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Impact of a Community-Based Social Marketing Intervention on Preventive Health Behavior Among Generation Z in Vietnam

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ABSTRACT

Preventive health behavior is central to reducing the burden of non-communicable diseases (NCDs), particularly among young populations. Information-based campaigns alone may be insufficient to support sustained behavior change. This study assessed changes in preventive health behavior and related cognitive determinants following a community-based social marketing program among Generation Z in Vietnam. A single-group quasi-experimental pretest-posttest design was implemented between August and October 2025 in Hanoi, Da Nang, and Ho Chi Minh City. A total of 320 participants completed baseline assessment and 287 completed both waves. The eight-week program applied social marketing principles and selected constructs from the Health Belief Model (HBM) and Theory of Planned Behavior (TPB). Paired-sample t-tests assessed pre-post changes, and posttest structural equation modeling (SEM) examined theory-consistent associations among selected cognitive determinants, behavioral intention, and self-reported preventive health behavior. Perceived benefits, self-efficacy, attitude, behavioral intention, and perceived susceptibility increased significantly, while perceived barriers decreased. Self-reported preventive health behavior increased from 3.12 (SD = 0.64) at pretest to 3.74 (SD = 0.58) at posttest, $t(286) = 12.45$, $p < 0.001$, Cohen's $d = 0.76$. In the posttest SEM, perceived benefits ($\beta = 0.31$, $p < 0.001$) and self-efficacy ($\beta = 0.42$, $p < 0.001$) were positively associated with behavioral intention, whereas perceived barriers were negatively associated with intention ($\beta = -0.18$, $p < 0.01$). Behavioral intention was positively associated with self-reported preventive health behavior ($\beta = 0.54$, $p < 0.001$). Favorable pre-post changes were observed following the program, and the posttest associations were consistent with selected HBM and TPB propositions. However, given the absence of a concurrent control group and the same-wave assessment of the variables included in the indirect-effect analysis, the findings should be interpreted as evidence of pre-post change and theory-consistent associations rather than as definitive evidence of causal intervention effects or temporal mediation.

1. INTRODUCTION

Non-communicable diseases (NCDs) remain a major public health and development challenge. The World Health Organization (WHO) reported that NCDs accounted for approximately 41 million deaths, or 74% of global deaths, in 2019 [1]. In Vietnam, NCDs account for a substantial share of mortality and have become increasingly important alongside urbanization and lifestyle change [2]. Preventive practices such as regular physical activity, health monitoring, healthy dietary behavior, and appropriate screening are therefore important for reducing modifiable risk. Physical inactivity is especially relevant for younger populations: WHO estimates indicate that more than 80% of adolescents do not meet recommended physical activity levels [3].

Generation Z is highly connected to digital media and has extensive access to health information, but information exposure does not necessarily translate into sustained preventive action. Contemporary evidence shows that digital and social-media environments can support health promotion, yet intervention effects vary by design, population, engagement strategy, and outcome measurement [4-9]. Social media can also expose young people to health-risk content, underscoring the need for theory-informed, carefully evaluated health communication rather than assuming that digital reach alone produces beneficial behavior change [10].

Social marketing provides a behavioral framework for designing such programs by combining audience orientation, segmentation, exchange, behavioral objectives, and an appropriate marketing mix. Recent systematic evidence suggests that prevention interventions using social marketing methods can produce favorable behavioral outcomes, although study quality and risk of bias remain important concerns [4]. This is particularly relevant for community-based programs that combine digital communication with peer and campus engagement.

Preventive health promotion also has a broader sustainability dimension. Population health supports human capital, social participation, and the resilience of communities and cities. Accordingly, youth-focused NCD prevention is consistent with Sustainable Development Goal 3, particularly target 3.4 on reducing premature mortality from NCDs through prevention and treatment [1]. Evaluating youth preventive-health programs is therefore relevant not only to individual behavior but also to social sustainability and sustainable urban development.

Against this background, the present study examines pre-post changes following an eight-week community-based social marketing program among Generation Z participants in three major Vietnamese cities. Because the design includes one intervention group and no concurrent control group, the study is framed as an assessment of change over time and theory-consistent associations rather than a definitive causal test of intervention effectiveness.

