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Improving the utilization of Barangay Health Stations through a community-based intervention

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ABSTRACT

Limited utilization of Barangay Health Stations (BHS) remains a persistent challenge in rural Philippine communities, despite the availability of essential primary healthcare services. This study aimed to evaluate the effectiveness of a theory-driven, community-based intervention based on the Health Belief Model (HBM) in improving BHS utilization in Burgos, Isabela, based on the premise that changes in health beliefs can influence healthcare-seeking behavior. A quasi-experimental pretest–posttest control group design was employed, involving 380 households selected through stratified random sampling with proportionate allocation across 14 barangays. Participants were assigned to intervention or control groups according to geographically defined clusters. Baseline analyses showed that age was significantly associated with perceived barriers, while self-rated health was significantly associated with cues to action. No significant associations were found between the other socio-demographic characteristics and the HBM constructs. The intervention consisted of four structured weekly health education sessions aligned with the HBM constructs. Post-intervention analyses showed statistically significant improvements in all HBM constructs in the intervention group (all $p < 0.05$), whereas changes in the control group were relatively small. Although improvements in perceived barriers were statistically significant, they appeared less pronounced than those observed in the other HBM constructs. The findings suggest that a culturally contextualized, theory-based intervention was associated with improvements in key behavioral determinants of BHS utilization and may enhance engagement with primary healthcare services in underserved rural settings. These findings provide quantitative evidence supporting the use of behaviorally informed strategies to strengthen equitable primary healthcare delivery.

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1. Introduction

Barangay Health Stations (BHS) serve as the frontline of primary healthcare delivery in the Philippines, providing essential preventive and promotive services such as immunization, maternal and child health care, family planning, disease screening, and health education. As the first point of contact in the health system, BHS are designed to support early detection, continuity of care, and improved access to basic health services (de Vera et al., 2024; Malinay, 2023).

Despite the availability of these services, evidence shows that utilization of primary healthcare facilities remains inconsistent (WHO, 2019). Preventive services are often underutilized compared to curative services, suggesting gaps in health-seeking behavior and awareness among community members, particularly in underserved communities (Reyes et al., 2023). These patterns indicate that service availability alone does not ensure service utilization, as utilization is influenced by behavioral and structural factors (Reyes et al., 2023; WHO, 2019).

The HBM provides a theoretical framework for understanding these behavioral gaps. It explains health-seeking behavior through constructs such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Becker, 1974; Carpenter, 2010). These constructs influence whether individuals

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decide to use preventive health services such as those offered in BHS.

However, there is limited barangay-level evidence that applies the HBM to systematically examine determinants of BHS utilization in rural Philippine settings. Most existing studies are descriptive and do not fully integrate behavioral constructs in explaining utilization patterns.

In the municipality of Burgos, Isabela, although Barangay Health Stations are operational in all barangays, inconsistent utilization of preventive services has been observed. This suggests the presence of behavioral barriers that may influence healthcare-seeking decisions despite service availability. To address this gap, this study applies the HBM to examine determinants of BHS utilization and evaluate changes in health beliefs following a community-based intervention. By linking behavioral constructs with service utilization, the study aims to generate evidence that can inform targeted strategies to improve primary healthcare uptake at the community level.

2. Methodology

This study employed a quantitative quasi-experimental pre-test–post-test control group design to evaluate the effectiveness of a community-based intervention in improving the utilization of Barangay Health Stations (BHS) in Burgos, Isabela. The research was conducted in three phases: (1) a baseline survey to assess initial levels of healthcare utilization, knowledge, attitudes, and practices (KAP), and HBM constructs; (2) a four-week HBM-based health education intervention; and (3) a posttest survey to measure changes following the intervention.

The study was conducted in the municipality of Burgos, Isabela, which comprises 14 barangays with a total population of 26,040 individuals and 6,410 households based on the 2020 Census of the Philippine Statistics Authority. A minimum sample size of 363 households was calculated using the Raosoft Sample Size Calculator with a 95% confidence level and a 5% margin of error. Because the study began with a community-based baseline survey to obtain a representative sample of households in the municipality, a population-based sample size calculation was considered appropriate. To account for possible non-response and attrition, the target sample size was increased to 395 households. Eligibility criteria included residency in Burgos for at least six months and having at least one child aged 10 years or older to ensure relevance to preventive and primary healthcare services delivered through the Barangay Health Stations.

A stratified random sampling technique with proportionate allocation was employed to ensure geographic representation across all 14 barangays. Each barangay served as a stratum, and the number of households selected from each barangay was proportional to its share of the total household population. Household lists were obtained from the Barangay Health Stations and served as the sampling frame. Eligible households were randomly selected using a manual lottery method, wherein household names were written on slips of paper, thoroughly mixed, and blindly drawn until the required sample size for each barangay was achieved.

