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Analyzing High-Risk Fertility Behavior for Sustainable Maternal-Child Health: A 2017 Sociodemographic Study in Urban and Rural Indonesia

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Abstract

Indonesia's goal of achieving *Indonesia Emas 2045* hinges on improving Maternal-Child Health (MCH), essential for building a healthy and competitive population. Despite some advancements, the Maternal Mortality Rate (MMR) and Under-five Mortality Rate (U5MR) remain high, particularly because of High-Risk Fertility Behavior (HRFB). The HRFB poses significant risks to MCH, affecting both urban and rural women. This study aimed to identify the factors associated with HRFB in these areas to enhance MCH outcomes and support Indonesia's sustainable health goals. This cross-sectional study used a secondary dataset from the 2017 Indonesian Demographic Health Survey. A total of 20,530 women of reproductive age were included in this analysis. The main dependent variable was the HRFB, and the independent variables were split into three factors: individuals, households, and community factors. The overall prevalence of HRFB was 37.0%, with a slightly higher prevalence in urban areas (37.6%) than in rural areas (36.1%). In rural areas, HRFB was significantly associated with the wealth quintile, while in urban areas, it was linked to women's autonomy and education level. Addressing these factors is critical for improving MCH outcomes and reducing HRFB use.

Keywords: High-Risk Fertility Behavior, Indonesian Demographic Health Survey, Maternal-Child Health, reproductive-age women, urban-rural

Introduction

Indonesia's ambition to achieve prosperity, inclusivity, and sustainability, as envisioned in *Indonesia Emas 2045*, is impossible without the support of healthy human resources. Human health status is influenced not only by present-day health-related behaviors but also by conditions established early in the life course, including Maternal-Child Health (MCH). Thus, MCH is imperative to achieve sustainable healthy human capital in the future. This concept is supported by SDGs Goal 3, which clearly portrays MCH's pivotal contributions to sustainable development.¹ By 2023, it is expected to reduce the maternal mortality ratio (MMR) to less than 70 per 100,000 live births globally and to reduce neonatal mortality (NMR) to at least 12 per 1,000 live births and under-five mortality (U5MR) to at least 25 per 1,000 live births nationally.¹

Indonesia has shown a 51.15% NMR decrease from 19 per 1,000 live births in 2007 to 9.28 per 1,000 live births in 2020, which complies with the SDGs target.² The MMR has also diminished by 45%, from 356 deaths per 100,000 live births in 2010 to 189 deaths per 100,000 live births in 2020.² However, this achievement does not occur evenly, as the MMR in eastern parts of Indonesia, including East Nusa Tenggara, West Papua, and Papua, is still high, ranging from 316 deaths per 100,000 live births to 565 deaths per 100,000 live births in 2020.²

A similar trend occurred in the U5MR, where the national rate in 2020 was 19.83 per 1,000 live births, with the lowest rates coming from western Indonesia and the highest from eastern Indonesia. All provinces in Java and Bali Island had no U5MR higher than 16.15 deaths per 1,000 live births. In contrast, in Nusa Tenggara, Maluku, and Papua Provinces, the rates ranged from 29.7 deaths per 1,000 live births to 49.04 deaths per 1,000 live births.² This uneven progress suggests the existence of unequal MCH risk factors across Indonesia, underscoring the need for targeted interventions to

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foster health equity by 2045. Adding targeted, context-specific measures to reduce these disparities is essential to achieving both the SDGs and *Indonesia Emas 2045* goals.²

High-risk fertility behavior (HRFB) is known to influence MCH and mortality rates. The HRFB is defined by the women's age during pregnancy, birth interval, and parity.³ Women are considered to have high-risk fertility if they experience any of these four conditions, including a) pregnancy started under the age of 18 years or b) pregnancy above 34 years; c) birth interval less than 24 months; and d) parity 4 and above.³⁻⁷ The HRFB is known to cause detrimental effects for both women and children, including various pregnancy complications, which are a higher risk of developing anemia for female adolescents, preeclampsia, premature birth, low birth weight, congenital abnormalities, a higher risk for maternal death, and stillbirth.^{4,7-13}

