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## ARTICLE

# Strengthening Maternal Health through Targeted Prenatal Class Promotion in Rural Indonesia

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## ABSTRACT

Prenatal classes are a key component of antenatal health promotion, supporting maternal knowledge, confidence, and preparedness for childbirth. However, evidence on determinants of prenatal class participation in rural settings remains limited, particularly from nationally representative data. This study aimed to identify sociodemographic determinants of prenatal class participation among rural women in Indonesia and to examine geographic disparities. We analyzed secondary data from the 2023 Indonesian Health Survey, including 34,243 rural women who had given birth within the previous five years. Prenatal class participation was the dependent variable, while age, marital status, education, employment, household wealth, and parity were included as independent variables. Binary logistic regression was applied, accounting for survey weights, and spatial mapping was conducted to visualize provincial variation. Overall, 35.8 percent of rural women attended prenatal classes. Older age, being married, higher education, unemployment, and higher parity were associated with higher participation. Compared with the richest group, women in poorer and middle wealth categories were more likely to attend prenatal classes, while the poorest group showed no significant difference. Substantial regional disparities were observed, with the lowest participation concentrated in eastern Indonesia. This study advances the literature by combining nationally representative analysis with spatial mapping to highlight inequities in

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prenatal class participation in rural Indonesia. Targeted interventions are needed to reach adolescents, first-time mothers, employed women, and socially disadvantaged groups.

**Keywords:** Prenatal Classes; Maternal Health; Pregnancy; Population Health; Big Data; Public Health

## 1. Introduction

It is beneficial for women to participate in prenatal classes, structured educational programs designed to enhance their knowledge, skills, and personal confidence. These workshops can be beneficial during pregnancy, childbirth, and the early stages of parenting. The goal of these programs, which are founded on the concept of health literacy, is to enhance women's capacity to obtain, understand, and use health information to facilitate informed decision-making and beneficial health behaviors throughout their pregnancies. Furthermore, frameworks for behavior change demonstrate that group-based education has the capacity to influence attitudes, perceived norms, and self-efficacy with respect to behaviors that are associated with maternal health<sup>[1,2]</sup>.

Health literacy theory suggests that sociodemographic factors such as education, age, and marital status influence women's ability to comprehend health information and navigate health services<sup>[3]</sup>. Behavior change models further emphasize the role of social support, prior experience, and structural constraints in shaping health-seeking behavior<sup>[4]</sup>. For pregnant women, factors such as parity and employment status may modify perceived benefits, opportunity costs, and motivation to attend prenatal education. These theoretical perspectives provide a framework for understanding why participation in prenatal classes varies systematically across population subgroups.

These programs enhance group dynamics and foster peer assistance during pregnancy<sup>[5,6]</sup>. Additionally, face-to-face interactions with medical personnel offer useful demonstrations and opportunities to practice skills, such as learning various birthing positions, becoming proficient in breathing methods during labor, and gaining an understanding of massage treatments during labor. The sentiments of fear, worry, and despair that are generally associated with childbirth can be alleviated through participation in these activities<sup>[7,8]</sup>. Moreover, nutrition, nursing, and family planning are all covered in prenatal programs, as mentioned in an earlier in-

quiry. In accordance with the guidelines established by the Indonesian Ministry of Health, the classes include a wide range of topics, such as postpartum care, newborn care, misunderstandings regarding mother and child health, sexually transmitted diseases, and the relevance of birth certificates<sup>[7,9]</sup>. Given the pivotal role of prenatal classes, it is essential to actively promote them.

Empirical evidence indicates that participation in prenatal classes is associated with improved maternal confidence, reduced fear and anxiety about childbirth, better breastfeeding practices, and greater engagement with antenatal and postnatal care services. While prenatal education is not expected to affect rare outcomes such as maternal mortality directly, it plays an essential upstream role by strengthening preparedness, care seeking, and risk recognition, which are central components of maternal health promotion<sup>[1,2,10,11]</sup>. Furthermore, a previous study found that the offspring of mothers who participated in prenatal classes breastfed for a longer period<sup>[12]</sup>.

