

Application of the Health Belief Model to Non-Alcohol Drinking Behavior Among Adolescents in Surakarta, Central Java, Indonesia

Muhammad Azim Zaqfaryawan¹⁾, Ika Sumiyarsih Sukamto²⁾,
Setyo Sri Rahardjo³⁾, Argyo Demartoto⁴⁾, Yulia Lanti Retno Dewi⁵⁾

¹⁾Master's Program in Public Health, Universitas Sebelas Maret, Indonesia

²⁾Study Program of Midwifery, Faculty of Medicine, Universitas Sebelas Maret

³⁾Department of Pharmacology, Faculty of Medicine, Universitas Sebelas Maret

⁴⁾Department of Sociology, Faculty of Social and Political Sciences, Universitas Sebelas Maret

⁵⁾Department of Nutrition, Faculty of Medicine, Universitas Sebelas Maret

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ABSTRACT

Background: Alcohol consumption among adolescents is an important public health concern due to its adverse physical, psychological, and social consequences. The Health Belief Model (HBM) provides a theoretical framework for understanding health-related behaviors based on individual perceptions and beliefs. This study aimed to analyze the relationships among HBM constructs and non-alcohol consumption behavior among adolescents.

Subjects and Method: A case control study was conducted in Surakarta, Central Java, Indonesia, from May to June 2025. A total of 200 adolescents aged 15–19 years were recruited, consisting of 100 adolescents who had consumed alcohol and 100 who had never consumed alcohol. Participants were selected using fixed disease sampling. Data were collected using a structured questionnaire measuring perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy, and alcohol consumption behavior. Data were analyzed using path analysis.

Results: Non-alcohol drinker behavior was negatively associated with high perceived susceptibility ($\beta = -0.02$; 95% CI = -0.05 to -0.01 ; $p = 0.044$). It was positively associated with strong self-efficacy ($\beta = 0.98$; 95% CI = 0.94 to 1.02 ; $p < 0.001$). Non-alcohol drinker behavior was positively associated with strong cues to action, but it was statistically non-significant ($\beta = 0.03$; 95% CI = -0.01 to 0.07 ; $p = 0.190$). Self-efficacy decreased with high perceived severity ($\beta = -0.08$; 95% CI = -0.13 to -0.03 ; $p = 0.002$) but increased with high perceived barrier ($\beta = 0.5$; 95% CI = 0.93 to 0.96 ; $p < 0.001$). Non-alcohol drinker behavior was indirectly associated with self-efficacy through cues to action ($\beta = 0.98$; 95% CI = 0.83 to 1.13 ; $p < 0.001$).

Conclusion: Strong self-efficacy was an important factor associated with non-alcohol drinker behavior among adolescents. Strengthening adolescents' confidence to refuse alcohol and increasing awareness of alcohol-related risks may support alcohol prevention efforts.

Keywords: Adolescent, alcohol consumption, health belief model, self-efficacy, path analysis.

Correspondence:

Ika Sumiyarsih Sukamto. Study Program of Midwifery, Faculty of Medicine, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta, Central Java 57126, Indonesia. Email: ikasumiyarsi@staff-uns.ac.id.

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BACKGROUND

Adolescence is a transitional stage from childhood to adulthood characterized by significant physical, psychological, and social changes that increase vulnerability to emotional and behavioral problems (Hurlock 2010; Yudrik 2011). During this period, adolescents often seek identity and independence while experiencing difficulties in emotional regulation, making them more susceptible to engaging in risky behaviors, including alcohol consumption (Stanhope and Lancaster 2016).

Alcohol consumption refers to the intake of beverages containing ethanol, a psychoactive substance that impairs consciousness and, when consumed excessively, can cause serious health consequences, including liver disease, gastrointestinal bleeding, cardiovascular disorders, hormonal imbalance, immune dysfunction, and neurological impairment (Peggy 2015; Mangapi et al., 2024). Despite these adverse effects, alcohol consumption among adolescents continues to increase globally.

According to the World Health Organization (WHO), approximately 64 million people consumed alcohol worldwide in 2019 (World Health Organization 2019). Among students, alcohol consumption was reported by 4.3% of males and 0.8% of females (Manek et al., 2019). Furthermore, the National Survey on Drug Use and Health estimated that 17.5 million individuals aged 18–25 years consumed alcohol in 2023, while the National Institute on Alcohol Abuse and Alcoholism identified this age group as being particularly vulnerable to alcohol dependence (National Survey on Drug Use and Health/

NSDUH, 2023; National Institute on Alcohol Abuse and Alcoholism, 2023).