Additionally, HRFB places infants at a 30% higher risk of mortality when born to female adolescents, highlighting the urgency of addressing this factor.¹⁴ The HRFB has an enormous influence over maternal and child mortality risk, so addressing the factors associated with HRFB is crucial to controlling MCH health further.⁷ In Indonesia, addressing the HRFB concerning the distinct risk factors of urban and rural areas is a strategic approach to improve favorable trends in MCH-related indicators and diminish the achievement gap between regions, thereby facilitating the attainment of national and international sustainable development objectives.¹⁵

This study analyzed the 2017 Indonesian Demographic Health Survey (IDHS) dataset collected by the Demographic Health Survey (DHS) Program. The 2017 IDHS was selected because it was the latest dataset to provide an overview of the reproductive health scheme in Indonesia. Other similar studies concerning HRFB in Indonesia have discussed the determinants of HRFB among Indonesian adolescents¹⁶ and proven HRFB as a risk factor for NMR.¹⁷ However, none of these studies analyzed the socioeconomic aspects of HRFB characterized by urban and rural areas. This study sought to elucidate the sociodemographic characteristics associated with HRFB in urban and rural regions in 2017, serving as a reference for stakeholders and policymakers to enhance MCH status in pursuit of sustainable MCH in *Indonesia Emas 2045*.

Method

The population in this cross-sectional study included women of reproductive age (15–49 years), with a total population of 49,627 individuals. The inclusion criterion for this study was currently married women in 2017. Among these, approximately 34,086 individuals were married during survey collection in 2017. Married status was obtained by asking about union status, which resulted in three different answers: currently in a union, formerly in a union, and never in a union. Thus, all women who were formerly in union and never in union were excluded. However, 13,556 individuals had incomplete data (any covariates with missing values) and were thus excluded from this study. Therefore, the final sample in this study comprised 20,530 reproductive-age women, implying a Complete Case Analysis (CCA) analysis method for this study. The CCA was used because of its simplicity, as well as its use in many papers with any DHS dataset, and it yielded results similar to those of MI and other imputation methods.^{18,19} The process of sample selection is explained in Figure 1.

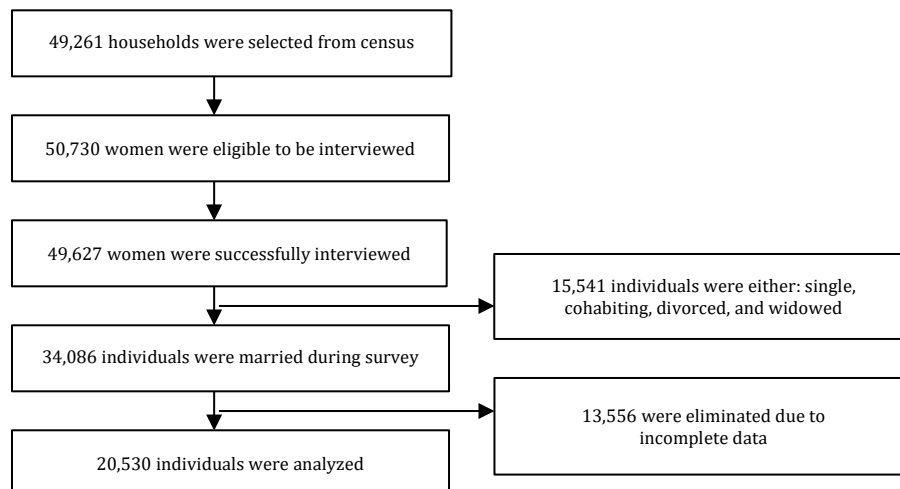


Figure 1. Sample Selection

This cross-sectional study utilized the 2017 IDHS dataset collected by the DHS Program, available at <https://dhsprogram.com/>. The 2017 IDHS asked about various health topics, including reproductive health status. The DHS Program is an open-source website. The DHS Program executed IDHS 2017 in compliance with the ethical directives established by Institutional Review Board number FWA00000845.

