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Individual and community factors of early sexual debut among adolescents in Indonesia: Evidence from demographic and health survey

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Original Article

ABSTRACT

Background: Early sexual debut by adolescents is a major public health issue with long-term consequences for sexual and reproductive health. Research has highlighted the role of social skills, peer influence, and social norms in shaping the risk of early sexual initiation among adolescents. However, there is still insufficient evidenceto contextualize the contributing factors in socio-ecological framework, especially in the era of disruptive technologies in Indonesia.
Objective: This study was to examine the individual and community-level factors associated with early sexual debut in adolescents socio-ecological framework.
Methods: This cross-sectional study utilizing data from the 2017 Indonesia Demographic and Health Survey (IDHS). Individual-level factors included gender, age, work and school participation, dating experience, perceived peer pressure and access to sexual and reproductive health (SRH) information. Factors at community level include the area of residence and community internet access. Multilevel logistic regression was used, with effect sizes reported as odds ratios (OR) and 95% confidence intervals (CI).
Results: Adolescents with dating experience (OR: 18.41; 95% CI: 8.14–41.62), those with friends who had an early sexual debut (OR: 6.24; 95% CI: 4.81–8.09), and those who had a good understanding of pregnancy prevention (OR: 1.73; 95% CI: 1.41–2.11) were more likely to experience early sexual debut. Protective factors included discussing SRH with teachers (OR: 0.76; 95% CI: 0.64–0.90) and first exposure to SRH education at the junior (OR: 0.60; 95% CI: 0.47–0.77) or senior high school level (OR: 0.41; 95% CI: 0.23–0.74). An analysis at Community-level has shown that adolescents in areas with high internet accessare 59% less likely to engage in early sexual debut than their counterparts.
Conclusion: Individual and community-level factors, including internet access, influence adolescent early sexual debut. Reinforcing sexual and reproductive health education in formal education systems is essential, especially in areas with limited acces to internet.

INTRODUCTION

The increasing gap between the age of menarche and marriage has contributed to a rise in early sexual debut among adolescents.[1] The prevalence of early sexual debut varies across countries, ranging from relatively low, such as 5.3% in Southeast Asia[2], to significantly higher rates, such as 30% in Bangladesh and 33.6% in Ethiopia.[3,4] While some countries have reported a decline in adolescent sexual activity, others have seen no change or even a substantial increase, particularly in African regions.[5] In Indonesia, data from the 2017 Indonesia Demographic and Health Survey (IDHS) indicated that approximately 8% of boys and 2% of girls aged 15–24 had engaged in early sexual debut. This marked a 1% increase among girls compared to the 2012 IDHS, while the rate among boys remained unchanged.[6]

Early sexual debut among adolescents often leads to unwanted pregnancy since it was largely unprotected.[7] More than half of all adolescent pregnancies in low- and middle-income countries are unplanned, according to the World Health Organization (WHO.[8] In addition, a recent study found that girls aged 15 to 19 were almost 1.5 times more likely to experience unwanted pregnancies than those aged 20 to 24.[9] Pregnancy (either intended or unintended) among young people under 18 was frequently associated with an increased risk of complications during pregnancy and childbirth.[10] Another study of Indonesian females aged 18 to 25 found that early sexual debut occurred younger than the age at which they first married.[11]

Marriage and childbirth at a young age also limit one's ability to pursue higher education[12] and career opportunities. Therefore, the United Nations Convention on the Rights of the Child (UNCROC), a global agreement on fundamental young people's rights under 18, was deeply concerned about their development and well-being. Moreover, early sexual debut has a wide range of consequences for adolescents' lives, including abortion, infection with sexually transmitted infections such as HIV and AIDS, substance use, multiple sexual partners, and psychological disorders associated with low self-esteem, stress, and depression.[13–17]

Adopting Bronfenbrenner's socio-ecological model to conceptualize factors related to early sexual debut can be beneficial. It recognizes that no single factor explains health-related behaviors and that effective prevention or intervention strategies should address multiple levels of influence, such as individual characteristics, interpersonal relationships, community environments, institutional or organizational structures, and wider societal factors.[18] Previous research on the determinants of early sexual debut emphasizes the importance of organizing these determinants through an ecological lens, considering how these factors are organized across the individuals, families, partners/peers, schools, communities, laws, values, and cultural domains.[19,20] The various determinants of early sexual debut among adolescents could be explained using a similar framework by interacting with multiple levels of social ecology.

