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Determinants of Smoking Behavior Among Indonesian Men: Evidence from the 2017 Indonesian Demographic and Health Survey

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ABSTRACT

Background: smoking remains a major public health problem in Indonesia, particularly among men. Despite ongoing tobacco control efforts, nationally representative evidence on factors associated with smoking behavior among Indonesian males remains limited. **Objective:** this study aimed to identify factors associated with smoking behavior among Indonesian men. **Methods:** a cross-sectional study was conducted using secondary data from the 2017 Indonesian Demographic and Health Survey male recode dataset. A total of 9,945 male respondents were included. Sampling weights were applied to account for the complex survey design. Data were analyzed using descriptive statistics, chi-square tests, and multivariable logistic regression, with statistical significance set at $p < 0.05$. **Results:** education level, wealth index, residence, and province were significantly associated with smoking behavior. Respondents with junior high school education were more likely to smoke (AOR=1.57; 95% CI: 1.13–2.19), whereas those with academy or university education were less likely to smoke (AOR=0.57; 95% CI: 0.39–0.82). High-income respondents had lower odds of smoking than low-income respondents (AOR=0.68; 95% CI: 0.61–0.77). Rural residence was associated with increased smoking behavior (AOR=1.16; 95% CI: 1.04–1.28). **Conclusion:** smoking behavior among Indonesian men was significantly associated with education level, socioeconomic status, residence, and regional characteristics. Targeted tobacco control interventions are needed to reduce smoking prevalence among vulnerable male populations.

Keywords: Smoking behavior, Male, Socioeconomic factors.

Background

Smoking remains one of the leading preventable causes of morbidity and mortality worldwide, particularly in low- and middle-income countries. Tobacco consumption contributes substantially to cardiovascular disease, chronic respiratory disorders, cancer, and premature death. According to the World Health Organization, more than 80% of smokers globally live in low- and middle-income countries, where tobacco control implementation is often less effective. Indonesia continues to experience a high burden of tobacco use and is recognized as one of the countries with the highest smoking prevalence among men worldwide. Recent evidence reported that smoking prevalence among Indonesian males remains considerably high despite ongoing tobacco control efforts (1) (2).

The high prevalence of smoking among Indonesian males has become a major public health concern because tobacco use not only affects individual health but also increases the economic burden on households and healthcare systems. Smoking behavior among men is strongly influenced by sociocultural acceptance, peer interaction, affordability of cigarettes, and exposure to tobacco advertising. In Indonesia, cigarette consumption is often normalized within social environments, particularly among adult males, which may contribute to the persistence of smoking behavior across generations. Previous studies conducted in Indonesia also showed that males represent the population group with the highest risk of smoking initiation and smoking persistence (1)(3)(4).

Several previous studies have identified multiple determinants associated with smoking behavior, including age, education level, occupation, socioeconomic status, residence, and media exposure. Individuals with lower educational attainment tend to have lower health literacy and reduced awareness regarding the harmful effects of smoking. Similarly, people from economically disadvantaged households may experience greater vulnerability to smoking due to stress, limited health information, and social

norms that tolerate tobacco use. Demonstrated that lower education and internet exposure were associated with smoking behavior among Indonesian male adolescents, that low education, rural residence, employment status, and media exposure significantly increased smoking risk among young males in rural Indonesia (1)(5).

In addition, regional and residential disparities may also influence smoking behavior due to differences in tobacco accessibility, local culture, and implementation of tobacco control policies. Rural populations frequently experience weaker tobacco control enforcement and reduced access to smoking cessation programs compared with urban populations. Previous international studies similarly found that socioeconomic inequality and place of residence significantly contributed to tobacco use patterns across populations (6)(7)(8).

Although numerous studies have investigated smoking behavior in Indonesia, several important gaps remain. First, many previous studies focused primarily on adolescents, women, or specific subpopulations, while limited studies have comprehensively examined smoking determinants among male respondents using nationally representative demographic survey data. Second, earlier studies often concentrated on selected factors such as education or socioeconomic status without simultaneously assessing media exposure, internet use, regional characteristics, and residential disparities within the same analytical model. Third, evidence regarding smoking behavior among Indonesian males using the Indonesian Demographic and Health Survey (IDHS) male recode dataset remains limited, particularly studies applying weighted multivariable analysis to produce nationally representative findings. Another limitation in previous literature is the inconsistency of findings related to media exposure and internet use. Some studies reported that media exposure increased smoking risk, whereas others found no significant association after adjustment for confounding variables. Furthermore, rapid technological development and expanding internet access in Indonesia may alter smoking-related information exposure, particularly among males. Therefore, updated evidence is necessary to better understand current smoking determinants among Indonesian men in the context of socioeconomic and demographic transitions (9)(5)(10).

