RESEARCH ARTICLE

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# Evaluating the Impact of Smoke-Free Policies in Jambi, Indonesia: A Mixed-Methods Approach

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## Abstract

**Objective:** This study evaluates the effectiveness of this policy and identifies socio-demographic factors influencing its acceptance and implementation. **Methods:** A convergent parallel design mixed-methods approach was employed, combining quantitative surveys and qualitative interviews. The study was conducted from January to March 2023. A total of 249 respondents including 9 policymakers and 240 public participants namely visitors to public places, workplaces, places of worship, children's play places, places of teaching and learning processes, health facilities and sports facilities. respondents were selected through purposive and accidental sampling. Quantitative data were analyzed using Mann-Whitney test and Spearman test is used in this study. Qualitative data coded and thematically analyzed. **Result:** The study revealed a low awareness of the smoke-free policy, with over 77.9% of respondents unaware of its existence. Despite this, more than 85% supported no-smoking signs and endorsed the policy. Education level emerged as a significant predictor of positive attitudes toward the policy ($r = 0.239$, $p = 0.000$). However, challenges in policy implementation, such as inadequate socialization, limited supervision, and budget constraints, were identified. **Conclusion:** Implementation of the smoke-free area policy has not been effective. This was in accordance with the findings that there was low public awareness and education level as a predictor of positive attitudes toward the policy. The findings highlight the need for improved public health communication and enforcement strategies to enhance the effectiveness of smoke-free policies in Jambi.

**Keywords:** Smoke-Free Policy- Socio-Demographic Factors- Indonesia

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## Introduction

Smoking is a primary global health concern, leading to significant mortality and morbidity. The World Health Organization (WHO) estimates that tobacco use causes over eight million deaths annually, with a substantial burden in low- and middle-income countries. In Indonesia, as middle-income countries, smoking remains prevalent, particularly among youth and adults. Smoking prevalence in Indonesia is a major public health issue, as numerous studies have pointed to the concerning statistics related to smoking in the country. Indonesia is one of the leading nations worldwide in terms of smoker numbers, with about 40.3% of the population reportedly smoking [1]. It's alarming that around 16.4 million new young smokers between the ages of 10 and 19 emerge in Indonesia each year, which translates to 45,000 new child smokers every day [2]. Although the prevalence of daily smokers slightly decreased, smoking-related health issues like cancer and cardiovascular diseases remain widespread.

In Jambi Province, one of province in Indonesia, with daily smokers increasing from 18.75% in 2015 to 21.54% in 2019. When Jambi is viewed from the percentage of the population aged 15 years and over who smoked in the last month, it shows that smokers aged 35-44 years dominate in behaviour. Smoking compared to other age groups (33.20). Meanwhile, the ages of 15-24 years (20.40), 25-34 years (32.90), 45-54 years (29.60), 55-64 years (27.90), and 65+ were 20.60 [3].

The Jambi government implemented regional regulation No. 03 in 2017, establishing smoke-free zones to curb smoking and protect the public from secondhand smoke. Despite evidence supporting the effectiveness of smoke-free policies in reducing smoking rates and improving public health, challenges in enforcement and compliance persist, particularly in high-prevalence areas like Jambi [4].

The current literature underscores the effectiveness of smoke-free policies in reducing smoking and protecting non-smokers from secondhand exposure [5, 6]. However, the successful implementation of these policies often faces obstacles, including non-compliance and influence from

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tobacco advertising. In Indonesia, while local smoke-free policies have shown some success in reducing smoking intensity among adults, comprehensive evaluations in regions with high smoking rates, such as Jambi, are limited.

This study addresses the high prevalence of smoking in Jambi Province by evaluating the effectiveness of the smoke-free policy since 2017. It seeks to identify socio-demographic factors associated with favorable attitudes toward these policies and assess their implementation and effectiveness. The research employs a mixed-methods approach, combining quantitative data analysis with qualitative insights from stakeholders and the community to comprehensively evaluate the policy's impact.

Existing literature consistently demonstrates the positive impact of smoke-free policies on reducing smoking prevalence [7]. In addition, Stronger smoke-free air laws were linked to lower rates of smoking and fewer annual new instances of lung cancer in those counties [8]. However, gaps still need to be in understanding local factors influencing policy effectiveness, particularly in high-prevalence regions with diverse socio-demographic characteristics. This study aims to determine what socio-demographic factors are correlated with Smoke-Free Policy Attitudes and fill the gap by providing a nuanced evaluation of Jambi's smoke-free policy, offering actionable recommendations to enhance its implementation. The novelty of this research lies in its mixed-methods approach, integrating quantitative and qualitative data to deliver a holistic understanding of the policy's impact and the socio-demographic factors influencing its success.

