Original Article

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HPV Vaccination Decision-Making Stages and Associated Factors Among Young Men Who Have Sex with Men in Thailand

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Abstract:

Objective: To examine human papillomavirus (HPV) vaccination stages and identify key determinants of HPV vaccination decision stages among young Thai men who have sex with men.

Material and Methods: This cross-sectional study recruited 397 young men who have sex with men (YMSM) aged 18-26 years. Data collection utilized an electronic questionnaire covering general information, health and sexual risk behaviors, HPV knowledge and attitudes, self-efficacy, subjective norms, and contextual perceptions of the HPV vaccine. Multivariate multinomial logistic regression was used to analyze the factors associated with vaccination across three stages: unawareness, undecided, and decided to vaccinate.

Results: YMSM in Thailand fell into three HPV vaccination decision-making stages: 42.3% unaware/unengaged, 39.8% undecided, and 17.9% committed to vaccination. Subjective norms had the strongest influence: participants with higher norms were more likely to be committed to vaccinating versus the undecided (adjusted odds ratio [AOR]=5.56, 95% confident interval [CI]: 2.30-13.45) or unaware (AOR=2.54, 95% CI: 1.05-6.14). Positive attitudes increased the odds of a vaccination commitment versus undecided (AOR=4.85, 95% CI: 1.78-13.21) and unaware participants (AOR=4.58, 95% CI: 1.41-12.23). Higher self-efficacy was associated with vaccination commitment versus undecided (AOR=2.94, 95% CI: 1.01-8.51) and unaware participants (AOR=3.31, 95% CI: 1.17-9.37). Neither HPV knowledge nor contextual perceptions were significantly associated with the decision-making stages.

Conclusion: Subjective norms and positive attitudes were the primary drivers of HPV vaccination decisions among YMSM in Thailand. Interventions targeting social influences and attitude change may be more effective than knowledge-based approaches alone for promoting vaccine uptake in this population.

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Introduction

Human papillomavirus (HPV) infection is one of the most prevalent sexually transmitted infections worldwide[1]. Transmission can occur through oral, vaginal, and anal sexual contact, as well as direct exposure to the virus. Currently, there are over 150 HPV genotypes identified, with types 6 and 11 primarily causing genital warts, while types 16 and 18 are associated with cancer development[2]. In males, HPV infection can lead to the development of oropharyngeal cancer, penile cancer, and anal cancer[3,4]. The incidence of HPV associated anal cancer among men who have sex with men (MSM) is 20 times higher compared to men who do not engage in sexual relations with other men[5].

HPV infection represents a significant public health concern with a substantial impact on population health. Vaccination is considered a crucial strategy for reducing the burden of HPV-related diseases and their associated complications[1]. Accurate disease awareness and comprehensive government vaccination policies are essential components in the global prevention of HPV infection and related malignancies[6]. Although Thailand currently implements a policy of free HPV vaccination exclusively for females, healthcare professionals recommend that high-risk populations, such as young men who have sex with men (YMSM), should also receive the vaccination as a necessary preventive measure. Thailand's HPV-associated cancer burden shows marked gender disparities[3], with males experiencing higher rates across most sites. Head and neck cancers predominate, led by oral cavity malignancies in both sexes (7.87 and 5.85 per 100,000 for males and females, respectively). Laryngeal and oropharyngeal tumors primarily impact men (4.77 and 2.67 per 100,000)[3]. Gynecological cancers occur infrequently (vulvar: 0.72, vaginal: 0.46 per 100,000), while anal cancer affects both genders equally (approximately 0.5 per 100,000)[3]. These epidemiological patterns underscore the importance of gender-specific HPV prevention programs emphasizing oral and pharyngeal cancer control among Thai males.

Consequently, YMSM represent a crucial target group for primary prevention, given their elevated risk of HPV infection due to sexual practices, particularly receptive anal intercourse[7]. However, infection can also occur through skin contact and oral sexual activity. Risk factors include frequent partner changes, multiple sexual partners, inconsistent condom use[8-10], and compromised immunity or HIV co-infection[11]. Undiagnosed infections or lack of awareness about infection status can lead to rapid viral transmission.

