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The Influence of the Health Belief Model on Reproductive Health Behavior among Adolescents in Surakarta, Indonesia

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ABSTRACT

Background: Adolescents are vulnerable to reproductive health problems. Globally, approximately 1.7 million adolescents are living with HIV, and 12 million births occur among those aged 15–19 years. In Surakarta, 224 cases have been reported, highlighting the need for a Health Belief Model (HBM)-based approach. This study aimed to analyze the influence of HBM constructs on adolescent reproductive health behavior in Surakarta, both directly and indirectly.
Subjects and method: This was a quantitative study with a cross-sectional design conducted among 200 respondents selected through multistage random sampling from five secondary schools. Data were collected using a structured questionnaire and analyzed using simple logistic regression and path analysis.
Results: Self-efficacy had a positive and significant effect (b= 0.08; p = 0.015), perceived barriers had a negative and significant effect (b= -0.03; p = 0.034), and cues to action had a positive and significant effect (b = 0.19; p < 0.001). In addition, several HBM components had indirect effects on reproductive health behavior through self-efficacy as a mediating variable. The model demonstrated a good fit to the data (p = 0.441; RMSEA= 0.001; CFI = 1.000; TLI = 1.003; SRMR = 0.016).
Conclusion: The components of the Health Belief Model significantly influence adolescent reproductive health behavior, both directly and indirectly through self-efficacy. Reproductive health interventions should emphasize improving self-efficacy and strengthening behavioral enabling factors.

Keywords: adolescents, health belief model, self-efficacy, reproductive health behavior.

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BACKGROUND

Adolescents are individuals aged 10–19 years (WHO, 2024a). and are in a critical developmental phase characterized by significant biological, psychological, and social changes (Liang et al., 2019). Globally, the adolescent population is estimated at approximately 1.3 billion, accounting for

16% of the world's population, while in Indonesia adolescents represent around 17% of the total population, equivalent to approximately 46 million individuals. The large size of the adolescent population positions this group as a valuable development asset; however, adolescents are also highly vulnerable to various health-related problems. High curiosity, a strong drive for exploration, and a tendency to experiment with new experiences may increase adolescents' involvement in risky behaviors when not accompanied by adequate guidance and a supportive environment. Adolescent reproductive health problems are not solely related to biological factors but are strongly influenced by adolescents' behaviors in responding to health risks (Glanz et al., 2015). In Indonesia, challenges in adolescent reproductive health include limited access to accurate information, changes in sexual behavior, inadequate availability of adolescent-friendly health services, and suboptimal social and policy support (Dungga & Ihsan, 2023). These conditions contribute to adolescents' continued vulnerability to various issues, such as early marriage, early and unintended pregnancy, sexually transmitted infections (STIs) including HIV/AIDS, unsafe abortion, and gender-based violence (Fatkhiyah et al., 2020).

In this study, adolescent reproductive health behavior encompasses the prevention of unintended pregnancy, prevention of sexually transmitted infections, healthy sexual decision-making, and the utilization of safe and age-appropriate reproductive health services. These aspects are essential components of health protection, psychosocial well-being, and the fulfillment of adolescents' rights to quality health services (UNFPA, 2023; WHO, 2022).

Data from the Indonesian Demographic and Health Survey indicate that dating behavior often serves as an entry point to risky behaviors. Approximately 81% of female adolescents and 84% of male adolescents reported having been in a dating relationship between the ages of 15 and 17 years, often accompanied by physical intimacy that increases the risk of unintended pregnancy, sexually transmitted infections, and unsafe abortion (IDHS, 2017).

Globally, in 2021, approximately 1.7 million adolescents were living with HIV, and adolescents accounted for 10% of new HIV infections, with a disproportionately higher burden among adolescent girls. In addition, an estimated 12 million births occurred among adolescents aged 15–19 years, with pregnancy-related complications remaining the leading cause of mortality in this age group. The global adolescent birth rate reached 42 per 1,000 adolescent girls, underscoring the urgency of achieving Sustainable Development Goal (SDG) 3, particularly universal access to sexual and reproductive health services (WHO, 2024b).

At the local level, adolescents in Surakarta, Central Java, Indonesia, also face substantial reproductive health challenges. According to data from the Surakarta Health Office, (2024), there were 224 reported cases of adolescent reproductive health problems in 2024, including premarital sexual activity, unintended pregnancy, reproductive tract infections, sexually transmitted infections, and HIV. The high number of cases indicates that adolescent reproductive health behaviors in Surakarta remain risky and require more effective and sustainable preventive efforts.

In Surakarta, the Youth Care Health Services (Pelayanan Kesehatan Peduli Remaja/PKPR) program has been implemented through collaboration between primary health centers and schools, however, its delivery remains suboptimal, and the high incidence of reproductive health

problems is associated with adolescents' reproductive health behaviors, highlighting the need to examine psychosocial determinants of behavior. Adolescent reproductive health behavior is strongly influenced by perceptions of susceptibility and severity of health risks, perceived benefits and barriers, and self-efficacy, as conceptualized in the Health Belief Model (HBM) (Glanz et al., 2015). Adolescents are more likely to engage in risky sexual behaviors when they do not perceive themselves as vulnerable or consider the consequences to be insignificant. Meanwhile, peer pressure, social norms, and feelings of shame often act as barriers to the adoption of safe behaviors, even when the benefits are well understood (Kusumawardani & Ayu, 2021; Yakubu et al., 2019). Low self-efficacy has also been associated with poor control over sexual behavior and low utilization of reproductive health services (Rajapakshe et al., 2024).