The dependent variable in this study was the HRFB. The HRFB is a risk factor for maternal health outcomes, which was determined by four different conditions: a) currently married women less than 18 years; b) currently married women over 34 years; c) currently married women with less than 24 months since preceding birth; and d) currently married women with more than three births. Meeting at least one of these four conditions categorized women into the HRFB. Various factors, including individual, household, and community levels, were selected as the independent variables. Individual factors consisted of the women's educational level (below senior high school [uneducated, primary, and junior high school], senior high school, and higher education [academy, diploma, and university degree]) and employment status (unemployed and employed).

Household factors consisted of the spouse's education status below senior high school [uneducated, primary, and junior high school], senior high school, and higher education [academy, diploma, and university degree]) and the spouse's occupation (white-collar workers [professional, clerical, and sales], blue-collar workers [agricultural and industrial workers], service workers, and unemployed). Community factors consisted of the wealth quintile (poorest, poor, middle, richer, and richest) as well as women's authority in deciding contraceptive use (the woman herself, other people [spouse/family], and joint decision [the woman and her spouse]). The choices of independent variables were similar to previous studies done in developing countries.^{7,20}

Data analysis was performed using Stata version 17.0 (licensed under StataCorp). Univariate analysis was performed by examining the distribution of each variable using tables. For each table, the frequency and percentage distributions were specified for categorical variables, whereas the means and standard deviations were specified for continuous variables, if applicable. Bivariate analysis was performed using simple logistic regression to examine the association between the independent and dependent variables, producing an unadjusted odds ratio. Finally, multivariate analysis was conducted using multiple logistic regression to produce an adjusted odds ratio. The enter method was chosen for the adjusted logistic regression. Significant values were set to 0.05, and to allow for more predictors, variables with a p-value <0.250 were selected for multivariate analysis. The results were stratified by place of residence (rural and urban) for both bivariate and multivariate analyses to check for risk factor differences. For all analyses, normalized weights, stratum, and primary sampling units were considered to accommodate the complex survey design.

Results

Among 20,530 currently married women in this study, the prevalence of HRFB was 37.0 (95% CI: 36.1–37.9), with urban areas showing a slightly higher prevalence (37.6%) than their rural counterparts (36.1%). Decomposing each condition of the HRFB, it was found that giving birth at under the age of 18 years was more prevalent in rural areas than urban areas. In contrast, urban areas had a higher prevalence of women at risk of giving birth at age above 34 years. The incidence of elevated birth orders was greater in rural regions (4.5%) than in urban areas (3.2%) (Table 1).

In rural areas, it was found that the women's employment status and wealth quintile were independently associated with HRFB. However, after adjusting with other variables, a statistical association of a women's employment status could not be established. In contrast, the association between the wealth quintile and HRFB remained significant, even after adjusting for other variables. This study also found that the risk of HRFB increased with the increasing status of the wealth quintiles. Those in the richest quintile (aOR: 1.29; 95% CI: 1.04, 1.61), richer quintile (aOR: 1.24; 95% CI: 1.05, 1.46), and middle quintile (aOR: 1.21; 95% CI: 1.04, 1.41) were more likely to have HRFB than those in the poorest quintile (Table 2).

In contrast to rural areas, women's education, spouses' education, women's employment status, wealth quintile, and women's autonomy showed significant unadjusted associations with the HRFB. However, the strength of the association between the spouse's education, wealth quintile, women's employment status, and HRFB was not strong enough to remain significant after adjusting for other variables.

