Determinants of contraceptive use prior to onset of childbearing among ever-married women in Indonesia: a secondary data analysis

Sarah Muharomah^{1*} and Linnea A. Zimmerman²

Abstract

Background Despite high rates of early marriage and adolescent childbearing in Indonesia—which increase risks for both maternal and child health—family planning efforts largely focus on birth spacing or limiting the number of children. Few programs specifically address the reproductive needs of ever-married women who wish to prevent or delay their first birth. This study investigates the sociodemographic factors influencing contraceptive use prior to childbearing among ever-married women in Indonesia.

Methods We analyzed weighted data from 121,916 ever-married women using the 2002–2017 Indonesia Demographic and Health Surveys. Variables were selected based on prior research and bivariate screening. Univariate and multiple survey logistic regression analyses were performed; model selection was guided by the Akaike Information Criterion, and Nagelkerke R-square quantified the explained variance.

Results Overall, 4.66% of ever-married women reported using contraception before having any children. Younger women (15–19 years), those preferring a smaller family size, being employed, and residing in Java were significantly associated with higher usage. Contrary to conventional assumptions, the poorest wealth quintile had notably high odds of pre-childbearing contraceptive use, second only to the richest. Interactions involving education and rural residence highlighted the multifaceted nature of these reproductive decisions.

Discussion These findings underscore the need for targeted policies to address diverse socioeconomic barriers and to empower women who wish to delay their first birth.

Keywords Contraceptive, Ever-married, Childless

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Introduction

Unwanted pregnancy poses significant risks for both maternal and child health, especially among young mothers, who are more likely to experience limited educational and career opportunities, reduced lifetime earnings, and heightened vulnerability to domestic violence [1-3]. They also have higher rates of mental health challenges such as depression and anxiety, with potentially long-lasting effects [4]. For these reasons, delaying childbearing until women are prepared—physically, financially, and emotionally—is critical for improving outcomes for both mothers and their children.

In Indonesia, child marriage remains a pervasive issue, with roughly 10% of all marriages involving minors and the highest number of births to adolescent girls aged 15–19 in Southeast Asia [4, 5]. Yet, national family planning initiatives primarily emphasize birth spacing or limiting family size, providing few options for young brides to exert greater control over their reproductive choices [6]. The absence of targeted programs for women who have not yet had their first child further constrains Indonesia's ability to address high fertility rates in underserved regions, where early marriage and frequent childbearing are prevalent. By broadening family planning efforts to support an increase in the childbearing age, Indonesia could make strides in women's empowerment, improve maternal and child health outcomes, and more effectively manage the demographic pressures in high-fertility areas.

Given that most pregnancies in Indonesia occur within marriage, understanding the factors influencing contraceptive use among married women before their first birth is essential to addressing early childbearing and its associated challenges. This study seeks to identify the key socioeconomic and demographic determinants shaping contraceptive use within this specific population. Despite the significance of this issue, there is limited data on the unique needs and characteristics of these women. By uncovering these factors, this research aims to inform targeted interventions that expand access to contraception, reduce barriers for women with limited resources, and empower women to make informed family planning decisions that align with their personal goals.

Materials and methods

Study setting and data source

Data for this study were derived from 2002 to 2017 Indonesia Demographic and Health Surveys (IDHS), conducted by by Statistics Indonesia (Badan Pusat Statistik). These years were selected to capture trends over a 15-year period, providing a comprehensive view of demographic changes and the impact of family planning initiatives during a time of significant social and economic transformation in Indonesia. The surveys gathered information about socioeconomic background, fertility, family planning, maternal and child health, sexual health, and sexually transmitted infections. A multi-stage cluster sampling design was employed, with a minimum of 40 census blocks (CBs) per province to adequately provide representative estimates of the whole nation [7, 8]. A detailed description of the survey design, sampling procedures, framework, and recoding of each variable has been published elsewhere [7, 9–11]. A total of 162,248 records of ever-married women aged 15–49 years were obtained for this study, with an average response rate of 97% [7, 8, 10, 11].

Including women aged 15–49 years provides insights into cohort changes and allows for comparisons between younger and older generations, capturing demographic shifts in Indonesia before and after periods of significant political and social transformation. Additionally, examining older generations provides the opportunity to assess women who achieved educational and career milestones, which may not be reflected among younger cohorts. The primary survey question assessed the number of children a woman had at the time of first contraceptive use, allowing for retrospective analysis. Prevalence was calculated directly from the data without adjustments to reflect the crude results.