The Health Belief Model is a theoretical framework that explains health behavior through six core constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Limbu & Gautam, 2023). This model has been widely applied to predict and guide health behavior change. However, studies on adolescent reproductive health frequently apply the HBM only partially. Although several studies have demonstrated the importance of individual HBM constructs in shaping reproductive health behaviors, few have integrated all constructs comprehensively within a single analytical model (Kustin & Handayani, 2024; Rohmah, 2025).

In Surakarta, previous studies have reported associations between reproductive health knowledge and adolescent sexual behavior, as well as the influence of HBM constructs in specific population groups, such as female sex workers (Prabandari & Rahayu, 2016; Wulandari et al., 2016). Nevertheless, research that specifically examines adolescent reproductive health behavior using a comprehensive HBM approach remains limited (Aprilia et al., 2025).

Based on these conditions, a clear research gap remains in the comprehensive analysis of adolescent reproductive health behavior using all constructs of the Health Belief Model, particularly in Surakarta City. Therefore, this study is essential to analyze the influence of the HBM on adolescent reproductive health behavior in Surakarta, serving as a foundation for the development of more effective and context-specific adolescent reproductive health interventions and programs.

SUBJECTS AND METHOD

1. Study Design

This study employed a cross-sectional design. The research was conducted at five public senior high schools and vocational high schools in Surakarta, Central Java, Indonesia, from September to October 2025. The schools were selected based on the high incidence of adolescent reproductive health problems and their representativeness of adolescent characteristics in the area. These schools have implemented the Youth Care Health Services (PKPR) program in collaboration with primary health centers, however, reproductive health education has not been comprehendsively addressed, making them relevant research settings.

2. Population and Sample

The population of this study comprised all adolescents aged 15–19 years who were enrolled in public senior high schools and vocational high schools (SMA/SMK Negeri) in Surakarta City. The exact size of the population was unknown. A multistage random sampling technique was employed, resulting

in a total sample of 200 respondents, which was determined based on Murti, (2018) formula and adjusted according to Roscoe's theory. A total of 200 respondents were selected using multistage random sampling from five public senior and vocational high schools in Surakarta. The sample was proportionally allocated with equal representation from each school (40 respondents per school) to ensure balanced participation. The selection of schools as research sites was a crucial aspect, given the diverse characteristics of adolescents and the social and cultural contexts that may influence reproductive health behaviors. In Surakarta, Indonesia, 224 cases of adolescent reproductive health problems have been recorded, encompassing various issues such as risky sexual behavior, unintended pregnancy, reproductive tract infections, sexually transmitted infections, and HIV. These conditions underscore the relevance of this study in understanding and addressing reproductive health challenges among adolescents. Furthermore, the schools included in this study implement health education programs that can be explored to assess their effectiveness in shaping adolescents' beliefs and promoting positive behaviors related to reproductive health.

3. Study Variables

The independent variables in this study comprised the constructs of the Health Belief Model, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The dependent variable was adolescents' reproductive health behavior.

4. Operational Definition of Variables

Reproductive health behavior Adolescents' actual practices in maintaining reproductive health, including preventive behaviors, utilization of health services, seeking accurate health information, and regulation of sexual behavior. In this study, the instrument used for this variable was a questionnaire developed by the researcher and demonstrated to be valid and reliable based on validity and reliability tests.

Perceived susceptibility Adolescents' perception of their vulnerability to reproductive health problems, such as unintended pregnancy, sexually transmitted infections (STIs), and HIV/AIDS, resulting from risky sexual behaviors and limited access to reproductive health information.

Perceived severity Adolescents' perception of the seriousness and potential consequences of reproductive health problems on their physical, psychological, and social well-being, as well as on their future, including the risks of pregnancy complications and sexually transmitted diseases.

Perceived benefits Adolescents' perception of the advantages of adopting reproductive health promoting behaviors, including health education, contraceptive use, regular health check-ups, and utilization of reproductive health services to prevent reproductive health problems.

Perceived barriers Adolescents' perception of obstacles to accessing and practicing reproductive health behaviors, encompassing personal, social, economic, and structural barriers.

Cues to action Internal and external factors that motivate adolescents to engage in reproductive health behaviors, including support from family members, peers, healthcare providers, schools, and access to reproductive health information.

Self-efficacy Adolescents' confidence in their ability to control and practice safe reproductive health behaviors and to avoid risky sexual behaviors.

5. Study Instruments

The instrument used in this study was a structured questionnaire consisting of 9 items measuring perceived susceptibility, 9 items measuring perceived severity, 10

items measuring perceived benefits, 10 items measuring perceived barriers, 10 items measuring cues to action, 9 items measuring self-efficacy, and 10 items measuring reproductive health behavior. The questionnaire was subjected to validity testing using the product–moment correlation technique and reliability testing using Cronbach's alpha.

6. Data analysis

Data analysis in this study was performed using Stata version 13. Univariate analysis was conducted to describe respondent characteristics using means, standard deviations, and ranges for continuous variables. Bivariate analysis was conducted using simple linear regression to examine the association between each independent variable and the dependent variable, with results presented as regression coefficients (b), 95% confidence intervals (CI), and p-values ($p < 0.05$). Multivariate analysis was conducted using path analysis to examine the magnitude of both direct and indirect effects among variables. The path analysis procedures included model specification, model identification, model fit evaluation, parameter estimation, and model re-specification.

