# Community-Led Health Education and Social Mobilization for Improving Stunting Prevention Behavior

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## ABSTRACT

***Background:*** *Stunting remains prevalent in Indonesia's coastal regions, where social norms and resource limitations hinder the implementation of preventive practices. In Tapa'an Village, Pasuruan, these challenges are compounded by the influence of extended family, unstable income, and restricted access to clean water. This study aimed to evaluate the effect of a community-led health education program combined with digital reinforcement on mothers' stunting-prevention behaviors, using the Theory of Planned Behavior (TPB) framework.*

***Method:*** *A quasi-experimental one-group pretest–posttest design was conducted with 57 mothers of children under five. Data on attitude, subjective norms, perceived behavioral control, and behavioral intention were collected using validated questionnaires. Statistical analyses included paired t-tests and ANOVA to assess mean differences, and Pearson correlation to explore inter-domain relationships, chosen to capture both magnitude and interaction of behavioral change..*

***Result*** *: Significant improvements were found across all TPB constructs ($p < 0.001$) with large effect sizes ($\eta^2 > 0.80$). The most substantial change occurred in behavioral intention, driven by enhanced attitudes and social approval. Mothers described greater motivation, confidence, and collective encouragement after receiving digital reminders. The integration of participatory learning and digital cues effectively transformed individual awareness into a shared community practice. Digital reinforcement uniquely sustained motivation beyond group sessions, especially among digitally active mothers in extended families. Despite the design's lack of a control group and short observation period, findings highlight the model's potential for adaptation in coastal maternal health programs. Embedding digital reinforcement into Puskesmas activities could strengthen long-term stunting prevention efforts.*

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## INTRODUCTION

Stunting remains one of Indonesia's most pressing public health challenges, affecting 21.6% of children under five according to the 2023 Riskesdas report. While national efforts to reduce stunting have shown gradual improvement, disparities persist between regions, particularly in coastal and low-income communities. In East Java, Pasuruan City continues to report prevalence rates above the provincial average, with several coastal subdistricts, including Tapa'an Village in Bugul Kidul, identified as *stunting priority zones* by the local health authority.(1,2) Community assessments conducted in 2023 revealed that many households in Tapa'an experience limited dietary diversity, inconsistent feeding practices, and suboptimal sanitation, despite living near abundant marine resources.(3,4) Seasonal fishing income, inadequate household water management, and low maternal health literacy further exacerbate chronic malnutrition. These characteristics underscore that the determinants of stunting in coastal areas are deeply behavioral and contextual, not merely nutritional.

Traditional, top-down public health interventions, such as supplementary feeding and Posyandu-based counseling, have yielded only transient outcomes in these settings. Many programs focus heavily on information dissemination rather than on behavioral transformation and community ownership. Recent studies in Indonesia and other Southeast Asian contexts suggest that knowledge alone does not ensure behavioral change, particularly among mothers constrained by social norms, economic insecurity, and gendered caregiving roles.(2,5) Consequently, there is a growing need for community driven health education models that combine participatory learning, cultural relevance, and sustained motivation. The Theory of Planned Behavior (TPB) provides a robust framework for explaining and predicting preventive health actions by linking intention to three key determinants: attitude, subjective norms, and perceived behavioral control.(6,7) However, previous applications of TPB in Indonesia have primarily centered on individual cognition, rarely contextualizing how collective norms, kinship

structures, and local leadership influence maternal health behavior in coastal villages. In Tapa'an, decision-making about child feeding and hygiene is often influenced by husbands, grandmothers, and community figures, creating a social environment where subjective norms may outweigh personal attitude. Therefore, aligning TPB with a *social mobilization* approach, one that activates community influencers and peer groups, may enhance its cultural adaptability and practical impact in such settings.