Study variables

The dependent variable of this study was the first use of contraception before having any living children, coded as a binary variable. During the survey, women were asked how many children they had when they first used any method to avoid pregnancy. A value of 1 was assigned to participants who reported zero living children, while a value of 0 was assigned to those who reported any other number. Women who had never used contraception were also assigned a value of 0, regardless of the number of living children. This variable aims to gauge the intention of women to prevent live births, despite limitations in the data that may exclude information on children ever born.

We calculated the overall and age-specific prevalence of the dependent variable to observe trends over the study period and to enable comparisons with other countries. Several explanatory variables were included in the analysis: age, place of residence, education level (for both the woman and her husband), employment status, region of residence, wealth index, and ideal family size. Current age was stratified into six groups: 15–19, 20–24, 25–29, 30–34, 35–39, and 40–44 years. Education level was categorized as no formal education, primary (up to 9 years), secondary (10–12 years), or higher education (any postsecondary education).

Place of residence was classified as urban or rural based on IDHS definitions. Age at first marriage was grouped into two categories: below 21 years and 21 years or older —to reflect the threshold at which parental or guardian consent was no longer required under the 1974 Marriage Law, thereby indicating marital autonomy for individuals in our study period [12]. This approach allowed us to distinguish women whose marriage timing might have been influenced by parental consent from those able to marry independently. The analysis included data on age at first union, age at first intercourse, and religion; however, these variables were excluded from the final model due to substantial missing data.

Wealth index, a measure of a household's living standard, was calculated separately for urban and rural areas and categorized into five quintiles: poorest, poorer, middle, richer, and richest. Ideal family size was defined as the number of children the participant desired and categorized into two groups: two or fewer, and more than two. Region of residence was divided into six regions: Java, Sumatra, Kalimantan, Celebes, Nusa Tenggara and Bali, and Papua and Maluku. Employment status was defined as whether the woman was currently employed or unemployed at the time of the interview, providing insights into the participant's socioeconomic standing.

Survey year was included as a covariate to account for time-varying aggregate effects, including Indonesia's economic, political, social, and cultural changes. The definitions and descriptions of each variable were obtained from the standard recode manual for DHS-7, unless otherwise stated as country-specific [9].

Data analysis

We conducted data analysis using appended data from IDHS 2002–2017 after excluding individuals with missing information related to the outcome of interest. Data were weighted using the recommended sample weight to account for IDHS' complex survey design [13]. All statistical analyses were conducted using the svy or pweight commands in STATA version 18, unless otherwise specified.

For the descriptive analysis, continuous variables were presented as means and standard deviations (SD), while categorical variables were summarized as counts and percentages. Differences between groups were assessed using the design-based F statistic and t-tests, considering a p-value below 0.05 as statistically significant. Univariate and multiple logistic regression analyses were performed to identify variables associated with the outcome of interest. Results were presented as crude (cOR) and adjusted odds ratios (aOR) with 95% confidence intervals (CI).

The final multiple logistic regression model was built iteratively, starting with variables significant in the univariate analysis (*p*-value < 0.05) and those identified in the literature review. Variables that changed the cOR by $\pm 10\%$ or more were included. Interaction terms were created to explore the combined effects of key variables, such as age and education, or region and wealth, to

identify potential modifiers of contraceptive use trends. These terms were selected based on theoretical relevance and prior evidence suggesting interactions between demographic and socioeconomic factors. They were evaluated for statistical significance and their impact on overall model fit, with only significant terms retained in the final model.

Collinearity was assessed by dummy-coding the categorical variables and then calculating standard VIF and the condition index. Although this method is not a direct computation of generalized VIF, it effectively checks for multicollinearity by treating each category as a separate indicator. We followed Belsley, Kuh, and Welsch (1980), which suggests using 30 as a guideline for severe multicollinearity; our highest condition index for non-intercept variables was 19.55, indicating that collinearity was not severe enough to threaten the reliability of our estimates [14]. Regarding VIF for "non-intercept" variables, we dummy-coded each categorical variable (excluding the intercept) so that each category was treated as a distinct indicator, and found that all VIF values were below 2, reinforcing the conclusion that there is no significant collinearity concern [15, 16]. Model selection was guided by the Akaike Information Criterion (AIC), comparing 12 logistic regression models with various combinations of predictors and interaction terms. Nagelkerke's R-square was used to quantify the proportion of variance explained, thereby enhancing model interpretability.