Most studies examining HPV vaccination intentions among YMSM, both in Thailand and internationally, have demonstrated moderate to low intention levels for HPV vaccination uptake[12-17]. Psychosocial factors associated with vaccination acceptance or intention among YMSM include knowledge of HPV infection and vaccination, attitudes toward HPV vaccination, subjective norms, perceived behavioral control, vaccination self-efficacy, perceived contextual factors related to vaccination, and cost considerations[14-19]. However, limited research has investigated the stages of vaccination decision-making among YMSM. A mixed-methods study conducted in the United Kingdom[18] identified that knowledge and attitudes toward vaccination influenced the decision-making stages regarding vaccine uptake. The study reported the following distribution across decision stages: 33.3% in Stage 2 (unengaged), 3.9% in Stage 3 (undecided), no reports for Stage 4 (decided not to act), 17.7% in Stage 5 (decided to act), and 21.6% in Stage 6

(acting). Similarly, a study among male college students in the United States[19] revealed comparable decision-making patterns, with most participants demonstrating low awareness and remaining undecided about vaccination. Critical factors promoting male vaccine acceptance included HPV-related knowledge, healthcare provider consultation, and social norms. Research findings reveal that both general male youth populations and YMSM share common characteristics regarding HPV vaccination: they are unaware of vaccine availability for males, show minimal engagement in vaccination decision-making processes, and possess a limited understanding of HPV infection and its prevention through vaccination. This pattern is consistent across different demographic contexts and geographical locations.

Research examining YMSM populations remains limited, with existing studies focusing on the binary outcomes of acceptance/non-acceptance or intention/non-intention regarding HPV vaccination. The study aimed to fill a significant research gap by examining the complex stages of decision-making rather than simply looking at the binary outcomes of acceptance or intention. However, behavioral implementation involves complex decision-making processes across various stages. Meta-analytic evidence demonstrates that readiness to act serves as the optimal behavioral determinant, indicating that intention leads to decision-making[20] and results in HPV vaccination uptake. The Precaution Adoption Process Model (PAPM)[21] conceptualizes the decision-making process leading to individual action through six distinct stages: Stage 1, unaware of the health behavior; Stage 2, aware of the health behavior but unengaged; Stage 3, engaged and thinking about performing the behavior but undecided; Stage 4, decided not to act; Stage 5, decided to act but not yet in action; Stage 6, acting. Thus, this study aimed to investigate the stages of HPV vaccination among YMSM and the associated factors across various stages among YMSM in Thailand, utilizing PAPM as the theoretical framework.

Material and Methods

Study design and participants

This cross-sectional study was conducted from February to April 2024. A total of 427 YMSM in Chonburi Province, Thailand's eastern tourism hub, were enrolled in this study. The inclusion criteria for participants were as follows: (1) aged between 18 and 26 years; (2) Thai nationality; (3) can access a smartphone or electronic device with internet connectivity; and (4) lived in Chonburi for more than six months. The exclusion criterion was prior receipt of the HPV vaccine. The number of participants in this study was calculated using a proportional formula with a 48.0% vaccination intention rate in the previous study[13] and a 95% confidence level, yielding 383 participants. Adding 10.0% for insincere response increased the target to 427. Participants who were unaware of both HPV and the HPV vaccine, as well as the PAPM HPV vaccination adoption stages with a small cell size (<30), were excluded from subsequent analyses. After excluding these cases, 397 were included in the final analysis.

Measures and instrumentation

Questionnaire development

The research team developed the questionnaire through a comprehensive literature review of psychosocial determinants in HPV vaccine decision-making, including vaccine attitude, subjective norms, and contextual factors. Content validity was established through consultation with three subject matter experts who evaluated and validated the instrument. Then, the survey underwent pilot testing with 30 participants, comprising 15 YMSM undergraduates and 15 general YMSM. Each participant received 100 Thai Baht compensation for providing feedback on question clarity and comprehension. The questionnaire was then refined based on participants' feedback.

