Model of Factors Explaining Human Papillomavirus Vaccination Intention of Men Who Have Sex with Men in Thailand: A Cross-Sectional Study

Chotravee Injumpa, Wanchai Lertwatthanawilat, Pimpaporn Klunklin, Akeau Unahalekhaka*

Abstract: Human papillomavirus is a leading cause of sexually transmitted infections worldwide, particularly affecting men who have sex with men. While vaccination remains the most effective strategy for preventing human papillomavirus, limited evidence exists regarding the factors influencing vaccine intention in this population. This descriptive, cross-sectional study developed and tested a model of factors explaining human papillomavirus vaccination intention using the extended Theory of Planned Behavior, which included attitude, subjective norms, perceived behavioral control, sexual risk behaviors, and human papillomavirus knowledge. The participants were 331 men who have sex with men residing in four provinces across four regions of Thailand, via multi-stage random sampling. Data were collected using online questionnaires, including the Demographic Data Form, the Attitude toward the Behavior Subscale, the Subjective Norm Subscale, the Perceived Behavioral Control Subscale, the Sexual Risk Behavior Questionnaire, the Mid-Adult Human Papillomavirus Vaccine Knowledge Scale, and the Behavioral Intention Subscale. Data were analyzed using descriptive statistics, Pearson's product-moment correlation, and structural equation modeling.

The findings showed that the participants had a high intention to receive the human papillomavirus vaccination. Attitude, subjective norms, and perceived behavioral control collectively explained intention, accounting for 39.5% of the variance. Subjective norms have a strong influence on intention, both directly and indirectly, through attitude and perceived behavioral control. Sexual risk behaviors and knowledge of human papillomavirus did not significantly influence vaccination intention. The findings can be applied to develop programs to promote human papillomavirus vaccination intention by reinforcing positive attitudes, supporting subjective norms such as peer groups, and enhancing perceived behavioral control over human papillomavirus vaccination. However, this intervention must be tested before it can be used in practice.

Keywords: Human papillomavirus, Intention, Men who have sex with men, Structural equation modeling, Theory of Planned Behavior, Vaccination

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Introduction

The human papillomavirus (HPV) is a major pathogen of sexually transmitted diseases (STDs) worldwide.[1] It is prevalent among sexually active

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individuals and is acquired immediately following a sexual debut or another direct contact.[2] Certain high-risk HPV types are associated with the development of various cancers affecting both males and females,[3] accounting for new cancer cases in women and for 70,000 men globally.[1] While HPV infection in women is widely acknowledged, less is known regarding HPV infection in men,[4] especially men who have sex with men (MSM). They exhibit a disproportionately higher rate of HPV infection and HPV-associated health issues compared to heterosexual men, which is attributable to the nature of their sexual activities,[4] particularly unprotected oral and anal sex.[5] Globally, the estimated prevalence of high-risk HPV among MSM has reached 21.0% at external genital sites and 12.7% at the urethra.[6] In Southeast Asia, HIV-positive MSM had a higher incidence of HPV infections than HIV-negative MSM (28.4/1000 compared to 13.9/1000 person-months).[7] In Thailand, anal HPV was present in 94% of MSM with HIV and 59% of HIV-negative MSM,[8] with the greatest infection rates among those 20-29 years old (55%) and 30-39 years old (24%).[9]

