

Unveiling Maternal Behavior in Stunting Prevention and Control: A Cross-Sectional Study of the Health Promotion Model in Surakarta, Indonesia

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Received: May 13, 2026; Accepted: July 01, 2026; Available online: July 16, 2026

ABSTRACT

Background: Child stunting is a major public health problem and a key indicator of child well-being. Indonesia aims to reduce stunting prevalence to below 14% through behavior change communication and health promotion. Guided by the Health Belief Model, Social Cognitive Theory, and the Social Support Model, this study aimed to develop a health promotion model of maternal behavior for stunting prevention and control.

Subjects and Method: This was a cross-sectional study conducted in Surakarta, Central Java, Indonesia, from June to August 2024. A sample of 143 mothers was collected for this study. Data collection techniques used questionnaires. Data were analyzed using a multiple logistic regression.

Results: Maternal behavior in stunting prevention and control was not associated with perceived threat (aOR=1.04; 95% CI=0.96 to 1.12; p=0.328), knowledge (aOR=0.87; 95% CI=0.71 to 1.05; p=0.146), outcome expectation (aOR=0.99; 95% CI=0.76 to 1.27; p=0.907), situational perception (aOR=1.03; 95% CI=0.85 to 1.26; p=0.746), self-efficacy (aOR=0.97; 95% CI=0.81 to 1.16; p=0.721), cues to action (aOR=1.02; 95% CI=0.94 to 1.12; p=0.623), or social support (aOR=1.01; 95% CI=0.92 to 1.10; p=0.831). Mothers with longer TPPS involvement had 2.94 times higher odds of demonstrating positive stunting prevention and control behaviors than those with shorter involvement (aOR=2.94; 95% CI=1.31 to 6.61; p=0.009). Conversely, each one-unit increase in perceived expectations was associated with a 6% lower odds of positive maternal behavior (aOR=0.94; 95% CI=0.88 to 1.00; p=0.032).

Conclusion: Duration of TPPS involvement and perceived expectations were significant factors associated with maternal behavior in stunting prevention and control.

Keywords: Health promotion, maternal behavior, stunting prevention.

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Cite this as:

Hastuti H, Sulaeman ES, Putri AAKEN, Rahman A, Mahzunah AK, Yunita FA, Hardiningsih (2026). Unveiling Maternal Behavior in Stunting Prevention and Control: A Cross-Sectional Study of the Health Promotion Model in Surakarta, Indonesia. *J Health Promot Behav*. 11(03): 405-416. <https://doi.org/10.26911/thejhp.2026.11.03.09>.



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BACKGROUND

Child stunting remains a major public health challenge worldwide and is an important indicator of child well-being and social inequality. According to the World Health Organization (WHO), stunting is defined as a height-for-age more than two standard deviations below the WHO Child Growth Standards median (WHO, 2009). It reflects chronic undernutrition during the first 1,000 days of life and is associated with impaired cognitive development, poor educational achievement, reduced productivity, and an increased risk of non-communicable diseases later in adulthood (WHO, 2014; Republic of Indonesia Ministry of People's Welfare, 2013). Because of its lifelong consequences, reducing stunting has become one of the six Global Nutrition Targets and is included in the Sustainable Development Goals (*Gerakan Kesehatan Ibu dan Anak*, 2024).

Despite continuous efforts, stunting remains a significant problem in Indonesia. UNICEF reported that Indonesia has one of the highest stunting prevalence rates in Asia (United Nations Children's Fund, 2021). The Indonesian Nutrition Status Survey reported a national prevalence of 24.4% in 2021, which remains above the WHO threshold of 20% (WHO, 2014). To address this issue, the Indonesian government has targeted a reduction in stunting prevalence to below 14% through the National Strategy for the Acceleration of Stunting Reduction (Presidential Regulation of the Republic of Indonesia Number 72 of 2021 Concerning the Acceleration of Reducing Stunting, 2021). In Central Java, the prevalence of stunting was 20.8% in 2022, while Surakarta reported a prevalence of 20.4% in 2021, indicating that stunting continues to be an important local public health concern (Governor of Central

Java, 2019; Surakarta City Health Office, 2023).

