on their: (a) sociodemographic characteristics (b) perceived *posyandu* performance before and after the intervention program in accordance with the aforementioned performance indicators and (c) perceived impacts of our stunting smart chart. To assess the performance indicators and perceived smart chart impacts, we used close-ended questions with a three-point scale (1 for 'Yes, always', 2 for 'Yes, often', 3 for 'No'). On some input-related questions, the definition of each point was modified to suit the question (e.g., for weight scales, 1 for 'Yes, present and working well', 2 for 'Yes, present but not working' or 'Yes, but not always present', and 3 for 'No'). This three-point scale was used to assign performance scores TO each indicator (2 for 'Yes, always', 1 for 'Yes, often', and 0 for 'No'). If there was no answer due to refusal or the lack of understanding the questions, the choice 'Not applicable (N/A)' was to be selected. The scores were summed to calculate an overall score to describe the performance of each IPO component and the overall *posyandu* program, which included stunting prevention measures (such as height monitoring and counseling). This approach followed the methods of previous performance assessment studies that were based on the IPO framework.^{18,19}

The questionnaire for CHWs had specific questions to their working history. Other specific questions were developed for mothers with children under-five to understand their valuation of the CHWs and *posyandu* programs. Specific questions were created to assess mothers' perceived level and trust of CHWs performance in conducting the main target processes of our intervention (height measurement

and counseling), as well as two other related processes (weight measurement and sweeping). The questionnaire for mothers did not contain detailed questions about the input and output aspects of the *posyandu* performance; instead, we included general questions on whether they felt the facilities and human resources were adequate. We also did not include questions regarding pregnancy services in *Posyandu* to mitigate recall bias (as we only included mothers with children under-five). Some open-ended questions about the input, process, and output domains were also developed to gain additional insights from the participants. The questionnaire was pre-validated by interviewing 17 CHWs and 15 mothers with children under-five, as well as interviewing the local field officers in both villages.

Our sample size was determined by assuming a 5% margin of error, for which the minimum sample size was 121 CHWs and 301 mothers with children under-five. Considering a 5% non-response rate, we consecutively recruited 130 active CHWs who were registered in the *Posyandu* program and had received training related stunting prevention program. We also consecutively recruited 317 mothers with children under-five who: (a) had received our smart chart intervention and (b) attended the *posyandu* regularly, at least one month prior to our study. We included mothers with children under-five, instead of those with children under-two, following the criteria of our intervention population, to accommodate for some children under-two who aged out and moved to the children under-five population. The participant recruitment was conducted in accordance with the general proportion of CHWs and mothers with children under-five in the two villages (approximately 70% in Senaru, 30% in Bayan).

Consenting participants were interviewed using a pre-validated, structured questionnaire by our pre-trained enumerators. As not all mothers experienced sweeping, sweeping-related questions were only asked to those who had prior experience. Participants were ensured that their response was anonymous. Descriptive statistics were used to describe participants' sociodemographic characteristics. The impacts of our intervention program on the performance of CHWs in *posyandu* were evaluated using the paired T-test. The differences in perceived skill of CHWs and trust reported by mothers pre- and post-intervention were

examined using the Wilcoxon signed-rank test. A P value below 0.05 was considered to be statistically significant. This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Mataram.

Results

Participants were CHWs (N=130) and mothers with children-under five (N=317) (Table 1). The mean age of CHWs was 30 (SD 6.41) years, while the median age of mothers with children-under-five was 27 (IQR 23-33) years. Most of the CHWs were women (92.3%). The median duration of CHWs' tenure was 4.21 (range 1.67-8.92) years.

Statistically significant improvements were reported across various components by both CHWs and mothers (Table 2). Significant improvements were particularly seen in the main targets of our intervention program: height measurement and counseling process both for both for CHWs and mothers. Significant improvements were also found in the weight measurement process for CHWs and mothers. However, for the sweeping outcomes, the significant improvements only found in the mothers. Of all indicators, sweeping-related indicators scored relatively lower even after the intervention program

was given (mean of 6.27 out of 12 according to CHWs and 5.75 out of 10 according to mothers). These results may have happened as our intervention program did not specifically focus on sweeping visits. Furthermore, the number of respondents answering these indicators are low (n=84). We also found that our intervention program led to significant improvements in the input for both CHWs and mothers and output indicators for the CHWs.

The large number of missing values in the total value of process indicators among mothers with children-under-five was due to the low number of mothers experiencing sweeping (n=84). Similarly, the large number of missing values in the nutrition intervention indicator was due to many mothers not knowing/experiencing malnutrition-related referrals (n=57). To improve accuracy, we re-analyzed the total value of process indicators without sweeping-related indicators; this revealed significant improvements in the process component of the posyandu performance [mean differences of 0.86; 95%CI 0.5 to 1.223; P<0.000 for CHWs, and 0.66; 95%CI 0.469 to 0.846; P<0.000 for mothers].

