BKM
Berita Kedokteran Masyarakat

Volume 42 Number 02, 2026, Pages e28877
DOI: 10.22146/bkm.v42i02.28877

Perception and smoking status among primary healthcare center staffs as predictors of support for a 100% smoke-free policy in a mixed rural-urban area

Rosalia Kurniawati Harisaputra[1,2]*, Citra Indriani[1], Yayi Suryo Prabandari[3]

Submitted:
January 23rd, 2026
Accepted:
February 26th, 2026
Published:
February 28th, 2026

[1]Department of Biostatistics, Epidemiology, and Population Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

[2]Center for Reproductive Health, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

[3]Department of Health Behavior, Environment, and Social Medicine Department, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada / Center for Health Behavior and Promotion, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

***Correspondence:**
rosaliakurnia@ugm.ac.id

Abstract

Purpose: Focusing on primary healthcare personnel at the district level in Indonesia and integrating behavioral theory and contextual tobacco control factors, this study aims to analyze health staff attitudes toward the implementation of a 100% smoke-free policy in primary healthcare centers (PHCs). **Methods:** This study utilized secondary data from Quit Tobacco Indonesia. The survey, conducted between 2011 and 2012, focused on staff employed at PHCs in Bantul District, Special Region of Yogyakarta. The study employed a cross-sectional design with 313 participants. The dependent variable in this study was attitude towards a 100% smoke-free policy in PHCs. The independent variables were beliefs regarding the effects of environmental tobacco smoke (ETS) and perceptions of ETS. Covariate variables included staff position, gender, educational level, training on the smoking problem, smoking status, knowledge level about the impacts of ETS, medical staff as role models, age, and length of working. Analysis was conducted using descriptive (proportion) and bivariable (chi-square) approaches, as well as multivariable (multiple logistic regression). **Results:** Individuals who perceived ETS exposure negatively (OR 16.6; 95%CI: 6.59-42.1), and those with a non-smoking status (OR 20.3; 95%CI: 7.43-55.3) or former smoking status (OR 6.7; 95%CI: 1.73-26.0), were more likely to demonstrate a favorable attitude toward a 100% smoke-free policy in PHCs. **Conclusion:** Stakeholders such as the district health office and PHC heads can strengthen smoking cessation efforts through education and financial strategies to help current smokers transition to former smokers.

Keywords: attitude; primary healthcare center; smoke-free policy; tobacco control

INTRODUCTION

The World Health Organization (WHO) reported that in 2019, the global number of smokers exceeded one billion, with the majority being men. Each year, tobacco use and environmental tobacco smoke (ETS) exposure contribute to approximately 8 million deaths worldwide, and strikingly, about 15% of these fatalities occur among individuals who do not smoke themselves [1]. In Indonesia, the proportion of the population aged ≥10 years who used tobacco reached 27.02% in 2023, with the majority being daily smokers (22.46% out of this 27.02%). Almost three-quarters (73.3%) of the Indonesian population aged ≥10 years reported being

exposed to people smoking in enclosed indoor spaces (including homes, workplaces, and transportation facilities), with more than 40% of them (30.4% of the total 73.3%) experiencing such exposure on daily basis. The number of current smokers in Indonesia indicates a substantial and persistent burden of tobacco use [2]. Cigarette smoking remains a predominant modifiable risk factor for cardiovascular disease (CVD) and continues to represent the foremost preventable cause of mortality on a global scale [3]. Exposure to ETS is a significant environmental health risk and has been shown to increase the risk of coronary heart disease by 25–30% [4].

To mitigate these adverse health effects, implementing a comprehensive 100% smoke-free policy is essential. The WHO underscores the implementation of 100% smoke-free policies as a core strategy in global tobacco control efforts. Smoke-free environments not only protect non-smokers but also encourage smokers to quit or reduce tobacco consumption [5]. Such policies are expected not only to protect non-smokers from ETS but also to reduce smoking prevalence by discouraging tobacco use and supporting smoking cessation. Supportive behavior toward a 100% smoke-free environment is influenced by individual perceptions, including beliefs about the health risks and comfort-related impacts of exposure to ETS [6]. A scoping study in Indonesia examining barriers and facilitators to the implementation of smoke-free area policies in public places identified multiple obstacles, including individual characteristics, the availability of tobacco products and smoking aids, weak enforcement mechanisms, insufficient support and collaboration from local government, limited examples of policy enactment at the local level, and inadequate no-smoking or smoke-free signage. Conversely, several facilitating factors were identified, including the imposition of fines and penalties, access to cessation services, smoke-free policy campaigns, and knowledge and attitudes toward smoke-free area policies [7]. Support for and compliance with tobacco control policies are influenced by the interplay of psychosocial and cultural factors, including sociodemographic characteristics, individual attitudes and beliefs, smoking behavior and nicotine dependence, perceptions of health risks associated with ETS, public health education campaigns, prevailing social and cultural norms regarding smoking, and the broader tobacco industry marketing and regulatory environments.