Maternal behavior plays a pivotal role in preventing and controlling stunting. Appropriate infant feeding practices, growth monitoring, health service utilization, hygiene, and child care are strongly influenced by mothers' knowledge, perceptions, self-efficacy, and social support (Republic of Indonesia Ministry of People's Welfare, 2013). Therefore, understanding the behavioral determinants of mothers is essential for designing effective health promotion strategies to reduce stunting (de Onis & Branca, 2016). To support the national strategy for accelerating stunting reduction, the Indonesian government has implemented community-based stunting prevention programs through Posyandu, with health cadres serving as key facilitators. Previous studies have shown that strengthening the capacity of health cadres improves the effectiveness of these programs. Martha et al. (2020) reported a significant improvement in health cadres' knowledge following stunting prevention training, with a 30.68% increase in knowledge scores. Similarly, Mediani et al. (2022) found that most health cadres demonstrated high levels of knowledge, while their knowledge and motivation were significantly influenced by education level, marital status, and age.

These findings suggest that continuous training and capacity-building are essential for improving community-based stunting prevention. However, successful stunting prevention requires not only competent health cadres but also the active involvement of mothers who play a central role in child care and who serve as members of the Village-Level Stunting Reduction Acceleration Team (TPPS). Despite their strategic role in implementing stunting prevention activities at both the household and

community levels, evidence regarding the behavioral factors influencing mothers who are TPPS members remains limited (Presidential Regulation of the Republic of Indonesia Number 72 of 2021 Concerning the Acceleration of Reducing Stunting, 2021).

Understanding the behavioral factors underlying maternal practices is essential for designing effective health promotion interventions. Behavioral theories provide a comprehensive framework for explaining maternal health behavior. The Health Belief Model (HBM) emphasizes the roles of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy in determining health behavior. Social Cognitive Theory (SCT) highlights reciprocal interactions among personal factors, behavioral capability, outcome expectations, and environmental influences, whereas the Social Support Model emphasizes the importance of emotional, informational, instrumental, and appraisal support in facilitating behavior change (Soviyati et al., 2023).

Previous studies have demonstrated the importance of behavioral factors in stunting prevention. Nenobais and Katmini (2021) found that perceived susceptibility, perceived severity, perceived barriers, perceived benefits, self-efficacy, and cues to action significantly influenced stunting prevention behavior. Similarly, Noor and Muniroh (2023) reported significant associations between perceived susceptibility, perceived severity, perceived barriers, self-efficacy, and stunting, whereas perceived benefits were not associated. Mirzakhani et al. (2023) further showed that higher maternal self-efficacy improved mothers' confidence in providing adequate nutrition for their children. Moreover, Soviyati et al. (2023) demonstrated that sanitation, self-efficacy, social support, socioeconomic

status, and parenting practices significantly influenced stunting prevention behavior through the integration of the Health Belief Model, Social Cognitive Theory, and Social Support Model.

Although previous studies have identified behavioral determinants of stunting prevention among mothers and evaluated community-based interventions, limited evidence is available regarding mothers who are members of the Village-Level TPPS. This population has unique responsibilities as both caregivers within the family and active participants in community stunting reduction programs. Furthermore, few studies have simultaneously examined cognitive, social, and demographic determinants using an integrated health promotion framework among this population.

Therefore, this study aimed to develop a health promotion model of maternal behavior in stunting prevention and control among mothers who were members of the Village-Level Stunting Reduction Acceleration Team (TPPS) in Surakarta City, Central Java, Indonesia.

SUBJECTS AND METHOD

1. Study Design

A cross-sectional study was conducted in Surakarta, Central Java, Indonesia, over three months from June to August 2024.

2. Population and Sample

The target population of this study is mothers who were members of the Village-Level Stunting Reduction Acceleration Team (TPPS) in Surakarta City, Central Java Indonesia. The study employed a quota sampling technique, with a sample size of 143 respondents.