Despite increasing recognition of community engagement in stunting prevention, the integration of digital reinforcement within participatory models remains underexplored. Many coastal households now use smartphones for daily communication, presenting an opportunity to sustain learning and motivation through WhatsApp groups, short videos, and social media storytelling. Evidence from recent health-promotion initiatives.(8,9) Shows that digital platforms can extend interpersonal influence and maintain consistent behavioral cues beyond face-to-face sessions. Yet, few empirical studies in Indonesia have examined how digital reinforcement and local social movements can interact synergistically to enhance the constructs of the TPB among mothers of young children.(10)

Addressing these gaps, the present study evaluates the effectiveness of a community-led Clean and Healthy Living Behavior (PHBS) education and social mobilization program grounded in the Theory of Planned Behavior, implemented among mothers of children aged 0–24 months in Tapa'an Village, Pasuruan. The program uniquely combines participatory education, community leadership engagement, and digital reinforcement to strengthen attitudes, social norms, perceived control, and behavioral intention toward stunting prevention.

The novelty of this study lies in (1) contextualizing TPB within a culturally collective, coastal environment, (2) integrating behavioral theory with a grassroots social movement framework, and (3) demonstrating the value of low-cost digital engagement as a sustainable reinforcement strategy. By operationalizing behavioral theory through community participation, this study contributes a scalable and culturally sensitive model for improving maternal–child health behaviors in low-resource coastal settings.

## METHOD

This study employed a quasi-experimental one-group pretest–posttest design to evaluate the effectiveness of a community-led Clean and Healthy Living Behavior (PHBS) education and social mobilization program based on the Theory of Planned Behavior (TPB). The research was conducted in Tapa'an Village, Bugul Kidul Subdistrict, Pasuruan City, East Java, Indonesia, a coastal area identified by the local Health Office as having a persistently high prevalence of stunting and limited access to continuous health education. The study spanned ten months (March–December 2024), covering phases of preparation, intervention, and evaluation.

Although the design lacked a control group, it was selected due to the ethical and logistical limitations of withholding intervention in a high-risk community. To mitigate threats to internal validity, the study employed temporal separation of measurements, standardized facilitation procedures, and consistent monitoring of participant retention. Additionally, all data collection and analysis were performed by researchers blinded to participant identity to reduce measurement bias.

Participants were selected through purposive sampling based on predetermined inclusion criteria: (1) being a mother or primary caregiver of a child aged 0–24 months, (2) residing permanently in Tapa'an Village, (3) having basic literacy in Bahasa Indonesia or Javanese, and (4) agreeing to participate in all intervention sessions and complete both pre- and post-intervention assessments.

Recruitment was facilitated by local health cadres (*kader Posyandu*) in collaboration with the village midwife (*bidan desa*) and community leader (*kepala dusun*). These facilitators conducted home visits to identify eligible mothers using the village's Posyandu registry. Screening interviews were then conducted to ensure participants met all criteria and were not currently involved in other nutrition programs. Out of 63 eligible mothers, 57 consented and completed the full study (response rate: 90.5%).

The intervention, a community-led PHBS education and social mobilization program, was implemented over 12 weeks and integrated key components of the Theory of Planned Behavior (TPB). It included: (1) group health education on balanced nutrition and Clean and Healthy Living Behavior, delivered at integrated health posts (*Posyandu*) and community halls; (2) participatory cooking demonstrations of nutritious, low-cost complementary foods using locally available ingredients such as fish, sweet potato, and moringa; (3) social mobilization through involvement of community leaders, religious figures, and health cadres to strengthen subjective norms; (4) interactive counseling sessions with role-playing and peer discussion; and (5) digital reinforcement via WhatsApp groups and Instagram posts containing educational videos, infographics, and testimonials from local mothers.

The 12-week community-led PHBS education and social mobilization program integrated participatory and digital learning approaches anchored in TPB constructs. The weekly cycle consisted of thematic modules designed to reinforce knowledge, motivation, and social norms in a sequential manner.(11)

**Table 1.** Sequence of intervention activities aligned with TPB constructs

| Week(s) | Main Activity | TPB Focus |
|---|---|---|
| 1-2 | Baseline survey, orientation, and group discussion on stunting awareness | Attitude formation |
| 3-4 | Cooking demonstrations using local foods (fish, moringa, sweet potato) | Perceived behavioral control |
| 5-6 | Role-playing and peer discussions with local leaders and religious figures | Subjective norms |
| 7-9 | Family engagement sessions with husbands and grandmothers | Norm internalization |
| 10-12 | Digital reinforcement via WhatsApp and Instagram (educational videos, success stories, quizzes) | Behavioral intention maintenance |

Each group session lasted approximately 90 minutes and was led by trained health cadres under the researcher's supervision. Digital reinforcement materials were disseminated twice weekly to sustain engagement between sessions. Attendance was monitored using a participation log, and participants received follow-up reminders via WhatsApp to ensure program adherence.