Measures

The survey instrument collected essential demographic and behavioral data, including age, study location, education level, income, occupation, alcohol consumption, smoking status, and sexual behavior. The HPV vaccination adoption stage was informed by the PAPM theoretical framework[19,21], where YMSM chose one of the following six stages: Stage 1, unaware that the HPV vaccine can be given to males, Stage 2, aware that the HPV vaccine can be given to males but unengaged, Stage 3, undecided about getting the HPV vaccine, Stage 4, decided not to get the HPV vaccine, Stage 5, decided to get the HPV vaccine, and Stage 6, vaccinated. Due to inadequate sample distribution across the original framework, whereby certain stages contained insufficient participants for meaningful statistical analysis, the six-stage model was restructured into three stages. Stage 6 cases were excluded per the initial exclusion criteria. Stage 4 (decided against vaccination) was excluded from the multinomial logistic regression due to a very small sample size (n=13) and inability to combine with other stages per the definition. Stages 1 and 2 were consolidated into a unified category. This modification produced three statistically viable classifications for subsequent analysis: unaware, undecided, and decided to vaccinate.

The HPV knowledge assessment was adapted from the original instrument, incorporating two additional knowledge items beyond Waller et al.'s[22] validated framework. The modified instrument included HPV general knowledge using a 25-item scale with seven HPV knowledge domains: 1) health consequences of HPV; 2) HPV and cervical screening; 3) symptoms; 4) causes, risk factors, and transmission; 5) prevention and treatment; 6) prevalence; and 7) testing/vaccination. Participants responded using a three-point scale ("Yes"/"No"/"Don't know"), with scoring assigned as follows: correct responses=1 point, incorrect or don't know responses=0 points. KR-21 was 0.906. Participants were dichotomized using a mean cutoff of 10 into sufficient (≥10) and insufficient (<10) knowledge groups.

Attitude towards HPV vaccine using the HPV vaccine attitude questionnaire, adapted from Malathamrat et al.[13], consisting of 6 semantic differential questions with opposing meanings (e.g., unnecessary-necessary, complicated-convenient, dangerous-safe, etc.) measured on a 9-point scale (1-9) with Cronbach's α=0.869. Participants were dichotomized using a median cutoff of 40 into negative (<40) and positive attitudes (≥40) groups.

HPV vaccination self-efficacy was measured using the 4-item scale by Malathamrat et al.[13], which evaluated participants' confidence in their ability to obtain HPV vaccination across four domains: finding access routes, managing vaccine costs, overcoming vaccination fears, and scheduling time for vaccination. Items were rated on a 5-point Likert scale (1=not confident at all to 5=extremely confident) with Cronbach's α=0.782. Participants were dichotomized using a mean cutoff of 12 into low (<12) and high (≥12) self-efficacy groups.

Subjective norms questionnaire for HPV vaccination assessed using a researcher-developed 4-item questionnaire examining beliefs about the level of support from significant others, including romantic partners, close friends, family, and healthcare personnel regarding HPV vaccination. Items were measured using a 5-point Likert scale (1=definitely do not support to 5=definitely support) with Cronbach's α =0.866 and CVI=1.0. Participants were dichotomized using a median cutoff of 16 into low-complying (<16) and high-complying (≥16) groups.

Contextual perceptions of the vaccine were assessed using the situational perception scale for the HPV vaccination developed by Malathamrat et al.[13]. The content encompasses physical environmental factors including the cost of the complete three-dose vaccination, service provision, ease of access to HPV vaccines, and HPV vaccination service locations, comprising 4 items measured

on a 5-point rating scale (1=not sure at all to 5=most certain) with Cronbach's α=0.856. Participants were dichotomized using a median cutoff of 12 into low perception (<12) and high perception (≥12) groups.

