



## **Data-Driven Social Marketing for Health Education: Predicting Low-Sugar Consumption Intentions with HBM and TPB among Indonesian University Students**

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### **Abstract**

This study investigates determinants of university students' intentions to shift from high-sugar to low-sugar products in Indonesia using an integrated Health Belief Model (HBM) and Theory of Planned Behavior (TPB) framework. Excessive sugar intake is a global health concern linked to obesity, type 2 diabetes, and other non-communicable diseases, and Indonesia is projected to face a sharp increase in diabetes prevalence by 2045. A cross-sectional explanatory survey of 150 Hasyim Asy'ari University students was conducted using stratified random sampling and a structured Likert-scale questionnaire measuring perceived benefits, perceived barriers, attitude, perceived behavioral control, subjective norm, and intention. Data were analyzed with PLS-SEM. All constructs met reliability and validity criteria, and the model explained 54.9% of the variance in attitude and 65.5% in intention. Attitude was the strongest predictor of low-sugar consumption intention, reinforced by perceived benefits and weakened by perceived barriers, while perceived behavioral control also significantly increased intention; subjective norm was not significant. The findings validate the applicability of the integrated HBM-TPB model for healthy consumption behavior in a developing-country context and offer evidence-based directions for social marketing and campus health interventions targeting low-sugar choices among Generation Z students.

**Keywords:** Health Belief Model; Health Education; Low-Sugar Consumption; Social Marketing; Theory of Planned Behavior.

### **Introduction**

Excessive sugar intake has emerged as a pressing global issue because of its close connection with rising rates of obesity, type 2 diabetes, and cardiovascular diseases. According to the World Health Organization, the average worldwide sugar consumption exceeds the recommended limit of 25 grams per day (WHO, 2023). Furthermore, global dietary trends reveal that high-sugar consumption patterns continue to escalate (OECD & FAO, 2023). The Global Burden of Disease study identifies excessive sugar intake as one of the top contributors to non-communicable disease risks globally (Brauer & Collaborators, 2024). Swinburn et al. also link this consumption behavior to the worsening obesity epidemic, which now poses a major challenge for public health systems worldwide (Swinburn et al., 2019). These circumstances highlight that excessive sugar intake has evolved beyond a

nutritional concern to become a significant global health crisis that demands multidimensional preventive measures.

In Asia, empirical evidence points to the prevalence of media and television advertisements promoting products rich in sugar, salt, and fat to young audiences (Karupaiah et al., 2024). Such advertising techniques often rely on emotional triggers, celebrity endorsements, and price incentives to attract children and adolescents. Consequently, early exposure helps shape a strong preference for sugary products. This aligns with global findings showing a substantial link between media advertising and poor dietary habits (Boyland et al., 2025). These trends reinforce the need for social marketing strategies to provide counterbalancing health-related messages.

Technological advancements have dramatically reshaped food marketing, placing digital media at the center of product promotion activities, including high-sugar foods and beverages (Chua et al., 2025). Online advertising now uses algorithm-based personalization, intensifying exposure among younger audiences and making it harder to avoid such promotions. Research confirms that digital marketing can shape preferences, intentions, and consumption behaviors toward unhealthy foods (Witting, 2024). These dynamics exacerbate public health issues in the digital era. Therefore, social marketing needs to leverage the same digital platforms to ensure health-oriented messages remain visible and competitive (Ali et al., 2025, 2024; Lee & Kotler, 2020; Brennan et al., 2015).

A similar trend is observable in Indonesia. Data from the 2018 National Basic Health Research (RISKESDAS) reported that 10.9% of individuals aged 15 and above were living with type 2 diabetes, a prevalence projected to rise to 16.09% by 2045, representing roughly 40.7 million cases (The Doctors, For The Doctors, 2024). National surveys also record an increase from 8.71% in 2020 to 9.49% in 2024 (The Doctors, For The Doctors, 2024). In East Java, household and industrial sugar consumption remains high and even contributes to inflationary pressures (BPS Jatim, 2023). Regional health reports further show a continuous rise in chronic diseases, including diabetes, particularly among the productive-age population (BPS Jatim, 2024; Dinkes Jatim, 2023).