Data were collected using a structured questionnaire based on the Theory of Planned Behavior, covering four constructs: (1) Attitude Toward Behavior (ATB), (2) Subjective Norms (SN), (3) Perceived Behavioral Control (PBC), (4) Behavioral Intention (BI). Each construct consisted of five Likert-scale items (1 = strongly disagree to 5 = strongly agree), yielding a total of 20 items. Example items included:

1) *"I believe that preventing stunting will improve my child's future health"* (ATB),
2) *"My family and community expect me to maintain clean living practices"* (SN),
3) *"I feel confident that I can provide nutritious meals using local foods"* (PBC),
4) *"I intend to practice all stunting prevention behaviors taught in this program"* (BI).

The questionnaire was adapted from validated TPB instruments and contextualized to the local setting through a forward–backward translation process. To ensure validity, five public health experts, including specialists in maternal–child nutrition (2), community health promotion (2), and psychometrics (1), assessed the content using the Content Validity Index (CVI), yielding an average score of 0.92, indicating excellent agreement. Construct validity was confirmed through corrected item–total correlations ($r > 0.60$ for all items). Reliability analysis produced Cronbach's alpha values of 0.83 (ATB), 0.81 (SN), 0.84 (PBC), and 0.85 (BI), with an overall alpha of 0.91, confirming that the instrument was both valid and reliable for data collection in this context.

Given the self-reported nature of data collection, potential social desirability bias was addressed through multiple strategies: (1) respondents completed questionnaires privately without cadre assistance, (2) neutral wording was used to minimize value-laden phrasing, (3) anonymity was emphasized in all communications, and (4) no incentives were offered for specific responses. Facilitators were trained to maintain a supportive but non-directive environment during all sessions and data collection procedures.

Data collection occurred at two points: pre-intervention (Week 0) and four weeks post-intervention (Week 16). Data were coded and analyzed using IBM SPSS Statistics version 26. Descriptive statistics summarized sociodemographic variables and mean TPB scores. Intervention effects were examined using paired *t*-tests and repeated-measures ANOVA, assuming normality, homogeneity of variances, and sphericity. Normality was verified using the Shapiro–Wilk test, and Mauchly's test confirmed sphericity assumptions. Where violations occurred, Greenhouse–Geisser corrections were applied. Effect sizes were calculated using partial eta squared ($\eta^2$) and Cohen's *d*. Additionally, Pearson's correlation analysis assessed interrelationships among the four TPB constructs to examine the internal coherence of behavioral determinants. All tests were two-tailed with statistical significance set at $p < 0.05$.

Ethical clearance was granted by the Health Research Ethics Committee of Universitas Jember (Certificate No. 231/UN25.1.14/KEPK/2024). All participants provided written informed consent and were assured confidentiality, voluntary participation, and the right to withdraw at any time without penalty.

## RESULT AND DISCUSSION

The respondents were mainly mothers aged 25–34 years (54.4%), predominantly housewives (82.5%) with junior- or senior-high education levels (89.4%). Most households lived in extended-family settings (64.9%) and had monthly incomes below IDR 5 million (82.5%). Nearly half had two children (47.4 %).

**Table 2.** Demographic characteristics of respondents (N = 57)

| Characteristic | Category | f | % |
|---|---|---|---|
| Age (years) | <25 | 12 | 21.1 |
| | 25-34 | 31 | 54.4 |
| | ≥35 | 14 | 24.6 |
| Education | Elementary School | 3 | 5.3 |
| | Junior High School | 28 | 49.1 |
| | Senior High School | 23 | 40.3 |
| | College | 3 | 5.3 |
| Occupation | Housewife | 47 | 82.5 |
| | Informal Worker | 7 | 12.3 |
| | Formal Employee | 3 | 5.3 |
| Family Type | Nuclear | 20 | 35.1 |
| | Extended | 37 | 64.9 |
| Monthly Household Income | < IDR 5,000,000 | 47 | 82.5 |
| | IDR 5,000,000–10,000,000 | 10 | 17.5 |
| Number of Children | 2 | 27 | 47.4 |
| | 3 | 23 | 40.4 |
| | 4 | 7 | 12.3 |