Ethical considerations were adhered to, as this study utilized publicly available, anonymized data. It was therefore exempt from review by The Johns Hopkins Institutional Review Board (IRB) following a determination request form submission. The DHS projects were reviewed and approved by the ORC Macro IRB and the respective national ethics committees to ensure adherence to ethical guidelines for research involving human subjects.

Results

Descriptive statistics of the respondents

The study analyzed data from 118,999 records of evermarried women aged 15–49 years, weighted to account for the complex survey design and to provide nationally representative estimates. This resulted in a weighted total sample to 121,916 women for analysis. Table 1 presents the sociodemographic characteristics of the sample, categorized by whether the women used contraception before having any living children. The mean age of the women in the sample was $34\cdot24\pm 8.34$ years old, with half of them (50.98%) aged between 15 and 34 years old. The women in the study had their first union/marriage at an average age of 19.73 ± 4.40 years old, with significant portion, 62.46% being less than 21 years old. More than half of them (71.75%) reported that their first sexual intercourse

Variables	Overall sample	Use of contraception	Use of contraception before having any children			
	(<i>n</i> =121,916.20)	Yes	No	P-value		
		(n=5675.78)	(n=116240.50)			
Age [Mean±SD]	32.24±8.34	28.86±7.87	34.47±8.27	<0.01*		
Age groups						
15–19	3229.01 (2.65)	508.75 (8.96)	2720.25 (2.34)	<0.01*		
20–24	14407.24 (11.82)	1504.05 (26.50)	12903.20 (11.10)			
25–29	21605.44 (17.72)	1292.59 (22.77)	20312.85 (17.47)			
30–34	22912.46 (18.79)	967.28 (17.04)	21945.18 (18.88)			
35–39	22761.67 (18.67)	727.93 (12.83)	22033.74 (18.96)			
40–44	19848.83 (16.28)	448.25 (7.90)	19400.58 (16.69)			
45–49	17151.59 (14.07)	226.93 (4.00)	16924.66 (14.56)			
Age at first marriage [Mean±SD]	19.73±4.40	18.92±3.95	19.77±4.42	<0.01*		
Age group at first marriage						
<20	76150.33 (62.46)	4121.80 (72.62)	72028.53 (61.97)	<0.01*		
≥21	45765.91 (37.54)	1553.98 (27.38)	44211.93 (38.03)			
First intercourse in first union						
Yes	87480.18 (71.75)	4074.27 (71.78)	83405.91 (71.75)	0.98		
No, not sure or missing data	34436.06 (28.25)	1601.51 (28.22)	32834.55 (28.25)			
Place of residence						
Rural	64496.18 (52.90)	3714.85 (65.45)	60781.33 (52.29)	< 0.01*		
Urban	57420.05 (47.10)	1960.93 (34.55)	55459.12 (47.71)			
Women's education						
No education	5327 18 (4 37)	94 94 (1 71)	5230 24 (4 50)	< 0.01*		
Primary	50794 92 (41 66)	251970 (44 39)	48275 22 (41 53)			
Secondary	54553.07 (44.75)	2720.45 (47.93)	51832 62 (44 59)			
Higher	11241 08 (9 22)	338.69 (5.97)	10902 38 (9 38)			
Husband's education	112 11.00 (9.22)	330.09 (3.97)	10902.30 (9.30)			
No education	3608 40 (2 96)	115 38 (2.03)	3493 02 (3 00)	< 0.01*		
Primary	47939 73 (39 32)	2420.00 (42.64)	4551973 (3916)	2001		
Secondary	56257.04 (46.14)	2608 59 (45 96)	53648 45 (46 15)			
Higher	11609.45 (9.52)	380.91 (6.71)	11228 53 (9.66)			
Dop't know or missing	2501.62 (2.05)	150.00 (2.66)	2350 72 (2.02)			
Wealth index	2501.02 (2.05)	100.90 (2.00)	2330.72 (2.02)			
Poprost	22112 41 (10 14)	1000 07 (17 79)	21104 25 (10 16)	< 0.01*		
Poorer	22113.41 (10.14)	1240.00 (17.76)	21104.33 (10.10)	< 0.01		
Middle	24034.37 (19.73)	1211 20 (22.03)	227 13.39 (19.34)			
Richar	24033.18 (20.39)	1245 59 (23.10)	23343.90 (20.23)			
Richer	25370.96 (20.97)	1243.30 (21.93) 769.04 (13.55)	24525.41 (20.95)			
Richest	25322.09 (20.77)	/08.94 (13.55)	24553.15 (21.12)			
Ideal family size		2004 52 (60 62)		.0.01*		
<3	68242.37 (55.97)	3894.52 (68.62)	64347.85 (55.36)	<0.01*		
23	53673.87 (44.03)	1/81.26 (31.38)	51892.61 (44.64)			
		000755(40.00)		0.011		
Yes	68523.56 (56.21)	2837.55 (49.99)	65686.01 (56.51)	<0.01*		
No	53392.68 (43.79)	2838.23 (50.01)	50554.45 (43.49)			
Kegion						
Sumatra	236/2.55 (19.42)	445.30 (8.02)	23217.25 (19.97)	<0.01*		
Java	74215.56 (60.87)	4351.51 (76.67)	69864.05 (60.10)			
Kalimantan	6819.21 (5.59)	524.67 (9.24)	6294.55 (5.42)			
Celebes	8329.87 (6.83)	172.51 (3.04)	8157.36 (7.02)			
Nusa Tenggara and Bali	6808.89 (5.58)	151.21 (2.66)	6657.68 (5.73)			
Papua and Maluku*	2070.16 (1.70)	20.58 (0.36)	2049.58 (1.76)			
Year						