Given that patients often perceive health professionals as role models for healthy lifestyles, as reported by Saeys [5], it is essential to examine the attitudes of PHC staff toward implementing a 100% smoke-free policy, as well as the factors associated with these attitudes. Evidence from a survey conducted in a teaching hospital in Portugal demonstrates that smoking status is the strongest predictor of attitudes toward tobacco control, including approval of hospital smoke-free policies, opposition to exposure to ETS in healthcare settings, and support for national smoking bans. Notably, smoking status has a stronger influence on tobacco control attitudes than the educational level of health professionals.

From a behavioral perspective, human actions have biological consequences for well-being, morbidity, and mortality. Behavior is shaped by intention, skills, and environmental factors, with behavioral intention representing the most critical determinant. Behavioral intention is shaped by specific, reasoned beliefs –though not always entirely rational– regarding a particular behavior [8]. Despite the growing body of evidence on the effectiveness of smoke-free policies, most existing studies in Indonesia have primarily focused on policy implementation barriers at the structural or regulatory level, as well as public compliance in general populations and public spaces. Limited attention has been given to the attitudes and supportive behaviors of PHC staff, particularly in district-level settings, who play a pivotal role as health promoters, policy implementers, and role models for the community. Moreover, few studies have comprehensively examined how individual perceptions, smoking behavior, and psychosocial factors collectively influence support for a 100% smoke-free policy among healthcare workers in primary care facilities.

Despite growing evidence on the harms of ETS and the importance of smoke-free healthcare settings, little is known about how PHC staff in Bantul District perceive and respond to 100% smoke-free policies. The objective of this study is to examine PHC staff attitudes toward a 100% smoke-free policy and to identify factors associated with supportive behaviors. This study is novel in its focus on district-level primary healthcare personnel in Indonesia, integrating behavioral theory with contextual tobacco control factors to provide evidence to inform more targeted and effective implementation and enforcement of smoke-free policies within healthcare settings.

METHODS

Study design and settings

This study is a secondary data analysis of a tobacco control survey conducted in collaboration between Quit Tobacco Indonesia (QTI) and the Bantul District Health Office. The survey targeted PHC staff in Bantul

District, Special Region of Yogyakarta, and was carried out between 2011 and 2012 using a cross-sectional design.

The dependent variable in this study was attitude towards a 100% smoke-free policy in PHC (a nominal scale: agree or disagree). The independent variables were beliefs about the effects of ETS (nominal scale: harmful and safe) and perceptions of the ETS (nominal scale: object ETS and accept ETS). Covariate variables were position of staff (nominal scale: medical personnel and non-medical personnel), gender (nominal variable: women and men), educational level (nominal variable: ≤high school and >high school), training about smoking problem (nominal variable: ever join and never join), smoking status (nominal scale: non-smoker, former smoker, and smoker), knowledge level about impacts of ETS (nominal scale: adequate and inadequate), medical staff as role model (nominal scale: agree, have no idea, and disagree), age (nominal scale using mean as the central tendency since the data normally distributed: <40 years old and ≥40 years old), and length of working (nominal scale using median as the central tendency since the data non-normally distributed: ≤6 years and >6 years). The regression analysis used these categories as references: safe, accept ETS, men, ≤high school, smoker, and inadequate knowledge.

The study population comprised all PHC staff working in Bantul District, Special Region of Yogyakarta, Indonesia. This study employed the following inclusion criteria: PHC staff working in Bantul District at the time the survey was conducted, and who participated in the survey. The exclusion criteria were observations with incomplete variables.