Since applying criterion-based grouping would result in insufficient sample sizes for analysis, HPV knowledge and perceived self-efficacy variables were divided into binary categories using mean values for normal distributions. Attitudes towards the HPV vaccine, subjective norms, and contextual perceptions of the HPV vaccine were divided into binary categories using median values for skewed distributions.

Data collection

The study employed snowball and venue-based sampling to access YMSM, a recognized hard-to-reach population. Participant recruitment was conducted in Muang District and Pattaya City (Chonburi Province) through systematic stratification into two distinct cohorts: in-school youth and out-of-school youth. Schools and universities are sources of youth in the educational system, while community learning centers and non-governmental organizations (NGOs) are sources of youth outside the educational system. Each group was assigned a primary coordinator who offered guidance and identified initial participants, who then functioned as seed members to share the survey with 2-3 peers of comparable gender identity. A three-level recruitment chain was established: the first wave (n=36), second wave (n=108), and third wave (n=420), ultimately reaching the target sample size (N=427). Participants utilized the LINE messaging platform to access the anonymous questionnaire administered via Google Forms, which was optimized for both mobile and desktop interfaces. Financial incentives were managed through a structured verification protocol whereby site coordinators received remuneration after confirming sampling quotas, subsequently distributing compensation to participants through electronic transfer via the LINE application and collecting transaction documentation for administrative records.

Statistical analysis

Statistical Package for Social Sciences (SPSS) version 29.0.2.0 was used for data analysis. Descriptive statistics were used to describe the demographic characteristics and health behaviors, HPV knowledge, attitude towards HPV vaccine, perceived self-efficacy, subjective norms, and contextual perceptual perceptions of HPV vaccine, including frequency, percentage, mean, median, Interqaurtile range (IQR), and standard deviation (S.D.). All predictors included in the multinomial logistic regression analyzed the factors influencing the HPV vaccination decision-making stages (dependent variable), categorized into three groups: unaware (combining Stages 1 and 2), undecided (Stage 3), and decided to vaccinate (Stage 5). Unadjusted odds ratios (OR) and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to analyze the likelihood of participants being in specific PAPM stages, using the unaware group as the reference category. Statistical significance was set at p-value<0.05.

Ethical considerations

This study was approved by the Human Research Ethics Committee of Burapha University (certification ID number IRBI-065/2566).

Results

Sociodemographic characteristics and health behaviors

The sociodemographic characteristics and sexual behavior of YMSM are reported in Tables 1 and 2. The final analysis comprised 397 participants categorized into three PAPM stages: unaware/unengaged (42.3%, n=168), undecided (39.7%, n=158), and decided to vaccinate

Table 1 Characteristics of the participants (n=397)

Characteristics	n (%)
Age (years), M±S.D.=21.36±2.54	
18–20	175 (44.1)
19–26	222 (55.9)
Group Sites	
In–school youth	121 (30.5)
Out–of–school youth	276 (69.5)
Education	
High school	140 (35.3)
Vocational school	147 (37.0)
Bachelor' s degree	110 (27.7)
Sufficiency of Income	
Enough, not left over	203 (51.1)
Not Enough, but not in debt	82 (20.7)
Enough, left over to save	58 (14.6)
Not Enough and in debt	54 (13.6)
Occupation	
Company Employee	183 (46.1)
Student	153 (38.5)
Personal business	34 (8.6)
Government employee/state enterprise	16 (4.0)
NA	11 (2.8)
Alcohol drinking	
Never	33 (8.3)
Yes but now already quit	29 (7.3)
Occasionally	303 (76.3)
Regularly	32 (8.1)
Smoking behavior	
Never	156 (39.3)
Yes but now already quit	61 (15.4)
Occasionally	130 (32.7)
Regularly	50 (12.6)
Sexual orientation	
Homosexual	171 (43.1)
Heterosexual	84 (21.2)
Transgender	68 (17.1)
Not comfortable answering	74 (18.6)
Sexual Experience	
Never	61 (15.4)
Yes	270 (68.0)
Not comfortable answering	66 (16.6)
STDs History	
No	312 (78.6)
Yes	46 (11.6)
Not comfortable answering	39 (9.8)