Table 1 Sociodemographic characteristic distribution of samples

Variables	Overall sample	Use of contraception before having any children				
	(<i>n</i> =121,916.20)	Yes	No	P-value		
		(<i>n</i> = 5675.78)	(<i>n</i> =116240.50)			
2002–2003	25168.29 (20.64)	1263.60 (22.26)	23904.69 (20.56)	< 0.01*		
2007	29086.42 (23.86)	1922.11 (33.87)	27164.32 (23.37)			
2012	32532.02 (26.68)	178.85 (3.15)	32353.17 (27.83)			
2017	35129.50 (28.81)	2311.22 (40.72)	32818.29 (28.23)			

Table 1 (continued)

Data are weighted

Data are n (percentage) unless otherwise specified

* No data available in IDHS 2007

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Age groups	IDHS 2002–2003	IDHS 2007	IDHS 2012	IDHS 2017	Overall
	(<i>n</i> /%)	(<i>n</i> /%)	(<i>n</i> /%)	(<i>n</i> /%)	(%)
15–19	164.98 (13.06)	161.85 (8.42)	1.54 (0.86)	180.38 (7.80)	8.96
20–24	422.14 (33.41)	564.32 (29.36)	21.18 (11.84)	496.40 (21.48)	26.50
25–29	302.38 (23.93)	472.87 (24.60)	39.87 (22.29)	477.45 (20.66)	22.77
30–34	197.03 (15.59)	319.81 (16.64)	27.00 (15.09)	423.45 (18.32)	17.04
35–39	72.03 (5.70)	241.87 (12.58)	39.20 (21.92)	374.84 (16.22)	12.83
40–44	38.66 (6.94)	106.61 (5.55)	21.43 (11.98)	232.55 (10.06)	7.90
45–49	17.39 (1.38)	54.78 (2.85)	28.63 (16.01)	126.14 (5.46)	4.00
Annual prevalence	1263.60 (5.02)	1922.11 (6.61)	178.85 (0.55)	2311.22 (6.58)	4.66
Proportion of Total (%)	22.26	33.87	3.15	40.72	100

Abbreviation: IDHS, Indonesia Demographic Health Survey

occurred during their first union. Majority of women had primary or secondary levels of education (86.41%), were employed at the time of the interview (56.21%), came from the Java region (60.87%), and preferred to have a family size of two or fewer children (55.97%). Regarding wealth, the majority of women (62.13%) belonged to the middle or higher quintiles.

Women who used contraception prior to having any living children had a younger age at first use of contraception (28.86 vs. 34.47 years old; p < 0.05) and a lower age at first union (18.92 vs. 19.77 years old; p < 0.05) compared to those who did not use contraception before having any living children. Additionally, the largest percentage of these women were aged 20–24 years (26.50%), lived in rural areas (65.45%), had secondary education (45.96%), originated from the Java region (76.67%), and belonged to the poorer quintile of the wealth index (23.63%). Approximately half of the women who used contraception before having any living children were not employed at the time of the interview (50.01%), and the majority (68.62%) preferred to have two or fewer children. Regarding the husband's level of education, mostly had attained secondary education or higher (52.67%).