7. Research Ethics

Ethical considerations, including informed consent, anonymity, and data confidentiality, were strictly applied throughout the research process. Ethical approval for this study was obtained from the Research Ethics Committee of Dr. Moewardi Hospital, Surakarta, Indonesia, on September 10, 2025, with approval number 1.968/IX/-HREC/2025

RESULTS

1. Sample Characteristics

In this study, the majority of respondents were 16 years old, totaling 102 students (51.0%). Most respondents were female, accounting for 108 students (54.0%), while 92 students (46.0%) were male. Based on place of residence, the largest proportion of respondents resided in Laweyan Sub-district, with 47 students (23.5%), followed by Jebres (22.0%) and Banjarsari (20.5%). Regarding school distribution, respondents were evenly selected from five public senior high schools in Surakarta, with 40 students from each school (20.0%). These results can be seen in Table 1.

Table 1. Univariate Results of Respondent Characteristics

Variable	Category	n	%
Age	15 years	74	37.0 %
	16 years	102	51.0 %
	17 years	24	12.0 %
Gender	Male	92	46.0 %
	Female	108	54.0 %
Residence	Jebres	44	22.0 %
	Banjarsari	41	20.5%
	Laweyan	47	23.5%
	Serengan	32	16.0 %
	Pasar Kliwon	28	14.0 %
	Outside Surakarta	8	4.0%

Perceived susceptibility, perceived severity, and self-efficacy were each measured using 9 items on a 4-point Likert scale (1 to 4), resulting in total scores ranging from 9 to 36. Perceived benefits, perceived barriers, and cues to action were each measured using

10 items on a 4-point Likert scale (1 to 4), yielding total scores ranging from 10 to 40. Reproductive health behavior was assessed using 10 items with a dichotomous scale (0 to 1), resulting in total scores ranging from 0 to 10.

Based on Table 2, among 200 respondents, perceived susceptibility had a mean score of 30.03 (SD = 2.86), with a range of 22 to 36. Perceived severity had a mean of 29.88 (SD = 2.81), ranging from 18 to 36. Perceived benefits showed a mean of 32.68 (SD = 2.91), with scores ranging from 20 to 40. Perceived barriers had a mean of 24.45 (SD = 5.23), with a range of 11 to 40. Furthermore, cues to action had a mean score of 32.85 (SD = 2.84), ranging from 27 to 40. Self-efficacy showed a mean of 30.82 (SD = 2.92), with a range of 23 to 36. Reproductive health behavior had a mean score of 8.010 (SD = 1.385), with a range of 5 to 10.

Overall, cues to action had the highest mean score, while reproductive health behavior had the lowest mean score, which is consistent with the respective measurement scale ranges. These results can be seen in Table 2.

Table 2. Results of Univariaate Research Variables

Variable	Mean	SD	Min.	Max.
1. Perceived Susceptibility	30.03	2.86	22	36
2. Perceived Severity	29.88	2.81	18	36
3. Perceived Benefits	32.68	2.91	20	40
4. Perceived Barriers	24.45	5.23	11	40
5. Cues to Action	32.85	28.49	27	40
6. Self-Efficacy	30.82	2.92	23	36
7. Reproductive Health Behavior	8.01	1.38	5	10

2. Bivariate Analysis

Based on the bivariate analysis, all constructs of the Health Belief Model were significantly associated with adolescents' reproductive health behavior. Perceived susceptibility was significantly associated with adolescents' reproductive health behavior ($p < 0.001$). A higher perceived susceptibility score was associated with an increase in reproductive health behavior score (b = 0.18; 95% CI = 0.13 to 0.24). This indicates that for every one-unit increase in perceived susceptibility, the reproductive health behavior score increased by 0.18 points. Adolescents with higher perceived susceptibility tended to demonstrate better reproductive health behavior.

Perceived severity was significantly associated with adolescents' reproductive health behavior ($p <0.001$). A higher perceived severity score was associated with an increase in reproductive health behavior score (b = 0.17; 95% CI = 0.12 to 0.23). This suggests that adolescents who perceived reproductive health problems as more serious were more likely to engage in better reproductive health behavior.

Perceived benefits showed a significant association with adolescents' reproductive health behavior ($p < 0.001$). An increase in perceived benefits was associated with an increase in reproductive health behavior score (b = 0.22; 95% CI = 0.16 to 0.28). This finding indicates that stronger beliefs in the benefits of reproductive health behavior were linked to better outcomes.

Perceived barriers were significantly associated with adolescents' reproductive health behavior ($p = 0.001$). However, the direction of the association was negative (b= -0.06; 95% CI = -0.10 to -0.03), indicating

that higher perceived barriers were associated with lower reproductive health behavior scores. For every one-unit increase in perceived barriers, the reproductive health behavior score decreased by 0.06 points.

Cues to action had a significant association with adolescents' reproductive health behavior ($p < 0.001$). Higher cues to action were associated with increased reproductive health behavior scores (b = 0.28; 95% CI = 0.22 to 0.33). This variable showed the strongest effect among all predictors in the bivariate analysis, indicating that greater exposure to stimuli or encouragement was linked to better reproductive health behavior.

Self-efficacy was also significantly associated with adolescents' reproductive health behavior ($p < 0.001$). Higher self-efficacy scores were associated with higher reproductive health behavior scores (b = 0.21; 95% CI = 0.16 to 0.26). This suggests that adolescents with greater confidence in their ability to perform reproductive health behaviors were more likely to demonstrate better behavior.

Overall, the results indicate that increases in positive Health Belief Model constructs are associated with improvements in adolescents' reproductive health behavior, while perceived barriers show an inverse relationship. These results are presented in Table 3.