In Indonesia, approximately 25% of adolescents have consumed alcoholic beverages (Ministry of Health of Indonesia, 2021). The Indonesian Demographic and Health Survey reported that alcohol initiation commonly occurs between 15 and 19 years of age, involving 70% of males and 58% of females (Indonesian Health Basic Survey, 2017). Similarly, the Central Statistics Agency reported alcohol consumption among individuals aged over 15 years in both urban and rural areas (Statistics of Indonesia, 2023). In Central Java Province, adolescent alcohol consumption remains a public health concern, with the highest prevalence observed among junior and senior high school students (Central Java Health Office, 2024). In Surakarta, adolescent drinking behavior has been associated with peer influence, curiosity, and social pressure (Rahman and Nurhadi, 2020).

Alcohol consumption among adolescents is influenced by multiple factors, including experimentation, peer pressure, identity exploration, and coping with personal or social problems (Arni et al., 2024). Persistent alcohol use may result in aggressive behavior, emotional dysregulation, anxiety, self-harm, suicidal tendencies, school dropout, and poor academic performance (Tampomalu et al., 2021; Solina and Widyastuti 2018). Their studies suggest the importance of identifying determinants of adolescent alcohol consumption to support effective prevention strategies.

The Health Belief Model (HBM) provides a useful theoretical framework for explaining health-related behaviors by examining individual perceptions regarding susceptibility, severity, benefits, and barriers.

ers (Rachman et al., 2021; Puspita et al., 2017; Setiyaningsih et al., 2016; Kasmaei et al., 2024). Within the context of alcohol consumption, HBM suggests that adolescents who perceive themselves as vulnerable to alcohol-related harm and recognize the benefits of avoiding alcohol are more likely to adopt healthier behaviors. However, these perceptions are also shaped by social influences such as peer norms, family support, and environmental factors.

Previous studies have demonstrated that HBM-based educational interventions significantly improve adolescents' knowledge, attitudes, and preventive behaviors toward alcohol consumption (Arni et al., 2024). Nevertheless, limited research has comprehensively examined the relationship between HBM constructs and alcohol consumption behavior among Indonesian adolescents, particularly in Surakarta. Therefore, this study aims to investigate the application of the Health Belief Model in explaining alcohol consumption behavior among adolescents in Surakarta City. The findings are expected to provide evidence for developing theory-based health promotion strategies to prevent alcohol consumption among adolescents.

SUBJECTS AND METHOD

1. Study Design

This was case control study conducted in Surakarta, Central Java, Indonesia, from May to June 2025.

2. Population and Sample

The target population consisted of adolescents aged 15–19 years living in Surakarta, Indonesia. A total of 200 adolescents were included, comprising 100 who had consumed alcohol and 100 who had never consumed alcohol. Alcohol consumers were recruited using snowball sampling, while non-consumers were selected using fixed disease sampling. The minimum sample

size was calculated based on Kline's recommendation for path analysis. Inclusion criteria were adolescents aged 15–19 years old.

3. Study Variables

The dependent variable was non-alcohol drinker behavior. The independent variables were the six constructs of the Health Belief Model (HBM), including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

4. Operational Definition of Variables

Non-alcohol drinker behavior was defined as adolescents' behavior related to the no consumption of alcoholic beverages.

Perceived susceptibility was defined as adolescents' beliefs regarding their likelihood of experiencing health problems resulting from alcohol consumption.

Perceived severity was defined as adolescents' perceptions of the seriousness of the physical, psychological, and social consequences associated with alcohol use.

Perceived benefit was defined as adolescents' beliefs about the advantages of avoiding alcohol consumption.

Perceived barrier was defined as perceived obstacles that might hinder adolescents from refraining from alcohol consumption.

Cues to action were defined as internal or external stimuli that encouraged adolescents to avoid alcohol consumption, including advice from parents, teachers, peers, or health professionals.

Self-efficacy was defined as adolescents' confidence in their ability to resist peer pressure and refuse alcoholic beverages.