This problem becomes increasingly relevant when viewed from the perspective of university students, a demographic particularly susceptible to unhealthy consumption patterns. A study in Surabaya showed that students frequently purchase sugar-sweetened beverages (SSBs), such as bubble tea, tea, and coffee, via online delivery applications, increasing their risk of obesity (Elkarima et al., 2023). Similarly, a Bandung-based study found that 74% of students preferred sugary foods, 44% consumed them more than five times weekly, and over a quarter seldom engaged in physical exercise (Mulyana et al., 2023). Such findings indicate that the lifestyle choices of Generation Z students in Indonesia may heighten their vulnerability to diabetes and other chronic health problems.

Two theoretical approaches are commonly employed to understand healthy consumption behaviors, the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB). The HBM explains how individuals' perceptions of benefits, barriers, susceptibility, and severity affect their

health behaviors (Rosenstock, 1974). In contrast, the TPB emphasizes the influence of attitudes, subjective norms, and perceived behavioral control in shaping behavioral intentions (Ajzen, 1991). Combining these frameworks allows for a comprehensive understanding of cognitive, psychological, and social factors that drive the intention to reduce sugar intake. Hence, applying the integrated HBM–TPB model can provide nuanced insights for developing social marketing interventions tailored to the Indonesian context.

Although numerous studies have investigated the influence of food marketing on consumption, most have focused on children or populations in developed nations (Boyland et al., 2025; Ali et al., 2023; Nieto et al., 2022). In Asia, research largely examines the effects of television advertising rather than digital engagement or student behavior (Chua et al., 2025; Karupaiah et al., 2024). To date, no study has specifically analyzed low-sugar consumption intentions in Indonesia through an integrated HBM and TPB perspective. Moreover, few studies have considered social marketing as an educational tool among university students (Baldemor et al., 2024; Ateş et al., 2021). This indicates a significant gap that warrants further empirical investigation.

Accordingly, this research seeks to identify the determinants influencing students at Hasyim Asy'ari University in their intention to switch from high-sugar to low-sugar products. The proposed conceptual framework merges the Health Belief Model (HBM) and Theory of Planned Behavior (TPB), integrating social marketing as a health education approach (Lee & Kotler, 2020; Brennan et al., 2015). Using predictive analytics via PLS-SEM, the study aims to model and forecast behavioral intentions. Theoretically, it contributes to the validation of the integrated HBM and TPB framework within the context of healthy consumption in a developing country. Practically, the outcomes are intended to support universities, local governments, and health institutions in formulating evidence-based educational programs. Through this approach, the research contributes to global initiatives aimed at reducing the burden of non-communicable diseases through behavior change.

### **Research Methodology,**

This research employs a quantitative method with an explanatory survey design in a cross-sectional setting to examine students' intentions to transition from consuming high-sugar products to low-sugar alternatives, using an integrated framework of the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB). The study population consisted of 3,520 active students at Hasyim Asy'ari University, from which 150 participants were chosen through stratified random sampling to ensure proportional representation across faculties and genders. Data collection utilized a structured questionnaire with a five-point Likert scale, measuring six constructs: perceived benefits, perceived barriers, attitude, perceived behavioral control, subjective norm, and behavioral intention. Ethical procedures were maintained by applying informed consent, ensuring anonymity, and protecting the confidentiality of respondents.

Perceived benefits refer to students' understanding of the positive outcomes obtained from consuming low-sugar products, such as enhanced energy, prevention of diabetes, and stable metabolism. Prior literature indicates that perceived health advantages, product taste, and environmental considerations influence positive attitudes toward healthy behaviors, organic food choices, and eco-friendly innovations (Fang et al., 2025; Singh et al., 2025; Kaur et al., 2024). On the other hand, perceived barriers involve deterrents such as higher prices, preference for sweet tastes, and limited product availability on campus, which may reduce favorable attitudes toward healthy consumption practices (Fang et al., 2025; Singh et al., 2025; Mohammad et al., 2024). Based on these arguments, the study proposes that perceived benefits have a positive relationship with attitude (H1), while perceived barriers have a negative relationship with attitude (H2).