## Materials and Methods

*Study Design, Setting, and Population*

This study used a convergent parallel design mixed-methods approach, combining quantitative surveys with qualitative interviews to assess the impact of Jambi Province's smoke-free policy and the factors influencing its implementation and acceptance. The study focused on areas designated as smoke-free zones under Jambi Regional Regulation No. 03 of 2017, including public places, workplaces, places of worship, children's play areas, educational institutions, health facilities, and sports facilities.

Participants, including policymakers and the general public, were recruited from January to March 2023. Policymakers were purposively selected from relevant agencies, such as the Mayor's Legal Agency, Development Planning Agency at Sub-National Level, Health Office, Education Office, Transportation Service, Environmental Services Office, Municipal Police Unit, and Jambi City Health Forum. Public participants were selected through accidental sampling from the specified smoke-free areas.

*Variables, Data Source, and Study Size*

Key variables included socio-demographic characteristics (age, sex, education level, occupation), knowledge of the smoke-free regulation, attitudes towards no-smoking signs, and attitudes towards the smoke-free policy. Data were collected via structured questionnaires for quantitative data and in-depth interviews for qualitative insights.

The study included 249 respondents, 9 policymakers, and 240 public participants, ensuring statistical power for quantitative analyses and comprehensive qualitative insights. Participants represented diverse experiences from various smoke-free zones, with 30 respondents sampled from each type of area. Informed consent was obtained from all participants, and confidentiality was maintained.

*Statistical Analysis*

Quantitative data were analyzed using R software with descriptive and inferential statistics. Descriptive statistics aim to summarize and describe the characteristics of a dataset [9, 10], while inferential statistics are used to make predictions or generalizations about a population based on sample data [11, 12]. Descriptive statistics summarized socio-demographic characteristics and attitudes through frequency and crosstabulation analysis. Given the categorical nature of the data, normality testing was not applied. The Mann-Whitney test was used to compare differences between two independent groups [13–15], and the Spearman test assessed the strength and direction of associations between categorical variables [16, 17]. Qualitative data from interviews were analyzed using NVivo 12 software, applying coding and thematic analysis to extract critical insights related to policy implementation.

*Data Integration*

A sequential explanatory design was employed, where quantitative findings contextualized and elaborated on qualitative results. This mixed-methods approach provided a comprehensive evaluation of the smoke-free policy's effectiveness in Jambi Province. The Mixed method offers valuable insights for policymakers and public health officials by integrating quantitative impact with qualitative experiences of policy implementation [18, 19].

## Results

*Descriptive Statistics*

Table 1 provides essential insights into the socio-demographic characteristics and attitudes of respondents toward the smoke-free policy in Jambi Province, highlighting key factors that may influence policy acceptance and implementation. The demographic profile reveals a younger population, with 38.0% of males and 50.0% of females aged 17-25. Education levels are predominantly intermediate, with the majority having completed senior high school (57.0% of males and 58.5% of females) and a small proportion holding postgraduate degrees.

A notable sex disparity exists in employment status, with 48.8% of females being unemployed compared to 25.9% of males, which may reflect broader socio-economic trends impacting public health outreach. Males are more commonly self-employed (27.2%) than females (22.0%), indicating different economic roles. Despite low knowledge of the smoke-free policy (77.9% of males and 81.7% of females were unknowledge), over 85% of both