Table 2 presents the overall and age-specific prevalence of contraceptive use before having any living children among ever-married women. The overall weighted prevalence, combining data from 2002 to 2017, was 4.66%. Across the five-year survey periods, the prevalence ranged from 5.02 to 6.61%, except in 2012, which showed a notable deviation with a drop to 0.55%. The highest prevalence was observed in 2007, with women aged 20–24 consistently making up the largest proportion of contraceptive users across survey years. However, in 2012, women aged 25–29 accounted for the largest proportion. Overall, contraceptive prevalence decreased consistently with increasing age across all survey years.

Logistic regression

Table 3 presents the results of the logistic regression analysis. The adjusted odds ratios (aOR) of using contraception before having any children decreased progressively with age (p < 0.01), with women aged 15–19 being the most likely to use contraception prior to their first living child. Women who desired a smaller family size of two or fewer children (aOR: 1.41, 95% CI: 1.27–1.57) and those employed at the time of the interview (aOR: 1.13, 95% CI: 1.01–1.25) were significantly more likely to use contraception compared to their counterparts.

Compared to women in the Java region, those in Sumatra, Celebes, Nusa Tenggara and Bali, Papua, and Maluku had lower odds of using contraception, with aORs of 0.29, 0.29, 0.34, and 0.14, respectively (p < 0.05). The odds for Kalimantan were higher (aOR: 1.17, 95% CI: 0.99–1.38), but this association was not statistically significant (p = 0.07). Survey year was included as a covariate to account for time-varying economic, political, social, and cultural changes in Indonesia. Using 2002–2003 as the reference, the odds ratios for using contraception
 Table 3
 Logistic regression results of the contraceptive use prior onset of childbearing by ever-married women's sociodemographic characteristics

Variable	Crude odds ratio			Adjusted odds ratio		
	OR	95% CI	P-value	OR	95% CI	P-value
Age Group						
15–19	Ref	-	-	Ref	-	-
20–24	0.62	0.52-0.74	< 0.01*	0.62	0.52-0.75	< 0.01*
25–29	0.34	0.29-0.41	< 0.01*	0.36	0.30-0.43	< 0.01*
30–34	0.24	0.20-0.28	< 0.01*	0.24	0.20-0.30	< 0.01*
35–39	0.18	0.15-0.21	< 0.01*	0.18	0.14-0.22	< 0.01*
40-44	0.12	0.10-0.15	< 0.01*	0.12	0.10-0.15	< 0.01*
45-49	0.07	0.06-0.09	< 0.01*	0.07	0.05-0.09	< 0.01*
Age Group at First Union						
15–20 years old	Ref	-	-	Ref	-	-
≥21 years old	0.61	0.56-0.68	< 0.01*	0.90	0.81-1.00	0.060
Place of Residence						
Urban	Ref	-	-	Ref	-	-
Rural	1.73	1.52-1.96	< 0.01*	0.89	0.64-1.24	0.485
Ideal Family Size						
≥3	Ref	-	-	Ref	-	-
<3	1.76	1.59–1.95	< 0.01*	1.41	1.27-1.56	< 0.01*
Employment Status						
No	Ref	-	-	Ref	-	-
Yes	0.77	0.70–0.85	< 0.01*	1.13	1.01-1.25	0.029*
Level of Education						
No education	Ref	-	-	Ref	-	-
Primary	2.82	2.06-3.85	< 0.01*	1.20	0.77-1.88	0.426
Secondary	2.83	2.08-3.85	< 0.01*	1.29	0.81-2.06	0.285
Higher	1.68	1.19-2.36	0.003*	0.40	0.15-1.11	0.080
Wealth Index						
Poorest	Ref	-	-	Ref	-	-
Poorer	1.23	1.05-1.45	0.009*	0.36	0.15-0.86	0.022*
Middle	1.16	0.99-1.37	0.061	0.20	0.07-0.58	0.003*
Bicher	1.07	0.91-1.27	0.424	0.19	0.04–1.04	0.056
Richest	0.65	0.55-0.78	< 0.01*	1 92	0.47-7.83	0.361
Region	0.00	0.00 0.70	10101		0.17 7.00	0.001
lava	Ref	-	-	Ref	-	-
Sumatra	0.31	0 27-0 37	< 0.01*	0.29	0 25-0 34	< 0.01*
Kalimantan	1 34	1 14-1 57	< 0.01*	1.16	0.98-1.38	0.075
Celebes	0.34	0.28-0.41	< 0.01*	0.29	0.24-0.35	< 0.01*
Nusa Tenggara and Bali	0.36	0.29-0.46	< 0.01*	0.29	0.27-0.43	< 0.01*
Papua and Maluku	0.16	0.12-0.22	< 0.01*	0.14	0.10-0.20	< 0.01*
Voar	0.10	0.12 0.22	< 0.01	0.14	0.10 0.20	< 0.01
2002_2003	Rof	_		Rof		_
2002-2003	1.34	1 10 1 62	-	1.41	- 1 16 1 71	-
2007	0.10	0.08 0.14	< 0.005	0.11	0.08 0.15	< 0.001
2012	1.33	1 11-1 60	0.002*	1.68	1 39_2 02	< 0.01*
Education with Wealth Index	1.55	1.11-1.00	0.002	1.00	1.39-2.02	< 0.01
NoEducation #Poorest	Rof	_		Rof		_
Drimory#Booror	1 70	077 / 17	0.179	1.09	0.95 4.64	0.114
Primary#Middlo	1./3	110 200	0.170	2.47	1 2/ 0 72	0.114
Primary#Richar	2.22	0.63 1775	0.022	3.47	1.24-9.12 0.62 10.17	0.010
Primary#Richoct	0.30	0.05-17.75	0.157	0.31	0.05-10.47	0.100
Socondary #Pooror	0.50	0.07=1.25	0.095	1.80	0.07-1.20	0.102
Socondary#Middla	י./ט רקר ר	102 752	0.19/	1.00	0.02 7 22	0.101
Jeconical y#Micule	2.11	1.02-7.33	0.040	2.01	5.1-0.52	0.009