This profile typifies the coastal families in Tapa'an Village, Pasuruan, where economic activity is mainly dependent on seasonal fishing and informal trade. Such living patterns shape mothers' daily routines and social roles.(3,12,13) The prevalence of extended-family households reflects a collectivist decision-making structure, in which grandmothers and other relatives significantly influence child-feeding and hygiene practices.(14) This condition directly relates to the subjective norms component of the Theory of Planned Behavior (TPB), as mothers' intentions are strongly guided by perceived family expectations and social approval rather than purely personal beliefs.(6,7)

Low education and limited income reduce mothers' perceived behavioral control in maintaining nutritional diversity and consistency in sanitation. Environmental constraints such as irregular income, dependence on marine products, and restricted access to clean water create practical barriers to applying health behaviors despite strong motivation.(1,4) These realities underscore the importance of community-based reinforcement and social support for achieving behavioral sustainability in such contexts.(2,15)

The demographic pattern also explains why, in subsequent analyses, the most notable improvements appeared in subjective norms and behavioral intention: behavior change in coastal communities tends to occur when collective endorsement and mutual observation are activated.(9,16–18) The intervention's participatory approach, supported by digital reminders and peer visibility, effectively leveraged these social dynamics. Overall, the demographic composition of the respondents provides a contextual foundation for interpreting the quantitative outcomes presented in the later tables. It underscores that in low-income, collectivist environments, successful health-behavior change depends not only on individual cognition but on social cohesion, family involvement, and culturally resonant reinforcement. All four domains of the Theory of Planned Behavior (TPB) showed statistically significant improvements after the twelve-week community-led intervention ($p < 0.001$). The F-values, ranging from 257.887 to 484.090, and the very high partial $\eta^2$ values (0.822–0.896), demonstrate that the program produced significant and consistent effects across all behavioral determinants.

From a statistical perspective, these results confirm that the intervention meaningfully changed mothers' cognitive and motivational states, not just marginally but at a magnitude rarely observed in community-based behavioral studies. Partial $\eta^2$ values above 0.80 indicate that over 80 % of the variance in each TPB construct can be attributed to the intervention rather than random error, a powerful indicator of practical significance.

Before the program, mean scores for each TPB construct were moderate (16–17), suggesting that mothers possessed partial awareness but lacked firm intention or perceived control to apply stunting-prevention behaviors. After twelve weeks, mean scores increased to 21–22, placing most participants in the "high" behavioral readiness category. This indicates that the education and mobilization activities successfully strengthened beliefs, social approval, and confidence to act on the desired health behaviors.(2,6) In TPB terms, intention is a direct precursor of behavior and is influenced by attitude, subjective norms, and perceived behavioral control.(6,7)

**Table 3.** Mean scores, standard deviations, and ANOVA results for TPB domains before and after intervention (N = 57)

| TPB Domain | Pre-Mean (SD) | Post-Mean (SD) | F (1.56) | p-value | Partial $\eta^2$ |
|---|---|---|---|---|---|
| Attitude Toward Behavior | 17.09 (2.14) | 21.63 (1.87) | 484.090 | < 0.001 | 0.896 |
| Subjective Norms | 16.46 (2.31) | 21.18 (1.95) | 259.924 | < 0.001 | 0.823 |
| Perceived Behavioral Control | 16.26 (2.28) | 20.88 (1.89) | 257.887 | < 0.001 | 0.822 |
| Behavioral Intention | 16.54 (2.35) | 21.28 (1.81) | 312.684 | < 0.001 | 0.848 |

The substantial increases across all domains suggest that the program enhanced internal motivation (attitude), external normative pressure (subjective norms), and self-efficacy (perceived control), which jointly form behavioral intention.(7,15)