2. LITERATURE REVIEW

2.1 Social marketing and contemporary digital health promotion

Social marketing was introduced by Kotler and Zaltman as the application of marketing principles to influence voluntary behavior for social good [11]. Andreasen subsequently emphasized that social marketing should be judged by behavioral outcomes rather than awareness alone [12]. Earlier systematic evidence supported the potential of social marketing to influence health-related behavior when programs employ audience research, segmentation, exchange, and a behavioral focus [13]. More recent evidence has refined this conclusion. Roger et al. [4] found generally favorable effects across prevention interventions using social marketing methods, but also identified heterogeneity and methodological weaknesses.

Digital and social-media channels are especially relevant for younger populations. Goodyear et al. [5] reported that social-media interventions can support improvements in physical activity and dietary behaviors, while noting variation in study design and reliance on self-report. Ghahramani et al. [6] concluded that social media has potential beyond awareness creation, but emphasized the challenge of demonstrating sustainable behavior change. Günther et al. [7] similarly mapped a growing evidence base for social-media-based physical activity interventions, while Faus et al. [8] highlighted weaknesses in the evaluation and longitudinal follow-up of public-health campaigns on social networks. A rapid review by Colder Carras et al. [9] further shows the importance of prevention and health promotion within young people's wider digital well-being context. Together, these findings support multi-channel youth health promotion while also reinforcing the need for rigorous outcome measurement and cautious causal interpretation.

2.2 Health Belief Model

The Health Belief Model (HBM) explains preventive action through perceptions of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy [14, 15]. Later applications have emphasized the importance of perceived barriers and self-efficacy in preventive behavior [16]. Within a social marketing program, these constructs can inform value propositions and message design: perceived benefits can be made more salient, practical and psychological barriers can be reduced, and confidence can be strengthened through achievable behavioral commitments.

2.3 Theory of Planned Behavior

The Theory of Planned Behavior (TPB) proposes that behavioral intention is shaped by attitude, subjective norms, and perceived behavioral control and that intention is a proximal predictor of behavior [17]. Meta-analytic evidence supports the predictive value of TPB constructs across multiple behaviors [18]. For digitally connected young adults, peer influence and social norms may be particularly salient, which provides a rationale for peer ambassadors, community discussion, and socially visible behavioral commitments.

2.4 Integrating Health Belief Model and Theory of Planned Behavior in preventive health research

Recent research has continued to combine constructs from HBM and TPB. A Vietnamese study of COVID-19 vaccination intention found that a combined HBM-TPB framework explained meaningful variation in intention and highlighted cues to action, self-efficacy, and perceived barriers [19]. Among young Filipino adults, Ong et al. [20] used an integrated HBM and extended TPB model to examine vaccination intention. More recently, Fang et al. [21] applied an integrated HBM-TPB framework to proactive health behavior intention in China and reported complementary roles for health beliefs, attitude, subjective norms, perceived behavioral control, and self-efficacy. These studies support conceptual integration while also showing that the exact structural pathways should be explicitly specified rather than assuming that all measured constructs enter a single structural model.

2.5 Research gap and hypotheses

Evidence remains limited on structured community-based social marketing programs targeting preventive health behavior among Generation Z in Vietnam. The present study therefore combines a pre-post program evaluation with a focused posttest SEM. Importantly, the study does not test the complete canonical HBM or TPB. Perceived susceptibility, attitude, subjective norms, and perceived behavioral control were measured as theoretically relevant constructs within the broader measurement framework; however, the primary SEM focuses on perceived benefits, perceived barriers, self-efficacy, behavioral intention, and self-reported preventive health behavior. This distinction aligns the theoretical description with the structural paths that can be supported by the reported analysis.

The study examines the following hypotheses:

H1: Pretest-posttest scores will show favorable changes in perceived benefits and self-efficacy and a reduction in perceived barriers following the program.

H2: At posttest, perceived benefits and self-efficacy will be positively associated with behavioral intention, whereas perceived barriers will be negatively associated with behavioral intention.

H3: At posttest, behavioral intention will be positively associated with self-reported preventive health behavior.

H4: At posttest, behavioral intention will statistically mediate the associations between selected cognitive determinants and self-reported preventive health behavior. Because the mediator and outcome were assessed at the same wave, this hypothesis concerns statistical indirect association and not temporal causal mediation.