For logistical feasibility during intervention implementation, the 14 barangays were grouped into two geographically contiguous clusters. Participants were assigned to either the intervention or control group according to the cluster in which their barangay was located. Thus, while participant selection was conducted using random sampling, allocation to the intervention and control groups was non-random, consistent with the quasi-experimental study design. During the study, 15 households withdrew (7 from the intervention group and 8 from the control group) due to illness, scheduling conflicts, or inconvenience, resulting in a final sample of 380 households, with 190 participants in each group. The intervention consisted of four weekly face-to-face health education sessions lasting approximately 30–60 minutes each. The sessions were structured around the six constructs of the HBM: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Educational content was culturally adapted and delivered through interactive lectures, facilitated discussions, and printed educational materials. Sessions were organized into concise, accessible modules to enhance attendance and participant engagement.

Data were collected using a validated researcher-developed questionnaire that measured socio-demographic characteristics, healthcare utilization, knowledge, attitudes, practices, and HBM constructs. The instrument demonstrated acceptable internal consistency, with Cronbach's alpha coefficients ranging from 0.78 to 0.94. Surveys were administered face-to-face to maximize response rates and minimize missing data.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' socio-demographic characteristics, baseline utilization of Barangay Health Station services, and HBM construct scores. Inferential analyses were performed to examine differences in HBM constructs across socio-demographic characteristics and to compare baseline and post-intervention scores within and between the intervention and control groups. Non-parametric statistical tests were employed, including the Mann–Whitney U test for between-group comparisons, the Wilcoxon signed-rank test for within-group comparisons, and the Kruskal–Wallis H test for comparisons involving more than two groups. Statistical significance was set at $p < 0.05$.

3. Results and discussion

The results of this study are presented in accordance with the specific objectives of the research.

Baseline utilization of Barangay Health Station (BHS) services varied across program areas in both the control and intervention groups (Table 1). Immunization was the most frequently used service, while adolescent health services, fasting blood sugar (FBS) monitoring, consultations, and community meetings were underutilized.

The mean utilization score was 49.77 ± 28.34 in the control group and 52.57 ± 28.41 in the intervention group.

Table 1: Baseline utilization of BHS services among the control and intervention groups (n = 380)

BHS	Response	Control group n (%)	Intervention group n (%)
Immunization	Yes	173 (91.05)	177 (93.16)
Childcare	Yes	108 (56.84)	119 (62.63)
Adolescent health	Yes	51 (26.84)	49 (25.79)
Pre/post-natal services	Yes	115 (60.53)	133 (70.00)
Family planning	Yes	116 (61.05)	118 (62.11)
Community meetings	Yes	63 (33.17)	64 (33.68)
Blood pressure monitoring	Yes	114 (60)	119 (62.63)
Fasting blood sugar monitoring	Yes	53 (27.89)	55 (28.95)
Consultation	Yes	58 (30.53)	65 (34.21)
Mean and standard deviation of utilization status		49.77 ± 28.34	52.57 ± 28.41

The socio-demographic characteristics of the participants are presented in Table 2. In both the intervention and control groups, participants were predominantly female, married, and unemployed. The largest proportion of participants belonged to the 25–34-year age group, although a substantial proportion of participants in the intervention group were also aged 45–54 years. Most participants had attained elementary or junior high school education, reported a monthly family income below ₱12,082, and had health insurance coverage.

In terms of self-rated health status, most participants perceived their health as good or average.

Table 2: Socio-demographic characteristics of participants

Characteristic	Category	Intervention group n (%)	Control group n (%)
Age (years)	18–24	10 (5.26)	15 (7.89)
	25–34	69 (36.32)	88 (46.32)
	35–44	25 (13.16)	17 (8.95)
	45–54	62 (32.63)	36 (18.95)
	55–64	17 (8.95)	30 (15.79)
	≥65	7 (3.68)	4 (2.11)
Sex	Male	36 (18.95)	35 (18.42)
	Female	154 (81.05)	155 (81.58)
Educational attainment	No formal education	6 (3.16)	8 (4.21)
	Elementary	103 (54.21)	69 (36.32)
	Junior high school	39 (20.53)	62 (32.63)
	Senior high school	16 (8.42)	11 (5.79)
	College	25 (13.16)	35 (18.42)
	Postgraduate	1 (0.53)	5 (2.63)
Employment status	Unemployed	116 (61.05)	100 (52.63)
	Employed	74 (38.95)	90 (47.37)
Civil status	Single	10 (5.26)	16 (8.42)
	Live-in	14 (7.37)	18 (9.47)
	Married	153 (80.53)	136 (71.58)
	Separated	1 (0.53)	5 (2.63)
	Widowed	12 (6.32)	15 (7.89)
Monthly family income (₱)	<12,082	151 (79.47)	146 (76.84)
	12,082–24,164	29 (15.26)	26 (13.68)
	24,165–48,328	8 (4.21)	17 (8.95)
	48,329–84,574	2 (1.05)	1 (0.53)
Health insurance	None	32 (16.84)	32 (16.84)
	With health insurance	158 (83.16)	158 (83.16)
Self-rated health status	Poor	13 (6.84)	10 (5.26)
	Average	83 (43.68)	71 (37.37)
	Good	94 (49.47)	109 (57.37)