Table 3. Simple Logistic Regression Analysis of the Effects of Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Cues to Action, and Self-Efficacy on Good Reproductive Health Behavior

Independent Variables	b	95% CI		p
		Lower limit	Upper limit	
High Perceived Susceptibility	0.18	0.13	0.24	<0.001
High Perceived Severity	0.17	0.12	0.23	<0.001
High Perceived Benefits	0.22	0.16	0.28	<0.001
High Perceived Barriers	-0.06	-0.10	-0.03	0.001
High Cues to Action	0.28	0.22	0.33	<0.001
High Self-Efficacy	0.21	0.16	0.26	<0.001

3. Multivariate analysis

Figure 1 presents the path analysis model illustrating the relationships among Health Belief Model constructs and adolescents' reproductive health behavior. The model indicates that self-efficacy plays a central role as both a direct and mediating factor. Self-efficacy has a direct positive effect on reproductive health behavior, suggesting that higher confidence in one's ability to perform health-related actions increases the likelihood of engaging in positive reproductive health behavior. Perceived benefits also show a direct positive influence on self-efficacy, indicating that adolescents who recognize greater benefits of healthy behavior tend to have stronger confidence in performing such behaviors. Similarly, perceived severity and perceived susceptibility exhibit indirect effects on reproductive health behavior through self-efficacy. This suggests that adolescents who perceive higher risk and seriousness of reproductive health issues are more likely to build confidence, which in turn promotes healthier behavior. Cues to action demonstrate a significant positive effect on self-efficacy and also contribute indirectly to reproductive health behavior, highlighting the importance of external or internal triggers in strengthening adolescents'

readiness to act. In contrast, perceived barriers show a negative direct effect on reproductive health behavior, indicating that greater perceived obstacles reduce the likelihood of engaging in healthy reproductive practices. The arrows in the model represent the direction of influence among variables, while the path coefficients indicate the strength and direction (positive or negative) of these relationships. Overall, the model emphasizes that adolescents' reproductive health behavior is influenced by a combination of cognitive perceptions and motivational factors, with self-efficacy acting as a key mediator.

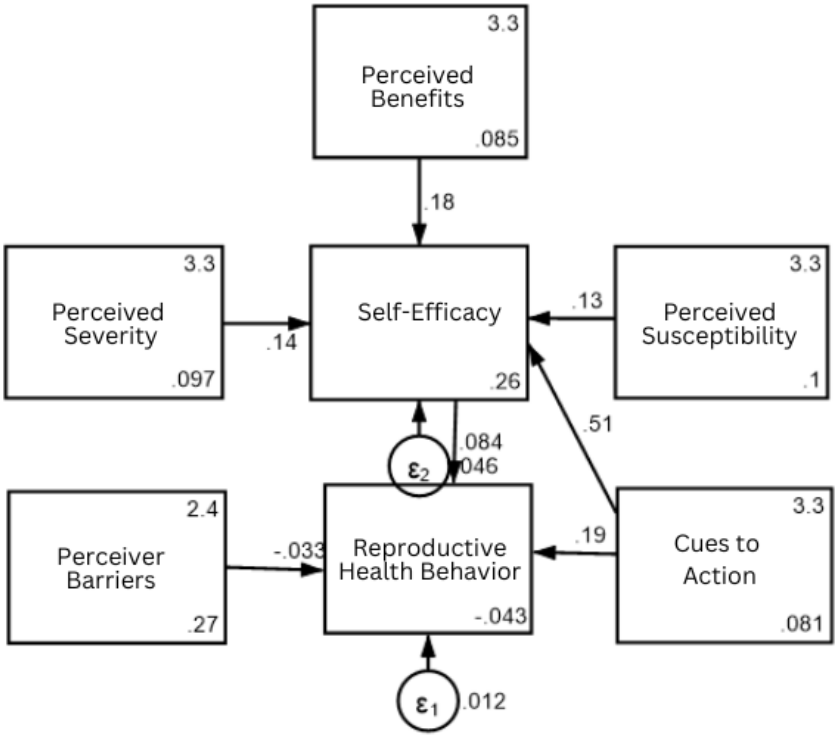

Figure 1. Path analysis model with estimation

The results of the multivariate analysis demonstrated both direct and indirect effects of Health Belief Model constructs on adolescents' reproductive health behavior. Self-efficacy has a direct and statistically significant effect on reproductive health behavior. Each one-unit increase in self-efficacy is associated with an increase of 0.08 units in reproductive health behavior (b = 0.08; 95% CI = 0.02 to 0.15; p = 0.015), indicating a positive and significant relationship.

Perceived barriers have a direct and statistically significant effect on reproductive health behavior. Each one-unit increase in perceived barriers reduces reproductive health behavior by 0.03 units (b = −0.03; 95% CI = −0.06 to 0.01; p = 0.034), indicating a negative and significant relationship.

Cues to action have a direct and statistically significant effect on reproductive health behavior. Each one-unit increase in cues to action increases reproductive health behavior by 0.19 units (b = 0.19; 95% CI = 0.12 to 0.27; p < 0.001), indicating a positive and significant relationship.

Perceived benefits have an indirect effect on reproductive health behavior through self-efficacy. Perceived benefits are

positively and significantly associated with self-efficacy (b = 0.18; 95% CI = 0.03 to 0.32; p= 0.017). This indicates that an increase in perceived benefits enhances self-efficacy, which in turn improves reproductive health behavior. Thus, self-efficacy acts as a mediating variable in this relationship.

Perceived severity has an indirect and positive effect on reproductive health behavior through self-efficacy (b = 0.14; 95% CI= 0.01 to 0.27; p = 0.049). This suggests that higher perceived severity increases self-efficacy, which subsequently promotes better reproductive health behavior. Therefore, self-efficacy mediates this relationship.

Perceived susceptibility has an indirect and positive effect on reproductive health behavior through self-efficacy (b= 0.13; 95% CI = 0.01 to 0.25; p = 0.033). This indicates that higher perceived susceptibility enhances self-efficacy, which in turn leads to improved reproductive health behavior. Thus, self-efficacy functions as a mediator.