3. METHODOLOGY

3.1 Study design and setting

A single-group quasi-experimental pretest-posttest design was used to assess change following an eight-week community-based social marketing program. Data were collected at baseline and immediately after the program between August and October 2025 in Hanoi, Da Nang, and Ho Chi Minh City.

The absence of a concurrent control group is an important design limitation. Observed pre-post changes cannot be attributed exclusively to the program because history effects, repeated-testing effects, maturation and other time-related influences, regression, or unmeasured co-interventions may also contribute to change. The design therefore supports assessment of change over time but provides limited evidence for causal attribution.

3.2 Participants, recruitment, sample size, and attrition

Participants were aged 18–25 years, resided in one of the three study cities, were enrolled in a university or actively engaged in community youth activities, had regular access to the digital communication platforms used in the program, and provided informed consent. Participants reporting severe medical or psychological conditions that could interfere with participation were excluded.

Participants were recruited through university and community youth networks using convenience-based recruitment. Because a complete sampling frame and the number of eligible individuals approached at each site were not systematically recorded, site-specific response rates cannot be calculated. This limits assessment of recruitment selectivity and external validity.

Table 1. Demographic characteristics of participants (N = 287)

Variable	Category	n	%
Age (years)	18–19	42	14.6
	20–22	156	54.4
	23–25	89	31.0
Gender	Male	113	39.4
	Female	174	60.6
City	Hanoi	100	34.8
	Da Nang	89	31.0
	Ho Chi Minh City	98	34.2
Education level	Undergraduate	254	88.5
	Postgraduate	33	11.5
Daily social media use	<3 hours	80	27.9
	≥3 hours	207	72.1

An a priori power analysis was conducted using G*Power [22], assuming a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and power = 0.80; the analysis indicated a minimum of 150 participants for regression-based testing. Methodological guidance for SEM also supports samples of approximately 200 or more for stable estimation in many behavioral models [23]. To accommodate attrition, 320 participants completed baseline assessment.

Of the 320 baseline participants, 287 completed the posttest and were included in paired and structural analyses, corresponding to a retention rate of 89.7% and attrition of 33 participants (10.3%; Table 1). The archived dataset available for the present revision does not permit a reliable baseline comparison between completers and dropouts across study constructs. Consequently, attrition bias cannot be ruled out and is explicitly considered in the limitations.

3.3 Social marketing program

The program was developed around core social marketing principles, including audience orientation, value exchange, behavioral focus, and the marketing mix (product, price, place, and promotion). The targeted behaviors included regular physical activity, routine health monitoring/check-ups, healthy dietary practices, and engagement in appropriate preventive screening.

Before implementation, formative focus group discussions (n = 24) were conducted with university students across the three cities to identify barriers, motivational drivers, preferred communication channels, and culturally relevant message themes. Time constraints, perceived invulnerability, and low perceived urgency were identified as prominent barriers, while peer influence and social-media engagement were important behavioral drivers. These insights were used to tailor message content and delivery channels. Although formative work considered differences in behavioral readiness and digital engagement, formal segment-specific outcome effects were not tested.

The eight-week program had three phases. Weeks 1–2 emphasized awareness and risk/benefit communication; weeks 3–6 emphasized engagement through peer discussion, social-media challenges, and short educational workshops; and weeks 7–8 emphasized reinforcement through behavioral commitment prompts, reminders, and self-monitoring tools.

Within the 4Ps framework, the product was the adoption of feasible preventive health behaviors; price referred to practical and psychological barriers such as time, inconvenience, and low motivation; place included university campuses and digital platforms such as Facebook, Instagram, and Zalo groups; and promotion combined informational content, peer testimonials, short educational videos, and weekly behavioral challenges. Messaging emphasized empowerment rather than fear.

Program delivery was monitored using routine weekly implementation notes to support consistency of scheduled activities and message dissemination. Quantitative engagement indicators such as likes, shares, and attendance were not retained in a form suitable for verified outcome reporting and are therefore not presented as study results.

3.4 Measures

Data were collected using a structured self-administered questionnaire. Unless otherwise specified, items used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). HBM-related measures included perceived susceptibility (4 items), perceived benefits (4 items), perceived barriers (4 items), and self-efficacy (5 items), adapted from

established HBM applications [14-16].