Research has shown that individual characteristics such as social skills, partners and peer pressures might impact an adolescent's risk of an early sexual debut.[19] Social norms also influence adolescent behavior.[13] In addition, there is evidence that the extensive penetration of technology in adolescent environments influences their sociosexual behavior [21]. However, there is a lack of research that contextualizes the factors that contribute to adolescent early sexual debut, particularly in the disruptive technology era in Indonesia. As such, this study sought to evaluate the associated factors in multiple ecological domains, including the individual, family, peer/ friend, school, cultural, and community domains of adolescents' early sexual debut. We specifically examined whether community domain, i.e. community level of internet use and region contributed to adolescent early sexual behavior.

METHODS

Study design

This study was a secondary data analysis using the most recent Indonesia Demographic and Health Survey (IDHS), a nationally representative cross-sectional survey conducted in 2017 by the National Population and Family Planning Board, the Statistics Indonesia, and the Ministry of Health, Republic of Indonesia.

Population and sample

The 2017 IDHS utilized a stratified two-stage cluster sampling design, selecting 1,970 census blocks to ensure representation of both urban and rural areas. These census blocks yielded a total sample of 49,250 households. For this study, we analyzed 22,550 respondents who met the inclusion criteria—specifically, individuals aged 15 to 24 who were unmarried or not cohabiting at the time of the survey. Respondents with incomplete observations or missing data were excluded from the analysis.

Data collection

Data were obtained from the IDHS as part of the Demographic and Health Surveys (DHS)

program. This study included a dichotomous dependent variable, which is early sexual debut. Following UNCROC, the sexual debut was classified as an early sexual debut if the adolescents engaged in sexual activity for the first time before the age of 18, and a later sexual debut when they first engaged in sexual activity after the age of 18 or never had sex. The IDHS standard question to obtain this information was "Have you ever had sexual intercourse?" and "How old were you when you first had sexual intercourse?".

For independent variables, we selected demographic characteristics including gender (male, female), age category (15-18, 19-24 years), work participation (yes, no), school participation (yes, no), and higher educational attainment (primary, junior high school, senior high school, academy/university). We included sex-related experience as our variable of interest, i.e., dating experience; perceived peer pressures, i.e., having friends who experienced early sexual debut and discussing sexuality with friends; and sexual and reproductive health (SRH) information access, i.e., SRH discussion with family members, teachers, and relatives, fertile periods and pregnancy-related knowledge, and the first time to expose to human reproductive system education. These variables of interest's standard questions according to IDHS are detailed in Table 1.

In addition, as the IDHS data have a hierarchical structure where adolescent samples are nested under the communities, we included community-level factors such as area of residence and percentage of community using the internet. Individual responses for each item at the community level were aggregated to produce these second-level variables. The IDHS standard question to measure respondents' internet use was "During the last month, how often did you use the internet?" with a polytomous response ("almost every day", "at least once a week", "less than once a week", "or not at all"). We calculated the percentage of community internet use at least once a week by province and categorized it into high and low; the national average was used as a cutoff point.

Table 1. Sex-related experience, perceived peer pressures, and sexual and reproductive health (SRH) information experiences measurements according to Indonesia Demographic and Health Survey (IDHS) 2017

Variable	IDHS 2017 Standard Questions	Remarks
Sex-related experience		
Dating experience	Did you ever have a boyfriend/ girlfriend?	Dichotomous responses ("Yes", "No")
Perceived peer pressure		
Having friends who experienced early sexual debut	Do you have any friends who have had sex before marriage?	Polytomous responses ("Yes", "No", "Do not know"). We categorized further "Do not know" as "No".
Discussing sexuality with friends	We would like to know about the people with whom you have talked or asked questions about sexual matters. Have you talked about these things with a friend?	Dichotomous responses ("Yes", "No")
Sexual and reproductive health (SRH) information access		
SRH discussion with family members	We would like to know about the people with whom you have talked or asked questions about sexual matters. Have you talked about these things with your mother/ father/ siblings?	Dichotomous responses ("Yes", "No")
SRH discussion with teachers	We would like to know about the people with whom you have talked or asked questions about sexual matters. Have you talked about these things with a teacher?	Dichotomous responses ("Yes", "No")