This study provides novelty by comprehensively analyzing factors associated with smoking behavior among male respondents in Indonesia using nationally representative IDHS 2017 male recode data. Unlike previous studies that focused on specific age groups or limited determinants, this study simultaneously examined sociodemographic characteristics, socioeconomic status, residence, regional distribution, media exposure, and internet use within a multivariable logistic regression framework. The study also applied sample weighting procedures to account for the complex survey design, thereby improving the representativeness and validity of the findings at the national level. The findings of this study are expected to provide updated evidence regarding smoking determinants among Indonesian males and contribute to the development of targeted tobacco control interventions. Understanding the influence of education, economic status, residence, and media exposure on smoking behavior is essential for designing more effective prevention and cessation programs, particularly among high-risk male populations in Indonesia. Moreover, the study may support policymakers in strengthening public health strategies aimed at reducing tobacco consumption and its long-term health consequences.

Methods

This study employed a quantitative approach using a cross-sectional design based on secondary data obtained from the Demographic and Health Surveys Program Indonesian Demographic and Health Survey (IDHS) 2017 male recode dataset (IDMR71FL). The study aimed to identify factors associated with smoking behavior among male respondents in Indonesia.. Descriptive statistics were used to summarize respondents' characteristics, while chi-square tests and multivariable logistic regression analyses were performed to examine factors associated with smoking behavior among male respondents. The study population consisted of all male respondents included in the IDHS 2017 dataset. The sample comprised 9,945 male respondents who met the inclusion criteria and had complete data for all variables analyzed in this study. The IDHS applied a stratified two-stage sampling design to obtain nationally representative samples from both urban and rural areas. In the first stage, census blocks were selected using probability proportional to size sampling. In the second stage, households were systematically selected from each census block. To ensure representativeness and reduce sampling bias, data weighting was applied prior to statistical analysis according to the sampling weight provided in the

IDHS dataset.

The dependent variable in this study was smoking behavior, categorized into “No” and “Yes.” Independent variables included age, education level, occupation, wealth index combined, residence, province, newspaper reading frequency, television watching frequency, radio listening frequency, and internet use. Age was categorized into 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and >45 years. Education level consisted of elementary or less, junior high school, senior high school, and academy/university. Occupation was classified into others, formal employee, non-formal employee, and farmer. Wealth index was grouped into low income and high income categories. Residence was categorized as urban or rural. Province was grouped into Jawa–Bali, Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia. Media exposure variables included newspaper reading, television watching, and radio listening frequencies, categorized into not at all, less than once a week, and at least once a week. Internet use was classified into “No” and “Yes.”

All variables analyzed in this study were obtained from the IDHS 2017 male recode dataset (IDMR71FL). The IDHS collected data through standardized structured questionnaires administered via face-to-face interviews by trained interviewers. Sociodemographic characteristics, media exposure, internet use, and smoking behavior information were self-reported by respondents during the survey process. The smoking behavior variable was identified from questions related to respondents’ smoking status. Sociodemographic variables such as age, education level, occupation, wealth index, residence, and province were directly extracted from the demographic section of the dataset. Media exposure variables were derived from questions regarding the frequency of accessing newspapers, television, and radio, while internet use was obtained from questions related to respondents’ internet access and utilization.

Data were analyzed using descriptive statistics, chi-square tests, and multivariable logistic regression. Prior to analysis, sampling weights provided in the IDHS dataset (mv005) were applied and normalized by dividing the weight values by 1,000,000, following the DHS guidelines. The weighting procedure was used to adjust for unequal probabilities of selection, non-response, and the complex survey design, thereby producing nationally representative estimates of the Indonesian male population and percentages. Bivariate analysis was conducted using the chi-square test to examine the association between independent variables and smoking behavior. Variables with statistical significance at $p < 0.05$ were included in the multivariable analysis.

Multivariable analysis was performed using binary logistic regression to identify factors independently associated with smoking behavior. The results were presented as crude odds ratios (COR), adjusted odds ratios (AOR), 95% confidence intervals (CI), and p-values. Statistical significance was determined at $p < 0.05$.