Table 1. Characteristics of Respondents

| Variables | Male (n=158) | Female (n=82) | p-value |
|---|---|---|---|
| Age | | | |
| 17-25 | 60 (38.0 %) | 41 (50.0 %) | 0.101 |
| 26-35 | 33 (20.9 %) | 13 (15.9 %) | |
| 36-45 | 24 (15.2 %) | 11 (13.4 %) | |
| 46-45 | 27 (17.1 %) | 13 (15.9 %) | |
| 56-65 | 14 (8.8 %) | 4 (4.8 %) | |
| Education | | | |
| Not in school | 1 (0.6 %) | 0 (0.0 %) | 0.181 |
| Elementary school | 4 (2.5 %) | 1 (1.2 %) | |
| Junior secondary school | 16 (10.1 %) | 4 (4.9 %) | |
| Senior high school | 90 (57.0 %) | 48 (58.5 %) | |
| Diploma or undergraduate | 41 (26.0 %) | 27 (32.9 %) | |
| Postgraduate | 6 (3.8 %) | 2 (2.5 %) | |
| Occupation | | | |
| Not Employed | 41 (25.9 %) | 40 (48.8 %) | 0.001* |
| Self-employed | 43 (27.2 %) | 18 (22.0 %) | |
| State civil apparatus | 24 (15.2 %) | 9 (11.0 %) | |
| Online Driver | 9 (5.7 %) | 1 (1.2 %) | |
| Outsourcing | 11 (7.0 %) | 1 (1.2 %) | |
| Retired | 2 (1.3 %) | 1 (1.2 %) | |
| Housewife | 0 (0.0 %) | 2 (2.4 %) | |
| Employees of state-owned enterprises | 9 (5.7 %) | 3 (3.7 %) | |
| Laborer | 8 (5.0 %) | 0 (0.0 %) | |
| Others | 11 (7.0 %) | 7 (8.5 %) | |
| Knowing the existence of a Regional Regulation on the Smoke-Free Policy | | | |
| Not knowing | 123 (77.9 %) | 67 (81.7 %) | 0.577 |
| Knowing but do not understand | 34 (21.5 %) | 12 (14.6 %) | |
| Knowing and understanding | 1 (0.6 %) | 3 (3.7 %) | |
| Attitude on the presence of no smoking signs in public places | | | |
| Not in favor | 11 (7.0 %) | 5 (6.1 %) | 0.533 |
| Favor | 135 (85.4 %) | 74 (90.2 %) | |
| Neutral | 12 (7.6 %) | 3 (3.7 %) | |
| Attitude to Smoke-Free Policy | | | |
| Not in favor | 10 (6.3 %) | 3 (3.7 %) | 0.186 |
| Favor | 140 (88.6 %) | 77 (93.9 %) | |
| Neutral | 8 (5.1 %) | 2 (2.4 %) | |

*Significance at alpha 5%

sexes support no-smoking signs and endorse the policy, suggesting a strong inclination toward anti-smoking measures despite limited knowledge.

Based on the characteristics of respondents, only the respondent's occupation variable is different between respondents based on sex (p=0.001), whereas other variables such as age, education, knowledge of the smoke-free regulation, attitudes towards no-smoking signs, and attitudes towards the smoke-free policy.

The similarity in age and education levels between sexes suggests that public health campaigns targeting these demographics could be broadly effective. However, the higher unemployment rate among females may limit their exposure to health messaging, especially if campaigns are predominantly workplace-based. This disparity underscores the need for targeted communication strategies that reach unemployed populations, particularly women [20].

The findings indicate a critical gap in the communication of smoke-free regulations despite widespread support for the policy itself. Public health authorities should enhance their dissemination efforts, primarily through media accessible to unemployed females. Addressing the socio-economic realities of different demographic groups could improve the effectiveness of smoke-free initiatives, leveraging the existing solid support for these

policies [21].

The data reveals a clear correlation between respondents' knowledge of the regional smoke-free policy, their attitudes towards no-smoking signs, and overall policy support. As knowledge and positive attitudes increase, so does support for the policy. Even among those who know but do not fully understand the policy, support remains high, becoming nearly unanimous among those with complete understanding. Additionally, respondents who favor no-smoking signs are more likely to support the smoke-free policy, indicating that public health campaigns focusing on visible measures like signage can enhance broader policy endorsement [22]. Conversely, opposition to no-smoking signs correlates with lower policy support, though this is a minority view.

Table 2 highlights the relationships between socio-demographic factors and attitudes toward the smoke-free policy. Education emerges as the most significant factor, with a moderate positive correlation ($r = 0.239$, $p = 0.000$), indicating that higher educational attainment is associated with more significant support for smoke-free policies [23, 24], likely due to increased awareness of smoking risks [25, 26]. Sex and age show very weak correlations with policy attitudes ($r = 0.086$ and -0.094, respectively), and non-significant p-values (0.186 for sex and 0.148 for age) suggest these factors are neutral in determining policy support. Occupation shows a weak negative correlation ($r = -0.120$, $p = 0.063$), approaching statistical significance, indicating that certain occupational groups may be less supportive of smoke-free policies, potentially due to workplace culture, economic interests, or varying exposure to health information [27, 28].