Furthermore, mothers reported that CHWs seemed to be more skilled in conducting weight measurement, height measurement, counseling, and sweeping. Mothers also displayed more trust towards the CHWs (Table 3). In general post-intervention,

Table 1. Sociodemographic characteristics of included participants

Demographic characteristics	CHWs (n=130)	Mothers with children under-five (n=317)
Age, years	30.40 (6.41)*	27.00 (23.00-33.00)**
Gender, n (%)		
Female	120 (92.3)	317 (100)
Male	10 (7.7)	0 (0)
Village, n (%)		
Bayan	40 (30.8)	103 (32.5)
Senaru	90 (69.2)	214 (67.5)
Highest education level, n (%)		
No schooling	1 (0.8)	50 (15.8)
Primary	20 (15.4)	83 (26.2)
Junior high	34 (26.2)	84 (26.5)
Senior high	67 (51.5)	82 (25.9)
Associate degree	1 (0.8)	5 (1.6)
Bachelor's degree or higher	7 (5.4)	13 (4.1)
Median CHW work tenure (IQR), years	4.21 (1.67-8.92)	N/A
Median number of children-under-five (IQR)	N/A	1 (1-1)

* mean (SD); **median (IQR)

Table 2. Analysis of improvements in posyandu performance indicators pre- and post-intervention

Posyandu performance indicators	According to CHWs (n=130)						According to mothers with children-under-five (n=317)					
	Maximum score	Mean performance score - pre (SD)	Mean performance score - post (SD)	Mean differences (95%CI)	P value	Maximum score	Mean performance score - pre (SD)	Mean performance score - post (SD)	Mean differences (95% CI)	P value		
Input												
Total (CHWs n=130; mothers n=312*)	26	21.58 (2.511)	22.33 (2.293)	0.746 (0.464 to 1.028)	<0.000*	12	8.878 (0.125)	9.419 (0.112)	0.542 (0.427, to 0.656)	<0.000*		
Tools and consumables (CHWs n=130; mothers n=315*)	18	14.68 (1.941)	15.31 (1.755)	0.622 (0.388 to 0.858)	<0.000*	10	6.914 (0.079)	7.437 (0.056)	0.524 (0.411 to 0.636)	<0.000*		
Human resources (CHWs n=130; mothers n=314*)	8	6.9 (1.237)	7.023 (1.216)	0.123 (0.026 to 0.22)	<0.05*	2	1.987 (0.1)	2 (0.1)	0.013 (0 to 0.025)	<0.05*		
Process												
Total (CHWs n=130; mothers n=67**)	42	32.26 (5.262)	33.32 (4.71)	1.061 (0.532 to 1.591)	<0.000	34	27.22 (0.41)	28.46 (0.41)	1.239 (0.653 to 1.824)	<0.000		
Total (excluding sweeping) (CHWs n=130; mothers n=254)	30	26.19 (2.45)	27.05 (1.814)	0.861 (0.5 to 1.223)	<0.000	24	20.74 (0.4)	21.41 (0.39)	0.657 (0.469 to 0.846)	<0.000		
Preparation (CHWs n=130; mothers n=315)	4	3.246 (0.817)	3.415 (0.724)	0.169 (0.082 to 0.256)	<0.000	2	1.832 (0.079)	1.917 (0.079)	0.086 (0.05 to 0.121)	<0.000		
Weight measurement (CHWs n=130; mothers n=312)	6	5.885 (0.46)	5.946 (0.313)	0.061 (0.005 to 0.118)	<0.05	6	5.841 (0.079)	5.895 (0.079)	0.054 (0.01 to 0.098)	<0.05		
Height measurement (CHWs n=130; mothers n=312)	6	5.446 (1.23)	5.823 (0.535)	0.38 (0.188 to 0.566)	<0.000	6	5.606 (0.125)	5.882 (0.112)	0.276 (0.162 to 0.389)	<0.000		
Counseling (CHWs n=130; mothers n=317)	4	3.469 (1.013)	3.754 (0.683)	0.285 (0.149 to 0.42)	<0.001	2	1.716 (0)	1.858 (0)	0.142 (0.098 to 0.186)	<0.000		

Table 2. Analysis of improvements in posyandu performance indicators pre- and post-intervention (continued)