The study was conducted in Bantul District, as at the time of the survey, Bantul District had no regulations equivalent to a regent's regulation (*Peraturan Bupati*) regarding a 100% smoke-free policy. The survey employed a cluster sampling method (one-stage cluster sampling with 5 clusters: north, east, south, west, and central). Clusters were selected based on the representativeness of each region regarding access to information from the Bantul District Health Office, including details on Special Region of Yogyakarta Governor Regulation No. 42 of 2009 on No-Smoking Zones, as well as access to training and health education provided by the Bantul District Health Office. The survey covered 37% of PHCs in Bantul District (10 out of 27). The number of PHCs selected was determined by funding availability from the Bantul District Health Office. Two PHCs were randomly selected per cluster. Respondents comprised all staff (health and non-health personnel) from the selected PHCs. Randomization yielded 5 inpatient PHCs and 5 non-inpatient PHCs.

Of the 331 questionnaires collected, 313 (94.6%) were fully completed and eligible for analysis. This number met the minimum sample size required for the study (n= 275). Staff representativeness was 32.7% (331 of 957 staff members). The selected PHCs were randomly chosen to represent all geographical areas of the district (east, south, west, north, and central regions).

Data collection

Secondary data used in this study were obtained from a survey that applied a one-stage cluster sampling method. Primary healthcare centers (PHCs) were selected as clusters. Secondary data were collected using a structured, self-administered questionnaire. The questionnaire followed standard research questionnaire guidelines and had been previously used in similar studies conducted in the Yogyakarta Municipality. One of the researchers involved in collecting the secondary data used in this study holds the rights to use the dataset.

Data analysis

Data analysis was performed using descriptive, bivariable, and multivariable approaches. Stata version 14, licensed to the Center for Reproductive Health, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, was used to analyse the data. Descriptive statistics were presented as proportions, while bivariable analysis employed the chi-square test. Multivariable analysis was conducted using multiple logistic regression. The 30 questionnaires that were not returned or had incomplete data were assumed to be missing at random and were therefore unlikely to introduce significant bias into the study.

RESULTS

Table 1 presents the baseline characteristics of the study participants (n = 313) with the majority of PHC staff in Bantul District were female, had education levels above high school, and worked as medical personnel. More than half of the respondents were aged 40 years or older and had a relatively shorter length of employment.

Regarding smoking status, most respondents were non-smokers, while a small proportion were former or current smokers. Among those who reported current smoking behavior, the vast majority were male. Notably, many male staff members who smoked still expressed agreement with the implementation of 100%

smoke-free policy in PHCs. Most respondents supported establishing smoke-free areas in PHCs. The majority believed that ETS is harmful and perceived its impact negatively. In addition, respondents generally agreed that medical staff should serve as role models in smoking behavior. More than half of the staff had previously attended training related to smoking issues. However, only a minority demonstrated adequate knowledge regarding the health impacts of ETS, while inadequate knowledge remained common among respondents.

Table 1. Respondent characteristics (N = 313)

Factors	N (%)
Attitude towards a 100% smoke-free policy in PHC	
Agree	289 (92.3)
Disagree	24 (7.7)
Belief about the impacts of ETS	
Harmful	272 (86.9)
Safe	41 (13.1)
Perception of the ETS	
Object ETS	266 (85.0)
Accept ETS	47 (15.0)
Position	
Medical personnel	250 (79.9)
Non-medic personnel	63 (20.1)
Gender	
Woman	226 (72.7)
Man	87 (27.8)
Education	
> high school	230 (73.5)
≤ high school	83 (26.5)
Training about smoking problem	
Ever join	190 (60.7)
Never join	123 (39.3)
Smoking status	
Non-smoker	240 (76.7)
Former smoker	36 (11.5)
Smoker	37 (11.8)
Knowledge about impacts of ETS	
Adequate	81 (25.9)
Inadequate	232 (74.1)
Medical staff as role model	
Agree	290 (92.6)
Have no idea	8 (2.6)
Disagree	15 (4.8)
Age	
< 40 years old	147 (47.0)
≥ 40 years old	166 (53.0)
Length of work	
≤ 6 years	162 (51.8)
> 6 years	151 (48.2)

Note: Source – QTI 2012 data analysis, ETS (Environment Tobacco Smoke), PHC (Primary Healthcare Center)

Table 2 shows that the majority of the respondents supported the designation of a 100% smoke-free policy in PHCs. Beliefs and perceptions regarding ETS were strongly and consistently associated with supportive attitudes toward smoke-free policies. Respondents who believed that ETS is harmful were significantly more likely to support a 100% smoke-free policy compared with those who perceived ETS as safe. Similarly, respondents who perceived ETS exposure as unacceptable demonstrated substantially higher support for smoke-free PHCs.