M=mean, S.D.=standard deviation

Table 2 Sexual behaviors of the sexual experienced participants (n=270*)

Sexual experience	n (%)
Age at first sex (n=259), M±S.D.=17±2.85	
<14	11 (4.2)
15–18	163 (62.9)
19–26	85 (32.8)
Not comfortable answering	11
Number of partners in lifetime (n=213) M±S.D.=2.99±2.955	
≤5	190 (89.2)
>5	23 (10.8)
Not comfortable answering	57
Sexually active: MSM n=205	
Once a month	108 (52.7)
Once a week	87 (42.4)
Almost everyday	10 (4.9)
Not comfortable answering	65
Condom use in past 6 mth (anal sex) n=270	
Never use	36 (13.3)
Don't use more than use	22 (8.1)
Use more than don't use	85 (31.5)
Every time	127 (47.0)
Condom use in past 6 month (oral sex) n=270	
Never use	159 (58.9)
Don't use more than use	56 (20.7)
Use more than don't use	31 (11.5)
Every time	24 (8.9)

*Of the total sample, 270 participants reported sexual experience, M=mean, S.D.=standard deviation

(17.9%, n=71). Figure 1 illustrates that psychosocial factors (subjective norms, attitudes, self–efficacy) show distinct distribution patterns across decision stages, while contextual perceptions and knowledge show similar distributions regardless of stage, supporting the quantitative findings in Table 3.

Table 4 shows that participants in the decided stage scored higher across all variables (HPV knowledge, attitudes, self–efficacy, subjective norms, and contextual perceptions) compared to undecided and unaware participants. The undecided and unaware groups showed similar mean scores with minimal differences.

Table 3 Descriptive statistics of the categorical variables by the HPV vaccination decision stage (n=397)

Variables	Stage of decision making n (%)			Total
	Unawareness	Undecided	Decided to act	n (%)
Total	168 (42.3)	158 (39.8)	71 (17.9)	397 (100)
Knowledge of HPV and HPV vaccine[a]				
Inadequate (<10)	86 (43.9)	94 (48.0)	16 (8.1)	196 (49.4)
Adequate (≥10)	82 (40.8)	64 (31.8)	55 (27.4)	201 (50.6)
Attitude towards HPV vaccine[b]				
Negative (<40)	85 (45.9)	94 (50.8)	6 (3.3)	185(46.6)
Positive (≥40)	83 (39.1)	64 (30.2)	65 (30.7)	212(53.4)
Perceived self-efficacy[a]				
Low (<12)	66 (47.8)	67 (48.6)	5 (3.6)	138 (35.4)
High (≥12)	102 (39.4)	91 (35.1)	66 (25.5)	259 (64.6)
Subjective norms[b]				
Low (<16)	77 (41.0)	103 (54.8)	8 (4.2)	188(47.4)
High (≥16)	91 (43.5)	55 (26.3)	63 (30.1)	209(52.6)
Contextual perceptions of HPV vaccine[b]				
Low (<12)	87 (44.4)	87 (44.4)	22 (11.2)	196 (49.4)
High (≥12)	81 (40.3)	71 (35.3)	49 (24.4)	201 (50.6)

[a]=Application of mean values as binary classification cutoffs, [b]=Application of median values as binary classification cutoffs, HPV=Human papilomavirus

Table 4 Descriptive statistics of the variables by the HPV vaccination decision stage (n=397)