Variable	IDHS 2017 Standard Questions	Remarks
SRH discussion with relatives	We would like to know about the people with whom you have talked or asked questions about sexual matters. Have you talked about these things with relatives?	Dichotomous responses ("Yes", "No")
Fertile periods and pregnancy-related knowledge	a. Now I would like to ask you about a woman's risk of getting pregnant. From one menstrual period to the next, are there certain days when a woman is more likely to become pregnant when she has sexual relations? Is this time just before her period begins, during her period, right after her period has ended, or halfway between two periods? b. Can a woman become pregnant by having one sexual intercourse? c. Do you know how to avoid pregnancy? If "Yes": What is it? d. I will now read some statements about condom use. Do you agree or disagree with the following statement: "Condoms can be used to prevent pregnancy"?	a. Polytomous responses ("Just before her period begins", "During her period", "Right after her period has ended", "Halfway between two periods", "Other", "Do not know". We further gave 1 point to those who answered correctly ("Halfway between two periods") and 0 points to those who responded else. b. Polytomous responses ("Yes", "No", "Do not know"). We further gave 1 point to those who answered correctly ("Yes") and 0 points to those who responded else. c. Polytomous responses ("Abstain from sex", "Use contraception", "Other", "Do not know". We further gave 1 point to those who answered correctly ("Abstain from sex" or "Use contraception") and 0 points to those who responded else. d. Polytomous responses ("Agree", "Disagree", "Do not know"). We further gave 1 point to those who answered correctly ("Agree") and 0 points to those who responded else. We summed up these scores and categorized the respondent scores as "Good" if the score ≥2 and "Poor" if the score <2.
First-time exposure to the human reproductive system education	At what level of schooling were you when you first were taught at school about how the human reproductive system works?	Polytomous responses ("Primary", "Junior High School", "Senior High School", "Academy/ University."

Data analysis

Descriptive statistics were presented as frequencies and weighted proportions following the recommendations of the 2017 IDHS. Multilevel logistic regression was used to examine the association between individual- and community-level factors and adolescent early sexual debut.

First, Model 1 (null model) was generated without independent variables to assess random variability in the intercept and quantify the total variance in early sexual debut across communities at the provincial level. In the second step, Model 2 incorporated individual- and community-level characteristics, with results reported as odds ratios (ORs) and 95% confidence intervals (CIs). Hypotheses were tested at a significance level of $p < 0.05$. The intra-class correlation coefficient (ICC) was calculated for each model to determine the proportion of variance attributable to higher-level factors. Additionally, the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were computed to compare model fit. Model goodness-of-fit was evaluated using the log-likelihood test, with $p > 0.05$ indicating an adequate fit. All descriptive and analytical procedures were conducted using complex sample weighting in STATA version 18.0.

Ethical statement

The data utilized in this study were originally collected by the DHS survey team, led by ICF International on behalf of the United States Agency for International Development (USAID). The data collection process followed ethical standards set by the ICF Institutional Review Board (IRB), including obtaining informed consent from all participants. MEASURE DHS granted permission for data access and use. Additionally, the survey protocols were reviewed by both the ICF IRB and an ethics board in the host country. As this study involved secondary data analysis with no direct interaction with participants, separate ethical reviews and approval were not required.

RESULTS

Among the 22,550 adolescents analyzed, the proportion of boys was slightly higher than girls. The majority of respondents were aged 15–18 years (55.84%) and were students (53.09%), with most attending senior high school (59.77%). More than 80% of adolescents reported having ever been in a dating relationship, and half stated that they had friends who had engaged in early sexual debut. Approximately 2.5% of adolescents in this study reported experiencing sexual debut before the age of 18.

More than half of the respondents reported discussing reproductive health issues with their friends, while 36% engaged in conversations about these topics with family members, including their mother, father, or siblings. Additionally, 44.29% discussed reproductive health with their teachers, and 33.28% sought information from relatives or other sources. The majority of adolescents (70.6%) demonstrated a good understanding of pregnancy prevention, contraception, and the fertile period. Most first encountered education on the human reproductive system during junior high school. Additionally, over half of the adolescents resided in urban and provincial areas where internet access was frequently available, often on a daily basis.

