

Visual communication for smoke-free homes: A community-based health promotion intervention in rural Indonesia

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ABSTRACT

Although tobacco-control interventions in Indonesia have largely emphasized public smoke-free areas, limited evidence exists on participatory visual communication strategies for reducing cigarette smoke exposure within rural households. This community service program aimed to improve community awareness and encourage the implementation of smoke-free homes through the installation of "Smoke-Free Home" stickers in Kasimburang Village. The program employed a Participatory Action Research approach with a *pre-post test without control intervention* design, involving initial screening, health education, sticker installation, interviews, and field observations. Respondents' knowledge increased from a mean score of 9.12 at pre-test to 9.62 at post-test I and 9.81 at post-test II, accompanied by decreasing score variability. Among 26 respondents, reported indoor smoking declined from 88.5% before counseling to 53.8% afterward, while 73.1% reported implementing household no-smoking rules. Field evaluation of 58 households showed that 81.0% of stickers remained installed and 77.6% remained intact and readable. These findings indicate that combining health education with visible household reminders may strengthen awareness, behavioral commitment, and smoke-free home practices. This low-cost, community-based intervention has potential to support protection from secondhand smoke and contribute to the prevention of tobacco-related non-communicable diseases in rural communities.

ABSTRAK

Meskipun intervensi pengendalian tembakau di Indonesia sebagian besar berfokus pada penerapan kawasan tanpa rokok di ruang publik, bukti mengenai strategi komunikasi visual partisipatif untuk mengurangi paparan asap rokok di rumah tangga perdesaan masih terbatas. Program pengabdian masyarakat ini bertujuan meningkatkan kesadaran masyarakat dan mendorong penerapan rumah bebas asap rokok melalui pemasangan stiker "Rumah Bebas Asap Rokok" di Desa Kasimburang. Program menggunakan pendekatan Participatory Action Research dengan desain *pre-post test without control intervention*, yang meliputi skrining awal, edukasi kesehatan, pemasangan stiker, wawancara, dan observasi lapangan. Rerata skor pengetahuan meningkat dari 9,12 pada pre-test menjadi 9,62 pada post-test I dan 9,81 pada post-test II, disertai penurunan variasi skor. Dari 26 responden, perilaku merokok di dalam rumah menurun dari 88,5% sebelum penyuluhan menjadi 53,8% setelah intervensi, sedangkan 73,1% telah menerapkan aturan tidak merokok di rumah. Evaluasi terhadap 58 rumah menunjukkan bahwa 81,0% stiker masih terpasang dan 77,6% tetap utuh serta terbaca. Temuan ini menunjukkan bahwa kombinasi edukasi kesehatan dan pengingat visual dapat memperkuat kesadaran, komitmen perilaku, dan praktik rumah bebas asap rokok serta mendukung pencegahan penyakit tidak menular akibat tembakau.

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INTRODUCTION

Smoking remains a major public health problem in Indonesia and contributes substantially to the increasing burden of non-communicable diseases (World Health Organization [WHO], 2023). Indonesia has one of the largest populations of smokers globally, with tobacco use remaining persistently high in national health surveys (Kementerian Kesehatan, 2022). An estimated 60.8 million adult men and 3.7 million adult women smoke, while tobacco use among adolescents has continued to increase (WHO, 2020). Beyond its direct effects on active smokers, smoking creates substantial health risks for individuals exposed to secondhand smoke (Delcroix-Gomez et al., 2022). Tobacco smoke contains thousands of harmful substances associated with cardiovascular disease, stroke, lung cancer, respiratory disorders, and other chronic conditions (Gallucci et al., 2020; Kopa-Stojak & Pawliczak, 2024). Although approximately 71% of the global population is protected by at least one WHO-recommended tobacco-control measure, tobacco-related morbidity remains a substantial and largely preventable public health burden (WHO, 2023).

The household is an important setting for secondhand smoke exposure because smoking inside the home directly affects non-smoking family members, particularly children, pregnant women, and older adults (Asfaw et al., 2024). Children living with smokers have increased risks of respiratory infections, asthma, impaired lung development, and poorer general health (Uthayakumar et al., 2023). Household exposure may also normalize smoking and contribute to smoking initiation among adolescents (Cheah et al., 2024). A systematic review of smoke-free-home interventions emphasized that private residences are generally beyond the scope of legislation regulating smoking in public indoor spaces, leaving household members vulnerable to prolonged secondhand smoke exposure (Nawawi et al., 2025). Consequently, household-focused interventions represent an important complement to population-level tobacco-control policies.