Variable	Crude odds ratio			Adjusted odds ratio		
	OR	95% CI	P-value	OR	95% CI	P-value
Secondary#Richer	3.19	0.60-16.87	0.172	2.87	0.53-15.37	0.219
Secondary#Richest	0.23	0.06-0.94	0.040*	0.23	0.06-0.92	0.038
Higher#Poorer	4.72	1.35-16.46	0.015*	4.84	1.33-17.61	0.017*
Higher#Middle	13.62	3.48-53.37	< 0.01*	12.67	3.12-51.48	< 0.01*
Higher#Richer	10.94	1.63-73.21	0.014*	7.90	1.15-54.08	0.035*
Higher#Richest	1.10	0.21-5.67	0.912	0.72	0.14-3.78	0.696
Wealth index with Place of Re	sidence					
Poorer#Rural	1.84	1.29-2.60	0.001*	1.75	1.22-2.51	0.002*
Middle#Rural	2.11	1.45-3.05	< 0.01*	2.10	1.43-3.08	< 0.01*
Richer#Rural	2.26	1.57-3.24	< 0.01*	2.35	1.61-3.42	< 0.01*
Richest#Rural	1.90	1.25–2.89	0.003*	1.93	1.25–2.98	0.003*

Table 3 (continued)

Abbreviation: OR, odds ratio

*P-values are significant if < 0.05

in 2007, 2012, and 2017 were 1.42 (95% CI: 1.17–1.72), 0.11 (95% CI: 0.09–0.15), and 1.70 (95% CI: 1.41–2.05), respectively, all statistically significant (*p* < 0.05).

After adjusting for covariates, women in the poorer, middle, and richer wealth quintiles had lower odds of using contraception compared to the reference group (poorest quintile), with aORs of 0.36, 0.20, and 0.19, respectively. Only the poorer and middle quintiles were statistically significant (p < 0.05). Women in the richest quintile had higher odds of using contraception (aOR: 1.92), but this result was not statistically significant (p > 0.05). Interaction terms between place of residence and wealth quintiles showed significantly higher odds for rural residents across all wealth categories higher than the poorest, with aORs ranging from 1.75 to 2.35 (p < 0.05). This suggests that the effect of rural residence on contraceptive use is moderated by wealth.

Level of education was not statistically significant after adjusting for other covariates. However, interaction terms showed that women with higher education from poorer, middle, and richer wealth quintiles had significantly higher odds of using contraception (aOR: 4.84, 12.67, and 7.90, respectively; p < 0.05). Additionally, women with primary education from the middle wealth quintile also had higher odds (aOR: 3.47, 95% CI: 1.24–9.72).