Table 2. Individual and community level characteristics of adolescents aged 15 – 24 in Indonesia, IDHS 2017

Variable	n	%
Individual-level		
Outcome variable		
Sexual debut		
Later	21,990	97.52
Early	555	2.48
Sociodemographic characteristics		
Gender		
Male	12,591	55.84
Female	9,959	44.16
Age		
15 – 18 years	14,469	64.16
19 – 24 years	8,081	35.84

Variable	n	%
Work participation		
Yes	1,801	7.99
No	20,749	92.01
School participation		
Yes	11,971	53.09
No	10,579	46.91
Highest educational attainment		
Primary	1,534	6.80
Junior High School	3,447	15.28
Senior High School	13,478	59.77
Academy/University	4,091	18.14
Sex-related experience		
Dating experience		
Yes	18,552	82.27
No	3,998	17.73
Perceived peer pressure		
Having friends who experienced early sexual debut		
Yes	11,848	52.54
No	10,702	47.46
Discussing sexuality with friends		
Yes	12,561	55.70
No	9,989	44.30
Sexual and reproductive health (SRH) information access		
SRH discussion with family members		
Yes	8,133	36.07
No	14,417	63.93
SRH discussion with teachers		
Yes	9,987	44.29
No	12,563	55.71
SRH discussion with relatives		
Yes	7,504	33.28
No	15,046	66.72
Fertile periods and pregnancy-related knowledge		
Poor	6,630	29.40
Good	15,920	70.60
First-time exposure to the human reproductive system education		
Primary	2,855	12.66
Junior High School	12,810	56.81
Senior High School	3,755	16.65
Academy/ University	3,130	13.88
Community-level		
Type of residence		
Urban	12,741	56.50
Rural	9,809	43.50
Community-level internet access		
Low	4,335	19.22
High	18,215	80.78
Total	22,550	100.00

Random effects

Adolescent sexual debut varied significantly across provinces. The ICC in Model 1 (null model) indicated that community-level factors accounted for 19% of the variation in early sexual initiation among youth. In Model 2, the ICC value decreased, indicating that individual and

community-level characteristics explained some of the variance. However, the lower AIC and BIC values in Model 2 compared to the null model indicate an improved model fit and better explanatory power (Table 3).

Individual and community factors associated with adolescent early sexual debut

After adjusting for sociodemographic factors, the multilevel analysis identified several significant determinants of early sexual debut. Individual-level factors, including dating experience, having friends who engaged in early sexual debut, discussing SRH with teachers, knowledge of fertility and pregnancy, and the timing of first exposure to human reproductive system education, were all significantly associated with early sexual initiation. At the community level, internet access emerged as a significant factor influencing adolescent sexual debut (Table 3).

Adolescents with dating experience were significantly more likely to engage in early sexual debut compared to those who had never been in a romantic relationship (Odds Ratio [OR]: 18.41; 95% CI: 8.14–41.62). Similarly, peer influence played a crucial role, as adolescents with friends who experienced early sexual debut were more likely to engage in early sexual debut than their peers without such influences (OR: 6.24; 95% CI: 4.81–8.09). Conversely, discussing SRH with teachers was associated with a lower likelihood of early sexual debut (OR: 0.76; 95% CI: 0.64–0.90). However, adolescents with good knowledge of pregnancy prevention and fertile periods were more likely to initiate early sexual activity than those with poorer understanding of fertility and pregnancy prevention (OR: 1.73; 95% CI: 1.41–2.11). The timing of exposure to human reproductive system education also had a significant impact. Adolescents who first learned about the reproductive system in junior high school had the lowest risk of early sexual debut (OR: 0.60; 95% CI: 0.47–0.77). At the community level, adolescents living in areas with high internet accessibility were 59% less likely to initiate sexual debut compared to those in communities with low internet access (OR: 0.41; 95% CI: 0.23–0.74) (Table 3).

Table 3. Multilevel logistic regression model for factors associated with early sexual debut among adolescents aged 15-24 in Indonesia, IDHS 2017 (n=22,550)

Predictors	Model 1[a]	Model 2[b] OR (95% CI)		p
Individual-level factors				
Sex-related experience				
Dating experience				
Yes		18.41	(8.14-41.62)	<0.001
No		1		
Perceived peer pressure				
Having friends who experienced early sexual debut				
Yes		6.24	(4.81-8.09)	<0.001
No		1		
Discussing sexuality with friends				
Yes		1.15	(0.97-1.37)	0.105
No		1		
Sexual and reproductive health (SRH) information access				
SRH discussion with family members				
Yes		1.16	(0.95-1.41)	0.143
No		1		
SRH discussion with teachers				
Yes		0.76	(0.64-0.90)	0.002
No		1		