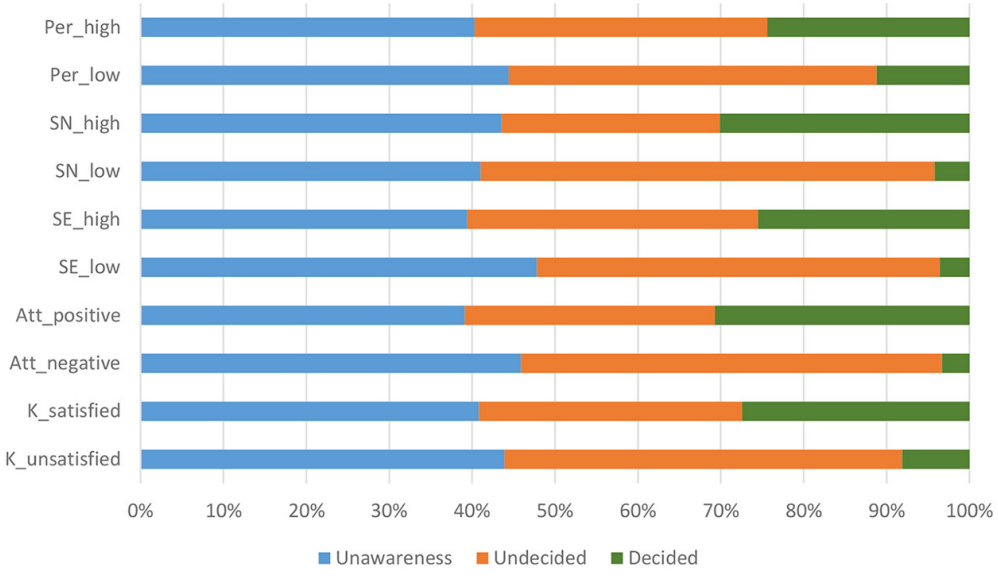
Variables	Stage of decision making			Total			
	Unawareness mean±S.D.	Undecided mean±S.D.	Decided to actmean±S.D.	Mean±S.D.	Mdn	IQR Q3-Q1	Range
Knowledge of HPV and HPV vaccine	9.91±6.19	10.61± 6.89	12.49±4.71	10.29±5.86	10.0	9.0	0-24
Attitude towards HPV vaccine	35.59±10.81	35.23±15.91	48.53±6.92	39.71±11.27	40.0	20.0	12-54
Perceived self-efficacy	12.14±3.96	9.61±4.15	15.46±2.94	12.43±3.96	12.0	5.5	4-20
Subjective norms	15.16±2.95	14.07± 3.3	16.90±2.38	15.34±2.97	16.0	5.0	7-20
Contextual perceptions of HPV vaccine	10.21±4.15	10.07±3.90	12.89±3.43	10.72±3.90	12.0	5.0	4-20

HPV=Human papilomavirus, IQR=interquartile range, Q=quartile, Mdn=median, S.D.=standard deviation

Factors associated with the decision stage

In the univariate multinomial logistic regression analyses, several factors were significantly associated with being in at least one decision stage (compared to being in the unaware stage) (Table 5). YMSM with adequate HPV knowledge and HPV vaccination knowledge were significantly more likely to be in the decided stage compared to the undecided and unaware stages, with ORs of 5.04 [95% CI: 2.66, 9.58] and 3.60 [95% CI: 2.66, 9.58], respectively.

YMSM with positive attitudes were significantly more likely to be in the decided stage compared to the undecided and unaware stages, with ORs of 15.91 [95% CI: 6.50, 38.92] and 11.09 [95% CI: 4.55, 26.99], respectively.



att=attitude, k=knowledge, per=contextual perception, se=self-efficacy, sn=subjective norm, HPV=human papilomavirus

Figure 1 Distribution of the research variables by the HPV vaccination decision stage

YMSM with greater confidence in their ability to obtain vaccination (self-efficacy) were significantly more likely to be in the decided stage compared to the undecided and unaware stages, with ORs of 9.71 [95% CI: 3.71, 25.44] and 8.54 [95% CI: 3.26, 22.31], respectively. YMSM with stronger social pressure or support for vaccination were significantly more likely to be in the decided stage, with ORs of 14.74 [95% CI: 6.59, 32.99] vs. undecided, 6.66 [95% CI: 3.00, 14.76] vs. unaware, and 2.21 [95% CI: 1.41, 3.45] for undecided vs. unaware. YMSM with high contextual perceptions about vaccination were significantly more likely to be in the decided stage compared to the undecided and unaware stages, with ORs of 2.72 [95% CI: 1.50, 4.93] and 2.39 [95% CI: 1.33, 4.30], respectively. Further analysis indicated that some associated factors were not significant in the model.