Tobacco-control strategies in Indonesia have primarily emphasized smoke-free regulations in public facilities, workplaces, educational institutions, transportation, and healthcare settings. More than 90% of Indonesian districts and municipalities have adopted regulations concerning smoke-free areas; nevertheless, the 2021 Global Adult Tobacco Survey showed continued exposure to secondhand smoke in restaurants (74.2%), workplaces (44.8%), government buildings (41.4%), public transportation (40.5%), and healthcare facilities (14.2%) (Kementerian Kesehatan, 2022). Although such policies are essential, they provide limited protection within private homes, where children, pregnant women, and older adults may spend substantial periods of time (Silvia et al., 2025; WHO, 2023). Establishing smoke-free homes therefore requires complementary family- and community-based promotive and preventive strategies capable of increasing awareness, strengthening household commitment, and encouraging voluntary behavioral change.

Visual communication represents a potentially effective health-promotion strategy because health messages can be communicated rapidly and repeatedly through symbols, colors, illustrations, and concise written information. Repeated visual exposure can reinforce awareness and influence everyday health behavior, while accessible visual materials can reach populations across different age groups and educational levels (Hasanica et al., 2020; Tan et al., 2023). Behavioral science similarly demonstrates that environmental cues, signage, and reminders can function as behavioral “nudges” by directing individuals toward healthier choices without eliminating personal autonomy (Jaber et al., 2025). Pictorial and text-based smoking warnings displayed within immediate environments may also influence smoking-related attitudes and intentions through repeated exposure (Sidhu et al., 2022).

Community-based evidence in Indonesia indicates that poster-supported health education can improve public awareness and household clean and healthy living practices (Nifami et al., 2023). In the context of tobacco control, a “Smoke-Free Home” sticker can operate simultaneously as an educational medium, a continuous reminder, and a visible expression of household commitment. Publicly displayed symbols may reinforce social expectations regarding acceptable behavior and strengthen collective norms (Constantino et al., 2022). Evidence from Indonesia and Malaysia further suggests that interventions engaging households collectively, rather than focusing exclusively on individual smokers, may be more acceptable to communities and more supportive of sustained

smoke-free behavior (O'Donnell et al., 2025). Visible smoke-free-home commitments may therefore contribute to social control and the development of community norms that discourage indoor smoking (Nurhijianti Akib et al., 2026).

Despite increasing evidence supporting smoke-free environments and health communication interventions, relatively limited attention has been given to simple, household-level visual communication strategies implemented through participatory community processes. This gap is particularly relevant in Kasimburang Village, where initial screening identified that 26.8% of community members still smoked inside their homes. Such behavior indicates persistent domestic secondhand smoke exposure and demonstrates the need for interventions closely integrated into everyday household settings. Continuous visual reminders may complement health education by maintaining the salience of smoke-free messages after educational activities have ended (Nitami et al., 2023). Furthermore, participatory approaches may strengthen community ownership because residents are actively involved in identifying problems, implementing solutions, and evaluating behavioral change.

Accordingly, this community service program introduced the installation of "Smoke-Free Home" stickers as a visual communication intervention within a Participatory Action Research framework involving community participation during planning, implementation, and evaluation. The novelty of the program lies in combining initial screening, health education, household-level visual cues, and participatory evaluation to promote voluntary smoke-free-home practices rather than relying solely on regulatory approaches. Using a pre-post intervention design without a control group, the program assessed changes in community knowledge alongside field observations and interviews concerning household smoking practices. The program aimed to improve community awareness and encourage the adoption of smoke-free homes, thereby reducing secondhand smoke exposure, protecting vulnerable household members, and supporting community-level prevention of tobacco-related non-communicable diseases (WHO, 2026).