The large F-statistic for attitude (F = 484.090) suggests that participants developed a strong positive evaluation of stunting prevention after being exposed to culturally contextual health messages and practical demonstrations. The equally high effect on subjective norms ($\eta^2$ = 0.823) reflects the strong influence of communal expectations and family endorsement, which are dominant in coastal societies.(12,13)

The improvement in subjective norms and behavioral intention aligns with the collectivist orientation of Tapa'an Village. Mothers often decide on childcare practices in consultation with their husbands, grandmothers, and religious leaders. Thus, the community-based learning model, in which these figures participated in education sessions, created a social environment where behavioral change became a shared commitment rather than an individual decision.(14,16)

Perceived behavioral control also increased notably, though slightly less than attitude. This can be explained by structural constraints, such as unstable income from fishing and limited access to protein sources, which may hinder mothers from fully exercising control despite improved motivation. These constraints emphasize that behavioral change in low-resource settings depends not only on knowledge but also on economic and environmental opportunities.(3,4)

A critical factor explaining these significant statistical effects is the digital reinforcement strategy integrated into the program. Educational videos, WhatsApp reminders, and social media storytelling served as behavioral cues that reinforced intention between sessions. This mechanism resonates with the digital self-regulation model, where repeated exposure and peer acknowledgment sustain intention and prevent behavioral relapse.(9,17)

Qualitative feedback supports this interpretation. Participants expressed that online messages served as constant motivators: "*When I see friends post healthy meals, I feel encouraged to do the same."* Such statements show that social comparison and digital visibility strengthened both attitude and perceived control, amplifying the TPB pathways.

Compared with earlier Indonesian interventions that relied solely on didactic counseling (2,19), This program achieved higher effect sizes because it blended participatory, culturally rooted, and digitally reinforced approaches. Similar outcomes were observed in coastal communities of Bangladesh and Kenya (8,20), confirming that social mobilization and mobile communication can complement traditional TPB interventions in low-literacy populations.

However, the slightly smaller gain in perceived control warns that without concurrent improvements in economic empowerment and infrastructure, behavioral consistency might decline over time. The design's one-group nature may also overestimate short-term gains, yet the strong $\eta^2$ values and consistent qualitative feedback indicate genuine behavioral adaptation rather than measurement bias.

Practically, this evidence supports scaling up community-led digital health education as an affordable and culturally appropriate strategy for stunting prevention. Theoretically, the findings extend TPB by demonstrating that in collectivist and low-resource contexts, social influence and digital reinforcement act as external amplifiers of intention formation. The program thus operationalizes TPB within a social-mobilization framework, providing a model for other coastal communities facing similar behavioral barriers.

Mothers with higher education levels (senior high school and above) showed greater mean increases across all TPB constructs, particularly in behavioral intention (+5.2) and subjective norms (+5.1). This pattern reflects that education enhances cognitive understanding and self-efficacy, enabling mothers to interpret health information more critically and translate it into behavior. In TPB terms, higher education contributes to stronger perceived behavioral control and more favorable attitudes toward stunting prevention.

Similar findings were reported by (14,17,21), showing that literate mothers are more responsive to digital messages and social modeling in health programs. Extended-family mothers showed greater improvement in subjective norms (+5.3) compared with those in nuclear families (+4.5). This outcome reflects the collectivist structure of coastal communities, where extended households often include grandparents and relatives who influence decisions regarding feeding and hygiene.

**Table 4.** Subgroup analysis of TPB construct changes by demographic variables (N = 57)

| Demographic Variable | Category | Attitude | Subjective Norm | Perceived Behavioral Control | Behavioral Intention |
|---|---|---|---|---|---|
| Age (years) | <25 | +4.3 | +4.8 | +4.1 | +4.5 |
| | 25–34 | +4.6 | +5.2 | +4.7 | +5.1 |
| | ≥35 | +4.0 | +4.5 | +4.2 | +4.3 |
| Education Level | Elementary–Junior HS | +4.2 | +4.4 | +4.1 | +4.3 |
| | Senior HS–College | +4.8 | +5.1 | +4.8 | +5.2 |
| Occupation | Housewife | +4.5 | +4.9 | +4.6 | +4.8 |
| | Informal Worker | +4.7 | +5.0 | +4.3 | +4.9 |
| | Formal Employee | +4.9 | +5.2 | +4.8 | +5.0 |
| Family Type | Nuclear | +4.2 | +4.5 | +4.3 | +4.4 |
| | Extended | +4.7 | +5.3 | +4.9 | +5.1 |
| Monthly Income | < Minimum Wage | +4.4 | +4.9 | +4.3 | +4.6 |
| | ≥ Minimum Wage | +4.9 | +5.4 | +4.9 | +5.3 |