Prenatal classes are explicitly incorporated into primary health care services in Indonesia, and they are also promoted as a component of government programs aimed at improving maternal health. Participation in prenatal classes remains unequal, despite well-covered antenatal care visits. According to national data, no more than one-third of pregnant women participate in prenatal classes, and the rate is significantly lower in rural and eastern regions of the country. A number of criteria, including education, parity, and family support, have been identified as essential predictors of participation in previous research conducted across Indonesia and other countries. On the other hand, the majority of the evidence that is now available is derived from research conducted at facilities or in specific locations, which restricts its potential to be generalized<sup>[13]</sup>.

Previous studies have demonstrated the favorable effects of prenatal classes on participants' health and happiness. Several factors, such as a mother's level of education, the number of children she has, her level of expertise in child rearing, and the support she receives from her family,

all play a role in determining whether or not she will participate in these sessions <sup>[2,12,14]</sup>. When it comes to acquiring health-related information during pregnancy, whether through in-person or online antenatal education classes, women's mentalities may be influenced by challenges such as insufficient knowledge, difficulty in linguistic communication, and negative comments from healthcare professionals. These challenges can manifest themselves in a variety of ways <sup>[6,15]</sup>.

There are still structural challenges that rural residents in Indonesia face in accessing health information and services. These barriers include distance, transportation constraints, and limited availability to appropriately educated medical personnel. It is well known that there are significant differences in maternal health service use between urban and rural areas. However, there is a lack of research on prenatal class participation in rural Indonesia, using data representative of the entire country. In addition, there have been very few studies that have coupled individual-level research with spatial mapping in order to describe geographical disparities <sup>[16-19]</sup>. The purpose of this study is to investigate rural women's involvement in prenatal classes in Indonesia as a function of demographic, socioeconomic, and reproductive characteristics. The study is guided by health literacy and behavior change theories. The purpose of this study is to discover theoretically relevant predictors of involvement and to illustrate regional inequities. This will be accomplished by integrating individual-level regression analysis with geographical mapping. The use of this methodology enhances the explanatory power of the findings and contributes to a more theory-informed understanding of the promotion of maternal health in rural settings.

## 2. Materials and Methods

### 2.1. Data Source and Study Design

Data from the 2023 Indonesian Health Survey, conducted by the Ministry of Health of the Republic of Indonesia, were used in this secondary scientific investigation. The survey employed a multistage, stratified sampling design to obtain a nationally representative sample of the population. Data collection was conducted through in-person and home-based interviews between May and July

2023, ensuring coverage across diverse geographic and socioeconomic settings. To further ensure national representativeness and to account for the complex survey design, sampling weights were provided and applied in the analysis, allowing the findings to be generalized to the broader Indonesian population <sup>[20]</sup>.

Women who had given birth within the five years prior to the survey were included in the study population, and all eligible participants were residents of rural areas. Rural residence was determined using Statistics Indonesia's official administrative classification, and no reclassification was applied during the analysis to maintain consistency with national standards. A total of 34,243 women met the inclusion criteria and were included in the final analytic sample. Restricting the sample to births within a five-year window enabled subgroup analyses with a sufficiently large sample. Although this approach carries an acknowledged risk of recall bias, it was considered an appropriate balance between data reliability and analytical robustness.

### 2.2. Dependent Variable

Participants' attendance at prenatal classes during the most recent pregnancy served as the dependent variable in this study. The level of participation was evaluated using a binary variable indicating whether the respondent had attended at least one prenatal program session. Due to the fact that the dataset did not contain any information regarding the frequency or quality of involvement, the evaluation of the intensity of exposure was severely restricted <sup>[21]</sup>. The study categorized prenatal class participation as either absent or present.

### 2.3. Independent Variables

Independent variables were selected and grouped based on the study's theoretical framework. Demographic variables, including age and marital status, reflect life-course position and social support structures that may influence health literacy and autonomy in health-related decision-making. Socioeconomic variables, including education, employment status, and household wealth, represent material and cognitive resources that shape access to information, opportunity costs, and engagement with pre-

ventive health services. Reproductive history, as measured by parity, captures prior experience with pregnancy and childbirth and may modify the perceived need for formal prenatal education.

Age was categorized as 19 years or younger, 20 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, and 45 years or older. Marital status was categorized as married, divorced, or widowed. Education was grouped into no formal education, primary, junior high, senior high, and college. Employment status was classified as employed or unemployed.