Table 1. The Prevalence of High-Risk Fertility Behavior

Variable	% CI [ub, lb]	Rural (% CI)	Urban (% CI)
HRFB	37.0 [36.1, 37.9]	36.1 [35.1, 37.7]	37.6 [36.5, 38.8]
Women aged <18	0.1 [0.1, 0.2]	0.2 [0.1, 0.4]	0.03 [0.01, 0.09]
Women aged >34	25.4 [24.5, 26.3]	24.0 [22.6, 25.3]	26.9 [25.7, 28.2]
Interval <24 months	7.6 [7.2, 8.0]	7.7 [7.1, 8.4]	7.4 [6.9, 8.1]
Birth order >3	3.9 [3.6, 4.2]	4.5 [4.1, 5.0]	3.2 [2.9, 3.6]

Notes: CI = confidence interval, HRFB = high-risk fertility behavior

Table 2. Factors Associated with High-Risk Fertility Behavior in Rural Areas

Variable	Rural			
	p-value	Crude odds ratio	p-value	Adjusted odds ratio (Enter)
Women's education				
Below senior high school	Ref	Ref	Ref	Ref
Senior high school	0.654	1.02 (0.90, 1.16)	0.900	0.99 (0.87, 1.12)
Higher education	0.119	1.16 (0.96, 1.39)	0.623	1.05 (0.85, 1.29)
Spouse's education				
Below senior high school	Ref	Ref	-	-
Senior high school	0.309	0.93 (0.82, 1.06)	-	-
Higher education	0.870	1.01 (0.82, 1.25)	-	-
Women's employment status				
Unemployed	Ref	Ref	Ref	Ref
Employed	0.038	1.10 (1.00, 1.22)	0.052	1.10 (0.99, 1.21)
Spouse's job characteristics				
Unemployed	Ref	Ref	Ref	Ref
White-collar	0.962	0.98 (0.56, 1.73)	0.711	0.91 (0.52, 1.62)
Blue-collar	0.939	0.97 (0.56, 1.69)	0.955	0.98 (0.56, 1.70)
Service worker	0.967	1.01 (0.57, 1.77)	0.990	1.00 (0.56, 1.77)
Other	0.237	2.00 (0.63, 6.35)	0.348	1.73 (0.54, 5.45)
Wealth quintile				
Poorest	Ref	Ref	Ref	Ref
Poorer	0.365	1.06 (0.92, 1.23)	0.322	1.07 (0.93, 1.23)
Middle	0.015	1.20 (1.03, 1.40)	0.011	1.21 (1.04, 1.41)
Richer	0.012	1.23 (1.04, 1.44)	0.010	1.24 (1.05, 1.46)
Richest	0.015	1.29 (1.05, 1.59)	0.020	1.29 (1.04, 1.61)
Women's autonomy in deciding contraceptive use				
Women	Ref	Ref	-	-
Other people	0.718	0.96 (0.77, 1.18)	-	-
Joint decision	0.354	1.05 (0.94, 1.17)	-	-

This study found that individuals whose education level was senior high school (aOR: 1.17; 95% CI: 1.03, 1.32) and higher education (aOR: 1.45; 95% CI: 1.19, 1.78) had a higher risk of HRFB than those whose education level was below senior high school. Similarly, individuals whose autonomy to decide contraceptive use was in the control of their spouses (aOR: 0.75; 95% CI: 0.63, 0.90) had a lower likelihood of HRFB. Similarly, individuals with a joint decision to use contraceptives (aOR: 0.85; 95% CI: 0.77, 0.95) had a lower likelihood of HRFB.