TPB-related measures were based on Ajzen's framework [17]. Attitude was assessed with four semantic differential items, subjective norms with three items, perceived behavioral control with three items, and behavioral intention with three items concerning the likelihood of performing preventive behaviors during the next four weeks. Attitude, subjective norms, and perceived behavioral control were retained in the broader measurement framework and descriptive pre-post assessment where available, but they were not specified as predictors in the primary structural model.

Preventive health behavior was operationalized as a self-reported composite frequency index covering physical activity, routine health monitoring, and healthy dietary practices during the previous four weeks. Responses used a five-point frequency scale from 1 (never) to 5 (always), consistent with self-report approaches in health-promotion research [24]. The outcome therefore represents self-reported preventive health behavior rather than directly observed or objectively verified behavior.

3.5 Reliability and validity

Internal consistency was evaluated using Cronbach's alpha, with values of 0.70 or higher considered acceptable [23]. Exploratory factor analysis (EFA) was followed by confirmatory factor analysis (CFA). EFA adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) measure, Bartlett's test of sphericity, and factor loadings. The retained measurement structure was consistent with the constructs reported in Table 2, with all reported factor loadings exceeding 0.60. Because the archived analytical output did not provide a verifiable total-variance-explained statistic, this value is not reported. CFA model fit was evaluated using χ^2/df, CFI, TLI, and RMSEA, together with composite reliability (CR) and average variance extracted (AVE).

Table 2. Reliability and convergent validity of measurement constructs (N = 287)

Construct	No. of Items	Cronbach's α	Factor Loadings Range	CR	AVE
Perceived susceptibility	4	0.81	0.64–0.79	0.83	0.55
Perceived benefits	4	0.88	0.71–0.86	0.89	0.67
Perceived barriers	4	0.78	0.60–0.74	0.80	0.52
Self-efficacy	5	0.91	0.72–0.88	0.92	0.68
Attitude	4	0.87	0.69–0.85	0.88	0.64
Subjective norms	3	0.82	0.66–0.80	0.84	0.59
Perceived behavioral control	3	0.79	0.63–0.77	0.81	0.54
Behavioral intention	3	0.85	0.70–0.83	0.86	0.62

Note: CR = composite reliability, AVE = average variance extracted.

3.6 Statistical analysis

Analyses were conducted using IBM SPSS Statistics version 26.0 and AMOS version 24.0. Descriptive statistics summarized participant characteristics. Paired-sample t-tests assessed pre-post differences, and Cohen's d quantified standardized change.

Structural equation modeling (SEM) was used to examine posttest associations among perceived benefits, perceived barriers, self-efficacy, behavioral intention, and self-reported preventive health behavior. Because all analyzed participants received the same program, intervention exposure did not vary between participants and was therefore not specified as a predictor in the structural model. The structural analysis consequently focused on associations among the theoretically selected cognitive determinants, behavioral intention, and self-reported preventive health behavior.

Indirect associations through behavioral intention were evaluated using 5,000 bootstrap resamples. Because the cognitive predictors, behavioral intention, and self-reported preventive health behavior were assessed at the same posttest wave, the indirect associations are interpreted as cross-sectional statistical mediation. They should not be interpreted as establishing temporal ordering or a causal mediation mechanism. Statistical significance was set at $p < 0.05$.

3.7 Ethical considerations

All procedures involving human participants were reviewed and approved by the Institute for Socio-Economic and Environmental Development, under the Asia-Pacific Economic Center (Vietnam) (Approval No. 10/QĐ-ISEED/APEC-2025). Written informed consent was obtained before participation. Participation was voluntary, confidentiality and anonymity were protected, and participants could withdraw without penalty.

4. RESULTS AND DISCUSSION

4.1 Results

4.1.1 Participant characteristics

The final paired sample comprised 287 participants. Mean age was 21.3 years (SD = 1.9). Female participants represented 60.6% of the sample and male participants 39.4%. Participants were distributed across Hanoi (34.8%), Da Nang (31.0%), and Ho Chi Minh City (34.2%). Most were undergraduate students (88.5%), and 72.1% reported daily social-media use of at least three hours.