Parity was categorized into three groups, namely primiparous, multiparous, and grand multiparous women, to capture differences in reproductive history. This classification enabled a clear distinction between women with no prior births, those with several births, and those with extensive childbearing experience. Grand multiparous women served as the reference group to reflect accumulated pregnancy experience and provide a meaningful baseline for comparison. Using this group as the reference allowed the analysis to assess differences in prenatal class participation across increasing levels of reproductive exposure.

Household wealth was measured using a composite asset-based index constructed via principal component analysis, which combined information on household assets and living conditions into a single summary measure of economic status. This method allowed multiple indicators of wealth to be synthesized into a standardized index that could be applied consistently across households. By using this approach, differences in economic position could be assessed in a comparable manner despite variation in individual assets. The resulting index was then categorized into five national wealth quintiles, enabling clear comparison of households across relative levels of wealth within the study population and facilitating the analysis of socioeconomic gradients in prenatal class participation<sup>[22]</sup>.

## 2.4. Data Analysis

To investigate disparities in prenatal class participation across population groups, the study first employed descriptive analyses to summarize key sample characteristics and participation patterns. This was followed by bivariate analyses to examine preliminary associations between prenatal class participation and relevant sociodemographic and contextual variables. Prior to conducting the multivari-

able analysis, multicollinearity diagnostics were carefully assessed to ensure the stability and reliability of the regression estimates. Variance inflation factors below 10 and tolerance values greater than 0.10 indicated the absence of problematic multicollinearity among the independent variables, supporting the validity of the multivariable analytical approach.

To estimate adjusted odds ratios and 95% confidence intervals, binary logistic regression was used. This method is suitable for dichotomous outcomes and large sample sizes. In conducting regression analyses, sampling weights and the intricate survey design were used. To map participation rates among rural women at the provincial level, a spatial analysis was conducted using ArcGIS tools.

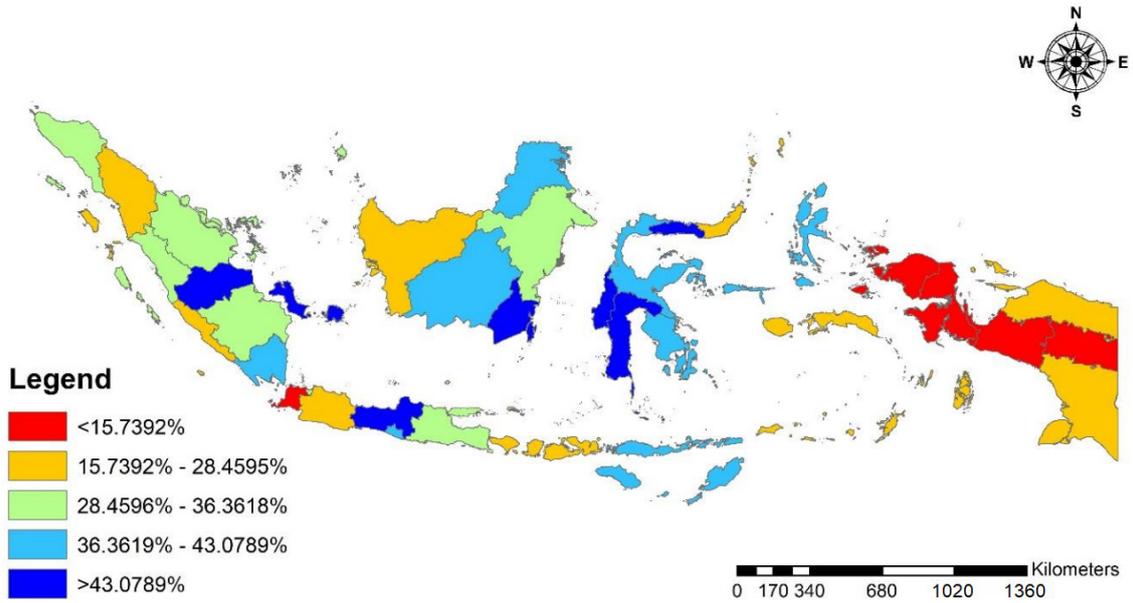
## 2.5. Ethical Approval and Consent to Participate

The 2023 Indonesian Health Survey received ethical approval from the National Ethics Committee under reference number LB.02.01/I/KE/L/287/2023, ensuring compliance with established ethical standards. In this secondary analysis, the authors had no direct contact with the survey respondents at any stage of the research process. All data used in the analysis were fully anonymized prior to access, thereby protecting participant confidentiality and minimizing any potential ethical risks.