The Institutional Review Board (IRB) approved the initial IDHS survey through the ICF IRB Review Board (FWA00000845). The dataset used in this study is publicly available and was accessed with permission from the Demographic and Health Surveys Program program. All respondent information in the dataset was anonymized to maintain confidentiality and privacy.

Results

Table 1. Sociodemographic Characteristics, Media Exposure, Internet Use, and Smoking Behavior Among Male Respondents

Variable	Frequency (n)	Percent (%)
Age		
15–19	27	0.3
20–24	327	3.3
25–29	1010	10.2
30–34	1580	15.9
35–39	1827	18.4
40–44	1848	18.6
>45	3326	33.4
Education Level		

Elementary or less	186	1.9
Junior high	3381	34.0
Senior high	5102	51.3
Academy/university	1275	12.8
Occupation		
Others	107	1.1
Formal employee	1351	13.6
Non-formal employee	5880	59.1
Farmer	2606	26.2
Wealth index combined		
Low income	3734	37.6
High income	6210	62.4
Residence		
Urban	4873	49.0
Rural	5072	51.0
Province		
Jawa-Bali	6019	60.5
Sumatra	2066	20.8
Kalimantan	612	6.2
Sulawesi	643	6.5
Eastern Indonesia	605	6.1
Reading newspaper		
Not at all	5104	51.3
Less than once a week	3350	33.7
At least once a week	1490	15.0
Watching television		
Not at all	254	2.6
Less than once week	1253	12.6
At least once a week	8437	84.8
Listening to the radio		
Not at all	4700	47.3
Less than once week	3558	35.8
At least once a week	1687	17.0
Internet use		
No	5936	59.7
Yes	4008	40.3
Smoking behavior		
No	2797	28.1
Yes	7147	71.9

Table 1 describes the characteristics of the 9,945 respondents included in this study. Based on age distribution, respondents aged >45 years constituted the largest proportion (33.4%), followed by those aged 40–44 years (18.6%) and 35–39 years (18.4%). In contrast, respondents aged 15–19 years represented the smallest age group (0.3%). Most respondents had attained senior high school education (51.3%), while 34.0% had completed junior high school. Only a small proportion had elementary education or lower (1.9%), whereas 12.8% had academy or university education. Regarding occupational status, the majority worked in the non-formal sector (59.1%). Farmers accounted for 26.2% of respondents, while 13.6% were formal employees. Respondents categorized in other occupations represented the smallest proportion (1.1%). More than half of the respondents were classified in the high-income category based on the wealth index (62.4%). The distribution of residence was relatively balanced, with 51.0% living in rural areas and 49.0% residing in urban areas.

Geographically, most respondents were from the Jawa–Bali region (60.5%), followed by Sumatra (20.8%). Smaller proportions originated from Sulawesi (6.5%), Kalimantan (6.2%), and Eastern Indonesia (6.1%).

In terms of media exposure, newspapers were the least accessed source of information, with 51.3% of respondents reporting that they never read newspapers. Meanwhile, television was the most commonly accessed media, as 84.8% watched television at least once a week. Nearly half of the respondents (47.3%) reported never listening to the radio. Internet use was reported by 40.3% of respondents, whereas 59.7% stated that they did not use the internet. Furthermore, smoking behavior was highly prevalent, with 71.9% of respondents identified as smokers.

Table 2. Bivariate Analysis of Factors Associated with Smoking Behavior Among Male Respondents