3. Study Variables

The independent variables were perceived vulnerability, severity, benefit, and barrier, and action triggers (media, personal, and

reminders), knowledge, outcome expectations, situational perceptions, perceived self-efficacy; and social support. The dependent variable was maternal behavior in preventing and controlling stunting.

4. Operational Definition of Variables

Duration of TPPS Involvement refers to the duration of the respondent's involvement as a member of the Village-Level Stunting Reduction Acceleration Team (TPPS), measured in years.

Perceived threat refers to a mother's perception of the seriousness and potential consequences of stunting for her child, including both health and social impacts.

Perceived expectation refers to a maternal beliefs regarding the expected outcomes of engaging in stunting prevention and control behaviors.

Knowledge refers to a maternal understanding of stunting, including its causes, consequences, prevention, and control.

Outcome expectation refers to a mother's belief that adopting appropriate preventive behaviors will result in positive outcomes for stunting prevention and control.

Situational perception refers to a mother's perception and interpretation of environmental conditions that may facilitate or hinder stunting prevention and control.

Self-efficacy refers to a mother's confidence in her ability to perform behaviors necessary for preventing and controlling stunting.

Cues to action refer to internal or external stimuli, such as health information, media messages, or encouragement from others, that motivate mothers to adopt stunting prevention and control behaviors.

Social support refers to emotional, informational, instrumental, and appraisal support received from family members,

health workers, or the community to encourage stunting prevention and control behaviors.

Maternal behavior in stunting prevention and control was the dependent variable and refers to mothers' practices related to stunting prevention and control, including child nutrition, parenting, hygiene, growth monitoring, immunization, and the utilization of health services.

5. Study Instruments

The questionnaire was measured using a Likert scale, with answer options consisting of always agree (SLS), often agree (SS), sometimes agree (KKS), rarely agree (JS), and never agree (TPS). Score for Favorable answers: TPS = 1, JS = 2, KKS = 3, SS = 4 and SLS = 5; while the score for Unfavorable answers: TPS = 5, JS = 4, KKS = 3, SS = 2 and SLS = 1. Cronbach alpha value $\alpha = 0.761$.

6. Data analysis

The data were analyzed using univariate, bivariate, and multivariate analyses. Prior to analysis, data normality was assessed using the Kolmogorov–Smirnov test, which indicated that the variables were not normally distributed. Therefore, continuous variables were categorized into two groups using the median as the cut-off point before further analysis. Univariate analysis was performed to describe the characteristics of the respondents and study variables. Multivariate analysis was conducted using multiple logistic regression to identify factors associated with maternal behavior in stunting prevention and control after adjusting for potential confounding variables. The results were presented as adjusted odds ratios (aORs), 95% confidence intervals (95% CIs), and p-values. Statistical significance was determined at a p-value of <0.05 .

7. Research Ethics

This investigation was executed subsequent to the approval of the research proposal by the Health Research Ethics Commission of Dr. Moewardi Hospital (Ethics Clearance Number: 637/III/HREC/2024) on first March 2024. The participants involved in the study were furnished with a comprehensive explanation regarding the study's purpose, method, and potential benefits.

RESULTS

1. Sample Characteristics

The results of univariate analysis were presented in categorical values (Table 1) and continuous values (Table 2). All respondents were married (81.12%), had graduated from a D1/D3/D4 Midwifery Academy (41.96%), and worked as civil servants (37.06%) or healthcare professionals (35.06%).