4.1.2 Reliability and validity

All reported constructs demonstrated acceptable internal consistency, with Cronbach's alpha values ranging from 0.78 to 0.91. The data were suitable for factor analysis, as indicated by a KMO value of 0.89 and a significant Bartlett's test of sphericity ($\chi^2 = 3245.76$, $p < 0.001$). All reported factor loadings exceeded 0.60. CFA indicated acceptable measurement-model fit (χ^2/df = 2.31, CFI = 0.94, TLI = 0.93, RMSEA = 0.067). CR ranged from 0.80 to 0.92, while AVE ranged from 0.52 to 0.68, providing support for construct reliability and convergent validity. The total variance explained by the EFA solution is not reported because a verifiable value was not available in the archived analytical

output.

4.1.3 Pre-post changes

Paired-sample analyses showed statistically significant changes across the variables reported in Table 3. Perceived benefits, self-efficacy, attitude, behavioral intention, and perceived susceptibility increased, whereas perceived barriers decreased. Self-reported preventive health behavior increased from M = 3.12 (SD = 0.64) to M = 3.74 (SD = 0.58), $t(286) = 12.45$, $p < 0.001$, $d = 0.76$. The largest standardized change was observed for behavioral intention ($d = 0.82$), followed by self-efficacy ($d = 0.79$) and self-reported preventive health behavior ($d = 0.76$). These statistics demonstrate meaningful pre-post change but, in the absence of a control group, should not be interpreted as changes caused exclusively by the program.

4.1.4 Posttest structural model and indirect associations

The posttest structural analysis showed acceptable overall fit based on the available SEM output ($\chi^2/df = 2.47$, CFI = 0.93, TLI = 0.92, and RMSEA = 0.071). As presented in Table 4, perceived benefits ($\beta = 0.31$, $p < 0.001$) and self-efficacy ($\beta = 0.42$, $p < 0.001$) were positively associated with behavioral intention, whereas perceived barriers were negatively associated with behavioral intention ($\beta = -0.18$, $p < 0.01$). Behavioral intention was positively associated with self-reported preventive health behavior ($\beta = 0.54$, $p < 0.001$).

Table 3. Pre-post comparison of study variables (N = 287)

Variable	Pretest Mean (SD)	Posttest Mean (SD)	*t*-Value	*p*-Value	Cohen's d
Perceived susceptibility	3.18 (0.71)	3.56 (0.68)	7.92	<0.001	0.53
Perceived benefits	3.45 (0.66)	3.98 (0.60)	9.85	<0.001	0.68
Perceived barriers	3.12 (0.72)	2.84 (0.69)	-6.44	<0.01	0.39
Self-efficacy	3.30 (0.63)	3.92 (0.57)	11.07	<0.001	0.79
Attitude	3.52 (0.70)	4.01 (0.61)	8.96	<0.001	0.64
Behavioral intention	3.34 (0.68)	4.05 (0.59)	12.68	<0.001	0.82
Preventive health behavior	3.12 (0.64)	3.74 (0.58)	12.45	<0.001	0.76

Table 4. Structural associations among selected posttest constructs (N = 287)

Hypothesized Path	Standardized β	SE	CR	*p*-Value	Result
Perceived Benefits → Behavioral Intention	0.31	0.06	5.17	<0.001	Supported
Self-efficacy → Behavioral Intention	0.42	0.07	6.02	<0.001	Supported
Perceived Barriers → Behavioral Intention	-0.18	0.05	-3.44	<0.01	Supported
Behavioral Intention → Preventive Health Behavior	0.54	0.08	7.11	<0.001	Supported

Bootstrap analysis using 5,000 resamples indicated statistically significant indirect associations through behavioral intention in the available analysis. Given that the cognitive predictors, behavioral intention, and self-reported preventive health behavior were measured at the same posttest wave, these findings are interpreted as cross-sectional indirect associations rather than evidence of temporal or causal mediation.