Variable	Smoking behavior		p-value
	No	Yes	
	N (%)		
Age			<0.001
15–19	6(0.1)	21(0.2)	
20–24	60(0.6)	267(2.7)	
25–29	247(2.5)	762(7.7)	
30–34	366(3.7)	1,215(12.2)	
35–39	450(4.5)	1,377(13.8)	
40–44	557(5.6)	1,290(13.0)	
>45	1,111(11.2)	2,215(22.3)	
Education Level			<0.001
Elementary or less	60(0.6)	126(1.3)	
Junior high	720(7.2)	2,661(26.8)	
Senior high	1,400(14.1)	3,703(37.2)	
Academy/university	618(6.2)	657(6.6)	
Occupation			<0.001
Others	41(0.4)	67(0.7)	
Formal employee	588(5.9)	763(7.7)	
Non-formal employee	1,524(15.3)	4,356(43.8)	
Farmer	644(6.5)	1,962(19.7)	
Wealth index combined			<0.001
Low income	769(7.7)	2,965(29.8)	
High income	2,028(20.4)	4,183(42.1)	
Residence			<0.001
Urban	1,562(15.7)	3,311(33.3)	
Rural	1,235(12.4)	3,836(38.6)	
Province			<0.001
Jawa-Bali	1,721(17.3)	4,299(43.2)	
Sumatra	531(5.3)	1,535(15.4)	
Kalimantan	226(2.3)	386(3.9)	
Sulawesi	178(1.8)	465(4.7)	
Eastern Indonesia	141(1.8)	463(4.7)	
Reading newspaper			<0.001
Not at all	1,313(13.2)	3,791(38.1)	
Less than once a week	941(9.5)	2,409(24.2)	
At least once a week	543(5.5)	947(9.5)	
Watching television			0.024
Not at all	71(0.7)	184(1.9)	
Less than once week	312(3.1)	941(9.5)	
At least once a week	2,414(24.3)	6,023(60.6)	
Listening to the radio			0.036
Not at all	1,321(13.3)	3,378(34.0)	
Less than once week	962(9.7)	2,596(26.1)	

	At least once a week	514(5.2)	1,173(11.8)	
Internet use				<0.001
No		1,511(15.2)	4,425(44.5)	
Yes		1,286(12.9)	2,722(27.4)	

Note: p-values were obtained using the chi-square test. Statistical significance was defined as $p < 0.05$.

Table 2 presents the bivariate analysis between respondents' characteristics and smoking behavior. The findings showed that all examined variables were significantly associated with smoking behavior, including age, education level, occupation, wealth index, residence, province, newspaper reading, television watching, radio listening, and internet use ($p < 0.05$).

The proportion of smokers tended to increase with age, with the highest prevalence observed among respondents aged >45 years (22.3%), followed by those aged 35–39 years (13.8%) and 40–44 years (13.0%). Conversely, respondents aged 15–19 years showed the lowest proportion of smoking behavior (0.2%). The association between age and smoking behavior was statistically significant ($p < 0.001$). Based on educational attainment, respondents with senior high school education represented the largest proportion of smokers (37.2%), followed by those with junior high school education (26.8%). Meanwhile, respondents with elementary education or lower accounted for the smallest proportion of smokers (1.3%). Education level demonstrated a significant relationship with smoking behavior ($p < 0.001$). Occupational status was also significantly associated with smoking behavior ($p < 0.001$). Respondents employed in the non-formal sector showed the highest proportion of smokers (43.8%), followed by farmers (19.7%). In contrast, respondents categorized in other occupations had the lowest proportion of smoking behavior (0.7%). According to socioeconomic status, respondents in the high-income group had a higher proportion of smoking behavior (42.1%) compared with those in the low-income group (29.8%). Smoking behavior was also more prevalent among respondents residing in rural areas (38.6%) than among those living in urban areas (33.3%), with both variables showing statistically significant associations ($p < 0.001$).

Regional analysis indicated that the highest proportion of smokers was identified in the Jawa–Bali region (43.2%), followed by Sumatra (15.4%). Lower proportions were observed in Sulawesi and Eastern Indonesia (4.7% each), as well as Kalimantan (3.9%). Province was significantly associated with smoking behavior ($p < 0.001$).

Regarding media exposure, respondents who never read newspapers constituted the largest proportion of smokers (38.1%), whereas those who read newspapers at least once a week accounted for only 9.5%. Similarly, the majority of smokers reported watching television at least once a week (60.6%). In terms of radio exposure, smoking behavior was more common among respondents who never listened to the radio (34.0%) compared with those who listened at least once a week (11.8%). Significant associations were identified between smoking behavior and newspaper reading ($p < 0.001$), television watching ($p = 0.024$), and radio listening ($p = 0.036$). Furthermore, smoking behavior was more frequently reported among respondents who did not use the internet (44.5%) than among internet users (27.4%). Internet use was significantly associated with smoking behavior ($p < 0.001$).