## 3. Results

In all, 35.8% of women living in rural areas reported taking part in prenatal classes during their most recent pregnancy. The data shown in **Figure 1** indicate the significant regional differences in participation in prenatal classes across rural Indonesia. In eastern Indonesia, participation rates were the lowest, while in parts of Sulawesi, Sumatra, and Kalimantan, they were higher. A wide range of participation rates was observed across the provinces.

The results of the bivariate analysis are presented in **Table 1**. There were substantial disparities in participation by age, marital status, education level, wealth, and parity, according to a bivariate analysis. The highest involvement rates were observed among women aged 25–34, married women, and those with higher levels of education. Prenatal classes were least likely to be attended by women with grand multiparous children.



**Figure 1.** Distribution map of the proportion of prenatal class participation by provinces in rural Indonesia in 2023

Source: Visualization by the authors.

**Table 1.** The results of bivariate analysis (n = 34,243).

Demographic Characteristics	Participation in Prenatal Classes		p-Value
	No (n = 21,967)	Yes (n = 12,276)	
<b>Age Group</b>			<0.001
• ≤19	76.0%	24.0%	
• 20–24	64.0%	36.0%	
• 25–29	62.4%	37.6%	
• 30–34	62.6%	37.4%	
• 35–39	66.3%	33.7%	
• 40–44	67.1%	32.9%	
• ≥45	74.0%	26.0%	
<b>Marital Status</b>			<0.001
• Married	64.1%	35.9%	
• Divorced/Widowed	73.3%	26.7%	
<b>Education Level</b>			<0.001
• No education	77.1%	22.9%	
• Primary School	67.9%	32.1%	
• Junior High School	61.9%	38.1%	
• Senior High School	62.9%	37.1%	
• College	61.0%	39.0%	
<b>Employment Status</b>			
• Unemployed	64.3%	35.7%	
• Employed	64.1%	35.9%	
<b>Wealth Status</b>			<0.001
• Poorest	65.6%	34.4%	
• Poorer	63.5%	36.5%	
• Middle	63.4%	36.6%	
• Richer	65.5%	34.5%	
• Richest	62.4%	37.6%	
<b>Parity</b>			<0.001
• Primiparous	64.0%	36.0%	
• Multiparous	63.8%	36.2%	
• Grand Multiparous	76.2%	23.8%	

The second element of the research project consisted of conducting a formal collinearity test to assess the relationships among the independent variables included in the model. The results indicated that the associations among the independent variables were either very weak or absent, suggesting a low risk of overlap among the predictors. In addition, the variance inflation factor for each variable was less than 10.00, and the tolerance value for each factor was at least 0.10. These diagnostic indicators consistently fall within acceptable thresholds. Based on these findings, it can be concluded that the regression model does not exhibit multicollinearity, supporting the stability and reliability of the estimated regression coefficients.

**Table 2** presents the results of the binary logistic

regression analysis. Multivariable regression results indicated that all age groups older than 19 years had higher odds of participation. Married women were significantly more likely to attend prenatal classes than divorced or widowed women. Higher education was strongly associated with participation in a graded pattern. Unemployed women had slightly higher odds of involvement than employed women.

Compared with the wealthiest group, women in poorer and middle wealth categories were more likely to attend prenatal classes, while the poorest group did not differ significantly. Primiparous and multiparous women had higher odds of participation than grand multiparous women.