Table 2. Correlation between Socio-Demography and Attitude to Smoke-Free Policy

| Variables | r-correlation | p-value |
|---|---|---|
| Sex | 0.086 | 0.186 |
| Age | -0.094 | 0.148 |
| Education | 0.239 | 0.000 |
| Occupation | -0.120 | 0.063 |

Figure 1's visual correlation matrix corroborates the numerical data in Table 2, clearly illustrating the relationships between socio-demographic factors and attitudes toward the smoke-free policy. This visual tool effectively enhances understanding by making the strength and direction of these relationships immediately clear.

*Qualitative Result*

*Theme 1: Program Aspects for Implementation of smoke-free policy*

*a. Socialization*

The implementation of regional smoke-free regulations hinges on adequate socialization by the leading sector. After ratification, socialization efforts included meetings from Urban Village to sub-district levels and TV media outreach. However, interviews revealed gaps, with some community members still unaware of the regulation. Additionally, challenges arose during implementation, including insufficient socialization of regulation to agency heads, particularly following leadership changes. Informant JF said *"So far, there hasn't been one yet, we're really destroyed, our program is really, well. So now the focus is for this head office, such as detecting the disease, it seems that it's rare in the case reports, isn't it, are they healthy or not, they don't come, do they get treatment, right? So, we're focusing now on hypertension, comorbid disease, right, going into there is also shortness of breath, right, but that's the reality, we really can't, we can't do much for this family now".*

*b. Monitoring*

A key issue identified is the absence of a supervisory team involving stakeholders, leading to suboptimal monitoring. Supervision occurs only upon orders from the leading sector, resulting in insufficient oversight, as public feedback indicates. Currently, supervision covers only 2 out of 8 designated areas, with 6 locations yet to be addressed. Additionally, measuring cigarette butts as an indicator of the smoke-free policy's effectiveness remains challenging. Informan JP said *"...it wasn't perfect at the time of implementing the smoke-free area, we didn't have*

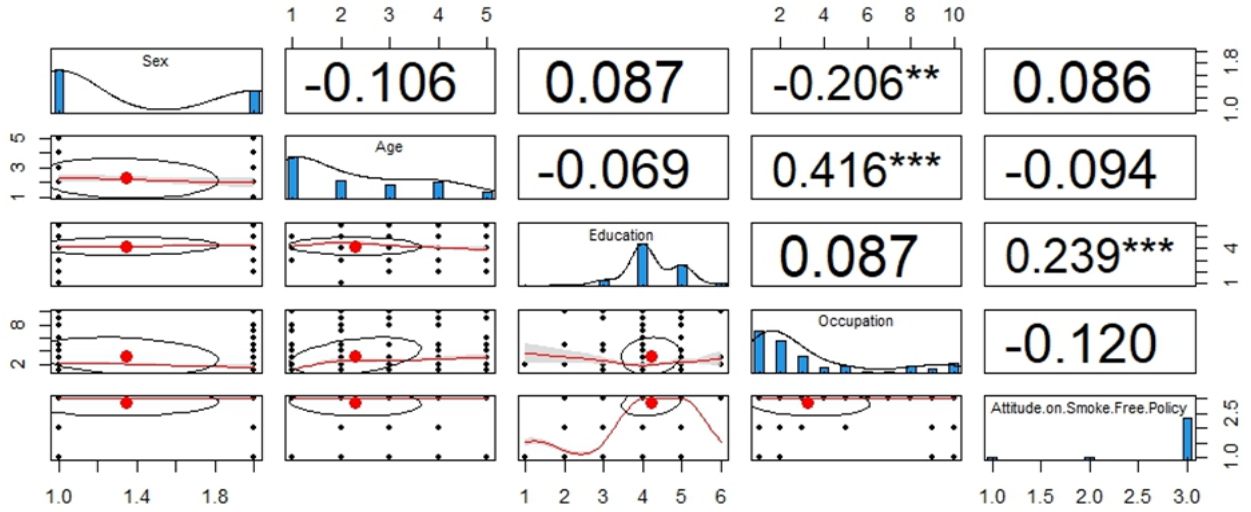


Figure 1. Visual Correlation Matrix: Socio-Demographics and Smoke-Free Policy Attitudes