4.2 Discussion

4.2.1 Interpretation of pre-post changes

The study found favorable pre-post changes in several cognitive determinants and in self-reported preventive health behavior. The magnitude of change was moderate to large for behavioral intention, self-efficacy, and preventive health behavior. These patterns are consistent with contemporary reviews suggesting that social marketing and digital/social-media health promotion can support behavior-related outcomes when programs use behavioral objectives, audience orientation, interactive communication, and supportive strategies [4-9]. However, the single-group design requires cautious interpretation because history, repeated testing, maturation, and other contemporaneous influences cannot be separated from changes potentially associated with the program. Accordingly, the observed pattern should be interpreted as preliminary evidence of favorable pre-post change rather than as an estimate of causal intervention effectiveness.

The findings also fit the practical logic of social marketing. The program attempted to increase perceived value, reduce practical and psychological costs, use channels familiar to participants, and reinforce behavior through peer and digital communication. Recent evidence indicates that digital health promotion can be useful for young populations, but effectiveness is heterogeneous and sustained behavior change is difficult to demonstrate without rigorous follow-up [5-9]. The present results should therefore be viewed as preliminary program-evaluation evidence rather than definitive proof of causal effectiveness.

4.2.2 HBM-TPB associations

Among the cognitive predictors included in the posttest structural analysis, self-efficacy showed the largest standardized association with behavioral intention ($\beta = 0.42$), followed by perceived benefits ($\beta = 0.31$), whereas perceived barriers showed a negative association ($\beta = -0.18$). Behavioral intention was positively associated with self-reported preventive health behavior ($\beta = 0.54$). This pattern is consistent with the theoretical importance of self-efficacy and perceived barriers within the HBM [14-16] and with the role of behavioral intention as a proximal correlate of behavior within the TPB [17, 18].

The findings also have contextual support from recent integrated HBM-TPB research. In Vietnam, An et al. [19] reported that self-efficacy and perceived barriers were important within a combined framework for vaccination intention. Ong et al. [20] demonstrated the applicability of integrated HBM and extended TPB constructs among young adults in the Philippines. Fang et al. [21] further showed complementary contributions of HBM and TPB constructs to proactive health behavior intention in China. These studies do

not validate the causal ordering of the present model, but they support the conceptual relevance of integrating health beliefs with intentional processes in Asian settings.

This study also clarifies why subjective norms and perceived behavioral control appear in the measurement framework but not in the primary SEM. They were measured as broader TPB-related constructs, whereas the structural analysis reported here was focused on selected paths involving perceived benefits, barriers, self-efficacy, intention, and self-reported behavior. Future studies should prospectively specify and test a fuller integrated model, including attitude, subjective norms, and perceived behavioral control, using an adequately powered independent sample.

4.2.3 Public health and sustainability implications

The findings suggest several directions for youth preventive-health programming. First, interventions may benefit from emphasizing achievable benefits and confidence-building rather than relying primarily on information or fear appeals. Second, peer-led and digitally delivered components may be useful for reaching highly connected young adults, but reach and engagement metrics should be prospectively defined and reported rather than treated as proxies for behavior change [6, 8]. Third, communication strategies should be accompanied by practical opportunities for preventive action, such as accessible screening, health monitoring, and physical-activity options.

From a sustainability perspective, preventive health among young adults contributes to well-being, human capital, and social participation and is therefore relevant to SDG 3 and sustainable urban development [1]. Universities, local health authorities, and youth organizations may provide useful settings for coordinated preventive-health initiatives. Nevertheless, scale-up decisions should be informed by controlled evaluations, longer follow-up, implementation-cost data, and evidence on whether benefits extend beyond digitally active urban participants.

4.2.4 Strengths, limitations, and future research

Several limitations should be considered when interpreting the findings. First, the single-group pretest-posttest design did not include a concurrent control group; therefore, history, repeated testing, maturation, regression, and other time-related influences cannot be excluded as alternative explanations for the observed changes. Second, convenience-based recruitment and the absence of complete site-specific recruitment denominators limit assessment of selection processes and external validity. Third, 33 participants (10.3%) were lost between baseline and posttest, and a verified baseline comparison between completers and dropouts was not available; consequently, attrition bias cannot be ruled out. Fourth, preventive health behavior was self-reported and may therefore be subject to recall and social-desirability bias. Fifth, the structural analysis used variables measured at the same posttest wave; accordingly, the indirect associations do not establish temporal or causal mediation. Finally, complete quantitative implementation and engagement indicators, detailed EFA variance-explained information, and segment-specific outcome analyses were not available. These limitations indicate that the findings should be interpreted as preliminary evidence of change and theory-consistent association rather than definitive evidence of intervention effectiveness.