Cues to action have an indirect and positive effect on reproductive health behavior through self-efficacy (b = 0.51; 95% CI= 0.36 to 0.67; p < 0.001). This indicates that increased cues to action substantially enhance self-efficacy, which subsequently improves reproductive health behavior. Therefore, self-efficacy acts as a mediator that strengthens this relationship.

Based on the Structural Equation Modeling (SEM) analysis, the research model demonstrates a very good fit and is appropriate for interpretation. Reproductive health behavior is directly influenced by self-efficacy, perceived barriers, and cues to action, with cues to action being the most dominant factor (b = 0.19; p < 0.001). Self-efficacy serves as a significant mediating variable linking perceived benefits, perceived severity, perceived susceptibility, and cues to action to reproductive health behavior. These variables do not directly influence behavior but operate through the enhancement of self-efficacy. Meanwhile, perceived barriers have a direct negative effect, indicating that higher perceived obstacles are associated with lower reproductive health behavior. Overall, the model suggests that improving reproductive health behavior among adolescents is best achieved by strengthening cues to action and self-efficacy while reducing perceived barriers.

Table 4. Path analysis of the effects of HBM constructs on reproductive health behavior

Dependent Variables		Independent Variables	b	95% Lower Limit	95% Upper Limit	p
Direct effect						
Good Reproductive Health Behavior	←	High Self-Efficacy	0.08	0.02	0.15	0.015
	←	High Perceived Barriers	-0.03	-0.06	0.01	0.034
	←	High Cues to action	0.19	0.12	0.27	<0.001
Indirect effect						
High Self-Efficacy	←	High Perceived Benefits	0.18	0.03	0.32	0.017
	←	High Perceived Severity	0.14	0.01	0.27	0.049
	←	High Perceived Susceptibility	0.13	0.01	0.25	0.033
	←	High Cues to Action	0.51	0.36	0.67	<0.001
N observation= 200						

Dependent Variables	Independent Variables	b	95%		p
			Lower Limit	Upper Limit	
Log likelihood= 31.78; p= 0.441; RMSEA= 0.01; CFI= 1.00; TLI = 1.00; SRMR= 0.02; CD = 62.4%.					

DISCUSSION

Direct effect of self-efficacy on reproductive health behavior

Self-efficacy has a direct and significant effect on reproductive health behavior. This coefficient value indicates that a one-unit increase in the self-efficacy score will increase the reproductive health behavior score by 0.08 points after controlling for other variables in the model, meaning that self-efficacy has an independent influence on shaping adolescents' reproductive health behavior.

Theoretically, this finding aligns with the concept in the Health Belief Model (HBM), which states that self-efficacy is an individual's belief in their ability to engage in health-related actions. Individuals with high self-efficacy are able to control their behavior, overcome barriers, and consistently adopt positive health behaviors. In the context of reproductive health, self-efficacy plays a role in enhancing adolescents' ability to make appropriate decisions, refuse risky behaviors, and utilize reproductive health services.

This finding is also in line with the theory proposed by Taba et al., (2022), which emphasizes that individual behavior is shaped through a learning process involving cognitive, affective, and social aspects. In this regard, self-efficacy is part of the cognitive and psychological aspects that influence an individual's ability to act.

These findings are also supported by the study by Ngoma-Hazemba et al., (2024), which shows that adolescent girls' reproductive health behaviors are influenced by various barriers, such as fear of contraceptive side effects, delays in seeking health services, and a lack of understanding regarding reproductive health (Ngoma-Hazemba et al., 2024). These conditions reflect low self-confidence in making health decisions, which is related to self-efficacy.

In addition, social factors such as stigma and cultural norms also play a role in influencing reproductive health behavior. Adolescents tend to avoid health services due to concerns about negative judgment from their social environment (Ngoma-Hazemba et al., 2024). This suggests that self-efficacy is influenced not only by internal factors but also by environmental support.

These findings are further supported by the study by Leekuan et al., (2022), which employed a qualitative design with an interpretive phenomenological approach among 30 late adolescents aged 18 to 19 in Thailand; data were collected through in-depth interviews and analyzed using interpretive phenomenological analysis. The results of the study indicate that adolescents who possess an understanding and belief in their ability to avoid reproductive health risks tend to be more cautious when making decisions regarding sexual behavior, such as contraceptive use and limiting risky behaviors (Leekuan et al., 2022). This suggests that self-efficacy plays a crucial role in the decision-making process and the adoption of reproductive health behaviors.

Direct effect of perceived barriers on reproductive health behavior

Perceived barriers have a direct and significant effect on reproductive health behavior. This negative coefficient indicates that a one-unit increase in the perceived barriers score reduces reproductive health behavior

by 0.03 points, meaning that even after controlling for other variables, perceived barriers remain an independent factor influencing adolescents' reproductive health behavior. Theoretically, these results align with the Health Belief Model (HBM), which states that perceived barriers are a primary determinant that can reduce an individual's likelihood of engaging in health-related behaviors, even when the individual already possesses a perception of benefits or awareness of risks.

The results of this study are consistent with the research by Decker et al., (2021), which employed a cross-sectional survey design involving 10,015 adolescents participating in a sexual health education program in California. The study sample consisted of adolescents with an average age of 14.9 years, the majority of whom were from the Hispanic/Latino group. Data were collected using an anonymous questionnaire and analyzed using mixed -effects logistic regression to account for the clustered data structure. The results showed that most adolescents faced various barriers, such as concerns about test results (52.7%), cost (52.0%), and confidentiality (49.8%), which were significantly associated with low access to reproductive health services (Decker et al., 2021). This suggests that the perception of barriers has a direct impact on reducing health-seeking behavior, particularly regarding the use of reproductive health services.