Attitude is defined as students' evaluative judgment of low-sugar consumption and is recognized within the TPB as the most influential predictor of behavioral intention (Ajzen, 1991). Empirical evidence from studies on health-promoting behaviors, organic product purchases, and healthy lifestyle adoption emphasizes the significant role of attitude in shaping intention (Fang et al., 2025; Md Nor et al., 2025; Singh et al., 2025). Perceived behavioral control (PBC), meanwhile, captures students' perceived ability to regulate their habits, for example, by reading nutritional information or avoiding sugary drinks. Previous research demonstrates that PBC strongly contributes to the enactment of healthy behaviors and vaccine uptake (Fang et al., 2025; Md Nor et al., 2025; Ong et al., 2023). Consequently, this study hypothesizes that attitude positively influences behavioral intention (H3) and PBC positively influences behavioral intention (H4).

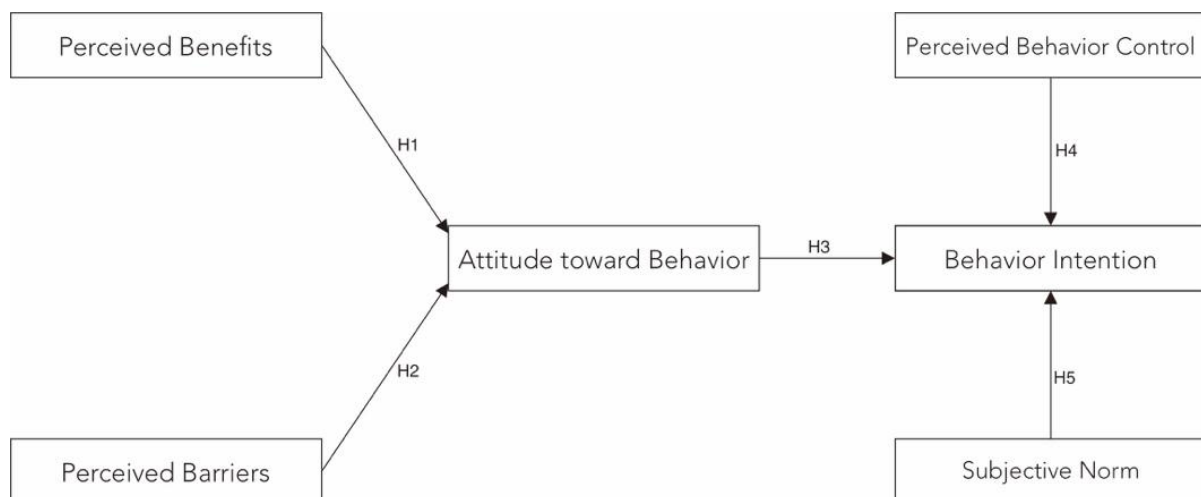
The subjective norm construct represents students' perceptions of social influence from peers, family members, or figures within the university environment in guiding their consumption patterns. Several previous studies report a positive relationship between subjective norm and behavioral intention, although its impact tends to be weaker compared with attitude and PBC (Fang et al., 2025; Md Nor et al., 2025; Kaur et al., 2024). In the context of university students, collective values, peer behaviors, and café culture on campus are relevant aspects when assessing subjective norms. Accordingly, the study posits that subjective norm has a positive effect on behavioral intention (H5). Altogether, hypotheses H1 through H5 constitute the conceptual foundation for testing the structural relationships within this model.