Table 3 presents the baseline mean scores of the intervention and control groups across the six Health Belief Model (HBM) constructs. Overall, the descriptive statistics indicate broadly similar baseline health belief profiles between the two groups prior to the intervention.

Table 4 presents the associations between socio-demographic characteristics and HBM constructs. Age was significantly associated with perceived barriers to healthcare ($H = 14.43$, $p = 0.0131$), whereas self-rated health was significantly associated with cues to action ($H = 6.18$, $p = 0.0454$). No statistically significant associations were observed between sex, educational attainment, employment status, civil status, monthly family income, or health insurance status and the remaining HBM constructs (all $p > 0.05$).

Table 3: Baseline health belief model scores of participants

Construct	Control group M (SD)	Intervention group M (SD)
Perceived susceptibility	2.87 (0.70)	2.90 (0.72)
Perceived severity	3.53 (0.55)	3.47 (0.62)
Perceived benefits	3.37 (0.49)	3.34 (0.55)
Perceived barriers	3.02 (0.61)	2.97 (0.68)
Cues to action	2.66 (0.77)	2.59 (0.82)
Self-efficacy	3.19 (0.68)	3.16 (0.74)

Table 4: Associations between socio-demographic characteristics and health belief model constructs

Characteristics	Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers	Cues to action	Self-efficacy
Age	H = 2.76 p = 0.7366	H = 2.21 p = 0.8199	H = 1.94 p = 0.8576	H = 14.43 p = 0.0131*	H = 6.52 p = 0.2592	H = 4.00 p = 0.5496
Sex	U = 10802 p = 0.7302	U = 10175.5 p = 0.2655	U = 10548.5 p = 0.5194	U = 10813.5 p = 0.7423	U = 10472.5 p = 0.4622	U = 11040.5 p = 0.955
Education	H = 4.45 p = 0.4865	H = 3.41 p = 0.6376	H = 4.80 p = 0.4408	H = 8.14 p = 0.1486	H = 2.78 p = 0.7342	H = 1.94 p = 0.8575
Work status	U = 16137.5 p = 0.3175	U = 16056 p = 0.2754	U = 16834 p = 0.7487	U = 15815 p = 0.1922	U = 16299 p = 0.404	U = 17100 p = 0.948
Civil status	H = 2.37 p = 0.6673	H = 3.57 p = 0.4673	H = 3.76 p = 0.4398	H = 1.02 p = 0.9069	H = 5.02 p = 0.2856	H = 6.00 p = 0.1991
Monthly family income	H = 2.68 p = 0.4444	H = 0.93 p = 0.819	H = 0.60 p = 0.897	H = 1.08 p = 0.7819	H = 0.95 p = 0.8136	H = 2.83 p = 0.418
Has health insurance	U = 10021.5 p = 0.9094	U = 8919 p = 0.1274	U = 9599 p = 0.5212	U = 9508 p = 0.4483	U = 9061 p = 0.1885	U = 8574 p = 0.053
Self-rated health status	H = 3.03 p = 0.2195	H = 2.30 p = 0.3173	H = 2.47 p = 0.2914	H = 0.81 p = 0.6685	H = 6.18 p = 0.0454*	H = 2.23 p = 0.3276

H = Kruskal–Wallis H statistic; U = Mann–Whitney U statistic; p = p-value; *: p < 0.05

Table 5 presents the pretest and post-test comparison of HBM construct scores among the intervention and control groups. Following the four-week HBM-based health education intervention, the intervention group demonstrated statistically significant within-group improvements across all HBM constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and perceived self-efficacy (all $p < 0.05$).