Table 3. Factors Associated with High-Risk Fertility Behavior in Urban Areas

Variable	Urban			
	p-value	Crude odds ratio	p-value	Adjusted odds ratio (Enter)
Women's education				
Below senior high school		Ref	Ref	Ref
Senior high school	<0.001	1.22 (1.10, 1.36)	<0.001	1.17 (1.03, 1.32)
Higher education	<0.001	1.56 (1.35, 1.81)	<0.001	1.45 (1.18, 1.78)
Spouse's education				
Below senior high school		Ref	Ref	Ref
Senior high school	0.001	1.18 (1.07, 1.31)	0.368	1.05 (0.93, 1.18)
Higher education	<0.001	1.40 (1.21, 1.61)	0.638	1.04 (0.86, 1.25)
Women's employment status				
Unemployed		Ref	Ref	Ref
Employed	0.013	1.13 (1.02, 1.25)	0.088	1.09 (1.21)
Father's job characteristics				
Unemployed		Ref	Ref	Ref
White-collar	0.091	1.46 (0.93, 2.29)	0.125	1.41 (0.90, 2.20)
Blue-collar	0.132	1.41 (0.90, 2.22)	0.051	1.55 (0.99, 2.43)
Service worker	0.198	1.34 (0.85, 2.09)	0.124	1.41 (0.90, 2.20)
Other	0.653	1.16 (0.59, 2.26)	0.903	1.04 (0.53, 2.05)
Wealth quintile				
Poorest		Ref	Ref	Ref
Poorer	0.761	1.03 (0.82, 1.29)	0.903	1.01 (0.80, 1.27)
Middle	0.141	1.17 (0.94, 1.44)	0.303	1.11 (0.90, 1.38)
Richer	0.071	1.20 (0.98, 1.47)	0.337	1.11 (0.89, 1.37)
Richest	<0.001	1.46 (1.20, 1.79)	0.061	1.23 (0.99, 1.54)
Women's autonomy in deciding contraceptive use				
Women		Ref	Ref	Ref
Other people	0.009	0.79 (0.66, 0.94)	0.002	0.75 (0.63, 0.90)
Joint decision	0.038	0.89 (0.80, 0.99)	0.005	0.85 (0.77, 0.95)

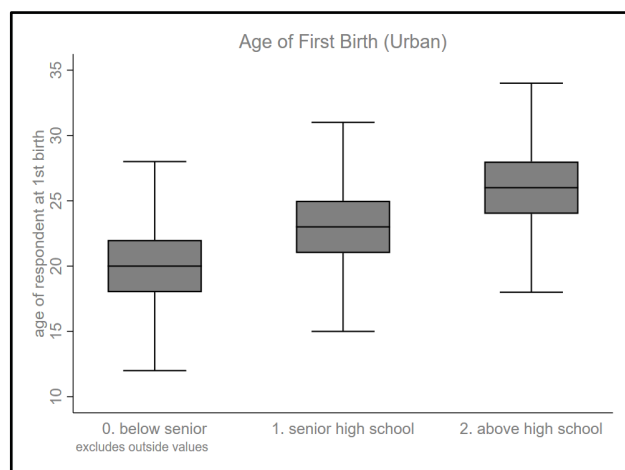


Figure 2. Median Age at First Birth by Education in Urban Areas

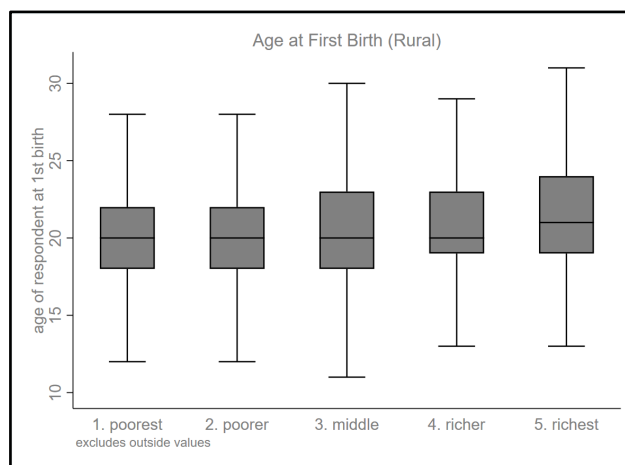


Figure 3. Median Age at First Birth by Wealth Quintile in Rural Areas

To confirm the results, this study also examined the median age at first birth. Boxplots in Figures 2 and 3 illustrate the trends in median age at first birth in urban and rural areas, stratified by women's educational level and wealth quintile, respectively, as significant factors in both settings.