Table 3. Multivariable Logistic Regression Analysis of Factors Associated with Smoking Behavior Among Male Respondents

Variables	Model 1 COR (95% CI)	Model 2 AOR(95% CI)
Age		
15–19	Reference	Reference
20–24	1.36(0.53-3.46)	1.66(0.64-4.27)
25–29	0.94(0.38-2.33)	1.33(0.53-3.32)
30–34	1.02(0.41-2.50)	1.43(0.57-3.55)
35–39	0.94(0.38-2.30)	1.29(0.38-2.38)
40–44	0.71(0.29-1.74)	0.96(0.38-2.38)
>45	0.61(0.25-1.49)	0.82(0.33-2.04)
Education Level		

Elementary or less	Reference	Reference
Junior high	1.74(1.26-2.39)***	1.57(1.13-2.19)**
Senior high	1.24(0.91-1.70)	1.16(0.83-1.61)
Academy/university	0.50(0.36-0.69)***	0.57(0.39-0.82)**
Occupation		
Others	Reference	Reference
Formal employee	0.78(0.52-1.18)	1.02(0.67-1.55)
Non-formal employee	1.78(1.17-2.57)**	1.42(0.94-2.13)
Farmer	1.85(1.24-2.76)**	1.21(0.80-1.84)
Wealth index combined		
Low income	Reference	Reference
High income	0.53(0.48-0.58)***	0.68(0.61-0.77)***
Residence		
Urban	Reference	Reference
Rural	1.46(1.34-1.59)***	1.16(1.04-1.28)**
Province		
Jawa-Bali	Reference	Reference
Sumatra	1.15(1.03-1.29)*	1.06(0.93-1.20)
Kalimantan	0.68(0.57-0.81)***	0.59(0.49-0.71)***
Sulawesi	1.04(0.87-1.25)	0.96(0.79-1.16)
Eastern Indonesia	1.31(1.07-1.59)**	1.17(0.95-1.44)
Reading newspaper		
Not at all	Reference	Reference
Less than once a week	0.88(0.80-0.97)*	1.06(0.95-1.18)
At least once a week	0.60(0.53-0.68)***	1.00(0.86-1.16)
Internet use		
No	Reference	Reference ¹
Yes	0.72(0.66-0.79)***	1.05(0.93-1.19)

Note: COR = crude odds ratio; AOR = adjusted odds ratio; CI = confidence interval; Reference = reference category. Statistical significance was set at $p < 0.05$. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3 presents the results of binary logistic regression analysis examining factors associated with smoking behavior. The analysis was performed using crude odds ratio (COR) in Model 1 and adjusted odds ratio (AOR) in Model 2 after controlling for potential confounding variables. After adjustment, education level, wealth index, residence, and province remained significantly associated with smoking behavior. In contrast, age, occupation, newspaper reading, and internet use were not significantly associated in the final model. Respondents with junior high school education were more likely to engage in smoking behavior compared with those having elementary education or lower (AOR=1.57; 95% CI: 1.13–2.19). Meanwhile, respondents with academy or university education showed significantly lower odds of smoking behavior (AOR=0.57; 95% CI: 0.39–0.82). No significant association was identified among respondents with senior high school education after adjustment. Socioeconomic status also demonstrated a significant relationship with smoking behavior. Respondents classified in the high-income group had lower odds of smoking behavior compared with those in the low-income group (AOR=0.68; 95% CI: 0.61–0.77). Place of residence remained a significant determinant in the multivariate model. Respondents living in rural areas were more likely to report smoking behavior than those residing in urban areas (AOR=1.16; 95% CI: 1.04–1.28). Regional differences were also identified. Compared with respondents living in the Jawa–Bali region, those residing in Kalimantan had significantly lower odds of smoking behavior (AOR=0.59; 95% CI: 0.49–0.71). However, the associations observed in Sumatra, Sulawesi, and Eastern Indonesia were no longer statistically significant after adjustment.

Although occupation, newspaper reading frequency, and internet use showed significant associations in the crude analysis, these variables lost statistical significance in the adjusted model. Similarly, no significant association was observed between age group and smoking behavior after controlling for other covariates.

Discussion

This study found that 71.9% of Indonesian male respondents reported smoking behavior. Multivariable logistic regression analysis showed that respondents with junior high school education were more likely to smoke (AOR=1.57; 95% CI: 1.13–2.19), whereas those with academy or university education were less likely to smoke (AOR=0.57; 95% CI: 0.39–0.82). High-income respondents had lower odds of smoking than low-income respondents (AOR=0.68; 95% CI: 0.61–0.77), while rural residents were more likely to smoke than urban residents (AOR=1.16; 95% CI: 1.04–1.28). In addition, respondents residing in Kalimantan had significantly lower odds of smoking compared with those living in the Jawa–Bali region (AOR=0.59; 95% CI: 0.49–0.71). The findings indicate that tobacco use continues to be a major public health challenge among Indonesian men, particularly in socially and economically vulnerable populations. Smoking behavior among Indonesian males was strongly influenced by sociodemographic disparities, including educational attainment, economic status, and place of residence (1)(3)(11).