Posyandu performance indicators	According to CHWs (n=130)					According to mothers with children-under-five (n=317)				
	Maximum score	Mean performance score - pre (SD)	Mean performance score - post (SD)	Mean differences (95%CI)	P value	Maximum score	Mean performance score - pre (SD)	Mean performance score - post (SD)	Mean differences (95% CI)	P value
Nutrition intervention (CHWs n=130; mothers n=259)	10	8.146 (1.233)	8.115 (1.217)	-0.031 (-0.153 to 0.091)	0.62	8	5.772 (0.387)	5.873 (0.385)	0.1 (0.029 to 0.172)	<0.05
Sweeping (CHWs n=130; mothers n=84)	12	6.069 (3.62)	6.269 (3.632)	0.2 (-0.076 to 0.476)	0.15	10	5.405 (0.442)	5.75 (0.442)	0.345 (0.037 to 0.653)	<0.05
Output										
Reporting (CHWs n=130)	2	1.9 (0.35)	1.962 (0.261)	0.062 (0.02 to 0.103)	<0.01					N/A

Pre-Post Mean Performances: Pre-intervention, post-intervention mean performances; * =some mothers gave "I | "now" answer; **=the low number resulted from the 'I don't know' answer and the low number of participants in the sweeping-related indicators; *** =many mothers did not experience any sweeping; ^=only CHWs were interviewed for this part as reporting does not fall under tasks experienced by mothers

we found that mothers were more inclined to perceive CHWs' role as important in the stunting prevention program (z-value=8.71, P<0.000).

Discussion

Our study showed that training and supervision for CHWs, when combined with home-based growth monitoring, contributed to the improvement of a stunting prevention program in Indonesia. The intervention program did not only lead to perceived improvements of its main targets which were statistically significant (i.e., height measurement and counseling), but also other services, suggesting that our intervention may have indirectly had positive effects on the *posyandu* program. Our findings suggest that the intervention program contributed to a decrease in stunting prevalence, although more research is needed to establish other factors at play.

The intervention program, particularly the training and supervision of CHWs, led to increased performance, skill and trust in *posyandu* programming, according to both the CHWs and mothers. This is potentially related to the low number of training sessions received by Indonesian CHWs; a 2017 survey found that only 13% CHWs received training prior to working at *posyandu*. Although training was given to over half of CHWs (51%) after they started working at the *posyandu*, a limited number of CHWs reported receiving training on growth measurement technique (47%), growth chart analysis (47%), identification of malnourished children (43%), counseling method (26%), and home visit method (20%).²¹ All of these services were the primary targets of our intervention. Furthermore, we also found that some CHWs were recruited solely for their ability to use measurement tools (e.g., traditional weighing-machine/scale), for whom training was crucial in improving knowledge of stunting.

Our intervention increased the performance score of height measurement in the *posyandu* program. This was crucial for the stunting prevention program, as this meant the process had been conducted more routinely and with higher quality. Nationally, only 63.7% of children under-five had their height measured at least twice a year.²² In addition to the low coverage, the measurement frequency is often lower

Table 3. Perceived improvements in skills and trusts for CHWs in Posyandu, as reported by mothers with children under-five (n=317)

Variables	Mothers with children under-five (n=317)	
	Z-value	P value
Weight measurement (n=315)	3.88	<0.000*
Height measurement (n=314)	4.78	<0.000*
Counseling (n=315)	5.49	<0.000*
Sweeping (n=88)	2.76	<0.01*
Weight measurement (n=317)	3.27	<0.001*
Height measurement (n=314)	3.27	<0.001*
Counseling (n=315)	4.31	<0.001*
Sweeping (n=89)	2.24	<0.05*
Perceived importance of CHWs role in stunting prevention (n=314)	8.71	<0.000*

compared to the trimonthly height measurement recommended by the national stunting prevention program, which is in line with our intervention. The intervention also resulted in an increased performance of nutrition-related counseling. When combined with counseling and other nutrition-related interventions, community-based routine height monitoring is beneficial in motivating families and caregivers to improve their care and feeding practices.^{13,23,24}

We also found a significant increase in the cumulative scores of other performance components. We inferred that this was due to indirect effects as our intervention program involved advocacy for local stakeholders. The implementation of our intervention might have led the stakeholders to have better understanding and commitment to the needs of the *posyandu* program. In Indonesia, the *posyandu* program is funded by the village budget, thus its implementation relies on the awareness of village-level stakeholders.^{25,26} A qualitative study in Nigeria reported that as the malnutrition awareness of stakeholders improved, they conducted more nutrition-related policy actions.²⁷ Similarly, a multi-country stakeholder analysis showed that active advocacy led to nutrition-related policy changes that improved stunting prevention programs.²⁸ However, more research is needed to better understand the indirect impacts of our interventions, particularly on stakeholders.