Discussion

This study found the prevalence and risk factors associated with HRFB among reproductive-age women in Indonesia using the 2017 IDHS dataset. The overall prevalence of HRFB was slightly higher among women in urban areas than in rural areas, at 37.6% and 36.1%, respectively. Among the four indicators of HRFB, it was found that giving birth at age over 35 years constituted 25.4% of HRFB individuals (24.0% in rural areas and 25.9% in urban areas). The least common indicator of HRFB was giving birth at age less than 17 years, with an overall prevalence of 0.1% (0.2% in rural areas and 0.03% in urban areas).

These findings were in line with other studies stating that place of residence was one of the risk factors associated with HRFB.^{7,21} This study also identified some differences in risk factors in rural and urban areas. This study discovered three main findings: 1) the wealth quintile remained the only significant predictor in rural areas; 2) education level and women's autonomy were significantly associated with HRFB in urban areas; and 3) there was a gradient of increasing risk along with the increasing status of wealth quintiles in rural areas and education status in urban areas.

One possible argument implied that a gradient of risk existed due to the intention to delay fertility among highly educated women in urban areas and upper-class women in rural areas. A narrative highlighted that the number of intentional delayed pregnancies among women was more prevalent among women with higher social status (often denoted by employment and career) of women,²² and such factors were associated with delays in childbearing.^{23,24} These findings were validated in Figures 2 and 3, where the median age of first birth increased with the increasing status of education in urban and wealth quintiles in rural areas.

Furthermore, it was also implied that women with higher education in urban areas were more likely to delay childbearing.²³ This is because higher education promotes career prospects and personal development, and it takes a prolonged period to establish a better career promotion.²² Frequently, having a child is considered a barrier to pursuing a better education and a better career life in urban areas.^{25,26} In contrast to its counterpart, education did not exhibit a significant association with HRFB, whereas the income quintile did. This result can be attributed to the unequal distribution of education levels in rural areas. The percentage disparity of women who finished high school and higher education was 14.50% in 2017, while women in urban areas had higher school participation rates than those in rural areas.²⁷ This might explain the educational significance of risk factor differences in rural and urban areas.

The wealth quintile correlated with the HRFB in rural but not urban areas. This study contended that this disparity resulted from variations in societal norms and the acceptance of childbirth at over 35 years. Social norms of having children at a later age were more acceptable in urban areas irrespective of wealth quintile.²⁸ Conversely, social norms of having children as early as possible are highly encouraged in rural areas, as shown by the high number of below 18 marriages.²⁹ This also explained why this study found that giving birth at age less than 17 years was more common in rural areas.

Additionally, women's autonomy in deciding on contraceptive use was associated with HRFB in urban areas, nevertheless not in rural areas. Women in urban areas have more autonomy than those in rural areas³⁰ and are not strictly bound to social norms compared to rural areas.²⁹ Thus, they can decide on their own or have equal voices as their partner regarding their reproductive health status,³¹ including birth planning. Drawing back to Indonesia's sustainability plan in the *Indonesia Emas 2045*, family planning policies to increase people's quality of life are addressed in the social transformation agenda, which aims to control high-risk pregnancies supported by robust knowledge and behavioral changes in society.³² The findings in this study are advantageous for policymakers in crafting evidence-based health policies to reduce HRFB risk according to the influencing sociodemographic factors in urban and rural areas.