The involvement of these family members in community meetings strengthened normative support and reinforced mothers' intention to change. This confirms Ajzen's TPB framework, which posits that social approval and perceived expectations from significant others are powerful motivators in shaping behavior. The study thus demonstrates that interventions leveraging family and community participation can amplify normative change more effectively than individual education alone.

Mothers aged 25–34 years exhibited the most considerable mean improvements across all TPB dimensions. This group represents digitally active adults who are more comfortable with smartphones and social media, making them ideal targets for digital reinforcement strategies. Younger mothers (<25 years) were also responsive, but they tended to rely more on peer influence than on intrinsic motivation.

Older mothers (≥35 years) exhibited slightly more minor changes, likely due to habitual practices and lower digital exposure, which aligns with the *digital divide hypothesis* observed in health promotion studies.(18) Therefore, age-sensitive reinforcement, combining online reminders with in-person encouragement, is recommended for future programs.

Occupational differences also shaped the intervention's impact. Formal employees demonstrated the most significant average improvements, partly because structured routines and stable income enabled them to implement PHBS more consistently.(22–24) Housewives and informal workers, although more time-flexible, often faced domestic workload and role strain, which limited practice despite firm intention. This aligns with behavioral evidence that intention does not always translate to behavior when situational barriers persist.(7) Thus, future reinforcement should include time-management support and involve husbands or family members to share domestic responsibilities.

Families earning below the minimum wage showed improvement in all domains, albeit with slightly smaller increases than their higher-income counterparts. Low-income mothers rely more heavily on community support, shared resources, and reinforcement from social networks, which explains why digital messages and peer testimonials were particularly effective for this group.

However, structural limitations such as the affordability of nutritious food restricted their complete behavioral control. This finding reinforces the need to combine behavioral interventions with economic or food-security components, ensuring that improved knowledge and intention can be sustained through access and affordability.

The subgroup analysis as a whole illustrates how socio-demographic factors interact with the psychological constructs of TPB. Education and occupation influence attitudes and control, while family type, age, and income impact subjective norms and the formation of intentions. In Tapa'an Village, where collective decision-making, religion, and economic interdependence shape daily life, behavioral change is not an isolated act of willpower but a socially negotiated process.

Therefore, interventions need to consider both individual cognition and collective context. The success of the digital reinforcement model in this environment demonstrates that combining community-led mobilization with social media-based *reinforcement* can bridge the gap between intention and sustained action.

**Table 5**. Correlation matrix among TPB constructs after intervention (N = 57)

| Variable | Attitude | Subjective Norms | PBC | Behavioral Intention |
|---|---|---|---|---|
| Attitude Toward Behavior | 1.000 | 0.742** | 0.711** | 0.798** |
| Subjective Norms | 0.742** | 1.000 | 0.688** | 0.755** |
| Perceived Behavioral Control | 0.711** | 0.688** | 1.000 | 0.773** |
| Behavioral Intention | 0.798** | 0.755** | 0.773** | 1.000 |

This extended analysis fulfills reviewer suggestions to clarify how demographic variations influence outcomes. Although no inferential tests were conducted for each subgroup due to sample size limitations, the observed patterns provide meaningful insights into target segmentation for future programs. For example, young, educated mothers respond best to digital content, while older and low-income mothers benefit more from peer reinforcement and community sessions. Additionally, extended families are crucial leverage points for sustaining social norms. Hence, the stunting prevention strategy in coastal settings should be adaptive, *context-sensitive*, and *family-centered*, ensuring inclusivity across all socio-economic strata.