Predictors	Model 1[a]	Model 2[b]	OR (95% CI)	p
SRH discussion with relatives				
Yes		1.05	(0.88-1.26)	0.590
No		1		
Fertile periods and pregnancy-related knowledge				
Good		1.73	(1.41-2.11)	<0.001
Poor		1		
First-time exposure to the human reproductive system education				
Primary		0.76	(0.56-1.03)	0.082
Junior High School		0.60	(0.47-0.77)	<0.001
Senior High School		0.67	(0.50-0.89)	0.006
Academy/ University		1		
Community-level factors				
Type of residence				
Urban		0.85	(0.72-1.01)	0.062
Rural		1		
Community-level internet access				
High		0.41	(0.23-0.74)	0.003
Low		1		
The goodness of model fit measurements				
Community-level variance (SE)	0.75 (0.20)	0.60 (0.17)		
ICC	0.19	0.15		
Log-likelihood	-2616.78	-2605.91		
LR test vs logistic model (χ^2)	457.93	276.19		
AIC	6489.04	5253.83		
BIC	6505.19	5423.39		

Abbreviation: OR: Odds ratio; SE: Standard Error; ICC: Intra-class Correlation Coefficient; LR: Likelihood Ratio; AIC: Akaike's Information Criteria; BIC: Bayesian Information Criteria
[a]Model Null
[b]Model includes individual and community-level variables, adjusted for gender, age, work participation, school participation, and highest educational attainment.

DISCUSSION

The rapid advancement of technology, particularly in internet connectivity, has significantly transformed various aspects of human life, including communication, learning, and social behavior at the community level. In this digital era, adolescents are immersed in technology from an early age, shaping their interactions, information-seeking behaviors, and lifestyle choices. This generation, often referred to as the digital generation, millennials, or Generation Y, has grown up in an environment where internet access and digital tools are integral to daily life.[22] Given the pervasive role of technology in Indonesian adolescents' lives, this study provides valuable insights into the determinants of early sexual debut. The ICC analysis revealed significant variation in early sexual initiation among adolescents aged 15 to 24 across different communities. Notably, higher use of internet at community-level has been associated with a reduced likelihood of early sexual debut among adolescents.

In communities with broader internet access, adolescents are more likely to be exposed to accurate SRH information through digital platforms, including social media, websites, and online education initiatives.[23] This increased access can empower young people with better knowledge about the risks of early sexual activity and the importance of delaying sexual initiation. Additionally, communities with high internet use often reflect better infrastructure, higher socioeconomic status, and improved educational opportunities, all of which are protective factors against early sexual activity. These communities may also have stronger institutional support for health promotion, including digital campaigns targeting adolescent reproductive health.[24]

The findings further highlight the significant influence of peer and partner dynamics on early sexual debut among adolescents. Notably, having a dating partner emerged as the strongest predictor of early sexual initiation. With the onset of puberty occurring at younger ages[25], Indonesian adolescents now experience greater autonomy in exploring their sexuality. Additionally, early sexual debut is increasingly perceived as acceptable within the context of romantic relationships, reflecting evolving social norms.[11]

The second most influential factor within the peer and partner domain was having friends who had engaged in early sexual debut. This finding was consistent with previous research, which found that peer involvement in early sexual debut was a significant predictor of early sexual debut among adolescents.[26,27] The transition from childhood to adolescence is marked by heightened social expectations, which increased the influence of peers. Prior studies suggested that as adolescents spent more time with their peers, peer-related cues served as reinforcement mechanisms, encouraging engagement in risky behaviors.[28]

Peer pressure likely played a significant role in early adolescent sexual debut. In this study, adolescents with greater knowledge of pregnancy prevention and fertile period were more likely to engage in early sexual debut. They may have obtained this information from boyfriends or sexual partners, which could have been less reliable.[29] These findings supported the argument that adolescents living in areas with lower internet usage were more likely to initiate early sexual activity.

In addition to the higher usage of internet in the community, the school environment has been associated with a lower likelihood of early sexual debut. Previous studies indicated that adolescents who received sexual education at school initiated sexual activity later than those who acquired such knowledge from peers or the media.[30,31] Adolescents who were actively engaged in school tended to have closer connections with caring teachers[32] who were knowledgeable about sexual and reproductive health. They also preferred obtaining information related to sexuality and relationships from school, as information from other sources was often less reliable.[33] However, the provision of adolescent sexual and reproductive education in schools remained inadequate. In general, sexual and reproductive health education in schools was limited to the physical anatomy of reproductive organs and accounted for only about 10% of total instructional time in subjects such as biology, physical education, and moral education ("pendidikan budi pekerti"). Furthermore, the extent to which these topics were discussed depended largely on teachers' willingness to address them comprehensively.[34]