The increase in education level and autonomy ownership among urban women and the higher wealth quintile among rural women are in line with a higher risk of HRFB, indicating that the good trends in sociodemographic factors among urban-rural communities have to be complemented by fertility education and access to family planning assistance from health facilities. This interpretation is supported by the IDHS 2017 findings, highlighting the insignificance of women's higher education level on HRFB protective behavior, such as contraception use.³³ The highest contraception use was found among women with basic education (64%) and decreased as the education level increased (46% among women with university degrees),³³ proving the relevance of improving fertility education in both urban and rural areas.

The fertility education content should be tailored specifically to address HRFB and be accessible to the whole population to influence the social norms that have been a significant incentive for HRFB practices. A previous study on

fertility education argue that improving it, regardless of its target population, can empower people to make informed decisions.³⁴ This underscores the importance of targeting both women and men in fertility education and sheds light on the role of fertility awareness in reducing HRFB through informed reproductive decisions, including childbearing age and number of children. Only targeting women in fertility education interventions could induce anxiety as if the burden of reproductive decisions were all on women.³⁴ Thus, addressing fertility education to a broader population is the key to creating a supportive society that prevents HRFB.

Improving HRFB knowledge among urban women is effective in influencing their behaviors and decisions in family planning, as they are already empowered by their high education level and autonomy in contraceptive use. However, the same intervention in rural areas should be accompanied by equitable access to formal education for women, as this study found that education level is not associated with HRFB in rural areas, unlike in urban settings, where education is a significant factor. This policy approach is aligned with *Indonesia Emas 2045's* strategy to strengthen family planning policy to achieve the social transformation agenda. According to Indonesia's current family planning program, the National Population and Family Planning Board manages the demand side, while the Ministry of Health manages the supply side.³⁵

Enhancing the fertility education program, as proposed in this study, will assist the National Population and Family Planning Board in augmenting the program's demand side, primarily focused on community engagement. Simultaneously, the Ministry of Health, on the supply side, needs to balance this improvement through robust health systems development, including health facilities and health workers, to accommodate fertility education delivery through family planning consultation in the local primary healthcare.³⁵ Subsequently, future research needs to address the appropriate methods for fertility education in urban and rural areas and explore the strategy to reach a broader community.

The socioeconomic factors associated with the HRFB identified in this study served as a crucial input to Indonesia's decentralized government, emphasizing the urgency to strengthen MCH service coordination, particularly at the regional level. However, limitations persisted in this study. First, the cross-sectional design of this study was insufficient for establishing causality. Second, because this study utilized a secondary dataset, the choice of variables was limited. Third, the covariate residuals might persist.

Conclusion

Addressing HRFB risk factors in urban and rural areas is a strategic approach to improving MCH indicator performance to achieve Indonesia's sustainable health targets. High education levels, women's autonomous ownership in urban areas, and higher wealth quintiles in rural areas are sociodemographic factors that correlate with a higher risk of HRFB. This study also found that delaying pregnancy was the most prevalent HRFB in both areas, increasing the likelihood of high-risk pregnancies and contradicting the government's aim of reducing such risks. Therefore, this study suggests that enhancing fertility education in urban and rural populations influences social norms and promotes informed reproductive decisions. These efforts aim to reduce HRFB practices in both areas and contribute to achieving the social transformation agenda of the *Indonesia Emas 2045*.

Abbreviations

MCH: Maternal-Child Health; MMR: Maternal Mortality Rate; NMR: Neonatal Mortality Rate; U5MR: Under-five Mortality Rate; HRFB: High-Risk Fertility Behavior; IDHS: Indonesian Demographic Health Survey; DHS: Demographic Health Survey; CCA: Complete Case Analysis.

Ethics Approval and Consent to Participate

Not applicable.

Competing Interest

The authors declare no competing interest.

Availability of Data and Materials

The dataset is open publicly at <https://dhsprogram.com/>.

Authors' Contribution

Conceptualization – FAKM, AAU, PY, MH; Data Analysis – FAKM; Manuscript Writing – AAU, FAKM; Review – PY, MH.

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