Several respondent background characteristics were also significantly associated with supportive attitudes. Medical personnel were more likely than non-medical staff to support smoke-free PHCs, and this difference was statistically significant. Regarding staff gender, female staff showed stronger support than male staff. Higher educational attainment was positively associated with support for the policy.

Smoking status emerged as the strongest predictor of attitudes toward smoke-free policies. Compared with current smokers, former smokers were significantly more likely to support a 100% smoke-free policy, while non-smokers also demonstrated far higher support. Respondents with adequate knowledge of the health impacts of ETS were more likely to support a 100% smoke-free policy in PHCs than those with inadequate knowledge. In addition, agreement that medical staff should serve as role models for healthy lifestyles was significantly associated with support for smoke-free policies. In contrast, age, length of employment, and participation in smoking-related training were not significantly associated with attitudes toward the implementation of a 100% smoke-free policy in PHCs.

Table 3 presents the multivariable analysis of the association between perceptions of the impacts of ETS and attitudes towards a 100% smoke-free policy in PHC. Respondents who object to the impacts of ETS continue to support the implementation of a 100% smoke-free policy in PHC after adjustment to belief regarding the impacts of ETS (model 2) and gender (model 4). The association between smoking status and support to a 100% smoke-free policy in PHC still can be seen after adjustment to belief about the impacts to ETS (model 5), to gender (model 3), or to the level of education (model 6)

Table 2. Relationship between beliefs regarding the health effects of environmental tobacco smoke, perceptions of tobacco smoke exposure, and respondents' background characteristics with attitude towards a 100% smoke-free policy in primary healthcare centers

Factors	Value N (%)	Agree N (%)	Disagree N (%)	OR	95% CI	p-value
N	313 (100)	289 (92.3)	24 (7.7)			
Belief about impacts of ETS						
Harmful	272 (86.9)	258 (89.3)	14 (58.3)	5.9	(2.43-14.52)	<0.001
Safe	41 (13.1)	31 (10.7)	10 (41.7)			
Perception of the ETS						
Object	266 (85.0)	258 (89.3)	8 (33.3)	16.65	(6.59-42.06)	<0.001
Accept	47 (15.0)	31 (10.7)	16 (66.7)			
Position						
Medical personnel	250 (79.9)	236 (81.7)	14 (58.3)	3.18	(1.34-7.55)	0.009
Non-medical personnel	63 (20.1)	53 (18.3)	10 (41.7)			
Gender						
Woman	226 (72.2)	219 (75.8)	7 (29.2)	7.60	(3.03-19.07)	<0.001
Man	87 (27.8)	70 (24.2)	17 (70.8)			
Education						
≤ high school	83 (26.5)	71 (24.6)	12 (50.0)			
> high school	230 (73.5)	218 (75.4)	12 (50.0)	3.07	(1.32-7.14)	0.009
Training about smoking problem						
Ever join	190 (60.7)	178 (61.6)	12 (50.0)	1.60	(0.70-3.69)	0.267
Never join	123 (39.3)	111 (38.4)	12 (50.0)			
Smoking status						
Non-smoker	240 (76.7)	233 (80.6)	7 (29.2)	20.26	(7.43-55.26)	<0.001
Former smoker	36 (11.5)	33 (11.4)	3 (12.5)	6.70	(1.73-26.00)	0.006
Smoker	37 (11.8)	23 (8.0)	14 (58.3)			
Knowledge about impacts of ETS						
Adequate	81 (25.9)	80 (27.7)	1 (4.2)	8.80	(1.17-66.28)	0.035
Inadequate	232 (74.1)	209 (72.3)	23 (95.8)			
Medical staff as role model						
Agree	290(92.6)	272 (94.1)	18 (75.0)	9.07	(2.01-40.99)	0.004
Have no idea	8 (2.6)	5 (1.7)	3 (12.5)			
Disagree	15 (4.8)	12 (4.2)	3 (12.5)	2.4	(0.36-16.21)	0.369
Age						
< 40 years old	147 (47.0)	137 (47.4)	10 (41.7)	1.26	(0.54-2.93)	0.589
≥ 40 years old	166 (53.0)	152 (52.6)	14 (58.3)			
Length of working						
≤ 6 years	162 (51.8)	154 (53.3)	8 (33.3)	2.28	(0.95-5.50)	0.066
> 6 years	151 (48.2)	135 (46.7)	16 (66.7)			