The correlation analysis revealed consistently strong and statistically significant relationships among all TPB constructs ($p < 0.01$), with coefficients ranging from r = 0.688 to r = 0.798. These results indicate that the psychological domains of attitude, subjective norms, and perceived behavioral control (PBC) were not only enhanced individually through the intervention, but also mutually reinforcing, collectively shaping the mothers' behavioral intentions toward stunting prevention. The strongest correlation was observed between attitude and behavioral intention (r = 0.798), implying that mothers who developed more positive beliefs and evaluations about healthy child-feeding and hygiene behaviors were more likely to form firm intentions to practice them.

This finding supports the TPB proposition that attitudinal beliefs form the cognitive foundation for purpose, particularly when the behavior is perceived as beneficial and socially valued. The second strongest association was found between subjective norms and behavioral intention (r = 0.755), highlighting the significant role of social expectations and normative approval within the communal life of coastal families.

In TPB theory, behavior change occurs when individuals not only recognize the value of an action (attitude), but also perceive social endorsement (norms) and personal capability (control) to perform it. The present correlation pattern illustrates that these three antecedents acted in concert. High correlations between attitude and PBC (r = 0.711) and PBC and intention (r = 0.773) indicate that once mothers gained confidence through participatory demonstrations and digital reinforcements, their beliefs about the feasibility of practicing healthy routines solidified into stronger intentions. Such relationships also confirm that increased control perceptions serve as a mediating bridge between improved attitudes and realized intentions. Mothers who believed they could manage feeding schedules, food hygiene, or child sanitation, even with limited resources, showed higher behavioral commitment. This aligns with (6), who reported that PBC mediates the link between attitude and intention in low-income populations. In the social context of Tapa'an Village, the strength of correlations, particularly for subjective norms (r = 0.742 with attitude; r = 0.755 with intention), illustrates how social approval and community solidarity drive behavioral consistency. Here, decisions related to child nutrition or sanitation are rarely made in isolation; instead, they are influenced by elders, neighbors, and local religious leaders.

The community-led health education sessions strategically involved these figures, transforming social norms into positive collective pressure for mothers to adopt and sustain healthy behaviors. The integration of digital reinforcement further amplified these normative influences. Social-media-based encouragement (e.g., WhatsApp reminders, shared success stories) created a sense of shared participation and accountability, sustaining intention between face-to-face sessions. Mothers described feeling *"motivated when I saw my friend post photos of her child eating vegetables."* Such digital visibility transformed private health actions into publicly affirmed community values, strengthening the normative and attitudinal constructs simultaneously.

This finding reflects the synergy between digital reinforcement and social mobilization, confirming that combining online cues with offline collective learning yields stronger and more durable behavioral intentions. Comparable evidence from community-based digital programs in research conducted by Halwa and Ratri found similar outcomes, emphasizing that digital reinforcement enhances social contagion effects, particularly in collectivist societies.(25,26)The observed correlation structure also holds theoretical significance for expanding TPB in community contexts. Traditional TPB models emphasize individual-level cognition, assuming personal autonomy in decision-making.

**Table 6**. Distribution of behavioral intention levels before and after intervention (N = 57)

| Behavioral Intention Level | Pretest n (%) | Posttest n (%) | Change (%) |
|---|---|---|---|
| Low (<15) | 18 (31.6%) | 3 (5.3%) | −26.3 |
| Medium (15-20) | 25 (43.9%) | 9 (15.8%) | −28.1 |
| High (>20) | 14 (24.6%) | 45 (78.9%) | +54.3 |

However, in communal societies like Tapa'an, intention formation is a socially negotiated process, influenced by collective attitudes and community validation. The strong association between subjective norms and attitude ($r$ = 0.742) demonstrates that belief formation itself is co-constructed socially, rather than developed independently.

Therefore, this study provides empirical support for a socially embedded TPB model, where normative influence not only predicts intention but also shapes attitude and perceived control. In other words, social norms function as both antecedent and amplifier within the behavioral framework. This theoretical nuance strengthens the relevance of TPB for health-promotion interventions in collectivist and low-resource settings.

Although correlations were strong, causal relationships cannot be inferred from these data. Because the study used a one-group pretest–posttest design, these interrelations may partly reflect shared method variance. Nevertheless, the combination of quantitative findings and qualitative insights suggests genuine psychological change, rather than a mere measurement artifact. Future research using longitudinal or controlled designs could examine whether these TPB correlations predict actual behavioral maintenance (e.g., sustained PHBS practices) over time.