The best method to prevent HPV infection is to be vaccinated against it,[1,3] most effectively in three doses.[1] Currently, health guidelines recommend initiating HPV vaccination in children between the ages of 11 and 12, while adults between the ages of 27 and 45 may receive the HPV vaccine if determined as necessary by physicians.[1] In Thailand, unfortunately, men, including MSM, are not included in the free-of-charge national vaccination program for HPV.[10] In Thai MSM, the HPV vaccination rate was strikingly low at 1%,[10] rendering it difficult to quantify vaccination behavior precisely. Intention is a proximal precursor of behaviors. MSM with a stronger intention for HPV vaccination are usually more likely to get vaccinated than individuals without the intention.[10,11] Nevertheless, a suboptimal level of HPV vaccination intention is reported among MSM globally[12] as well as in Thailand.[13,14] Numerous barriers encountered by MSM seem to create an intention-behavior gap. Particularly, in Asian societies, MSM seeking HPV vaccination can be stigmatized.[15] In Thailand, discussion of sex-related topics is discouraged, and disclosure of sexual orientation as MSM can be unacceptable.[15] The act of concealing one's sexual behavior among MSM influenced MSM's decision to get HPV vaccines.[11] This makes them disproportionately affected by STDs; this group is still less studied in Thailand, with a higher incidence of HPV infection. Furthermore, there is a limitation in terms of the sample's representativeness, as the data were not obtained from a nationally representative population. This highlights the need to enhance HPV vaccination intention, which can be done by first understanding the predicting factors.

Conceptual Framework and Review of Literature

This study was guided by the extended model of the Theory of Planned Behavior (TPB),[16] which is an important social cognitive paradigm that seeks to comprehend the mechanisms behind deliberated activities, considering a person's intention as the most accurate indicator of their behavior.[16] In the original TPB, the core framework comprises three primary belief-driven constructs: attitude, which reflects how favorably or unfavorably a person evaluates the behavior; subjective norms, which pertain to perceived social pressure to engage or not engage in a specific action; and perceived behavioral control, which refers to an individual's assessment of their capacity or ease in performing the behavior.[16] These components are conceptually distinct but closely related, collectively shaping behavioral intentions. Research has shown that a positive attitude is often influenced by perceived social approval, and both

subjective norms and perceived behavioral control can directly affect behavioral intention. Moreover, perceived control may also moderate the effects of attitudes and norms.[17] In MSM, HPV vaccination intention refers to the readiness to obtain all three doses of HPV vaccination in the following 12 months, which includes intending, planning, and trying.[18] HPV vaccination intention is influenced by attitude toward HPV vaccination,[11,13,14,19] subjective norms about HPV vaccination,[11,13,14,] and perceived behavioral control over HPV vaccination.[11,13] MSM who believe that HPV vaccination is beneficial in preventing HPV, believe that their significant persons would want them to get vaccinated, and are confident that they can get vaccinated without difficulty, are more likely to intend to be vaccinated.

Earlier studies have highlighted that attitude has the strongest direct effect on MSM's intention to receive the HPV vaccine.[11] Subjective norms also play a meaningful role in fostering perceived expectations from peers or partners.[14] Perceived behavioral control, meanwhile, exerts a moderately strong influence and reflects the individual's confidence in overcoming barriers.[11] Moreover, MSM's subjective norms about HPV vaccination are influenced by their attitudes towards HPV vaccination and perceived behavioral control over HPV vaccination.[13] MSM with supporting social influences toward HPV vaccination are more prone to develop a favorable attitude toward HPV vaccination and perceive fewer challenges to get vaccinated.[13]

Additionally, the extended TPB incorporates more background factors into the original TPB, enabling a more accurate prediction and comprehension of human behavior,[16] which in turn facilitates a deeper understanding of decision-making processes and the development of interventions to encourage desirable behaviors.[20] According to Ajzen, the three principal predictors of behavioral intention are attitude, perceived social pressure, and perceived control.[16] However, TPB also acknowledges the influence of "background factors," such as personality, demographic characteristics, and past behavior, which can indirectly shape intention and behavior by influencing the three proximal predictors (attitude, norms, and perceived behavioral control).[16] The extended TPB model has been extensively employed as a theoretical framework to investigate vaccination intention and behavior in diverse adult populations.[20] In the MSM context, the background factors affecting HPV vaccination intention are sexual risk behaviors,[14,19,21,] and HPV knowledge.[10,11,19] Sexual risk behaviors in MSM include multiple partner sexual relationships, insufficient or absence of usage of protective barriers, drug or alcohol-induced sexual activity, and the couple's awareness of one another's past sexual history.[22] Sexual risk behaviors influence MSM's perception of health risks and thus lead to greater intention to vaccinate.[21] HPV knowledge refers to correctly understanding HPV and the HPV vaccine.[23] Moreover, MSM who have partners and engage in condomless anal sex influence the intention to get the HPV vaccine.[24] HPV knowledge directly influences HPV vaccination intention[10] and also helps to establish positive attitudes for preventing HPV.[11,14]