Instrument validation involved expert-based content assessment and a pilot test with 30 respondents. Reliability was confirmed with Cronbach's alpha values equal to or greater than 0.70. Data were analyzed using Partial Least Squares Structural Equation Modeling (SmartPLS 4). The measurement model was assessed through convergent validity (loading  $\geq 0.70$ ; AVE  $\geq 0.50$ ), construct reliability (CR  $\geq 0.70$ ), and discriminant validity using HTMT ratios below 0.85. The structural model was subsequently evaluated by testing multicollinearity (VIF  $< 5$ ), estimating path coefficient significance through bootstrapping with 5,000 resamples ( $t \geq 1.96$ ;  $p < 0.05$ ), and

measuring predictive relevance using  $R^2$ ,  $f^2$ , and  $Q^2$  indicators (Hair et al., 2019). This analytical procedure ensures methodological robustness and theoretical consistency in explaining students' behavioral intentions toward low-sugar product consumption.

**Table 1.** Research Literature Summary

Author(s), Year	Context / Sample	Key Findings	Gap / Relevance
(Fang et al., 2025)	China, 462 respondents, HBM–TPB integration	Perceived benefits (+) attitude; perceived barriers (–) attitude; attitude, PBC, and SN (+) intention	Benefits and barriers remain general, not yet specific to low-sugar consumption
(Singh et al., 2025)	India, 550 young respondents, organic food	Perceived benefits (+) attitude; perceived barriers (–) attitude; attitude (+) intention	Focused on organic food, not low-sugar consumption
(Kaur et al., 2024)	India, 323 farmers, biopesticides	Perceived benefits (+) attitude; SN (+) intention	Agricultural context, not personal consumption
(Mohammad et al., 2024)	Hungary, 313 consumers, dairy functional foods	Perceived barriers (–) attitude	Limited to dairy products; not yet tested in Southeast Asia
(Md Nor et al., 2025)	Malaysia, 404 married couples	Attitude (+) intention; PBC (+) intention; SN (+) intention	General healthy lifestyle, not sugar consumption
(Ong et al., 2023)	Philippines, 865 adolescents and young adults, COVID-19 vaccination	PBC (+) intention	Vaccination context; relevance: self-control is important for low-sugar consumption



**Figure 1.** Conceptual Framework

**Findings and Discussion,**

**Findings**

The assessment of the measurement model indicates that all constructs satisfied the established standards for reliability and convergent validity. The Composite Reliability values were

above 0.87, and Average Variance Extracted (AVE) values for every construct exceeded 0.50, confirming both internal consistency and sufficient explanatory variance. Most measurement indicators recorded outer loadings above 0.70, with one indicator showing a loading value of 0.709, which was retained due to its theoretical significance and because the construct's AVE remained above the minimum acceptable level. These results are consistent with Hair et al.'s guidelines, which suggest that indicator loadings between 0.60 and 0.70 may still be considered valid if the construct demonstrates adequate reliability (Hair et al., 2019). Therefore, the measurement model in this study is deemed valid and reliable.

**Table 2.** Measurement Model

Construct	Cronbach's Alpha	Composite Reliability	AVE	Outer Loadings (range)
Attitude	0.873	0.913	0.724	0.795 – 0.880
Intention	0.909	0.933	0.735	0.785 – 0.917
Perceived Benefit	0.914	0.936	0.745	0.790 – 0.891
Perceived Barriers	0.891	0.924	0.754	0.830 – 0.915
Perceived Behavioral Control	0.801	0.878	0.708	0.709 – 0.929
Subjective Norm	0.825	0.883	0.655	0.743 – 0.850

The evaluation of the structural model further demonstrated that Attitude had a significant positive impact on Intention ( $\beta = 0.478$ ;  $p = 0.003$ ), reaffirming its role as the dominant predictor of students' intentions to consume low-sugar products. Perceived Benefits were also found to positively influence Attitude ( $\beta = 0.393$ ;  $p = 0.014$ ), while Perceived Barriers exhibited a negative association with Attitude ( $\beta = -0.373$ ;  $p = 0.018$ ). Additionally, Perceived Behavioral Control showed a significant positive effect on Intention ( $\beta = 0.359$ ;  $p = 0.048$ ), whereas Subjective Norm produced no statistically significant influence ( $\beta = 0.062$ ;  $p = 0.723$ ). Collectively, the model accounted for 54.9% of the variance in Attitude and 65.5% of the variance in Intention, reflecting a strong level of explanatory capability.