Results from multivariate multinomial logistic regression analyses, with age as a control variable, are presented in Table 5. The following associated factors were found to be significant: subjective norms, attitudes towards the HPV vaccination, and perceived self-efficacy. Social influences emerged as the primary driver of vaccination decisions. YMSM experiencing stronger social pressure or support for vaccination were significantly more likely to progress through the decision-making continuum, with AORs of 5.56 [95% CI: 2.30, 13.45] (decided vs. undecided), 2.54 [95% CI: 1.05, 6.14] (decided vs. unaware), and 2.18 [95% CI: 1.29, 3.68] (undecided vs. unaware). Favorable HPV vaccination attitudes emerged as the second most significant influence. Those with positive attitudes were considerably more likely to decide on vaccination, with AORs of 4.85 [95% CI: 1.78, 13.21] vs. undecided and 4.58 [95% CI: 1.71, 12.23] vs. unaware. Self-efficacy beliefs also played a meaningful role in the decision-making process. YMSM with greater confidence in their ability to obtain vaccination were nearly three times more likely to decide to vaccinate, with AORs of 2.94 [95% CI: 1.01, 8.51] vs. undecided and 3.31 [95% CI: 1.17, 9.37] vs. unaware stage.

Table 5 Univariate and multivariate multinomial logistic regression analysis between decision stages and the associated factors (n=397)

Variables	Stages of decision making					
	Undecided vs unawareness		Decided to act vs unwareness		Decided to act vs undecided	
	OR (95%CI)	AOR (95%CI)	OR (95%CI)	AOR (95%CI)	OR (95%CI)	AOR (95%CI)
Knowledge of HPV and vaccine (Ref=inadequate)						
Adequate	1.40 (0.90–2.17)	1.08 (0.66–1.77)	3.60** (1.91–6.79)	1.76 (0.87–3.57)	5.04** (2.66–9.58)	1.92 (0.92–4.00)
Attitude towards HPV vaccine (Ref=negative)						
Positive	1.43 (0.92–2.22)	1.06 (0.66–1.80)	11.09** (4.55–26.99)	4.58* (1.71–12.23)	15.91** (6.50–38.92)	4.85* (1.78–13.21)
Perceived self-efficacy (Ref=low)						
High	1.14 (0.73–1.77)	0.88 (0.53–1.47)	8.54** (3.26–22.31)	3.31* (1.17–9.37)	9.71** (3.71–25.44)	2.94* (1.01–8.51)
Subjective norms (Ref=low)						
High	2.21* (1.41–3.45)	2.18* (1.29–3.68)	6.66* (3.00–14.76)	2.54* (1.05–6.14)	14.74* (6.59–32.99)	5.56** (2.30–13.45)
Contextual perceptions of HPV vaccine (Ref=low)						
High	1.14 (0.73–1.76)	0.95 (0.59–1.52)	2.39* (1.33–4.30)	1.22 (0.62–2.37)	2.72* (1.50–4.93)	1.16 (0.58–2.33)
Constant		0.034		1.802		1.836

*=indicates a statistically significant odds ratio at the p-value<0.05 level, **=indicates a statistically significant odds ratio at the p-value<0.001 level, CI confidence interval, HPV=human papillomavirus, AOR=adjusted odds ratio for multivariate analysis, OR=odds ratio for univariate analysis, Ref=reference category

Constant=the log-odds of an outcome falling into a specific category relative to the reference category when all predictor variables are set to zero, with adjustment for age. A likelihood ratio Chi-square of 104.85. (df=12, sig<0.001): This indicates that the overall model significantly predicts decision stages better than a model with no predictors.