Table 1. Characteristic Respondents

Variables	Category	n	%
Marriage	Married	116	81.12
	Widow/widowed	7	4.90
	Not reported	20	13.99
Education Level	Junior high school	6	2.40
	High school graduate	26	18.18
	Diploma Midwifery Academy	60	41.96
	College Graduation	51	35.66
Jobs	Housewife	29	20.8
	Entrepreneurship	4	2.8
	PNS	53	37.06
	Midwife/Nurse/Nutritionist	53	35.06
	Private Employee	4	4.28

The univariate analysis described the characteristics of respondents and the distribution of the study variables. The mean duration of TPPS involvement was 5.99 years (SD = 6.74), ranging from 1 to 35 years. The mean scores were 39.24 (SD= 5.79) for perceived threat, 40.08 (SD= 7.37)

for perceived expectation, 23.25 (SD= 2.67) for knowledge, 17.88 (SD = 2.28) for outcome expectation, 26.55 (SD = 3.24) for situational perception, 26.08 (SD= 3.45) for self-efficacy, 39.94 (SD = 5.92) for cues to action, and 45.19 (SD = 6.71) for social support

Table 2. Results of univariate analysis of continuous variables

Variable	Mean	SD	Min.	Max.
Duration of TPPS Involvement (years)	5.99	6.74	1	35
Perceived Threat	39.24	5.79	25	54
Perceived Expectations	40.08	7.37	25	64
Knowledge	23.25	2.67	15	25
Outcome Expectations	17.88	2.28	12	20
Situational Perception	26.55	3.24	18	30
Self-Efficacy	26.08	3.45	18	30
Cue to Action	39.94	5.92	26	55
Social Support	45.19	6.71	28	60

2. Bivariate analysis

The results of bivariate analysis were presented in Table 3. Based on the bivariate logistic regression analysis, duration of TPPS involvement and perceived expectation were significantly associated with stunting prevention behavior. Respondents with longer work experience had 3.25 times higher odds of demonstrating stunting prevention behavior than those with shorter work experience (OR=3.25; 95% CI=1.60 to 6.59; $p=0.001$). Respondents with higher perceived expectations had 0.43 times the odds of demonstrating stunting prevention behavior than those with lower perceived expectations (OR=0.43; 95% CI=0.21 to 0.86; $p=0.017$). In contrast, respondents with higher perceived threat had 0.88 times

the odds of demonstrating stunting prevention behavior (OR=0.88; 95% CI=0.45 to 1.74; $p=0.730$), those with higher knowledge had 0.71 times the odds (OR=0.71; 95% CI=0.35 to 1.43; $p=0.347$), those with higher outcome expectation had 1.30 times the odds (OR=1.30; 95% CI=0.66 to 2.56; $p=0.442$), those with higher situational perception had 1.22 times the odds (OR=1.22; 95% CI=0.62 to 2.39; $p=0.561$), those with stronger cues to action had 1.38 times the odds (OR=1.38; 95% CI=0.70 to 2.75; $p=0.346$), and those with greater social support had 1.52 times the odds (OR=1.52; 95% CI=0.77 to 3.00; $p=0.224$) of demonstrating stunting prevention behavior; however, these associations were not statistically significant.

Table 3. Bivariate analysis of determinants associated with maternal behavior in stunting prevention and control

Independent variables	OR	95% CI		p
		Lower Limit	Upper Limit	
Duration of TPPS Involvement (long vs. new)	3.25	1.60	6.59	0.001
Perceived Threat (high vs. low)	0.88	0.45	1.74	0.730
Perceived Expectation (positive vs. negative)	0.43	0.21	0.86	0.017
Knowledge (high vs. low)	0.71	0.35	1.43	0.347
Outcome Expectation (positive vs. negative)	1.30	0.66	2.56	0.442
Situational Perception (high vs. low)	1.22	0.62	2.39	0.561
Cues to Action (positive vs. negative)	1.38	0.70	2.75	0.346
Social Support (high vs. low)	1.52	0.77	3.00	0.224

3. Multivariate analysis

Multivariate analysis was conducted to determine the variables that most influenced maternal behavior in stunting prevention and control, using multiple logistic regression (Table 4).