METHODS

This community service program was conducted in Kasimburang Village in 2026 as a community-based health promotion intervention aimed at increasing awareness of the health risks associated with cigarette smoke exposure within the household. The program employed a Participatory Action Research (PAR) approach combined with a *pre-post test without control intervention* design. PAR emphasizes active participation and leadership of community members experiencing the health problem, allowing them to collaborate in identifying problems, implementing actions, evaluating outcomes, and generating locally relevant solutions (van der Vlegel-Brouwer, Eelderink, & Bussemaker, 2023). This approach is particularly appropriate for community-based health promotion because iterative engagement with village stakeholders can strengthen community ownership and facilitate the implementation and sustainability of preventive interventions (Gadsden et al., 2025). Similar participatory approaches have also demonstrated potential for strengthening community engagement in tobacco-control programs in rural Indonesian settings (Trisnowati, Ahsan, & Kramer, 2024).

The target population consisted of residents of Kasimburang Village, particularly households in which smoking behavior and potential exposure to secondhand smoke occurred. Participants were recruited using a non-probability, voluntary community-based sampling approach. Individuals were eligible to participate if they were residents of Kasimburang Village, were adults or household representatives capable of participating in educational and evaluation activities, were willing to receive the intervention, and provided consent to participate. Households willing to support the smoke-free home initiative were invited to have the "Smoke-Free Home" sticker installed at their residence. Twenty-six respondents participated in the interview-based assessment of attitudes and smoking behavior, while field evaluation of sticker retention and condition covered 58 participating households.

The intervention was implemented through several sequential and participatory stages. The first stage consisted of problem identification and initial screening to determine the extent of smoking behavior within households and identify community needs related to protection from secondhand

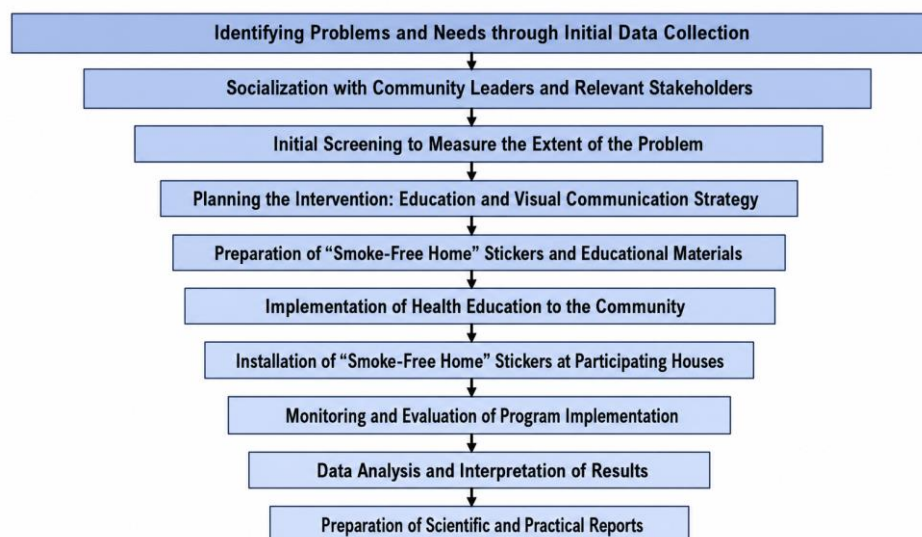
smoke. The second stage involved preparation of visual communication media in the form of “Smoke-Free Home” stickers containing concise, promotive, and persuasive messages. The third stage consisted of health education regarding the adverse effects of active smoking and secondhand smoke exposure, with particular emphasis on children, older adults, and other vulnerable household members (Uthayakumar et al., 2023). Following education, stickers were installed in visible locations at the front of participating households as continuous environmental reminders and symbols of household commitment to maintaining a smoke-free environment.

Program evaluation incorporated quantitative and qualitative assessment. Respondents' knowledge was measured repeatedly through *pre-test*, *post-test I*, and *post-test II* assessments to determine changes following the educational and visual communication intervention. Direct interviews were subsequently conducted to explore respondents' understanding, acceptance, willingness to avoid smoking inside the home, implementation of household smoking restrictions, and perceived behavioral changes. A follow-up field observation was also conducted using a structured checklist to assess whether the stickers remained attached to participating houses and whether they were intact, readable, blurred, damaged, removed, or lost.