Study Aim

Based on the TPB[16] and previous findings, the Model of Factors Explaining Human Papillomavirus Vaccination Intention (MFE-HPVI) among MSM was constructed. **Figure 1** depicts the direct and indirect effects as well as the direction of the relationship of sexual risk behaviors, HPV knowledge, subjective norms, attitude, and perceived behavioral control, on the intention to vaccinate against HPV. It was hypothesized that the Model would fit the data.

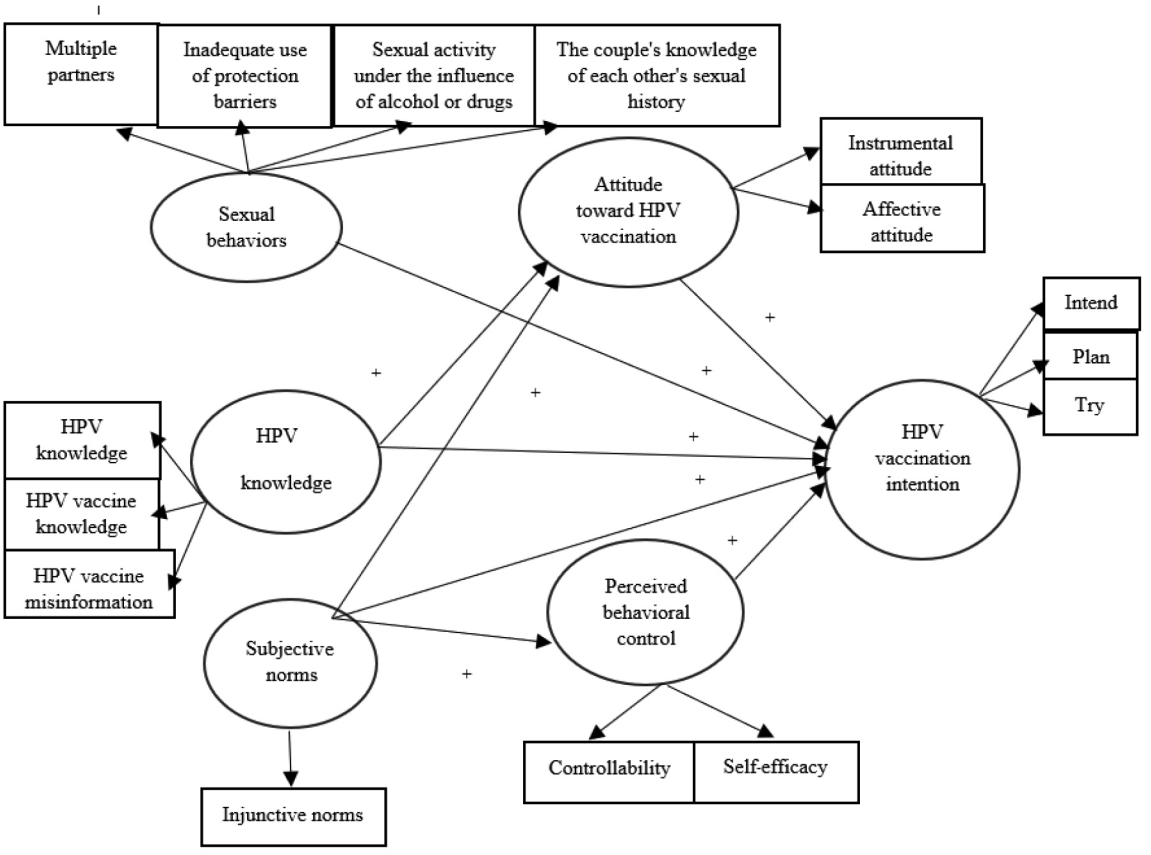


Figure 1. The hypothesized model

Methods

Design: This study employed a cross-sectional design.[25] This report is based on the STROBE checklist for cross-sectional studies.