Education level was identified as one of the strongest determinants of smoking behavior in this study. Respondents with junior high school education had a greater likelihood of smoking, whereas those with academy or university education were less likely to smoke compared with respondents with elementary education or lower. Individuals with higher educational attainment generally possess better health literacy and greater awareness regarding the harmful effects of tobacco consumption. Higher education may also improve the ability to critically evaluate cigarette advertising and social influences related to smoking behavior. That lower educational attainment significantly increased the likelihood of smoking among Indonesian male adolescents. Lower education was consistently associated with cigarette and waterpipe smoking in Middle Eastern populations (5)(10).

The relationship between education and smoking behavior may be explained through differences in access to health information and preventive knowledge. Individuals with limited educational backgrounds are more likely to underestimate the long-term consequences of tobacco use and may experience stronger peer or environmental influences that normalize smoking. In contrast, respondents with higher education tend to demonstrate healthier lifestyle choices and greater engagement in disease prevention behaviors. Lower educational status remained an important predictor of tobacco use in low- and middle-income countries. Identified educational inequality as a major determinant of smoking prevalence in the Gambia (7)(11).

Socioeconomic status was another important factor associated with smoking behavior. Respondents classified in the high-income group had lower odds of smoking compared with those in the low-income category. Economic disadvantage may increase vulnerability to tobacco use due to chronic stress, occupational burden, and limited access to health promotion resources. In low-income populations, smoking is also frequently influenced by community norms where tobacco use is socially accepted among adult men. Wealth status was inversely associated with smoking behavior in Indonesia. Young males from poorer households were more likely to maintain smoking habits over time (3)(14)(15).

The findings also revealed that respondents living in rural areas were more likely to smoke than those residing in urban settings. Rural populations often experience lower exposure to health education programs and weaker implementation of tobacco control policies. In many rural communities, smoking remains culturally accepted and is commonly integrated into social interaction among males. Limited access to smoking cessation services in rural areas may further contribute to the persistence of smoking behavior. Substantial rural–urban disparities in tobacco use patterns. reported that rural residence significantly increased the likelihood of smoking persistence among Indonesian males (3)(6)(14).

Regional variation in smoking behavior was also observed in this study. Respondents living in Kalimantan demonstrated lower odds of smoking compared with those residing in the Jawa–Bali region. Differences in smoking prevalence across regions may reflect disparities in sociocultural norms, economic development, cigarette accessibility, and exposure to tobacco marketing. Jawa–Bali, as the most densely populated and economically developed region in Indonesia, has extensive cigarette distribution and higher exposure to tobacco advertising, which may contribute to increased smoking behavior. Similar regional disparities in smoking behavior have been identified in demographic health survey analyses conducted in Southeast Asia and other low- and middle-income countries. Both emphasized that geographic and contextual factors substantially influence tobacco use patterns across populations (15)(16)(17).

Although media exposure and internet use were significantly associated with smoking behavior

in the bivariate analysis, these variables were no longer significant after adjustment. This finding suggests that the influence of media exposure may be mediated by education, socioeconomic status, and environmental factors. Nevertheless, digital media and online platforms remain important channels that may shape smoking behavior, particularly among younger populations. Internet use and low newspaper exposure increased the likelihood of smoking among Indonesian male adolescents. Highlighted that demographic characteristics and media-related factors continue to influence smoking patterns in Indonesian society (5)(18).

The present study has several important implications for tobacco control programs in Indonesia. Public health interventions should prioritize males with lower educational attainment, low socioeconomic status, and those residing in rural communities. Strengthening health promotion activities, improving smoking cessation services, and increasing public awareness regarding smoking-related diseases are essential strategies to reduce tobacco consumption. In addition, stricter regulation of cigarette advertising and stronger implementation of smoke-free policies are needed to prevent the normalization of smoking behavior among Indonesian men.