The correlation results confirm that attitude, subjective norms, and perceived control are mutually reinforcing determinants of behavioral intention, affirming the TPB's applicability to community-led and digitally supported interventions. In Tapa'an's coastal setting, behavioral intention emerges not only from individual beliefs but also from collective convictions, reinforced through digital communication and family participation.

This integration of theory, community, and technology marks a significant advancement in stunting-prevention behavior research, both practically and theoretically. Following the intervention, a noticeable shift occurred in the distribution of behavioral intentions. The proportion of mothers in the "high" category increased from 24.6% to 78.9%, while those in the low and moderate groups decreased substantially.

This suggests that the majority of mothers have internalized the knowledge and motivation to consistently engage in stunting-prevention behaviors. This transformation demonstrates the success of the digital community reinforcement model, which maintained mothers' motivation between educational sessions. WhatsApp reminders, short videos, and peer stories acted as continuous cues, reminding participants of positive practices and reinforcing group identity as "healthy mothers." This mechanism aligns with the intention-maintenance concept within TPB, where repetition and social feedback strengthen commitment and prevent intention decay.(6)

However, around 5% of mothers remained in the low category even after the intervention. These participants mainly were those with limited digital literacy, unstable internet access, or higher caregiving burdens. Their lower improvement reflects structural and situational constraints, not a lack of motivation. This supports the TPB notion that while intention is a proximal predictor of behavior, actual performance depends on resources and perceived control.(7)

Therefore, maintaining behavioral change requires not only psychological reinforcement but also environmental and social support. Comparatively, studies in rural Bangladesh and Indonesia's coastal areas (18), Found similar patterns of significant behavioral gains among digitally engaged participants, and smaller ones among those constrained by socio-economic or infrastructural barriers. This consistency across contexts confirms that digital reinforcement is most effective when supported by accessibility and community cohesion.

From a reflective perspective, this result also answers the reviewers' point regarding uneven changes across indicators. While overall improvement was substantial, the small subgroup with limited gains suggests that future programs should incorporate adaptive reinforcement, such as offline follow-ups, printed messages, or home visits, to ensure inclusivity among mothers with low digital capacity.

The distributional improvement in behavioral intention indicates that behavioral transformation occurred at a population level, not just among a select few participants. By combining face-to-face education, collective learning, and digital reinforcement, the intervention effectively transformed social norms into sustained behavioral commitment. This confirms the suitability of TPB as a guiding framework, especially when embedded within community structures and supported by digital engagement.

## CONCLUSION

This study confirmed that a community-led education model combined with digital reinforcement significantly improved all constructs of the Theory of Planned Behavior (TPB) among mothers of under-five children in Tapa'an Village. Quantitative results showed large effect sizes and strong inter-construct correlations. At the same time, qualitative insights revealed an enhanced sense of confidence, motivation, and social accountability, demonstrating that behavioral change emerged from both individual conviction and community support.

The most prominent finding was the synergistic role of digital reinforcement, which strengthened mothers' attitudes and maintained intention between sessions. The group that benefited most consisted of digitally active mothers in extended families, where social norms and peer encouragement amplified commitment. Reinforcement is best implemented at least twice weekly, with health cadres facilitating message delivery, verification, and motivation. Integration into Puskesmas programs is crucial for sustaining engagement beyond research activities.

Despite strong results, several limitations exist: the one-group pretest–posttest design limits causal interpretation, and self-reported data may be influenced by social desirability. Future studies should employ controlled or longitudinal designs to assess long-term behavioral maintenance and compare reinforcement frequencies or cadre-led delivery models.

Theoretically, this study extends TPB by illustrating its adaptability in collectivist and digitally connected contexts, where intention formation is socially negotiated. Practically, it offers a low-cost, culturally sensitive, and sustainable framework for stunting prevention, emphasizing that behavior change in coastal communities thrives when digital communication, community solidarity, and local leadership converge.

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## Conflict of Interest

The authors declare that there's no conflict of interest.

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