Data were analyzed using univariate and bivariate approaches. Univariate analysis was used to summarize respondent characteristics, knowledge scores, attitudes, reported indoor smoking behavior, implementation of household no-smoking rules, and sticker retention. Numerical data were presented using minimum, maximum, mean, median, and standard deviation, while categorical variables were summarized using frequencies and percentages. Changes in respondents' repeated knowledge measurements were assessed using the Friedman test, a non-parametric procedure appropriate for comparing three or more related measurements when data are ordinal or do not satisfy assumptions required for repeated-measures parametric analysis (Sheldon, Fillyaw, & Thompson, 1996; Technology Networks, 2024). Statistical findings were complemented by descriptive interpretation of interview and observation results.

All results were presented in tables, figures, and narrative descriptions to illustrate changes following the intervention and the sustainability of the visual communication media. Program activities were documented throughout the planning, implementation, and evaluation stages for scientific reporting and community service publication. Before participation, community members received information regarding the objectives, procedures, voluntary nature of participation, and confidentiality of collected information. Participation in interviews, assessments, and household sticker installation was undertaken after informed consent was obtained. The overall implementation process, including problem identification, education, sticker installation, and evaluation, is showed in Figure 1.

Figure 1
The process of implementing activities



RESULTS AND DISCUSSION

The findings indicate that the visual communication intervention combining health education with the installation of "Smoke-Free Home" stickers was associated with improved knowledge, more favorable attitudes toward smoke-free homes, reductions in reported indoor smoking, and sustained visibility of the intervention media. Overall, these findings suggest that the program achieved its primary objective of increasing community awareness and encouraging the implementation of household-level smoke-free practices. The results also provide evidence that a simple visual reminder positioned within the community environment may complement interpersonal health education by continuously reinforcing messages regarding protection from secondhand smoke.

Figure 2
Smoke-Free House stickers and respondent interview activities



Changes in Knowledge Following the Intervention

Evaluation was conducted through direct interviews following health education and the installation of the "Smoke-Free Home" stickers (see Figure 2). The interviews assessed respondents' understanding, acceptance, and responses to the visual communication intervention. Most respondents reported that the counseling sessions and sticker media increased their awareness of the health risks associated with cigarette smoke exposure inside the home. Respondents also perceived the sticker displayed at the front of the house as a practical visual reminder for household members and visitors not to smoke indoors (Dima et al., 2026). Documentation of the interview-based evaluation process is presented in Figure 2.

Table 1
Results of the descriptive test on changes in respondents' knowledge

Knowledge Score	Min	Max	Mean	Median	Std. Deviation
Pre-Test	4	10	9.12	9	1.306
Post-Test I	8	10	9.62	10	0.637
Post-Test II	9	10	9.81	10	0.402
Follow-up test	11	19	15.824	16	2.1574

The quantitative evaluation demonstrated a progressive improvement in respondents' knowledge scores after the intervention. As presented in Table 1, the mean knowledge score increased from 9.12 at pre-test to 9.62 at post-test I and further increased to 9.81 at post-test II. The median score similarly increased from 9.00 at baseline to 10.00 at both post-intervention measurements. At the same time, the standard deviation declined from 1.306 at pre-test to 0.637 at post-test I and 0.402 at post-test II. This pattern indicates not only higher average knowledge but also

a more homogeneous distribution of knowledge among respondents following the intervention (Datanovia, 2023). The reduction in score variability suggests that participants with initially lower levels of understanding may have benefited from the educational activities, resulting in a more consistent level of knowledge across the group.

These findings are consistent with previous community-based health promotion activities demonstrating that structured education can improve public knowledge regarding tobacco-related health risks. In North Konawe Regency, Akib et al. (2026) reported an increase in the proportion of respondents categorized as having good knowledge about the dangers of smoking from 60% before counseling to 95% after the intervention. Similarly, visual health-promotion materials have been reported to facilitate comprehension and retention because they communicate information through concise and repeatedly observable messages (Hasanica et al., 2020). The current intervention extends these findings by combining face-to-face counseling with an environmental visual cue placed directly at the household level. Rather than limiting message exposure to the education session itself, the sticker remained visible after counseling and therefore had the potential to repeatedly reinforce the message in respondents' daily environment.