Our study described improvements perceived by both CHWs and mothers with children under-five after a quality improvement intervention program. As the study involved both target populations of the

posyandu program, we expected it to comprehensively illustrate the real-world impact of the interventions. However, our study has several limitations. First, while we attempted to compare the situation before and after the intervention, the participants were interviewed post-intervention due to resource constraints. No pre-intervention assessment was conducted. Also, our study design increased the risk of recall bias. Considering the questionnaires were about CHWs performance, there was also a possibility for social desirability bias. To mitigate these issues, we based the study on objective indicators. We also required each interview to be conducted separately from other participants. Secondly, we used consecutive sampling in the selected intervention area, which may have led to selection bias. However, we included two different populations (CHWs and mothers with children under-five) to ensure better generalization of the results. We also included 74.2% of the total CHWs working in the two villages, in hopes of reducing selection bias.

Our quality improvement model, comprising CHW capacity building and home-based smart chart growth monitoring, improved the performance of the Indonesian *posyandu*, which is at the forefront of the Indonesian stunting prevention program. Our analysis and findings showed that investing in CHWs and *Smart Charts* is beneficial in the efforts to achieve stunting reduction in Indonesia. Stunting prevention-related implementers, policymakers, and other relevant stakeholders should consider these approaches to improve the quality of community-based stunting prevention programs.

Conflict of interest

None declared.

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Appendix 1. Posyandu performance indicators

Framework component/domain	Indicator	Definition
Input		
Tools and consumables	Posyandu location	The location of posyandu can either be inside or outside a building
	Weight scale	Including manual and/or electronic weight scale
	Leaflet or food model	Including leaflet/posters/flyers/food model
	Fe supplement	Fe supplement for pregnant women
	Vitamin A	Vitamin A supplement for children-under-five
	Deworming drugs	Deworming drugs for children-under-five
	Posyandu reporting book (KIA)	Book to be given to posyandu participants
	Supplementary food	Fruits and other food provided for children-under-five in posyandu
	Reporting forms	Reporting forms to puskesmas and village offices

Appendix 1. Posyandu performance indicators (continued)

Framework component/domain	Indicator	Definition
Human resources	Number of CHWs	A posyandu ideally has at least five CHWs
	Organizational structure	A clear organizational structure with at least a designated team leader and members
	Clear task assignment	Clear task assignment provided monthly to each CHW
	Activity schedule	Clear activity schedule, including at least monthly posyandu schedule
Process		
Preparation	Pre-activity meeting	CHW meeting among to prepare for posyandu-related activities
	Community engagement	Engagement to target population about CHWs activities
Weight and height measurement	Frequency of weight measurement	Weight measurement should be conducted monthly
	Weight reporting	Weight should be reported in the posyandu report book
	Weight plotting	Weight should be plotted into the WHO weight-for-age plot
	Frequency of height measurement	Height measurement should be conducted trimonthly according to the national program, but in our intervention, we recommend monthly measurement to accommodate for children-under-five who missed their Posyandu appointments
Counseling	Height reporting	Height should be reported in the posyandu report book
	Weight plotting	Height should be plotted into the WHO height-for-age plot
	Counseling for pregnant women	Counseling for pregnant women included reminding them to attend antenatal care, take Fe supplements, and to be cautious of pregnancy-related alarm symptoms
	Counseling for mothers with children-under-five	Counseling for mothers with children-under-five included explanation regarding the weight and height measurement and plotting results, good nutrition practices for children-under-five, and alarm symptoms of malnutrition
Nutrition intervention	Fe supplementation	Fe supplementation was given monthly for pregnant women in the posyandu
	Vitamin A supplementation	Vitamin A supplementation was given every 6 months for children-under-five in Posyandu (in February and August)
	Deworming	Deworming was conducted every 6 months for children-under-five in posyandu (in February and August)
	Supplementary food	Supplementary food was given every month for children-under-five in posyandu
	Referral to healthcare system	Children-under-five suspected of being malnourished must be referred to the government-owned primary healthcare facilities (puskesmas)
Sweeping	Sweeping through home visits	Home visit was conducted if a pregnant women/mothers with children-under-five does not visit the Posyandu in the scheduled month
	Weight measurement	Similar to weight measurement in the posyandu
	Height measurement	Similar to height measurement in the posyandu
	Counseling	Similar to the counseling in the posyandu but with additional reminder to visit the Posyandu in the next month
	Supplementary food Vitamin A supplementation and deworming	Similar to supplementary food provision in the posyandu A program called 'sweeping' is conducted every 6 months to provide vitamin A supplementation and deworming for children-under-five who do not visit the posyandu during the vitamin A supplementation and deworming activities (in February and August)
Output		
Reporting	Reporting to puskesmas/village office	The report forms should be clearly and comprehensively filled