Discussion

Based on our analysis, the prevalence of contraceptive use before having any children was calculated to be low, at 4.04%. However, the data from 2012 exhibited an unusual prevalence of 0.45%, which may be attributed to a significant change in sampling methodology, including the addition of non-married women in the sample. Other than 2012, the prevalence remained stable, with 2007 showing the highest prevalence at 6.61%. Data from India shows similar results, ranging from 3.3–6.2% between 1992 and 2016 [17]. Additionally, we identified several sociodemographic factors significantly associated with contraceptive use prior to the onset of childbearing, revealing unique patterns within this specific population. These factors include age, ideal family size, employment status, region, and wealth index. While place of residence and level of education were not significant individually, their interactions revealed a significant association with contraceptive use.

Age emerged as a crucial determinant, with women aged 15-19 demonstrating the highest odds ratio of contraceptive use prior to childbearing after adjustment for covariates. Women who had their first union before the age of 21 (the legal age for marriage without parental permission in Indonesia) showed a higher odds ratio for using contraception prior to their first birth, although the association was not significant after adjustment. This association may stem from the higher likelihood of these young women still being enrolled in school and their improved access to reproductive health services compared to their unmarried counterparts [18–20]. However, the odds ratio for contraceptive use prior to having any children decreased as age increased. Younger women in this study, aged 15 to 30 years, were born between the 1970s and 1990s, a period marked by significant economic growth and geopolitical changes in Indonesia [21]. These women had better access to education and employment opportunities compared to older generations [22–25], which aligns with our finding that employment status was significantly associated with contraceptive use (p < 0.05).

Studies in Indonesia also indicate that younger generations received better sexual education and experienced greater equality within marriage, giving them more agency in deciding when to bear children [6, 25, 26]. Although the age group 15–19 had the highest odds ratio, women aged 20–24 represented the highest prevalence of contraceptive use prior to having any children, underscoring the significant shifts that occurred during this time period and affected fertility behavior such as the enforcement of law against underage marriage.

Beyond age, we identified distinct patterns in contraceptive use before the first birth, particularly concerning education, wealth index, and regional factors. While prior research has shown that urban [6, 25, 26], wealthy [17, 27, 28], and highly educated women [27, 29], are the most likely to use contraception, our findings indicate that contraceptive use prior to first childbearing is most common among the most and least socially privileged.

Level of education alone was not statistically significant, but its interaction with wealth index revealed notable findings. Women with higher education consistently had higher odds of contraceptive use across poorer, middle, and richer wealth quintiles (p < 0.05) but not in the richest quintile (p=0.70). This suggests that higher education supports contraceptive use across most wealth levels, except the richest. However, the confidence intervals for the higher-education & middle/richer subgroups were very wide, indicating substantial variability or uncertainty in those estimates-despite reaching statistical significance (p < 0.05). Consequently, these results should be interpreted with caution, as the wide intervals may reflect underlying heterogeneity in these groups. Additionally, wealth index influenced the relationship between urban and rural residence. Women in rural areas had higher odds of contraceptive use across all wealth quintiles (aOR: 1.75–2.35, p < 0.05). These results underscore the combined effect of wealth and residence on contraceptive use patterns.

The mechanisms driving these results likely differ across subgroups. Women with no education or from may lack knowledge of contraceptives, have limited understanding of family planning, reduced access to services, and less autonomy in childbearing decisions [18, 30]. They are also more likely to become child brides and face cultural pressures to bear children soon after marriage [5]. Conversely, women with education, who are at least able to read and write, often possess greater knowledge of reproductive health and more likely to enroll in national health insurance programs that provides free or low-cost reproductive health services [31, 32] Yet, women with education may also financially unstable, especially in the poorest quintile, thus motivating a delay in first birth [33]. On the other hand, affluent and urban women may have greater financial stability, access to childcare services [25, 34], and improved health services, enabling them to manage risks associated with pregnancy (c-section, abortion services) [21, 35]. Furthermore, these women often marry later, prioritizing education and career aspirations [25, 26, 36, 37], and face less societal pressure to marry young [26, 38]. Given that childbearing in Indonesia typically occurs within marriage, women who marry later may have children soon after to avoid further delays in fertility [39, 40].

The association between rural residence and contraceptive use may stem from extensive government-led contraceptive initiatives in rural areas since the 1960s, such as door-to-door counseling targeting isolated regions [41]. Nonetheless, wealth remains critical, as women need financial resources for transportation and health services. Observed patterns in wealth index, education level, and place of residence highlight the confounding and modifying effects of these variables, underscoring the need to explore how social privilege influences contraceptive behavior. Programs aiming to increase contraceptive use before first birth should address the distinct barriers faced by both privileged and underprivileged groups.