This study has several strengths, including the use of nationally representative IDHS data and the application of sample weighting procedures to account for the complex survey design. However, several limitations should be acknowledged. The cross-sectional design limits causal interpretation between independent variables and smoking behavior. In addition, all variables were self-reported, which may introduce recall bias and reporting bias. The analysis was also restricted to variables available in the dataset, preventing assessment of psychological, cultural, and environmental determinants that may influence smoking behavior. Despite these limitations, the findings provide important evidence for developing targeted tobacco control interventions among male populations in Indonesia.

Conclusions and Recommendations

This study demonstrated that smoking behavior among Indonesian men was significantly associated with education level, wealth index, residence, and region. Junior high school education increased the likelihood of smoking (AOR=1.57; 95% CI: 1.13–2.19), whereas academy or university education reduced the likelihood (AOR=0.57; 95% CI: 0.39–0.82). High-income respondents were less likely to smoke than low-income respondents (AOR=0.68; 95% CI: 0.61–0.77), while rural residence increased the likelihood of smoking (AOR=1.16; 95% CI: 1.04–1.28). Respondents from Kalimantan also had lower odds of smoking compared with those from the Jawa–Bali region (AOR=0.59; 95% CI: 0.49–0.71).

Strengthening tobacco control interventions targeting males with lower education and low socioeconomic status is necessary, particularly in rural areas. Health promotion programs should focus on improving health literacy, increasing awareness regarding the harmful effects of smoking, and expanding access to smoking cessation services. In addition, stricter implementation of tobacco control policies, including regulation of tobacco advertising and public smoking restrictions, is recommended to reduce smoking prevalence among Indonesian men.

Ethical Considerations

The original Indonesian Demographic and Health Survey (IDHS) 2017 protocol was reviewed and approved by the ICF Institutional Review Board (IRB) and relevant national ethics authorities. This study used anonymized secondary data obtained from the Demographic and Health Surveys (DHS) Program with official permission. No personally identifiable information was available to the researchers. Therefore, additional ethical approval and informed consent were not required for this secondary data analysis.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

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References

1. Effendi DE, Ardani I, Handayani S, Agustiya RI, Nugroho AP, Oktirianto O, et al. Factors associated with quitting smoking among males: Findings from Indonesian national health survey. *Clin Epidemiol Glob Heal* [Internet]. 2024;28:101672. <https://doi.org/10.1016/j.cegh.2024.101672>
2. World Health Organization. World Health Organization. 2025 [cited 2026 May 21]. Tobacco kills up to half of its users who don't quit (1–3). Tobacco kills more than 7 million people each year, including an estimated 1.6 million non-smokers who are exposed to second-hand smoke (4). Around 80% of the world's 1.3 billion tobacco.
3. Widyaningsih V, Mashuri YA, Nugroho SD, Zaen NA, - S, Probandari A. Sociodemographic predictors for smoking persistence among young males in Indonesia: 10.55131/jphd/2022/200314. *J Public Heal Dev* [Internet]. 2022 Sep 9;20(3 SE-Original Articles):175–83. <https://doi.org/10.55131/jphd/2022/200314>
4. Deva HS, Efendi F, Aditya RS, Mckenna L, Asmoro CP, Alruwaili AS. Predictors Of Tobacco Smoking Initiation Among Indonesian Teenagers: The 2019 Global Youth Tobacco Survey. 2025;(May):1–22. <https://doi.org/10.12688/f1000research.147006.3>
5. Putri D, Astutik E, Machmud P, Dwi Tama T. Male adolescents' (Aged 15-24 years) smoking habit and its determinant: analysis of Indonesia demographic and health survey data, 2017. *Afr Health Sci* [Internet]. 2025 Jan 11;24:362–72. <https://doi.org/10.4314/ahs.v24i4.45>
6. Da Rosa P, Richter M. Rural–Urban Disparities in Perinatal Smoking in the United States: Trends and Determinants [Internet]. Vol. 22, *International Journal of Environmental Research and Public Health*. 2025. p. 895. <https://doi.org/10.3390/ijerph22060895>
7. Aboagye RG, Ahinkorah BO, Donkoh IE, Okyere J, Yaya S. A nonlinear decomposition analysis of the rural-urban disparities in tobacco use among women in sub-Saharan Africa. *PLoS One* [Internet]. 2025 Sep 9;20(9):e0331738. <https://doi.org/10.1371/journal.pone.0331738>
8. Shariful Islam M, AlWajeah H, Rabbani MG, Ferdous M, Mahfuza NS, Konka D, et al. Prevalence of and factors associated with tobacco smoking in the Gambia: a national cross-sectional study. *BMJ Open* [Internet]. 2022 Jun 1;12(6):e057607. <https://doi.org/10.1136/bmjopen-2021-057607>
9. Muhammad R, Nursani. The Role of Socioeconomic Determinants on Individual Decision to Quit Smoking: Evidence from Indonesia. *J Dev Econ* [Internet]. 2023 Dec 3;8:364–78. <https://doi.org/10.20473/jde.v8i2.41636>
10. Ramlan P, Syam S, Anas AS, Muhammadiyah U, Rappang S, Tadulako U. *Medicor : Journal of Health Informatics and Health Policy*. 2024;(4):259–73. <https://doi.org/10.61978/medicor.v2i4.749>
11. Asri Dion Kunto Adi; Priasmoro, Dian Pitaloka; Zakaria, Amin YP. HUBUNGAN PERILAKU MEROKOK DAN AKTIVITAS FISIK DENGAN TERJADINYA INFEKSI SALURAN PERNAFASAN ATAS (ISPA). *coba* [Internet]. 2024;(Vol 12 No 2 (2024): Mei 2024):198–205. Available from: <https://ejurnaladhkdr.com/index.php/jik/article/view/677/311>
12. Kheirallah KA, Shugaa Addin N, Alolimat MM. Trends of maternal waterpipe, cigarettes, and dual tobacco smoking in Jordan. A decade of lost opportunities. *PLoS One* [Internet]. 2021 Jul 9;16(7):e0253655. <https://doi.org/10.1371/journal.pone.0253655>
13. Shukla R, Kanaan M, Siddiqi K. Tobacco Use Among 1 310 716 Women of Reproductive age (15–49 Years) in 42 Low- and Middle-Income Countries: Secondary Data Analysis From the 2010–2016 Demographic and Health Surveys. *Nicotine Tob Res* [Internet]. 2021 Dec 1;23(12):2019–27. <https://doi.org/10.1093/ntr/ntab131>
14. Haryanto AN, Noer M, Kusumayati A, Machmud R, Hafizurrachman H, Bachtiar A. Determinant of Smoking Behavior among Elementary Student in Indonesia: A Structure Equation Model. *Open*