An additional follow-up value is presented in Table 1 with a mean of 15.824, median of 16.000, and standard deviation of 2.1574. However, because the reported follow-up score ranges from 11 to 19, whereas the preceding knowledge measurements range from 4 to 10, this follow-up value appears to have been measured using a different scoring scale. Therefore, it should not be directly interpreted as a numerical continuation of the pre-test and post-test knowledge scores unless the scoring procedure is standardized or further clarified. Moreover, although the study methodology specified the Friedman test to assess repeated measurements, the corresponding test statistic and *p*-value were not provided in the available results. Consequently, the present interpretation emphasizes the observed descriptive trend rather than claiming statistical significance.

Changes in Attitudes and Indoor Smoking Behavior

The second major finding concerns changes in attitudes and reported household smoking behavior after the intervention. Interviews with 26 respondents showed that 57.7% strongly agreed and 26.9% agreed that smoking inside the home is dangerous. Thus, 84.6% of respondents expressed a favorable attitude toward recognizing the health risks of indoor smoking. This finding is consistent with community health-promotion evidence showing that increased understanding of smoking-related risks can strengthen awareness and support healthier household practices (Mayumi Nitami, Decy Situngkir, & Mugi Wahidin, 2023).

Table 2
Distribution of the frequency of non-smoking attitudes and actions

Variable	Freq. (n=26)	%
Attitudes to the Dangers of Smoking in the Home		
Strongly agree	15	57.7
Agree	7	26.9
Attitudes towards Willingness to Quit Smoking in the House		
Yes	21	19.2
No	5	80.8
Indoor Smoking Behavior Before Counseling		
Yes	23	88.5
No	3	11.5
Indoor Smoking Behavior After Counseling		
Yes	14	53.8
No	12	46.2
Frequency of Smoking in House		
No	12	46.2
Sometimes	3	11.5
Everyday	3	11.5
Behavior of Implementing No Smoking Rules in the House		
Already	19	73.1
Not yet	7	26.9

A substantial proportion of respondents also expressed willingness to stop smoking inside the home. Based on the reported frequencies in [Table 2](#), 21 of 26 respondents, or 80.8%, stated that they were willing to stop smoking indoors, whereas 5 respondents, or 19.2%, were unwilling. This distribution indicates that the percentages in the corresponding table should be interpreted according to the frequency values, as 21/26 corresponds to 80.8%. The high level of willingness suggests that the intervention may have influenced not only factual knowledge but also behavioral intention. This pattern is consistent with findings by Ravi et al. (2021), who demonstrated that health behavior approaches such as the Health Belief Model can influence perceptions, attitudes, and cessation-related intentions among tobacco users. In the present program, information about the harmful effects of secondhand smoke was reinforced by a visible environmental message, potentially increasing the perceived relevance of smoke-free behavior within the family setting.

More importantly, respondents reported changes in actual indoor smoking behavior. Before counseling, 23 of 26 respondents (88.5%) reported smoking inside the home, whereas after counseling this decreased to 14 respondents (53.8%). Correspondingly, 12 respondents (46.2%) reported that they no longer smoked indoors after the intervention. Although more than half of respondents continued to report some indoor smoking, the reduction from 88.5% to 53.8% represents an important behavioral shift within a relatively brief community intervention. In addition, 73.1% of respondents reported that they had already implemented a household no-smoking rule, while 26.9% had not yet introduced such a rule.

The observed behavioral change supports the use of household environmental cues as an adjunct to health education. Hasanica et al. (2020) emphasized that visual communication can transmit health information in a simple, accessible, and memorable form, allowing health messages to remain present beyond the initial educational encounter. Similarly, Berardi et al. (2022) reported that household-level environmental feedback concerning indoor air quality increased the likelihood that families would establish and maintain smoke-free homes. Although the form of environmental cue differs, both interventions share an important mechanism: making an otherwise invisible health risk more salient within the household environment. In this study, the sticker provided a visible social and behavioral reminder rather than technological feedback, which may make the approach more feasible in communities with limited resources.