Sample and Setting: Sample size determination followed the general recommendation of having 5 to 10 participants per estimated model parameter.[26] This study's hypothesized model contained 53 free parameters (9 factor loadings, 15 errors, 15 intercepts, 6 factor variances, and 8 path coefficients). This requires a minimum of 265 participants (53 × 5). With a 20% addition for incomplete data,[27] the sample size was set at 331 participants. The participants, between the ages of 20 and 45, who were both current and former clients of treatment for STDs, sexual health consultations, or anal cancer screenings, were selected from four community-based organizations that promote sexual health for MSM.

This study employed a multi-stage sampling approach based on Thailand's four-region administrative system, as classified by the National Economic and Social Development Council.[28] The sampling process was designed to ensure both regional representation and practical accessibility to MSM communities through existing health service networks. In the first stage, one province was purposively selected from each of four regions: Central, Northern, Northeastern, and Southern. Selection was based on documented records from the Ministry of Public Health and civil society organizations, which identified the provinces with the highest number of health service centers specifically catering to MSM. For purposes of generalization and anonymity, these provinces are hereafter referred to as Province 1

(Central), Province 2 (Northern), Province 3 (Northeastern), and Province 4 (Southern).

The second stage involved selecting one community-based organization or health center within each province that provides specialized sexual health services for MSM. These centers were randomly selected from regional lists of active MSM clinics. The total number of centers available for selection included 13 in the Central region, four in the North, two in the Northeast, and two in the South. From these pools, one center per province was randomly chosen to serve as a recruitment site.

In the final stage, participants were recruited from each selected center using purposive sampling. This non-probability technique was considered appropriate due to the marginalized and often hidden nature of the MSM population, as well as the need to adhere to specific inclusion criteria. To ensure proportional representation across regions, the number of participants recruited from each province was determined using the probability proportional to size (PPS) method, based on client volume data from each health center.[29] Accordingly, the final sample consisted of 153 MSM from Province 1 (Central), 73 from Province 2 (Northern), 69 from Province 3 (Northeastern), and 36 from Province 4 (Southern), as detailed in **Table 2.** Inclusion criteria included: 1) self-identified as Thai MSM, 2) had access to an internet-enabled device, 3) were able to read and understand Thai, and 4) consented to voluntarily participate in the study. Individuals who had previously received one or more doses of the HPV vaccine were excluded from the study.

Ethical Considerations: This study was approved by the Research Ethics Committee of the Faculty of Nursing at Chiang Mai University (2567-FULL021). Regarding the recruitment of participants, the research assistants provided and explained the study information to the participants. Participants had the freedom to choose whether to participate in the study voluntarily and could decline or leave at any time without facing any consequences. Each participant signed an informed consent form. No personal identifiers were used in the anonymous data collection process.

Research Instruments: This study employed seven research instruments. All instruments, except the Demographic Questionnaires, were translated into Thai using a standardized back-translation method,[30] with permission from the original authors. To ensure content validity, a panel of six experts, including a doctor specialized in HPV infection and HPV vaccination, a nursing instructor specialized in HPV infection and research in MSM, a nursing instructor specialized in instrument development, an instructor specialized in behavioral science, a nursing instructor specialized in infection control, and a nurse specialist in infection control. The S-CVI reliability type and value (both in the pilot study with 331 participants and in the actual study), along with an example of items, are shown in **Table 1.**

Table 1. Content validity index, Cronbach's alpha reliability, and examples of items of the instruments

Instruments	CVI	Reliability		Example of items
	S-CVI/	Pilot study	Main study	
The Attitude toward the Behavior Subscale	1.00	0.88[a]	0.88[a]	"I believe receiving all three doses of the HPV vaccine in the next 12 months would be highly protective."
The Subjective Norm Subscale	1.00	0.92[a]	0.89[a]	"Most of my significant others think that I should get all three doses of the HPV vaccine in the upcoming 12 months."
The Perceived Behavioral Control Subscale	0.97	0.88[a]	0.84[a]	"If I wanted to, I am certain I could obtain all three doses of the HPV vaccine in the subsequent 12 months."