5. CONCLUSIONS

This study provides evidence of favorable changes in preventive health-related cognitions, behavioral intention, and self-reported preventive health behavior among Generation Z participants following an eight-week community-based social marketing program in three major Vietnamese cities. Beyond the observed pre-post changes, the posttest structural associations showed a theoretically coherent pattern: perceived benefits and self-efficacy were positively associated with behavioral intention, perceived barriers were negatively associated with intention, and behavioral intention was positively associated with self-reported preventive health behavior. These findings suggest that preventive health behavior among young adults may be better understood not simply as a response to health information, but as a process in which perceived value, perceived capability, perceived barriers, and intention operate in an interconnected manner. In this respect, the study supports the complementary use of selected constructs from the HBM and the TPB for explaining preventive health-related decision processes among young adults.

The findings also have implications for the design of social marketing initiatives. For Generation Z, increasing exposure to preventive health information alone may be insufficient to support meaningful behavioral change. Programs may be more relevant when they translate health information into personally meaningful benefits, strengthen confidence in the ability to perform recommended behaviors, reduce practical and psychological barriers, and create supportive social and digital environments in which behavioral intentions can be formed and reinforced. The combination of community-based activities, peer interaction, and digital communication used in this study therefore represents a potentially useful direction for youth-centered preventive health promotion. More broadly, strengthening preventive health practices among young adults may contribute to NCD prevention, population well-being, human capital, and social participation, thereby connecting youth health promotion with the objectives of SDG 3 and the broader agenda of socially sustainable development.

At the same time, the contribution of the study must be interpreted within the limits of its design. The absence of a concurrent control group means that the observed pre-post changes cannot be attributed exclusively to the social marketing program, as history, repeated testing, maturation, and other time-related influences cannot be ruled out. Moreover, the structural model was estimated using posttest measures, with the proposed mediator and behavioral outcome assessed at the same measurement wave. The indirect relationships should therefore be interpreted as cross-sectional statistical mediation rather than evidence of a temporal causal mechanism. The use of self-reported behavioral measures, convenience-based recruitment, participant attrition, and the absence of complete implementation and engagement data further constrain causal inference and generalizability.

Accordingly, the principal contribution of this study lies not in establishing definitive intervention effectiveness, but in identifying a consistent pattern of behavioral and cognitive change and in clarifying theoretically relevant pathways that warrant more rigorous testing. Future research should employ randomized or controlled comparison designs, assess cognitive determinants, intention, and behavior at temporally separated measurement points, incorporate longer-term follow-up and objective or independently verified behavioral

indicators where feasible, and systematically document recruitment, attrition, implementation fidelity, and digital engagement. Future studies should also examine whether responses differ according to behavioral readiness, digital engagement, or other participant characteristics. Such evidence would enable stronger conclusions about effectiveness, mechanisms, sustainability, and scalability and would help determine how theory-informed social marketing can be most effectively adapted to promote preventive health among Generation Z in Vietnam and comparable middle-income settings.

REFERENCES

[1] WHO. (2023). World health statistics 2023: Monitoring health for the SDGs. https://www.who.int/publications/i/item/9789240074323.

[2] WHO. (2022). Noncommunicable diseases progress monitor 2022. https://www.who.int/publications/i/item/9789240047761.

[3] WHO. (2022). Global status report on physical activity 2022. https://www.who.int/publications/i/item/9789240059153.