5. Study Instruments

Data were collected using a structured self-administered questionnaire consisting of three sections. The first section obtained respondents' demographic characteristics. The second section measured the six

constructs of the Health Belief Model, comprising 30 items (five items for each construct: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy). The third section assessed alcohol consumption behavior using a 20-item questionnaire.

Prior to data collection, the questionnaire underwent validity and reliability testing among 30 adolescents. Item validity was evaluated using Pearson's product-moment correlation, whereas internal consistency reliability was assessed using Cronbach's alpha coefficient.

6. Data analysis

Descriptive statistics were used to summarize respondents' characteristics and study variables using frequencies, percentages, means, and standard deviations. The relationships among Health Belief Model constructs and alcohol consumption behavior were examined using path analysis. The analysis estimated both direct and indirect effects and included model specification, identification, parameter estimation, and goodness-of-fit evaluation. Statistical analyses were performed using Stata software, with statistical significance established at $p < 0.05$.

Table 1. Sample Characteristics

Characteristics	n	%
Age		
≤19 years	92	46.00
>19 years	108	54.00
Educational Status		
Grade 9	21	10.50
Grade 10	28	14.00
Grade 11	24	12.00
Graduated from Senior High School	127	63.50
Alcohol Consumption		
Ever consumed alcohol	100	50.00
Never consumed alcohol	100	50.00

7. Research Ethics

This study involved human participants; therefore, ethical issues including informed consent, anonymity, and data confidentiality were carefully addressed throughout the research process. Ethical approval was obtained from the Health Research Ethics Committee of Dr. Moewardi Hospital, Surakarta, Indonesia. (Approval No. 2.660/XI/HREC/2025), dated May 19th, 2025.

RESULTS

1. Sample Characteristics

Table 1 shows the demographic characteristics of the 200 study participants. More than half of the respondents were aged over 19 years (54.0%), while 46.0% were aged 19 years or younger. Regarding educational status, the majority of respondents had graduated from senior high school (63.5%), followed by Grade 10 students (14.0%), Grade 11 students (12.0%), and Grade 9 students (10.5%). Based on alcohol consumption status, the study included an equal proportion of adolescents who had ever consumed alcohol and those who had never consumed alcohol, with 100 participants (50.0%) in each group.

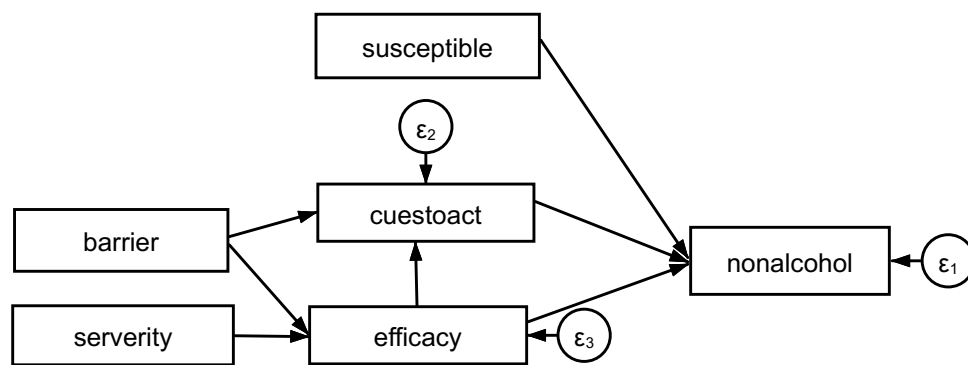


Figure 1. Path analysis model with estimation

2. Path Analysis

Figure 1 presents the path analysis model examining the relationships among Health Belief Model constructs and alcohol consumption behavior. The model included direct pathways from perceived susceptibility, self-efficacy, and cues to action to alcohol consumption behavior, as well as pathways among perceived severity, perceived barriers, self-efficacy, and cues to action.

Table 2 path analysis showed that perceived susceptibility was negatively associated with alcohol consumption behavior ($\beta = -0.02$; 95%CI = -0.05 to -0.01 ; $p = 0.044$). Self-efficacy was positively associated with alcohol consumption behavior

($\beta = 0.98$; 95%CI = 0.94 to 1.02 ; $p < 0.001$). Cues to action were not significantly associated with alcohol consumption behavior ($\beta = 0.03$; 95%CI = -0.01 to 0.07 ; $p = 0.190$).