**Table 3.** Structural Model

Hypothesis / Path	$\beta$	t-value	p-value	Result
Attitude → Intention	0.478	2.998	0.003	Supported
Perceived Benefit → Attitude	0.393	2.457	0.014	Supported
Perceived Barriers → Attitude	-0.373	2.384	0.018	Supported
Perceived Behavioral Control → Intention	0.359	1.986	0.048	Supported
Subjective Norm → Intention	0.062	0.355	0.723	Not supported

**Table 4.** Coefficient of Determination

Endogenous Construct	R <sup>2</sup>	R <sup>2</sup> Adjusted
Attitude	0.549	0.530
Intention	0.655	0.633

## Discussion

The finding that Attitude emerged as the strongest determinant of low-sugar consumption intention is consistent with the central premise of the Theory of Planned Behavior (Ajzen, 1991). This

outcome also aligns with evidence from various cross-contextual studies (Fang et al., 2025; Singh et al., 2025), which repeatedly highlight attitude as the dominant factor shaping behavioral intention. Within the Indonesian student setting, positive attitudes toward low-sugar products may be further developed through educational initiatives emphasizing their health-related advantages, such as maintaining body weight and reducing diabetes risk. Accordingly, social marketing strategies should incorporate both affective and utilitarian appeals to strengthen individuals' attitudes toward choosing low-sugar options.

Perceived Benefits were shown to enhance favorable attitudes, echoing earlier studies that revealed the influence of health outcomes and product quality on consumer acceptance (Singh et al., 2025). In contrast, Perceived Barriers had a weakening effect on attitudes, reflecting constraints such as higher costs, an inherent preference for sweet flavors, and the limited presence of low-sugar products within campus facilities. These findings underline the necessity for interventions that not only promote awareness of benefits but also alleviate perceived obstacles, for example, by ensuring more affordable prices and improving accessibility to healthier beverage alternatives.

The significant relationship between Perceived Behavioral Control and intention underscores the importance of self-confidence in managing consumption behavior. Concrete indicators include the ability to examine nutritional labels and the willingness to decline sugary drinks in social interactions. On the other hand, Subjective Norms did not yield a significant effect, possibly due to the strong cultural inclination toward sugary beverages among students. This result suggests that behavioral change efforts are likely to achieve greater impact when focused on developing self-efficacy and reinforcing individual attitudes rather than depending solely on social influences.

### **Conclusion and Suggestion**

The results of this study indicate that the intention of Hasyim Asy'ari University students to transition from high-sugar to low-sugar products is largely shaped by attitude, which emerged as the strongest predictor. Perceived benefits were found to enhance positive attitudes, while perceived barriers reduced them. Perceived Behavioral Control also exerted a significant positive influence on intention, whereas the effect of Subjective Norm was not statistically significant. The integrated HBM and TPB framework successfully explained 54.9% of the variance in attitude and 65.5% of the variance in intention, reaffirming the applicability of both theories for understanding healthy consumption behaviors among university students.

From a theoretical perspective, this study contributes to the validation of HBM-TPB integration in examining healthy consumption behaviors within developing country contexts, particularly in relation to low-sugar product choices. On a practical level, the findings provide valuable insights for universities, local authorities, and health organizations in formulating more targeted, data-based intervention programs. Social marketing initiatives should prioritize the

enhancement of positive attitudes through education on the health advantages of low-sugar consumption, while also addressing barriers such as cost, product accessibility, and taste preferences. Moreover, the findings emphasize the need to strengthen students' self-efficacy by providing practical skills, such as understanding nutritional labels and adapting healthier social habits.

Despite these contributions, the study acknowledges certain limitations. The relatively small number of respondents and the focus on a single university constrain the generalization of the results. In addition, the cross-sectional approach limits the ability to capture long-term causal dynamics. For future research, it is recommended to involve larger and more diverse samples across several universities, apply longitudinal methods, and incorporate additional factors such as digital advertisement exposure and health-related motivation. These extensions would improve the predictive capacity of behavioral models and enhance their usefulness for designing comprehensive public health interventions.

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