The control group also showed statistically significant within-group differences in perceived susceptibility, perceived severity, perceived barriers, cues to action, and perceived self-efficacy, whereas perceived benefits did not change significantly ($p = 0.8672$). However, the corresponding changes in mean scores were generally small.

Between-group comparisons at post-test showed statistically significant differences across all HBM constructs ($p < 0.05$), with higher post-test mean scores observed in the intervention group than in the control group. These findings indicate that participants who received the HBM-based health education intervention reported more favorable health belief scores following the intervention. Because baseline comparability was not formally assessed and effect sizes were not calculated, the findings should be interpreted in terms of statistical significance rather than the magnitude of the observed differences.

Table 5: Pre-test and post-test comparison of HBM constructs

Domain	Time	Control group	Intervention group	Between-group p-value	Within-control p-value	Within-intervention p-value
Perceived susceptibility	Before	2.87 ± 0.70	2.90 ± 0.72	0.5421	0.0034	< 0.0001
	After	2.83 ± 0.68	3.39 ± 0.52	< 0.0001		
Perceived severity	Before	3.53 ± 0.55	3.47 ± 0.62	0.3260	< 0.0001	< 0.0001
	After	3.48 ± 0.54	3.74 ± 0.27	< 0.0001		
Perceived benefits	Before	3.37 ± 0.49	3.34 ± 0.55	0.7519	0.8672	< 0.0001
	After	3.38 ± 0.53	3.70 ± 0.29	< 0.0001		
Perceived barriers	Before	3.02 ± 0.61	2.97 ± 0.68	0.5293	< 0.0001	0.0081
	After	3.01 ± 0.72	3.13 ± 0.34	0.0232		
Cues to action	Before	2.66 ± 0.77	2.59 ± 0.82	0.4813	0.0108	< 0.0001
	After	2.63 ± 0.75	3.19 ± 0.42	< 0.0001		
Perceived self-efficacy	Before	3.19 ± 0.57	3.16 ± 0.63	0.8222	< 0.0001	< 0.0001
	After	3.09 ± 0.56	3.47 ± 0.38	< 0.0001		

This study examined baseline utilization patterns of Barangay Health Station (BHS) services, socio-demographic differences in HBM constructs, and changes in health beliefs following a community-based intervention.

Baseline findings revealed uneven utilization of BHS services. Immunization services showed the highest uptake, while adolescent health and preventive services were less utilized. This pattern suggests that services with established routines and strong external prompts tend to achieve higher participation, whereas preventive services requiring proactive engagement remain underutilized.

This may be explained by low perceived susceptibility and limited awareness of the benefits of early care, consistent with the assumptions of the HBM (Shmueli, 2021; Tang et al., 2022). These findings indicate the need to strengthen health promotion strategies that emphasize risk awareness and early health-seeking behavior.

Non-parametric analyses indicated a statistically significant association between age and perceived barriers to healthcare ($H = 14.43$, $p = 0.0131$), suggesting that perceptions of barriers differed across age groups. Although the present analysis did not identify which age groups differed, this finding highlights the potential importance of considering age-related factors when designing interventions to improve Barangay Health Station (BHS) utilization. Previous studies have suggested that mobility limitations, transportation constraints, and competing responsibilities may influence healthcare access among different age groups, underscoring the value of age-sensitive strategies such as mobile health services and community outreach (Cochran et al., 2022).

Self-rated health was also significantly associated with cues to action ($H = 6.18$, $p = 0.0454$), indicating that participants' responsiveness to health-related prompts differed according to their perceived health status. While the direction of this association was not examined in the present study, the finding is consistent with the HBM, which proposes that perceived health status can influence an individual's readiness to act when appropriate cues are present (Champion and Skinner, 2008; Pradhan and De, 2025).

In contrast, sex, educational attainment, employment status, civil status, monthly family income, and health insurance status were not significantly associated with the HBM constructs examined. These findings indicate that there was no statistical evidence of associations between these socio-demographic characteristics and participants' health beliefs within the study population.

Post-intervention findings demonstrated statistically significant improvements across all HBM constructs in the intervention group. Participants reported higher scores for perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and perceived self-efficacy following the four-week HBM-based health education intervention.

The increase in perceived susceptibility suggests greater awareness of personal health risks associated with the underutilization of Barangay Health Station (BHS) services. This finding is consistent with Champion and Skinner (2008), who explained that higher perceived susceptibility increases the likelihood of engaging in preventive health behaviors. Likewise, the improvement in perceived severity indicates a stronger recognition of the potential consequences of delaying or failing to utilize available healthcare services, supporting previous evidence that perceived severity contributes to preventive health behaviors (Carpenter, 2010).