Nevertheless, the persistence of indoor smoking among 53.8% of respondents demonstrates that awareness and intention do not automatically translate into complete behavioral change. Smoking behavior is influenced by nicotine dependence, social habits, household norms, perceived inconvenience, and long-established routines. Therefore, stickers and education should be viewed as components of a broader tobacco-control strategy rather than stand-alone mechanisms for smoking cessation. The advantage of the current intervention lies in its low-cost, highly visible, household-based format, which can reinforce behavioral expectations continuously and potentially support more intensive cessation interventions.

Sustainability and Community Acceptance of the Visual Intervention

The third finding relates to the sustainability and physical retention of the intervention media. Field observations using checklist forms were conducted to determine whether the "Smoke-Free Home" stickers remained installed and visible after program implementation. Among 58 observed houses, 47 stickers (81.0%) remained attached, while 11 (19.0%) had been removed or were no longer present. Regarding sticker condition, 45 stickers (77.6%) remained intact and readable, one (1.7%) was blurred, one (1.7%) was damaged or partially detached, and 11 (19.0%) were lost or removed (see [Table 3](#)).

The high proportion of stickers that remained attached and readable indicates substantial community acceptance of the visual communication medium. Maintaining the sticker on the house may reflect willingness to preserve the health message and publicly display support for a smoke-free household environment. This interpretation is consistent with Silvia et al. (2025), who emphasized the importance of observable household-level indicators for evaluating the sustainability of smoke-free home initiatives. The visible placement of the sticker may also create a form of social accountability

because it communicates the household's expected behavior not only to residents but also to guests and surrounding community members.

Table 3
The Evaluation Program for Installing Sticker

Variable	Freq.	%
The sticker is still attached to the house		
Yes	47	0.81
No	11	19.00%
Sticker condition		
Intact, still readable	45	0.776
Yes, but it's blurry.	1	1.70%
Damaged/peeled off	1	1.70%
Lost/revoked	11	19.00%

The 19.0% of stickers that were lost or removed is nevertheless important. Removal may result from physical deterioration, environmental exposure, relocation, reduced interest, disagreement among household members, or resistance to maintaining a visible smoke-free commitment. These possibilities were not differentiated in the available observation data and therefore warrant further investigation. Future evaluation should include qualitative interviews with households in which stickers were removed to distinguish between technical problems with the media and behavioral or social barriers to smoke-free home implementation.

Taken together, the knowledge, behavioral, and observational findings suggest that visual communication through "Smoke-Free Home" stickers can serve as a feasible community-based health promotion strategy. The combination of interpersonal education, household commitment, and repeated visual exposure appears particularly relevant for settings where formal smoke-free regulations cannot directly regulate behavior inside private residences. The intervention therefore contributes practical evidence that household-level visual cues can be integrated into participatory tobacco-control programs to strengthen knowledge, encourage smoke-free rules, and protect children, older adults, and other vulnerable family members from secondhand smoke exposure. However, longer follow-up periods, larger samples, standardized outcome measures, and controlled study designs are required to determine whether these improvements are sustained and whether they can be attributed specifically to the visual communication intervention.

CONCLUSION

The community service program implemented through a visual communication approach using "Smoke-Free Home" stickers demonstrated positive outcomes in improving community knowledge, awareness, and household smoking behavior. Increased knowledge scores following health education, reduced reported indoor smoking, implementation of household no-smoking rules, and the continued presence of stickers in most participating homes indicate that combining education with visible environmental reminders can support smoke-free home practices. The integration of health education, evaluative interviews, and field observations further suggests that simple visual media can serve as a feasible and sustainable community-based health promotion strategy, particularly for protecting children, older adults, and other vulnerable family members from secondhand smoke exposure. This approach contributes to preventive efforts against tobacco-related non-communicable diseases by extending health promotion directly into the household environment. Future programs should involve larger populations, longer follow-up periods, standardized outcome measures, and comparison groups to assess the sustainability and effectiveness of the intervention more rigorously.

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AUTHORS' CONTRIBUTION

Emmi Bujawati conceptualized the study, developed the research methodology, supervised the research process, and critically revised the manuscript. Titi Haerana contributed to data analysis and interpretation of the findings. Evi Aprianti Radjiman contributed to data collection and manuscript review. All authors read and approved the final version of the manuscript.

COMPETING INTEREST

The author(s) declare no potential conflict of interest with respect to the research, authorship, or publication

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