All regions, except Kalimantan, demonstrated lower associations with contraceptive use before childbearing compared to Java. Given that Java and Kalimantan have higher regional incomes compared to the rest of Indonesia, regional wealth appears to play a role in women's contraceptive use, underscoring the issue of unequal development across the nation. This trend emphasizes the capacity of wealthier regions to decentralize health services, improve education levels, and overcome traditional childbearing values [42].

The strengths of this study lie in the utilization of IDHS dataset. Its comprehensive design ensures estimates that truly reflect the entire Indonesian population. Notably, the IDHS offers insights into diverse characteristics of women, considering their geographic and socioeconomic backgrounds. The study is also supported by high response rate (average of 97%) and minimal missing data. The 2002–2003 dataset is particularly significant as it was the first to align with the Health Indonesia 2010 vision, emphasizing the need for reliable data to guide evidencebased decision-making, thus improving the quality of the survey and its subsequent versions [7]. This dataset al.so reflect the consequences of the 1998 economic collapse and the 1999 decentralization of family planning programs, which transferred decision making to provincial and district levels [25].

Despite these strengths, the study has limitations. IDHS survey question used to identify contraceptive use before having any children only accounts for living children, rather than any children ever born. This may omit pregnancies that did not result in a live birth (e.g., miscarriages, stillbirths), potentially leading to an underestimation of the true prevalence of contraceptive use among women who have never had a surviving child. Nevertheless, given the structure of the IDHS and the relative rarity of non-live births, we believe this limitation likely has a minimal effect on our overall findings. Additionally, the 2002–2017 IDHS datasets mark

a period of transition from a 3-year to a 5-year survey interval, introducing methodological and sampling variations as the IDHS refined its processes [7, 11]. For example, the 2012 survey incorporated unmarried individuals for the first time and adopted new sampling methods [11]. This may explain the significant deviation in 2012 results compared to other years. Additionally, data from conflict-affected regions such as Papua and Maluku were absent in the 2002-2003 survey, leaving contraceptive behaviors in these areas underexplored [43]. Furthermore, the cross-sectional design introduces potential recall bias, as responses rely on participants' memory. Moreover, the wealth index reflects financial standing only at the time of the survey and does not account for economic fluctuations, which may disproportionately affect older women. Their financial status at the time of the survey may not align with their economic conditions immediately after marriage. Lastly, several variables in our dataset show extremely wide confidence intervals (CIs), often reflecting small subgroup sizes, high heterogeneity, or data subdivision in interaction terms-each of which inflates the standard errors. While many estimates are statistically significant, these wide CIs indicate substantial uncertainty and should be interpreted cautiously. Future research with larger or more targeted samples-potentially through data pooling across multiple surveys—could verify whether these wide-CI findings represent genuine subgroup effects or arise from sampling variability.

Conclusion

Contraceptive use before the first birth remains limited among ever-married women in Indonesia, highlighting the need to strengthen women's reproductive autonomy-particularly their freedom to decide if and when to have children. Younger women, those preferring smaller families, and those with paid employment in more developed regions appear more inclined to delay or prevent childbearing. By contrast, both the least and most privileged groups face unique barriers rarely addressed by traditional programs. Tailored interventions, supported by multi-sectoral collaborations among policymakers, healthcare providers, educators, and community leaders, may help shift societal norms around contraception and expand women's reproductive choices. Future longitudinal and qualitative research should further elucidate the socio-cultural dimensions of contraceptive behaviors, especially within Indonesia's decentralized system where provincial-level authorities guide program implementation.

Author contributions

S.M.: Conceptualization, methodology, writing-original draft, formal analysis L.Z.: Supervision, validation, writing-review and editing.

Data availability

The study utilized secondary data from the IDHS 2002-2003, 2007, 2012 and 2017 surveys, which were part of the MEASURE Demographic Health Surveys Project Phase II and have been reviewed and approved by the Institutional Review Board of Macro International, Inc. The DHS obtained written informed consent from all participants and maintained adherence to international ethical standards governing privacy, confidentiality, anonymity, and informed consent. The Ministry of Health of Indonesia determined that DHS surveys did not require IRB review. For more information regarding the ethical review of DHS surveys, please visit: https://www.dhsprogram.com/methodology/Prote cting-the-Privacy-of-DHS-Survey-Respondents.cfm. Derived data supporting the finding of this study are available from the corresponding author on request.

Declarations

Competing interests

The authors declare no competing interests.

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