Perceived benefits also increased significantly following the intervention, indicating stronger beliefs regarding the usefulness and value of BHS services. This finding is supported by evidence from Agyemang-Duah and Rosenberg (2023), who found a positive and statistically significant association between perceived benefits of care-seeking and healthcare utilization in their initial model. Although perceived barriers also showed statistically significant improvement, the increase in mean score was smaller than that observed for the other HBM constructs. This finding suggests that while the intervention may have positively influenced participants' perceptions, structural barriers such as accessibility, availability of resources, and service delivery constraints may continue to affect healthcare utilization (Agyemang-Duah and Rosenberg, 2023; Hou et al., 2025; Kukulka et al., 2024).

Cues to action and self-efficacy showed notable improvement, reflecting increased motivation and confidence among participants to utilize available services. These findings suggest that the short, community-based, and contextually relevant health education intervention implemented in this study was associated with improvements in participants' health beliefs.

Although statistically significant within-group differences were also observed in the control group for perceived susceptibility, perceived severity, perceived barriers, cues to action, and perceived self-efficacy, the corresponding changes in mean scores were generally small, whereas perceived benefits did not change significantly. These modest changes may reflect pretest sensitization (Hawthorne effect), whereby completing the baseline questionnaire increased participants' awareness of health issues, or possible contamination resulting from the exchange of health information within the community.

Overall, statistically significant post-intervention differences were observed between the intervention and control groups across all HBM constructs, with higher post-test mean scores observed among participants who received the HBM-based health education intervention. However, because effect sizes were not calculated, the magnitude of these differences could not be quantified. Therefore, the findings should be interpreted in terms of statistical significance rather than the magnitude of the observed differences. Nevertheless, the results suggest that the HBM-based health education intervention was associated with improvements in participants' reported health beliefs related to Barangay Health Station utilization.

The findings highlight the importance of strengthening both behavioral and system-level strategies to improve BHS utilization. Interventions should focus on increasing awareness of health risks, particularly among individuals who may not perceive themselves as vulnerable.

Targeted approaches for older adults, including improved accessibility and outreach services, may help reduce perceived barriers. In addition, sustained improvements in service utilization require addressing structural factors such as availability of supplies, staffing, and accessibility of care.

4. Conclusions

This study examined baseline utilization patterns of Barangay Health Station (BHS) services, socio-demographic differences in HBM constructs, and changes in health beliefs following a community-based intervention. Baseline results showed uneven utilization of BHS services, with higher uptake in immunization services and lower utilization in preventive and adolescent health services, suggesting variation in service use across different program areas. Age was significantly associated with perceived barriers, indicating that perceptions of barriers differed across age groups. Self-rated health was also significantly associated with cues to action. Other socio-demographic characteristics, including

sex, education, employment status, income, and health insurance, showed no significant associations with HBM constructs. Following the intervention, the intervention group showed statistically significant improvements across all HBM constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The improvement in perceived barriers was statistically significant, although the observed change was less pronounced than that of the other HBM constructs. Overall, these findings suggest that the HBM-based community intervention was associated with improvements in participants' health beliefs related to Barangay Health Station utilization. These findings support the potential value of theory-based community health education as a strategy for strengthening primary healthcare engagement in rural communities.

This study has several limitations. One limitation is the relatively short duration of the intervention, which lasted only four weeks, and may not be sufficient to determine the long-term sustainability of changes in health beliefs and service utilization. Future research should consider longer follow-up periods to assess the sustained effects of HBM-based health education on the utilization of Barangay Health Station services.

Potential contamination between the control and intervention groups may have occurred, as participants could have been indirectly exposed to health information through community interactions. In addition, pretest sensitization (Hawthorne effect) may have influenced participants' responses, particularly in the control group.

The study also relied on self-reported data, which may be subject to response bias. Furthermore, effect sizes were not computed, which limits the ability to determine the magnitude or practical significance of the observed differences. Future studies are recommended to include effect size measures to strengthen the interpretation of results.

List of abbreviations

BHS	Barangay health stations
FBS	Fasting blood sugar
H	Kruskal–Wallis H statistic
HBM	Health belief model
KAP	Knowledge, attitudes, and practices
M	Mean
n	Sample size
p	p-value
SD	Standard deviation
U	Mann–Whitney U statistic

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Compliance with ethical standards

Ethical considerations

Ethical approval for this study was obtained from the Angeles University Foundation Ethics Review Committee (Protocol Code: 2024-DPH-Students-088). Written informed consent was obtained from all participants before data collection. Participation was voluntary, and participants' confidentiality and anonymity were maintained throughout the study.

Conflict of interest

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

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