Furthermore, the findings of this study are supported by the research conducted by Langat et al., (2024), which employed a qualitative design using a focus group discussion (FGD) approach across 36 discussion groups involving 358 respondents comprising adolescents aged 10 to 14, 15 to 19 years old, and young adults aged 20 to 24 in Kenya. The sampling technique used was convenience sampling, with data analysis employing thematic analysis. The study results indicate that individual barriers such as shyness, fear, and lack of self-confidence, as well as social barriers such as parental influence, cultural stigma, and limited health services, are the primary factors hindering adolescents from accessing reproductive health information and services (Langat et al., (2024). These findings suggest that perceptions of these barriers directly influence the low level of adolescent engagement in reproductive health behaviors.

Furthermore, a study by Tilahun et al., (2021) which employed a cross-sectional design using a quantitative approach combined with qualitative data among 771 adolescents aged 15 to 24 years in Ethiopia, the sample was selected using a multistage sampling technique, with data collection conducted through structured interviews; analysis was performed using logistic regression to identify factors influencing the utilization of reproductive health services. The results of the study indicate that the utilization of reproductive health services remains low (8.6%) and is influenced by various barriers such as lack of access, cost, concerns regarding confidentiality, and the attitudes of health workers (Tilahun et al., 2021). These barriers significantly reduce the likelihood of adolescents utilizing reproductive health services, indicating a direct influence of the perception of barriers on health behavior.

Findings by Decker et al., (2021), Langat et al., (2024), and Tilahun et al., (2021) align with this study, indicating that perceptions of barriers continue to have a direct influence on reproductive health behaviors even after controlling for other variables. Adolescents who perceive high barriers whether psychological, social, or structural tend to be less likely to engage in reproductive health behaviors. Thus, the

perception of barriers is a determinant that consistently plays a role in reducing reproductive health behaviors among adolescents.

Direct effect of cues to action on reproductive health behavior

Cues to action have a direct and significant effect on reproductive health behavior. A one-unit increase in the call-to-action score is associated with a 0.19-unit increase in the reproductive health behavior score, indicating a positive and statistically significant relationship. This means that the higher the exposure to external stimuli or encouragement received by adolescents such as health information, social peer pressure, or health education the better their reproductive health behavior. Theoretically, this finding aligns with the Health Behavior Model (HBM), which states that cues to act are triggering factors that encourage individuals to take health related actions. These cues can include exposure to information from the media, health education, personal experiences, or support from healthcare providers and the social environment.

The results of this study are consistent with the research by Khatirpasha et al., (2019), which employed a cross-sectional design with a quantitative approach in a population of adolescents and young adults. That study involved respondents selected using sampling techniques (typically random or convenience sampling) and utilized a questionnaire based on the Health Behavior Model (HBM). Data analysis was conducted using multiple logistic regression to identify factors influencing health behaviors. The results indicate that cues to act significantly influence health behaviors, with individuals exposed to information and external encouragement being more likely to engage in health-promoting behaviors compared to those not receiving such stimuli (Khatirpasha et al., 2019).

Furthermore, the findings of this study are supported by the research conducted by Katirayi et al., (2021), which employed a cross-sectional design based on a household survey of 396 adolescents aged 15 to 19 years in Uganda using a stratified two stage cluster sampling technique; data were collected via a questionnaire and analyzed using bivariate and multivariate Poisson regression. The results of the analysis indicate that exposure to reproductive health information through the media, as a form of cue to act, has a significant effect on improving adolescents' ability to avoid risky sexual behavior (Katirayi et al., 2021).

Furthermore, research by Limbu & Gautam, (2023), through a systematic review of 109 quantitative studies involving a total of 174,490 respondents, also showed that cues to act are one of the constructs most consistently associated with health behaviors. This study employed a comparative analysis approach to various studies, predominantly using cross-sectional designs and regression analysis. The results showed that approximately 84.61% of the studies found a significant association between cues to act and health behaviors, indicating that external cues such as information, education, and social support play a crucial role in triggering behavioral change (Limbu & Gautam, 2023).

Findings by Khatirpasha et al., (2019), Katirayi et al., (2021), and Limbu & Gautam, (2023) align with this study, indicating that cues to act have a positive influence on health behaviors. Adolescents who are exposed to more information, social support, and environmental stimuli tend to be more motivated to engage in healthy reproductive behaviors. Thus, cues to act are important factors that serve as direct

triggers for changes in reproductive health behavior.

Indirect effect of perceived benefits on reproductive health behavior through self-efficacy

Perceived benefits have an indirect effect on reproductive health behavior through self-efficacy. Perceived benefits were found to have a positive and significant effect on self-efficacy. This indicates that a one-unit increase in the perceived benefits score will increase self-efficacy, which in turn leads to improved reproductive health behaviors. Thus, self-efficacy acts as a mediating variable in the relationship between perceived benefits and reproductive health behavior. Theoretically, this finding aligns with the Health Belief Model (HBM), which states that perceived benefits not only directly influence behavior but also enhance an individual's belief in their ability to perform health-related actions (self-efficacy). Individuals who believe that a particular action provides benefits will be more confident in carrying out that action, thereby increasing the likelihood of adopting health-related behaviors.

The results of this study are consistent with the research conducted by Appau et al., (2024), which employed a quantitative design with a cross-sectional approach among a population of university students in Sri Lanka. The study involved hundreds of respondents selected using stratified sampling, with data collected via an HBM based questionnaire; data analysis was conducted using multiple logistic regression to identify factors influencing health behaviors. The results indicate that self-efficacy is one of the strongest predictors of health behavior, with a higher explanatory contribution compared to other HBM constructs (Appau et al., 2024). This suggests that self-efficacy plays a crucial role in bridging the gap between individual perceptions and health behavior.