Multivariate logistic regression analysis showed that respondents with longer TPPS involvement had 2.94 times higher odds of demonstrating better stunting prevention behavior than those with shorter TPPS involvement (aOR=2.94; 95% CI=1.31 to 6.61; $p=0.009$). Respondents with higher

perceived expectations had 0.94 times the odds of demonstrating better stunting prevention behavior (aOR=0.94; 95% CI=0.88 to 1.00; $p=0.032$). In contrast, respondents with higher perceived threat had 1.04 times the odds of demonstrating better stunting prevention behavior (aOR=1.04; 95% CI=0.96 to 1.12; $p=0.328$), those with higher knowledge had 0.87 times the odds (aOR=0.87; 95% CI=0.71 to 1.05; $p=0.146$), those with higher outcome expectation had 0.99 times the odds (aOR=0.99; 95% CI=0.76 to 1.27; $p=0.907$), those with

higher situational perception had 1.03 times the odds (aOR=1.03; 95% CI=0.85 to 1.26; p=0.746), those with higher self-efficacy had 0.97 times the odds (aOR=0.97; 95% CI=0.81 to 1.16; p=0.721), those with stronger cues to action had 1.02 times the odds (aOR= 1.02; 95% CI=0.94 to 1.12; p=

0.623), and those with greater social support had 1.01 times the odds (aOR= 1.01; 95% CI= 0.92 to 1.10; p=0.831) of demonstrating better stunting prevention behavior; however, these associations were not statistically significant.

Table 4. Multivariate logistic regression analysis of factors influencing maternal behavior in stunting prevention and Control (n = 143)

Independent Variables	aOR	95% CI		p
		Lower Limit	Upper Limit	
Duration of TPPS involvement	2.94	1.31	6.61	0.009
Perceived threat	1.04	0.96	1.12	0.328
Perceived expectations	0.94	0.88	1.00	0.032
Knowledge	0.87	0.71	1.05	0.146
Outcome expectation	0.99	0.76	1.27	0.907
Situational perception	1.03	0.85	1.26	0.746
Self-efficacy	0.97	0.81	1.16	0.721
Cues to action	1.02	0.94	1.12	0.623
Social support	1.01	0.92	1.10	0.831

DISCUSSION

The results from the logistic regression model highlighted that work experience was significantly associated with an increased likelihood of positive stunting prevention behaviors. In the multivariate model, mothers with longer work experience had nearly three times higher odds of demonstrating better stunting prevention behavior compared with those with shorter work experience. This finding suggests that longer work experience may contribute to improved practical knowledge, time management skills, confidence, and the ability to implement preventive behaviors effectively. This is supported by Arini et al. (2022), who found that mothers with high self-efficacy were more capable and confident in providing proper care, ensuring adequate nutrition, and fostering physical activity among children. Their study also identified a positive relationship between maternal self-efficacy and cognitive development in children affected by stunting. Therefore,

work experience may strengthen maternal competence and indirectly enhance confidence in implementing child health practices.

Similarly, perceived expectation emerged as a significant factor associated with stunting prevention behavior. The multivariate analysis showed that perceived expectation was significantly associated with the outcome, indicating that higher perceived expectations were associated with lower odds of the outcome based on the variable coding. Although the effect size was relatively small, this finding suggests that mothers' expectations regarding stunting prevention may influence their engagement in preventive behaviors. Unrealistic expectations, misunderstanding of preventive goals, or perceived difficulties in achieving expected outcomes may reduce motivation to adopt recommended practices. This finding is consistent with Arini et al. (2022) who highlighted that limited self-efficacy may reduce motivation

even when mothers understand the importance of appropriate nutrition and child-rearing practices.

Other variables included in the model did not show statistically significant associations with stunting prevention behavior. Perceived threat was not significantly associated with preventive behavior. Although perceived threat is an important construct within the Health Belief Model (HBM), the absence of significance in this study suggests that perceived risk alone may not be sufficient to encourage behavioral change. Previous studies have reported that perceived vulnerability and severity can influence maternal preventive behaviors. Wardani et al. (2022) reported significant associations between perceived vulnerability and perceived severity with stunting prevention behaviors. Similarly, Anggraini et al. (2024) found that many mothers still had low perceptions of vulnerability (65%) and severity (53%) regarding stunting, and 65% of participants did not perceive preventive actions as useful. These findings indicate that maternal perceptions remain important, although their influence may depend on contextual factors.