Among the pathways involving HBM constructs, perceived severity was negatively associated with self-efficacy ($\beta = -0.08$; 95%CI = -0.13 to -0.03 ; $p = 0.002$), whereas perceived barriers were positively associated with self-efficacy ($\beta = 0.95$; 95%CI = 0.93 to 0.96 ; $p < 0.001$). Self-efficacy was positively associated with cues to action ($\beta = 0.98$; 95%CI = 0.83 to 1.13 ; $p < 0.001$). Perceived barriers were not significantly associated with cues to action ($\beta = -0.09$; 95%CI = -0.25 to 0.08 ; $p = 0.307$).

Table 2. Path analysis of factors associated with non-alcohol drinking behavior

Dependent variables	Independent variables	Standardized path coef. (β)	95% CI		p
			Lower limit	Upper limit	
Direct effect					
Non-alcohol drinker behavior	← High perceived susceptibility	−0.02	−0.05	−0.01	0.044
	← Strong self-efficacy	0.98	0.94	1.02	<0.001
	← Strong cues to action	0.03	−0.01	0.07	0.190
Indirect effect					
Self-efficacy	← High perceived severity	−0.08	−0.13	−0.03	0.002
	← High perceived barrier	0.5	0.93	0.96	<0.001
Cues to action	← Strong self-efficacy	0.98	0.83	1.13	<0.001

Dependent variables	Independent variables	Standardized path coef. (β)	95% CI		p
			Lower limit	Upper limit	
	← High perceived barrier	-0.09	-0.25	0.08	0.307

DISCUSSION

1. Effect of Perceived Susceptibility on Alcohol Consumption Behavior

Adolescents who perceived greater vulnerability to alcohol-related harm were more likely to avoid alcohol consumption. Within the HBM, greater perceived vulnerability may increase awareness of personal risk and encourage protective behavior.

This finding is consistent with De Jans et al. (2026), who found that perceived susceptibility was positively associated with adolescents' intention to reduce alcohol consumption. Similarly, Fathian-Dastgerdi et al. (2021) reported that perceived susceptibility was significantly associated with preventive behavior among adolescents. A path analysis among junior high school students in Surakarta also supported the role of perceived susceptibility in adolescent health behavior. These findings suggest that prevention programs should communicate realistic and age-relevant alcohol-related risks to strengthen adolescents' awareness of personal vulnerability.

2. Effect of Self-Efficacy on Alcohol Consumption Behavior

Alcohol related self-efficacy generally refers to confidence in refusing alcohol and resisting peer pressure. If higher outcome scores represent non-alcohol consumption, the finding supports the protective role of self-efficacy; if they represent alcohol consumption, the positive direction should be re-examined.

Lee et al. (2020) found that lower alcohol-refusal self-efficacy was associated with alcohol use and alcohol-related problems among adolescents. Mares et al.

(2013) similarly highlighted the role of alcohol-related cognitions in adolescent drinking behavior. Guldager et al. (2022) further demonstrated the relevance of targeting drinking-refusal self-efficacy in alcohol prevention. These findings support strengthening adolescents' confidence to refuse alcohol and manage peer pressure.

3. Effect of Perceived Severity on Self-Efficacy

Alcohol related consequences as more serious did not necessarily increase adolescents' confidence in resisting alcohol. De Jans et al. (2026) similarly found that perceived severity was not a significant predictor of adolescents' intention to reduce alcohol consumption, while self-efficacy was more influential. Fathian-Dastgerdi et al. (2021) also identified self-efficacy as the strongest predictor of preventive behavior. Tsai et al. (2021) emphasized that perceived severity and self-efficacy represent distinct but related components of health behavior. Therefore, alcohol prevention should combine awareness of serious consequences with practical skills to strengthen adolescents' confidence in refusing alcohol.

4. Effect of Perceived Barrier on Self-Efficacy

Perceived barriers had a strong positive association with self-efficacy. This direction is unexpected within the conventional HBM, where greater barriers generally reduce preventive behavior. It may therefore reflect the operationalization or coding of the variables.