Furthermore, the findings of this study are supported by research conducted by Decker et al., (2021), which employed a cross-sectional survey design involving 10,015 adolescents participating in a sexual health education program in California; The sample in this study consisted of adolescents aged approximately 10 to 19 years selected from various social backgrounds; data were collected using an anonymous questionnaire and analyzed using multilevel logistic regression (mixed-effects logistic regression) to account for the clustered nature of the data. The study results indicate that the majority of adolescents face various barriers in accessing reproductive health services, such as concerns about test results (52.7%), cost (52.0%), and confidentiality (49.8%) (Decker et al., 2021). These barriers are related to psychological factors such as fear and lack of self-confidence, indicating that health behaviors are influenced not only by perceived benefits but also by an individual's ability to overcome these barriers, which relates to self-efficacy.

Another study conducted by Abdurahman et al., (2022), which employed a cross-sectional design among adolescents, showed that the utilization of reproductive health services is influenced by cognitive and psychological factors, including perceived benefits and self-efficacy. The study involved adolescents as the study popularion, with data collected using a structured questionnaire and analyzed using multivariate logistic regression. The results showed that adolescents who believed in the benefits of reproductive health services and had high self-efficacy tended to be more active in utilizing these services (Abdurahman et al., 2022). This indicates that self-efficacy acts as a bridging factor between health perceptions and actions.

Findings by Appau et al., (2024), Decker et al., (2021), and Abdurahman et al., (2022) align with this study, indicating that the perception of benefits does not directly shape reproductive health behavior but rather through the psychological mechanism of self-efficacy. Adolescents who believe in the benefits of health behaviors will be more confident in practicing them, especially when they are able to overcome various barriers such as fear, stigma, and limited access to services. Thus, self-efficacy is a key factor in linking perceived benefits to reproductive health behaviors.

Indirect effect of perceived severity on reproductive health behavior through self-efficacy

The results of the multivariate analysis showed that perceived severity has an indirect effect on reproductive health behavior through self-efficacy. Perceived severity was found to have a positive and significant effect on self-efficacy, which in turn contributes to improved reproductive health behavior; in this study, self-efficacy acts as a mediating variable in the relationship between perception of severity and reproductive health behavior.

Conceptually, these findings align with the Health Belief Model (HBM), which states that perceptions of the severity of a health issue not only directly influence behavior but can also enhance adolescents' confidence (self-efficacy) in their ability to take preventive actions. Adolescents who recognize that a health issue has serious consequences are more likely to feel capable and confident in taking appropriate actions.

These findings are consistent with a study conducted by Rajapakshe et al., (2024), which applied HBM to university students in Sri Lanka and demonstrated that the variables of perceived seriousness and self-efficacy have a significant influence on increasing the perceived benefits of reproductive health education. The results of the multivariate analysis in that study confirm that self-efficacy and perceived seriousness are important factors that jointly influence reproductive health behavior (Rajapakshe et al., 2024). Thus, these findings reinforce the notion that perceived seriousness and self-efficacy are interrelated and do not operate independently.

Furthermore, the findings of this study are supported by research conducted by Gebreyesus et al., (2019), which indicates that self-efficacy and perceived seriousness are important determinants of reproductive health service utilization among adolescents. That study used a cross-sectional design with multivariate logistic regression analysis and found that adolescents with higher levels of self-efficacy and a positive perception of seriousness tended to be more active in utilizing reproductive health services (Gebreyesus et al., 2019). This suggests that self-efficacy acts as a psychological mechanism that bridges the perception of risk with health-related actions.

Another study conducted by Tadesse et al., (2020) also shows that factors that enhance knowledge and access to reproductive health information contribute to increased utilization of reproductive health services through mechanisms that boost individuals' confidence and ability to make health decisions (Tadesse et al., 2020). This indicates that cognitive and psychological aspects, including self-efficacy, play a crucial role in transforming perceptions into actual behavior.

Thus, the findings of this study align with various previous studies, where the perception of the seriousness of an issue not only has a direct effect but also an indirect one through self-efficacy in shaping reproductive health behavior. Adolescents who have a high perception of the seriousness of reproductive health issues will be more

motivated to boost their confidence in taking preventive actions, such as avoiding risky sexual behavior, using contraception, and seeking reproductive health information.

Indirect effect of perceived susceptibility on reproductive health behavior through self-efficacy

Perceived susceptibility has an indirect effect on reproductive health behavior through self-efficacy. Perceived susceptibility was found to have a positive and significant effect on self-efficacy. This indicates that the higher adolescents' perception of the risk or likelihood of experiencing reproductive health problems, the higher their confidence in their ability to take appropriate preventive measures. This increase in self-efficacy then contributes to the development of better reproductive health behaviors. Thus, self-efficacy acts as a mediating variable that bridges the relationship between perceived vulnerability and reproductive health behaviors.

The findings of this study are consistent with the research conducted by Adaralegbe et al., (2021), who examined the factors influencing reproductive health behavior among adolescents using a quantitative approach with a cross-sectional design. The study was conducted among high school adolescents, with the sample obtained through multistage sampling to ensure respondents were representative of the study population. Data were collected using a structured questionnaire based on the Health Belief Model (HBM) that measured several psychosocial variables such as perceived vulnerability, perceived severity, perceived benefits, barriers, and self-efficacy. Data analysis was performed using statistical methods to identify factors associated with reproductive health behavior (Adaralegbe et al., 2021). The results of this study indicate that perceptions of vulnerability to reproductive health risks are associated with increased self-confidence among adolescents in taking preventive measures, which ultimately contributes to more positive health behaviors (Adaralegbe et al., 2021). This finding reinforces the results of this study that perceived vulnerability not only directly influences behavior but can also enhance self-efficacy as a key factor in shaping reproductive health behavior among adolescents.