**Table 2.** The findings from the binary logistic regression (n = 34,243).

Variables	Participate in Prenatal Classes			
	p-Value	Adjusted Odds Ratio	95% Confidence Interval	
			Lower Bound	Upper Bound
Age: ≤19 (Ref.)	-	-	-	-
Age: 20–24	*<0.001	1.663	1.643	1.683
Age: 25–29	*<0.001	1.737	1.716	1.758
Age: 30–34	*<0.001	1.726	1.705	1.747
Age: 35–39	*<0.001	1.523	1.504	1.542
Age: 40–44	*<0.001	1.557	1.537	1.578
Age: ≥45	*<0.001	1.223	1.204	1.243
Marital: Married	*<0.001	1.477	1.459	1.495
Marital: Divorced/Widowed (Ref.)	-	-	-	-
Education: No education (Ref.)	-	-	-	-
Education: Primary School	*<0.001	1.518	1.503	1.533
Education: Junior High School	*<0.001	1.937	1.917	1.956
Education: Senior High School	*<0.001	1.844	1.825	1.862
Education: College	*<0.001	2.028	2.006	2.050
Employment: Unemployed	*<0.001	1.006	1.003	1.009
Employment: Employed	-	-	-	-
Wealth: Poorest	0.350	1.003	0.997	1.008
Wealth: Poorer	*<0.001	1.049	1.044	1.055
Wealth: Middle	*<0.001	1.019	1.014	1.025
Wealth: Richer	*<0.001	0.908	0.903	0.913
Wealth: Richest (Ref.)	-	-	-	-
Parity: Primiparous	*<0.001	1.538	1.523	1.553
Parity: Multiparous	*<0.001	1.578	1.563	1.592
Parity: Grand multiparous (Ref.)	-	-	-	-

Note: \*p-value < 0.001.

## 4. Discussion

A tight alignment can be seen between the findings of this study and theories concerning health literacy and behavior change. The results show that education was one of the most important factors in determining whether a woman attended a prenatal class, highlighting the central role of educational attainment in shaping health-related behavior. This finding lends credence to the idea that women with higher levels of education are better able to access, understand, and digest health information, and are therefore more likely to participate in activities intended to promote health. In light of this tendency, prenatal classes appear to function not only as informational interventions but also as literacy-dependent services that require certain cognitive and comprehension skills. As a result, these programs may unintentionally exclude women with limited formal education. Following the principles of the health literacy hypothesis <sup>[1,23]</sup>, the observed significant correlation between higher education and involvement suggests that women with a greater capacity to assimilate health information are more likely to engage in formal prenatal education <sup>[23-25]</sup>. This pattern reinforces the view that educational disparities translate into unequal opportunities to benefit from maternal health promotion efforts <sup>[23-25]</sup>.

Additionally, age and marital status were found to be important predictors of prenatal class participation, reflecting variations in levels of social support, autonomy, and perceived vulnerability. Younger women, particularly adolescents, may face constraints related to limited decision-making capacity, lower confidence, or insufficient knowledge about available maternal health services. These factors can reduce their likelihood of attending prenatal classes, even when such services are available. In contrast, married women may benefit from greater spousal support, encouragement, and shared responsibility, which can make participation in prenatal classes easier and more acceptable. Together, these findings are consistent with theoretical models that emphasize the social embeddedness of health behaviors, highlighting how interpersonal relationships and social contexts shape individual health-related decisions <sup>[26-28]</sup>.

When it comes to attending prenatal classes during pregnancy, women of all educational levels are more likely to do so than women without formal education. As a result,

educated pregnant women might urge other mothers to enroll in prenatal classes. Similar findings were discovered in a previous evaluation of the pregnancy seminars offered by Community Health Centers. According to the study's findings, there is a correlation between pregnant women's educational level and the quality of care they receive. There is a correlation between higher education and greater antenatal education <sup>[29,30]</sup>.

In addition, variables related to parity shed light on the significance of perceived need in the decision to seek medical attention. Compared to grand multiparous women, primiparous and multiparous women were more likely to attend prenatal classes. This finding suggests that accumulated childbearing experience may lower the perceived benefits of formal schooling. Depending on how risk and benefit are viewed, previous experience can either enable or hinder the process of changing behavior <sup>[1,31]</sup>.

A minor but meaningful correlation was found between employment status and prenatal class attendance, suggesting that structural constraints play an important role in shaping participation. Factors such as limited time availability, inflexible work schedules, and competing responsibilities can restrict attendance even when motivation or perceived benefit is present. This indicates that practical barriers may outweigh individual willingness to engage with prenatal education. The significance of this study lies in its emphasis on aligning service delivery methods with the everyday realities of women's lives, particularly in rural settings. By drawing attention to these constraints, the findings underscore the importance of designing prenatal programs that are more responsive to women's work patterns and lived circumstances <sup>[1,32]</sup>.