Note: ETS (Environment Tobacco Smoke), OR (Odds Ratio), CI (Confidence Interval), Source – QTI 2012 data analysis

Table 3. Multivariable analysis

Variables	Model 1 (Unadjusted)	Model 2	Model 3	Model 4	Model 5	Model 6
Attitude towards a 100% smoke-free policy in PHC						
Belief about the impacts of ETS						
Safe	1	1	–	–	1	–
Harmful	5.94*** (2.43–14.5)	2.56*** (0.91–7.15)	–	–	3.17* (1.15–8.80)	–
Perception to ETS						
Accept ETS	1	1	–	1	–	–
Object ETS	16.6*** (6.59–42.1)	12.7*** (4.79–33.8)	–	10.0*** (3.62–27.6)	–	–
Gender						
Men	1	–	1	1	–	–
Women	7.60*** (3.03–19.1)	–	1.47 (0.25–8.66)	3.19* (1.12–9.08)	–	–
Smoking status						
Smoker	1	–	1	–	1	1
Former smoker	6.70** (1.73–26.0)	–	6.64** (1.71–25.8)	–	5.98* (1.50–23.8)	6.20** (1.57–24.5)
Non-smoker	20.3*** (7.43–55.3)	–	14.6** (2.41–88.5)	–	15.5*** (5.48–43.7)	18.0*** (6.21–52.1)
Education						
≤ high school	1	–	–	–	–	1
> high school	3.07** (1.32–7.14)	–	–	–	–	1.38 (0.52–3.66)
Pseudo R^2	–	0.24	0.22	0.25	0.24	0,22
AIC	–	135.0	140.8	133.3	136.4	140.6
df_m	–	2	3	2	3	3
Observations	313	313	313	313	313	313

Note: *p< 0.05, **p< 0.01, ***p< 0.001, ETS (Environment Tobacco Smoke), Source – QTI 2012 data analysis

DISCUSSION

This study on the attitudes of PHC staff toward a 100% smoke-free policy is important, as attitudes and perceptions regarding tobacco control may effectively influence adults' smoking behavior [9]. Previous studies indicate that smoking behavior among health professionals can influence both their knowledge and attitudes toward smoke-free policies, with smokers typically demonstrat- ing lower awareness of harms and less support for tobacco control measures compared to non- and former-smokers [10]. Individuals who objected to exposure to ETS and who were non-smokers or former smokers were more likely to express support toward the implementation of a 100% smoke-free policy in PHCs. This aligns with findings from a cross-sectional study in a Portuguese teaching hospital, where smoking behavior was the most important predictor of tobacco control attitudes and significantly shaped staff support for smoke-free policies [11]. These models strengthen confidence that perception and smoking status not only associated with attitudes but also serve as core drivers underlying staff support for smoke-free health environments. Chi-square analysis revealed an association between beliefs about the harmful impacts of ETS and perceptions of the ETS objecting to or accepting ETS, such that individuals who believed ETS to be harmful were significantly more likely to object to exposure.

Respondents' perceptions of objection to ETS exposure substantially influence attitude formation when PHCs are designated as 100% smoke-free areas. Mediation analysis showed that changes in perception accounted for 36.7% of the variation in smoking status and 21.9% of the variation in knowledge, indicating that perception mediates the relationship between smoking behavior and cognitive awareness and their translation into attitudes. These findings suggest that smoking status affects staff attitudes not simply through behavioral classification but via how individuals interpret and integrate risk information. Mediation analysis here further demonstrated that more than one-third of the effect of smoking status on attitudes toward a 100% smoke-free PHC was mediated through perception, reinforcing the centrality of cognitive factors. By elucidating this pathway, the study identifies perception as a modifiable target for interventions to build supportive attitudes toward comprehensive smoke-free policies.

Consistently, smoking status exerted a strong influence on attitudes toward smoke-free policies in both practical and statistical terms. More than 10% of staff members were still active smokers, a prevalence with meaningful implications for policy implementation. Prior research in hospital settings has similarly observed that high smoking prevalence among staff may paradoxically undermine enforcement and compliance, as smoking employees are less likely to support or enforce smoke-free norms actively [11]. This finding resonates with data from studies in diverse settings, including a local health agency in Italy, where ever-smokers and never-smokers differed in their perceptions of ETS exposure and the effectiveness of smoke-free policies [12]. The cognitive linkage between belief in harm and attitudinal support underscores the psychosocial dimension of policy adoption, in which the internalization of health risks enhances normative support for tobacco control measures. Study in Europe underlined that low support for smoke-free policy in outdoor settings, although in settings with minors and in indoor settings is strong. Further education is needed to increase awareness regarding potential ETS exposure in specific outdoor settings [13].