Furthermore, the findings of this study are also supported by the research conducted by Leekuan et al., (2022), which employed a qualitative approach with a phenomenological design to explore adolescents' experiences and perceptions regarding reproductive health in Thailand. The study involved adolescents aged 18 to 19 years selected using purposive and snowball sampling, with approximately 30 participants; data were collected through in-depth interviews and analyzed using Modified Interpretative Phenomenological Analysis (Leekuan et al., 2022). The results indicate that adolescents' awareness of reproductive health risks can enhance their ability to make decisions regarding reproductive health behaviors, such as contraceptive use or the prevention of sexually transmitted infections. These findings suggest that when adolescents are aware of the potential reproductive health risks they face, they tend to have stronger self-confidence to make healthier decisions, which indirectly reflects increased self-efficacy in maintaining reproductive health (Leekuan et al., 2022).

These findings are further supported by the study by Thongmixay et al., (2019), which employed an exploratory qualitative approach to examine adolescents' perceptions of access to reproductive health services in the Lao People's Democratic Republic. The study involved adolescents

and health workers selected using purposive sampling until data saturation was reached; data collection was conducted through in-depth interviews using a semi-structured interview guide, and the data were analyzed using thematic analysis (Thongmixay et al., 2019). The study's findings indicate that adolescents' perceptions of reproductive health risks and their self-efficacy in seeking information or health services significantly influence their behavior regarding reproductive health maintenance; adolescents who recognize they are at risk of reproductive health issues tend to be more confident in seeking information, consulting with health workers, or utilizing available reproductive health services (Thongmixay et al., 2019). This finding supports the results of this study that perceptions of vulnerability can increase adolescents' self-efficacy, which ultimately encourages the development of better reproductive health behaviors (Thongmixay et al., 2019).

Theoretically, these findings are also consistent with the Health Belief Model (HBM), which explains that the perception of vulnerability to a health problem can motivate individuals to take preventive actions. However, such actions are often influenced by self-efficacy that is, an individual's belief in their ability to engage in specific health behaviors. Therefore, when adolescents perceive themselves as at risk of reproductive health issues, they are motivated to build greater self-confidence in taking preventive measures, ultimately fostering more positive reproductive health behaviors.

Indirect effect of cues to action on reproductive health behavior through self-efficacy

Cues to action have an indirect effect on reproductive health behavior through self-efficacy. The analysis indicated that cues to action have a very strong and significant positive effect on self-efficacy, this means that any increase in cues to act will significantly enhance self-efficacy, which ultimately leads to improved reproductive health behaviors. Thus, self-efficacy acts as a mediator that strengthens the relationship between cues to act and reproductive health behaviors.

Theoretically, these findings align with the Health Belief Model (HBM), which states that cues to act are external stimuli that can prompt individuals to act while simultaneously enhancing self-efficacy in engaging in such health behaviors. Exposure to information, health education, and social support can strengthen self-efficacy, thereby making individuals better prepared to make health-related decisions.

The results of this study are consistent with the research by Tadesse et al., (2020), which employed a cross-sectional design among adolescents and young adults in Ethiopia using probability sampling. The study involved hundreds of respondents ranging in age from adolescence to young adulthood and utilized a questionnaire based on the Health Belief Model (HBM), data analysis was conducted using multiple logistic regression. The results indicate that exposure to reproductive health information and education as cues to action significantly influences increased self-efficacy and health behaviors; individuals more frequently exposed to such information exhibit greater confidence in taking preventive measures (Tadesse et al., 2020).

The results of this study are consistent with the research by Joorbonyan et al., (2022), which employed an empirical-intervention design using the HBM approach with high school students. The intervention was conducted through peer-based education over several sessions, and the analysis results showed a significant increase in HBM constructs, including self-efficacy,

behavioral intention, and preventive behavior following the intervention (Joorbonyan et al., 2022). This indicates that educational stimuli, serving as cues to act, can enhance self-efficacy and thereby drive changes in health behavior.

In addition, a study by Anokye et al., (2022), which employed a cross-sectional design among adolescents aged 15 to 24, showed that sexual behavior is influenced by constructs within the Health Belief Model (HBM), including perceptions and self-efficacy. Although not all constructs showed statistically significant associations, individuals with higher self-efficacy tended to engage in safer sexual behavior (Anokye et al., 2022). This confirms that self-efficacy is a key factor in driving changes in reproductive health behavior.

These three studies indicate that stimuli or cues to act, such as health education and exposure to information, play a role in enhancing an individual's self-efficacy. This increased self-efficacy then becomes a key factor driving individuals to adopt better reproductive health behaviors.

AUTHOR CONTRIBUTION

BL made substantial contributions to the conception and design of the study, data acquisition, data analysis and interpretation, and drafted the original manuscript. ISS contributed substantially to the study design and methodology, supervised the research process, critically reviewed the manuscript for important intellectual content, and provided academic guidance throughout the study. OPA contributed to the study design, data analysis and interpretation, and critically revised the manuscript for important intellectual content. RGHN contributed to the validation of data analysis and interpretation and provided critical revisions of the manuscript for important intellectual content. VW contributed to the critical review of the manuscript and provided important intellectual input. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work in ensuring the accuracy and integrity of the study.

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CONFLICT OF INTEREST

There are no conflicts of interest.

RESULTS

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