Fathian-Dastgerdi et al. (2021) found that perceived barriers were negatively related to preventive behavior, whereas

self-efficacy was the strongest predictor. Karimi et al. (2022) similarly reported a negative role of perceived barriers and a positive role of self-efficacy in adolescent preventive behavior. Yan et al. (2024) identified perceived barriers and self-efficacy as distinct dimensions of adolescent alcohol-related cognition. The unexpected positive association in the present study should therefore be interpreted cautiously, and the questionnaire scoring should be verified before drawing a definitive conclusion.

5. Effect of Self-Efficacy on Cues to Action

Self-efficacy associated with cues to action. This indicates that adolescents with greater confidence in managing alcohol-related situations may be more responsive to triggers encouraging preventive action. Keshani et al. (2018) identified self-efficacy and cues to action as important predictors of healthy behavior among adolescents. Fathian-Dastgerdi et al. (2021) also identified self-efficacy as a strong predictor of preventive behavior, while Karimi et al. (2022) supported the relevance of both constructs in adolescent health behavior. These findings suggest that alcohol prevention should combine practical self-efficacy-building strategies with repeated cues from family, school, peers, and health education.

6. Effect of Perceived Barriers on Cues to Action

Perceived barriers were negatively associated with cues to action, but the association was not statistically significant. This suggests that perceived barriers did not significantly determine adolescents' responsiveness to alcohol-prevention cues.

De Jans et al. (2026) similarly found that perceived barriers were not significantly associated with adolescents' intention to reduce alcohol consumption. In contrast, Fathian-Dastgerdi et al. (2021) reported a significant negative relationship between

perceived barriers and preventive behavior. Karimi et al. (2022) also demonstrated that perceived barriers may contribute to adolescent preventive behavior, although their influence differs from that of self-efficacy and cues to action. The non-significant finding in the present study may indicate that social and informational factors are more influential in generating cues to action than perceived barriers.

7. Effect of Cues to Action on Alcohol Consumption Behavior

Cues to action associated with alcohol consumption behavior. This indicates that health information, family influence, peer messages, and other cues alone may be insufficient to change alcohol-related behavior.

De Jans et al. (2026) found that self-efficacy and perceived benefits were stronger predictors of adolescents' intention to reduce alcohol use. Lee et al. (2020) similarly emphasized alcohol-related cognitions, particularly alcohol-refusal self-efficacy, as important factors associated with adolescent alcohol use. Fathian-Dastgerdi et al. (2021) also identified self-efficacy as the strongest predictor of preventive behavior. Thus, alcohol prevention programs should combine cues to action with strategies that strengthen self-efficacy, address peer pressure, and emphasize the benefits of avoiding alcohol.

Overall, the findings indicate that the HBM provides a useful framework for understanding adolescent alcohol-related behavior. Perceived susceptibility was significantly associated with alcohol consumption behavior, while self-efficacy showed the strongest association with the behavioral outcome. Perceived severity, perceived barriers, and self-efficacy were also significantly associated within the HBM pathways, whereas cues to action and

perceived barriers did not show significant associations in some pathways.

These findings are broadly consistent with De Jans et al. (2026), who identified self-efficacy as an important determinant of adolescents' intention to reduce alcohol consumption. Lee et al. (2020) likewise demonstrated the importance of alcohol-refusal self-efficacy, while Yan et al. (2024) supported the applicability of HBM constructs to adolescent alcohol-related cognition. Overall, prevention programs should strengthen adolescents' awareness of alcohol-related risks and, particularly, their confidence and skills to refuse alcohol, supported by family, peer, school, and health-education cues.

Self-efficacy was an important factor associated with alcohol consumption behavior among adolescents in Surakarta City. Perceived susceptibility was significantly associated with alcohol consumption behavior, while perceived severity, perceived barriers, and self-efficacy were significantly interconnected within the Health Belief Model pathways. In contrast, cues to action were not significantly associated with alcohol consumption behavior, and perceived barriers were not significantly associated with cues to action. These findings suggest that adolescent alcohol prevention programs should strengthen self-efficacy and awareness of individual susceptibility to alcohol-related harm, supported by appropriate health education and social cues to promote healthier behavioral choices.

AUTHORS CONTRIBUTION

MAZ: Conceptualization, study design, data collection, and manuscript writing. ISS: Literature review, theoretical framework development, and interpretation of findings. SSR: Methodology review, statistical analysis, and validation of results. AD: Data

interpretation, critical evaluation of the manuscript, and discussion development. YL: Reference management, manuscript editing, and final proofreading.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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