- Access Maced J Med Sci [Internet]. 2021 Aug 14;9(E SE-Public Health Disease Control):773–8. <https://doi.org/10.3889/oamjms.2021.5833>
15. Laksono A, Dwi Wulandari R, Razak R, Matahari R. Determinant of Smoking Behavior among Childbearing Age Women in Indonesia [Internet]. 2020. Available from: https://www.researchgate.net/publication/341508395_Determinant_of_Smoking_Behavior_among_Childbearing_Age_Women_in_Indonesia
 16. Wihatno Yuni; Kushayati, Nuris; Parahita, Doxana Putri EA. Urban-Rural Disparities in Smoking Prevalence, Consumption, and Indoor Smoking Habits Among Older Adults in Indonesia. Care J Ilm Ilmu Kesehat [Internet]. 2025;(Vol 13, No 1 (2025): EDITION MARCH 2025):30–41. <https://doi.org/10.33366/jc.v13i1.6704>
 17. Andriani H, Putri S, Kosasih RI, Kuo HW. Parental Smoking and Under-Five Child Mortality in Southeast Asia: Evidence from Demographic and Health Surveys. Int J Environ Res Public Health [Internet]. 2019 Nov;16(23). <https://doi.org/10.3390/ijerph16234756>
 18. Kress AC, Vashist A, Zhang QC, Dragicevic A, Njie GJ. Tobacco use among adults with disabilities in nine countries–Demographic and Health Survey, 2016–2021. PLOS Glob Public Heal [Internet]. 2024 Jun 17;4(6):e0003232. <https://doi.org/10.1371/journal.pgph.0003232>
 19. Pei D, Popova L, Chowdhury P, Shi J, Njie G. Exposure to anti- and pro-smoking messages among adults in China: Results from the Global Adult Tobacco Survey, 2018. PLoS One [Internet]. 2024 Jun 13;19. <https://doi.org/10.1371/journal.pone.0304028>
 20. Rahayu H, Rachmah A. Smoking Behavior In Indonesian Society. J Soc Res [Internet]. 2025 Sep 3;4:2455–62. <https://doi.org/10.55324/josr.v4i9.2754>