The observed wealth pattern suggests that the richest women may be more inclined to rely on alternative sources of information or private health services rather than participating in publicly provided prenatal programs. In contrast, women from middle-income groups appear to be more actively engaged with public prenatal services, possibly because these programs align more closely with their needs and expectations. At the same time, spatial disparities in participation highlight that access and utilization vary considerably across locations. These geographic differences underscore the presence of persistent regional disparities, indicating that where women live continues to play an

important role in shaping their access to and use of prenatal education services<sup>[33,34]</sup>. Conversely, the likelihood of low-income families using health services increased as the availability of health insurance expanded. Greater insurance coverage appears to reduce financial barriers that often limit access to care among economically disadvantaged households. As a result, insured low-income families may feel more able and willing to seek needed health services without concern about out-of-pocket costs. This pattern highlights the important role of health insurance in promoting health service utilization and improving access to care for low-income populations<sup>[35]</sup>.

Finally, the spatial disparities observed across provinces reflect a complex interaction between individual-level determinants and broader contextual factors, including differences in service availability, infrastructure, and levels of regional development<sup>[36,37]</sup>. Variations in local health system capacity and geographic accessibility appear to shape opportunities for participation in prenatal classes, beyond personal characteristics alone. These patterns reinforce the importance of situating individual health behaviors within their wider structural and geographic contexts, as emphasized in socioecological models of health behavior. Viewing prenatal class participation through this lens highlights how multiple layers of influence operate simultaneously to shape health-related decisions. Overall, by explicitly linking theoretical constructs to empirical findings, this study advances understanding of prenatal class participation as a socially patterned health behavior. In doing so, it provides a stronger, more coherent conceptual basis for designing targeted, context-appropriate maternal health interventions in rural Indonesia.

### Strengths and Limitations

An outstanding feature of the study is its meticulous examination of vast datasets, which enables robust, nuanced analysis and provides comprehensive insights into conditions in rural Indonesia. The large sample size strengthens the reliability of the findings and enables the identification of patterns and disparities that might not be visible in smaller studies. However, the survey inherently limits the assessment to elements already available and relevant in the existing dataset, as it relies on secondary data. As a result, certain contextual factors or emerging variables of interest could not be explored in depth, and the

analysis remains constrained by the scope and structure of the original data collection.

## 5. Conclusions

This study demonstrates that several sociodemographic factors, including younger maternal age, divorced or widowed marital status, low educational attainment, employment, higher household wealth, and primiparity, are associated with lower participation in prenatal classes among rural women in Indonesia. Taken together, these characteristics identify specific subgroups of women who are consistently less likely to engage with available prenatal education services. The findings point to persistent and multifaceted disparities in access to prenatal education in rural settings, where social position, life stage, and competing responsibilities may influence health-seeking behavior. These results suggest that current prenatal class programs may not be sufficiently responsive to the diverse needs and circumstances of rural women. Overall, the evidence underscores the importance of adopting more inclusive, context-sensitive approaches to increase participation in prenatal classes and reduce longstanding inequities in maternal health education across rural communities.

In response to these disparities, targeted strategies are required to increase participation among underserved groups identified in the study. Priority actions may include strengthening community-based outreach efforts for adolescents and first-time mothers who may lack experience or confidence in accessing maternal health services. The use of tailored, culturally appropriate, and easy-to-understand communication materials could help engage women with limited formal education. In addition, offering flexible class schedules and alternative delivery formats may better accommodate employed women and those with time constraints. Local health centers could work more closely with village leadership and community organizations to enhance social support and trust, while practical measures such as transportation subsidies or childcare support may help address structural barriers. Integrating prenatal class promotion into broader maternal health initiatives and rural development policies would further support equitable access and help ensure that women in rural Indonesia can fully benefit from prenatal education.

## Author Contributions

Both authors contributed equally to the conception, design, data collection, analysis, and writing of this study. Both authors have read and agreed to the published version of the manuscript.

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## Institutional Review Board Statement

The National Ethics Committee approved the Indonesian Health Survey to be conducted in 2023 (LB.02.01/IK/KE/L/287/2023).

## Informed Consent Statement

To ensure that the data collection was voluntary and confidential, the survey utilized written informed consent, which participants or guardians signed.

## Data Availability Statement

The authors can't share the data with the public because they don't have the Ministry of Health of the Republic of Indonesia's permission to do so. The 2023 Indonesian Health Survey dataset can be downloaded from the website <https://layanandata.kemkes.go.id/> by eligible academics. The dataset contains private data, and certain conditions must be met to view it.

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## Conflicts of Interest

The authors declare that they have no competing interests.

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