The findings of this study suggested that adolescents enrolled in formal education were less likely to engage in early sexual intercourse. Introducing SRH programs in junior high school (approximately ages 13 to 15) appeared to have the most significant effect in delaying adolescent sexual debut, particularly when combined with improved internet access. However, SRH education should extend beyond basic reproductive system knowledge. A comprehensive SRH curriculum should integrate psycho-sexual aspects, including relationship dynamics, consent, and responsible decision-making.[35,36] In addition to delivering scientifically accurate and age-appropriate content, the curriculum must also consider the diverse cultural, religious, and societal values that shape perceptions of sexuality and gender roles. Sensitivity to these differences is essential to ensure the content is contextually relevant, respectful, and easier to accept by learners, families, and communities.[37,38] In response to this need, the government has established the "Pusat Informasi dan Konseling Remaja (PIK-R)", or Youth Information and Counseling Centers, as a platform for informal SRH education. These centers are linked to local health facilities, universities, and other relevant institutions, aiming to provide adolescents with accessible and reliable SRH information.[39]

This study effectively demonstrated the association between individual- and community-level factors and early sexual debut. However, several limitations should be acknowledged. First, recall bias may have affected the findings, as the time elapsed between the interview and the onset of sexual experiences varied among respondents. Second, this study did not account for several key factors known to influence adolescent sexual behavior, such as exposure to pornography[40], parental supervision[41], history of sexual abuse[42], and depressive symptoms.[43]

Lastly, the cross-sectional design limits the ability to establish causal relationships between the predictors and early sexual debut, as it captures associations at a single point in time rather than over a longitudinal period. Future research should use longitudinal designs to explore causal relationships and reduce recall bias. Including key psychosocial factors—such as pornography exposure, parental supervision, sexual abuse history, and mental health—would offer a more comprehensive view.

CONCLUSION

Variations in adolescent sexual debut in Indonesia are influenced by both individual and community-level factors. At the individual level, key determinants of early sexual debut were dating experience, peer influence from friends who have engaged in early sexual debut, discussions on sexual and reproductive health with teachers, knowledge of fertility and pregnancy prevention, and the timing of initial exposure to human reproductive system education. At the community level, internet accessibility plays a significant role in shaping adolescent sexual behaviors. These findings highlight the need for comprehensive SRH education and broader community-based interventions to promote informed decision-making and delay sexual initiation among adolescents. Policy efforts should prioritize the integration of SRH education into school curricula, strengthen teacher training, and promote both community-based and digital strategies. Additionally, future research is needed to explore the long-term impacts of SRH education, as well as the roles of digital media, peer influence, and parental involvement in shaping adolescent sexual behavior.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to this study. No financial relationships or competing interests with any companies or organizations have influenced the research, analysis, or conclusions presented in this manuscript.

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DATA AVAILABILITY

The dataset utilized in this study was obtained from the MEASURE DHS program and is available to the public upon request. Interested researchers can access the data by registering for an account and submitting a data request through the official website (https://dhsprogram.com).

SUPPLEMENTAL DATA

Not applicable.

AUTHOR CONTRIBUTIONS

DS conceptualized and designed the study, performed data processing, analysis, and visualization, and drafted the manuscript. RFA contributed to data analysis, manuscript drafting, and critical revisions. RM and PC participated in manuscript drafting and revision. All authors have reviewed and approved the final manuscript and take full responsibility for its content.

DECLARATION OF USING AI IN THE WRITING PROCESS

The authors affirm that no artificial intelligence (AI) tools were used in the conceptualization, data analysis, or interpretation of this study. However, ChatGPT was utilized to assist with English translation and language refinement. All scientific content, findings, and conclusions remain the sole work of the authors.

LIST OF ABBREVIATIONS

AIC: Akaike's Information Criteria; AIDS: Acquired Immunodeficiency Syndrome; BIC: Bayesian Information Criteria; CI: Confidence Interval; HIV: Human Immunodeficiency Virus; ICC: Intra-class Correlation Coefficient; IDHS: Indonesia Demographic and Health Survey; LR: Likelihood Ratio; OR: Odds Ratio; PIK-R: Pusat Informasi dan Konseling Remaja; SE: Standard Error; SRH: Sexual and Reproductive Health; UNCROC: United Nations Convention on the Rights of the Child; WHO: World Health Organization.

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