Knowledge played a substantial role in shaping attitudes toward smoke-free policies. However, chi-square analysis revealed no significant association between participation in smoking-related training and knowledge levels, indicating a gap between training exposure and effective knowledge acquisition. Similar gaps have been identified in other settings, where healthcare workers may possess a general awareness of tobacco harms but lack detailed or practical knowledge of smoke-free policy impacts and enforcement mechanisms. This suggests the need to evaluate and redesign training programs to move beyond basic awareness and to emphasize a comprehensive understanding of ETS effects, policy structures, compliance strategies, and behavior-change support. A study regarding the implementation, barriers, and challenges of smoke-free policies in hospitals in Egypt revealed that to achieve adequate enforcement of smoke-free policies, comprehensive interventions, including the integration of cessation training and services, alongside effective communication programs to educate all levels of health care workers regarding the dangers of ETS exposure and effective measures for protection, are needed [14]. Altogether, the findings suggest that efforts to enhance the designation of PHCs as 100% smoke-free areas should not focus solely on policy declaration but also on strengthening the cognitive and educational framework that underlies staff attitudes. Individuals who object to ETS are more likely to agree with implementing 100% smoke-free policies in PHCs. Therefore, efforts should focus on building perceptions of objection to ETS exposure to ensure that supportive attitudes toward a 100% smoke-free policy in PHCs are fully realized. Effective capacity building that targets

perceptions and knowledge, combined with cessation support mechanisms for smoking staff, may enhance acceptance and compliance with smoke- free policies, contributing to a healthier institutional environment and advancing tobacco control goals more broadly.

In this study, beliefs about the impact of ETS influenced attitudes toward implementing 100% smoke-free policies in PHCs. However, this effect was weaker compared to perceptions of objection to ETS. This also represents a limitation of the study, the restricted use of available secondary data. Therefore, we recommend incorporating probing questions in future research on beliefs.

CONCLUSION

Perceptions of ETS (objecting to exposure) and smoking status (non-smoker or former smoker) exerted a strong influence in shaping supportive attitudes toward the implementation of a 100% smoke-free policy in PHCs. The district health office and the heads of PHCs can strengten smoking cessation efforts by employing financial strategies, improving infra-structure, and training and educating stakeholders [15]. A study in Europe also concluded that sustainable funding for tobacco control is essential to support additional preventive measures, including education, communication campaigns, and monitoring [16].

Acknowledgments
The authors would like to express their gratitude to Quit Tobacco Indonesia (QTI) and the Bantul District Health Office for granting access to the survey data used in this study. Appreciation is also extended to all staff at primary healthcare centers in Bantul District who participated in the survey. The authors would also like to thank Tutik Istiyani, Althaf Setyawan, Bayu Satria Wiratama, Anggriyani Wahyu Pinandari, and Akto Adhi Kuntoro for their valuable support and facilitation during the research and writing of this manuscript.

Authors' contributions
R.K.H.: conceptualized the study, conducted data analysis, and drafted, revised, and finalized the manuscript. C.I.: contributed to data interpretation and manuscript revision. Y.S.P.: provided critical input on study design, analytical approach, and intellectual content. All authors read and approved the final manuscript.

Funding
This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability
The data used in this study were secondary data obtained from Quit Tobacco Indonesia (QTI) in collaboration with the Bantul District Health Office. These data are available only with permission for the current study and are not publicly available. Data may be obtained from the corresponding author upon reasonable request and with permission from the data owner.

Ethics statement
This study involved secondary analysis of anonymized survey data. Quit Tobacco Indonesia obtained ethical approval for the original survey in collaboration with the Bantul District Health Office. The present analysis complied with ethical principles for research involving human subjects. Ethical approval for this secondary analysis was granted by the Medical and Health Research Ethics Committee (MHREC), Faculty of Medicine, Gadjah Mada University (UGM) and Dr. Sardjito General Hospital, with reference number KE/FK/709/EC/2015, dated 17 June 2015.

Conflicts of interest
The authors declare no conflicts of interest related to this study.

Use of artificial intelligence (AI)
Portions of this manuscript were edited using Perplexity and Copilot to improve grammar and clarity. All AI-assisted content was reviewed and validated by the authors, who take full responsibility for the final content.

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