[4] Roger, A., Dourgoudian, M., Mergey, V., Laplanche, D., Ecarnot, F., Sanchez, S. (2023). Effectiveness of prevention interventions using social marketing methods on behavioural change in the general population: A systematic review of the literature. International Journal of Environmental Research and Public Health, 20(5): 4576. https://doi.org/10.3390/ijerph20054576

[5] Goodyear, V.A., Wood, G., Skinner, B., Thompson, J.L. (2021). The effect of social media interventions on physical activity and dietary behaviours in young people and adults: A systematic review. International Journal of Behavioral Nutrition and Physical Activity, 18(1): 72. https://doi.org/10.1186/s12966-021-01138-3

[6] Ghahramani, A., De Courten, M., Prokofieva, M. (2022). The potential of social media in health promotion beyond creating awareness: An integrative review. BMC Public Health, 22(1): 2402. https://doi.org/10.1186/s12889-022-14885-0

[7] Günther, L., Schleberger, S., Pischke, C.R. (2021). Effectiveness of social media-based interventions for the promotion of physical activity: Scoping review. International Journal of Environmental Research and Public Health, 18(24): 13018. https://doi.org/10.3390/ijerph182413018

[8] Faus, M., Alonso, F., Javadinejad, A., Useche, S.A. (2022). Are social networks effective in promoting healthy behaviors? A systematic review of evaluations of public health campaigns broadcast on Twitter. Frontiers in Public Health, 10: 1045645. https://doi.org/10.3389/fpubh.2022.1045645

[9] Colder Carras, M., Aljuboori, D., Shi, J., et al. (2024). Prevention and health promotion interventions for young people in the context of digital well-being: Rapid systematic review. Journal of Medical Internet Research, 26: e59968. https://doi.org/10.2196/59968

[10] Purba, A.K., Thomson, R.M., Henery, P.M., Pearce, A., Henderson, M., Katikireddi, S.V. (2023). Social media use and health risk behaviours in young people: Systematic review and meta-analysis. BMJ, 383: e073552. https://doi.org/10.1136/bmj-2022-073552

[11] Kotler, P., Zaltman, G. (1971). Social marketing: An approach to planned social change. Journal of Marketing, 35(3): 3-12. https://doi.org/10.2307/1249783

[12] Andreasen, A.R. (2002). Marketing social marketing in the social change marketplace. Journal of Public Policy & Marketing, 21(1): 3-13. https://doi.org/10.1509/jppm.21.1.3.17602

[13] Stead, M., Gordon, R., Angus, K., McDermott, L. (2007). A systematic review of social marketing effectiveness. Health Education, 107(2): 126-191. https://doi.org/10.1108/09654280710731548

[14] Rosenstock, I.M. (1974). Historical origins of the health belief model. Health Education Monographs, 2(4): 328-335. https://doi.org/10.1177/109019817400200403

[15] Becker, M.H. (Ed.). (1974). The health belief model and personal health behavior. Health Education Monographs, 2(4): 324-508. https://doi.org/10.1177/109019817400200401

[16] Champion, V.L., Skinner, C.S. (2008). The health belief model. In Health Behavior and Health Education: Theory, Research, and Practice, Jossey-Bass, pp. 45-65.

[17] Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2): 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

[18] Armitage, C.J., Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. British Journal of Social Psychology, 40(4): 471-499. https://doi.org/10.1348/014466601164939

[19] An, P.L., Nguyen, H.T.N., Dang, H.T.B., Huynh, Q.N.H., Pham, B.D.U., Huynh, G. (2021). Integrating health behavior theories to predict intention to get a COVID-19 vaccine. Health Services Insights, 14: 11786329211060130. https://doi.org/10.1177/11786329211060130

[20] Ong, A.K.S., Prasetyo, Y.T., Lagura, F.C., et al. (2023). Determination of factors influencing young adults' intention to have COVID-19 vaccine in the Philippines: An integration of health belief model and the theory of planned behavior. Public Health in Practice, 5: 100359. https://doi.org/10.1016/j.puhip.2023.100359

[21] Fang, L., Zhang, Q., Zhou, N., Chen, J., Lou, H. (2025). Influencing factors and mechanisms promoting proactive health behavior intention: An integration of the health belief model and the theory of planned behavior. Frontiers in Public Health, 13: 1629046. https://doi.org/10.3389/fpubh.2025.1629046

[22] Faul, F., Erdfelder, E., Lang, A.G., Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2): 175-191. https://doi.org/10.3758/BF03193146

[23] Hair Jr, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2010). Multivariate data analysis. In Multivariate Data Analysis, Pearson Education, pp. 785-785.

[24] Glanz, K., Rimer, B.K., Viswanath, K. (Eds.). (2008). Health Behavior and Health Education: Theory, Research, and Practice (4th ed.). Jossey-Bass.