Discussion

The study revealed a vaccination prevalence of 4% (17/427 participants) at baseline, indicating substantial healthcare delivery deficits among Thai YMSM, a population with elevated HPV-related disease risk. Among 397 unvaccinated participants (mean age 21), vaccination decision-making encompassed three distinct stages: unaware/unengaged (42.3%), undecided (39.8%), and committed to vaccination (17.9%). Given that 68.0% reported sexual activity, these findings demonstrate significant gaps in provider-initiated vaccination practices, inconsistent with established clinical guidelines advocating routine HPV vaccination for men who have sex with men. These results align with US and UK studies conducted under female-only vaccination policies, which found similar distributions among MSM of comparable age: unengaged (33.3%), undecided (3.9%), decided to vaccinate (17.7%), and vaccinated (21.6%)[18]. Additional U.S. research among Black MSM aged 18–30 years revealed comparable patterns: unengaged (14.2%), undecided (56.3%), and intending to vaccinate (29.4%)[19]. These findings confirm consistently low vaccination uptake among MSM, consistent with Southern Thai college student research demonstrating limited HPV vaccination interest[12].

The modest vaccination intention levels in this study likely reflect reality more accurately than previous research, which typically examined either exclusively low-risk populations (students) or high-risk individuals (YMSM

attending Sexually Transmitted Infection (STI) clinics). By recruiting participants from both educational and non-educational settings, this study achieved better YMSM representation despite the limitations of purposive sampling. The findings confirm previous studies showing insufficient HPV education among vulnerable populations[12,13,18,19].

Multinomial logistic regression analysis found that HPV vaccination decision-making among YMSM was primarily driven by social and psychological factors rather than knowledge-based approaches. These results align with Weinstein et al.'s framework[21], demonstrating that psychosocial factors vary systematically across the different decision-making stages. This staged approach provides deeper insights compared to traditional binary intention/non-intention models. Subjective norms emerged as crucial factors in HPV vaccination decision-making among YMSM. Those with stronger social pressure or support for vaccination were significantly more likely to advance through the decision-making stages, consistent with previous research findings[13,19]. Due to their marginalized gender identity perception, YMSM commonly avoid openly discussing the HPV vaccination with friends and family. This reluctance extends to concealing sexual behavior information from parents, friends, and healthcare providers. Within MSM communities, more experienced older gay peers frequently emerge as key influencers in decision-making processes, as documented in studies[23-25].

Attitudes toward the HPV vaccination and self-efficacy significantly influence decision-making across the decided stage compared to both the undecided and awareness stages. This finding indicates that YMSM begin to evaluate received information and assess the risks and benefits of vaccination. The perception of the HPV infection threat serves as a critical factor in developing vaccination-related beliefs[14,15,26].

Yet, these social influences prove insufficient on their own to drive vaccination choices without positive attitudes and confidence in one's ability to act. Contrary to expectations, neither HPV knowledge nor contextual vaccination perceptions were significantly associated with the decision-making stages. These results align with previous research[27-29] showing mixed knowledge-vaccination relationships. While knowledge appears critical for initial awareness, vaccination decisions seem influenced by multiple psychosocial factors beyond knowledge alone.

Despite its valuable implications, this study has limitations that inform future research directions. The cross-sectional design prevented tracking decision stage progression over time, necessitating longitudinal studies to understand how vaccination intentions evolve among Thai YMSM. Non-probability sampling introduced potential selection bias, indicating the need for probability sampling methods to enhance generalizability. Limited sample size reduced the statistical power for subgroup analyses, requiring larger studies to detect meaningful differences and provide precise effect estimates. Future qualitative research should identify the sources of social norms affecting YMSM in the Thai context.

Conclusion

The findings indicate that the traditional educational approaches have a limited impact on HPV vaccination uptake among YMSM, as knowledge showed no significant association with decision-making. This challenges conventional health behavior change assumptions.

Public health efforts should prioritize social influence over education. Since subjective norms were the strongest predictor, interventions should create supportive environments using peer champions to normalize vaccination. Programs must simultaneously address attitudes and self-efficacy by cultivating emotional acceptance of vaccination while building confidence to navigate practical barriers and access processes.

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Conflict of interest

The authors report no conflicts of interest relevant to this research.

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