Although the knowledge variable did not demonstrate a significant effect in the multivariate model, knowledge remains a fundamental component of the HBM in shaping perceptions and motivating health behaviors. The HBM suggests that maternal knowledge about stunting contributes to accurate risk perception, which can encourage preventive actions. Hall et al. (2018) revealed that only 66 participants (2.1%) reported awareness of stunting, and many respondents incorrectly attributed stunting to hereditary factors rather than modifiable causes. Despite the lack of statistical significance in this study, previous research has demonstrated that mothers with higher levels of knowledge are more likely to engage

in effective preventive behaviors. Syahputra et al. (2023) found that mothers with comprehensive knowledge about stunting were more likely to provide balanced nutrition, monitor child growth regularly, and seek early intervention. Similarly, Noviana et al. (2023) reported that knowledge regarding the causes, prevention, and consequences of stunting significantly influenced maternal actions, while Mustikawati et al. (2024) demonstrated that stunting prevention campaigns effectively improved maternal knowledge.

Maternal education has also been identified as an important contextual factor related to stunting prevention. Although education was not a significant predictor in the current multivariate model, it may influence maternal behavior indirectly through access to information, health literacy, and healthcare utilization. Wulandari et al. (2022) observed that mothers with elementary education had a higher risk of having stunted children compared with mothers with higher education levels, with increased odds of 1.263 times for elementary education, 1.22 times for junior high school, and 1.12 times for high school education. Similarly, Muche and Dewau (2021) reported that household income and maternal characteristics influenced stunting severity, while maternal education acted as a protective factor, with lower odds of severe stunting among more educated mothers.

Other Social Cognitive Theory (SCT) constructs, including outcome expectation, situational perception, and self-efficacy, were not significantly associated with stunting prevention behavior in this study. Outcome expectation showed no significant association, while situational perception and self-efficacy also did not demonstrate significant effects. However, SCT emphasizes that knowledge, outcome expectations, environmental perceptions, self-

efficacy, and self-control contribute to behavioral change. Anjomshoa et al. (2018) demonstrated that these constructs significantly influenced maternal feeding practices, particularly through changes in situational and environmental perceptions. Shorey and Lopez (2021) also emphasized that self-efficacy, defined as the belief in one's ability to perform actions, plays an important role in determining behavior. Therefore, although these variables were not significant in this study, they may interact with other contextual factors to influence maternal practices.

Furthermore, cues to action and social support were not significant predictors in the multivariate model. Cues to action showed no significant association, and social support also did not demonstrate a significant relationship. Nevertheless, previous studies emphasize the theoretical importance of social support in shaping maternal behavior. Pandani (2021) found that emotional support from family members influenced maternal decisions regarding stunting prevention, while Fajar et al. (2023) highlighted the importance of family support from pregnancy through child development stages. Irfa et al. (2024) further demonstrated that peer-support-based stunting prevention education significantly improved maternal knowledge and child nutritional status ($p = 0.005$). These findings suggest that although social support was not statistically significant in this model, supportive environments remain important components of comprehensive stunting prevention strategies.

Overall, the findings suggest that although the Health Believe Model (HBM), Social Cognitive Theory (SCT), and Social Support Model (SSM) provide valuable frameworks for understanding maternal behavior in stunting prevention, not all theoretical constructs showed independent

effects in this study. Only duration of TPPS involvement and perceived expectation demonstrated significant associations after adjustment for other variables. This indicates that behavioral change may depend not only on individual perceptions and knowledge but also on practical experience, contextual conditions, and the ability to translate knowledge into action. Therefore, health promotion programs should adopt multidimensional strategies that strengthen maternal knowledge, improve self-efficacy, manage expectations, enhance social support, and address structural barriers affecting preventive behaviors.

FINANCIAL SUPPORT AND SPONSORSHIP

This work was financially supported by Universitas Sebelas Maret.

ACKNOWLEDGMENTS

The research team extends its sincere appreciation to the Institute for Research and Community Service of Sebelas Maret University for its financial support of this study.

CONFLICT OF INTEREST

There are no conflicts of interest

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