*time to form a team, which involved stakeholders."*

*c. Budgeting*

Implementation challenges stem from budget constraints and the reallocation of tobacco excise funds to other health programs. The COVID-19 pandemic further disrupted monitoring efforts as resources were redirected to the pandemic response, leading to suboptimal implementation of the smoke-free policy. Informant Ei said *"and the budget, too, has begun to decrease, now the non-communicable disease budget has moved to health promotion, now... it seems that part of it has been taken over by the health promotion program, maybe that's how it is, so the non-communicable disease no longer discusses it in the field..."*

*Theme 2: Stakeholder Aspects for Implementation of smoke-free policy*

Interviews and observations indicate that the implementation of regulation in Jambi City remains suboptimal. Issues arise from three aspects: stakeholders, the community, and the program itself. Critical problems include a lack of stakeholder commitment and inconsistent enforcement. While some offices have designated smoking areas and posted smoking bans, others still provide ashtrays, with cigarette smoke detectable indoors. Informant Ei said *"At that time, we only said that because the local regulation was just finished, right, so...just internal commitments, in every relevant office like that, if something goes wrong, it's still internal, not until we make one commitment, we sign it. all hands, nothing until now, because it is still in the socialization stage."*

*Theme 3: Society Aspects for Implementation of smoke-free policy*

Many people are unaware of the regulation, as the information has not been thoroughly disseminated across all communities. Despite the regulation being in place, violations remain common, and the public is largely unaware that the regulation includes sanctions. The results indicate that most people are unfamiliar with Jambi Regional Regulation No. 3 of 2017. Informant 60 said *"Many of the people who do not know this regulation may be due to a lack of socialization from the government so that they carelessly spread cigarette smoke, for example, many young people today smoke in public places."*

## Discussion

This study found a significant gap in public knowledge especially unaware of the policy. However, there is strong support for smoke-free policies, as evidenced by high favorability towards no-smoking signs. Notable socio-demographic patterns, such as higher female unemployment, may impact exposure to public health campaigns [20, 29].

The paradox of strong support despite low knowledge reflect a general recognition of smoking harms rather than knowledge of specific regulations. This aligns with studies emphasizing education's role in shaping health attitudes [30, 31]. The findings suggest a disconnect between policy knowledge and behavior, challenging traditional assumptions about the need for knowledge as a prerequisite for behavior change [32].

These results, while specific to Jambi, may be generalizable to similar regions with high smoking prevalence and diverse demographics. However, unique socio-cultural factors in Jambi may limit broader applicability. Future study should explore barriers to policy knowledge and consider socio-demographic factors in designing effective smoke-free policies.

The study's findings have several implications. Theoretically, they challenge existing health behavior change models by highlighting the gap between knowledge and support. For future research, the study suggests investigating the long-term effects of smoke-free policies and exploring targeted public health campaigns. Practically, the findings underscore the need for refined public health communication strategies to enhance policy knowledge [33, 34], particularly among low-knowledge groups like unemployed females [35, 36].

From a policy perspective, the study indicates the need for revised enforcement and communication strategies to improve the dissemination and effectiveness of smoke-free regulations [37]. Increasing funding for public health campaigns [38, 39] and enhancing the visibility of smoke-free zones could be critical steps [40, 41]. The study's limitations include a sample size that may not fully represent Jambi's diverse population and potential confounding variables, such as cultural factors, that could have influenced results. Future studies should address these limitations with longitudinal designs and more comprehensive measures.

In conclusion, this study highlights the critical need for improved public health communication in Jambi Province. The strong public support for smoke-free policies presents an opportunity for policymakers to build on existing sentiments by addressing gaps in communication and enforcement. The originality of this study lies in its mixed-methods approach, providing a comprehensive understanding of the policy's impact and its socio-demographic influences consistent with the study's objectives.

## Author Contribution Statement

Conceptualization: Reskiaddin L.O., Sasmita N., Ahsan A.,.R. Data curation: Reskiaddin L.O, Putri F.E.,. Formal analysis: Fitri, A., Hubaybah., Putri F.E. Methodology: Sasmita N.R., Reskiaddin L.O Writing – original draft: Sasmita N.R., Writing – review & editing: Reskiaddin L.O., Sasmita N.R. Ahsan A

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*Ethical Considerations*

The study was approved by the University of Fort De Kock Bukittinggi Ethics Committee (No. 1011/KEPK/VII/2021).

*Conflict of Interest*

The author declare that there are no conflicts of interest.

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