Table 1. Content validity index, Cronbach's alpha reliability, and examples of items of the instruments (Cont.)

Instruments	CVI	Reliability		Example of items
	S-CVI/	Pilot study	Main study	
The Sexual Risk Behavior Questionnaire	0.99	0.88 [a]	0.86 [a]	"I have two or more sexual partners at the same time."
The Behavioral Intention Subscale	1.00	0.86 [a]	0.94 [a]	"I plan to receive three doses of the HPV vaccine within a 12-month period."
The Mid-Adult HPV Vaccine Knowledge Scale	0.98	0.88 [b]	0.81 [b]	"The HPV vaccine is more effective if you have never had sex."

Note. [a] = Cronbach's alpha; [b] = KR-20, CVI = Content validity index

Table 2. Number of MSM in each setting and the entire participants in this study

Region	Setting	Total number of MSM	Participants in the study
Central	Health Center in Province 1	3,776	153
Northern	Health Center in Province 2	1,800	73
Northeastern	Health Center in Province 3	1,715	69
Southern	Health Center in Province 4	900	36
Total		8,191	331

Note. MSM = Men who have sex with men

The Demographic Data Questionnaire, developed by the primary investigator (PI), included information on age, sexual orientation, monthly income, employment status, education, and history of STDs.

The Attitude toward the Behavior Scale was developed by Catalano et al.[18] to assess attitude towards HPV vaccination. It has seven items to measure instrumental attitude (3 items) and affective attitude (4 items), rated on a scale of 1 (completely disagree) to 7 (completely agree). Total possible scores range from 7 to 49 for the attitude toward the behavior scale. A more positive attitude regarding receiving all three doses of the HPV vaccine within the following 12 months is indicated by higher scores, and was classified into low (7-28), moderate (29-38), and high (39-49) attitudes toward HPV vaccination.[18]

The Subjective Norm Scale was developed by Catalano et al.[18] to assess subjective norms regarding HPV vaccination. It has four items rated on a scale of 1 (completely disagree) to 7 (completely agree). The range of possible scores is 4 to 28, where a higher score indicates greater societal pressure to receive all three doses of the HPV vaccine within the next 12 months. It is classified into low (4-16), moderate (17-21), and high (22-28) subjective norms.[18]

The Perceived Behavioral Control Scale was developed by Catalano et al.[18] to assess perceived behavioral control over HPV vaccination. There are six items in domain-specific self-efficacy (5 items) and beliefs about controllability (1 item) of the behavior rated on a scale from 1 (completely disagree) to 7 (completely agree). Total possible scores range from 6 to 42 with a higher score indicating higher perceived control over receiving all three HPV vaccine doses within the upcoming 12 months. It is categorized into low (6-24), moderate (25-33), and high (34-42) perceived behavioral control.[18]

The Scale of Risk Behaviors was developed by Ferrer-Urbina et al.[22] to assess sexual risk-taking behaviors. It consists of 16 items in four domains of

risky sexual behaviors: a) having sex with more than one partner (4 items); b) using protection barriers insufficiently or inadequately (4 items); c) having sex while under the influence of drugs or alcohol (4 items); and d) the couple's awareness of one another's past sexual experiences (4 items). Items are rated on a 4-point Likert scale, ranging from 0 (never) to 3 (always). Total possible scores range between 0 and 48, where higher scores indicate more risky sexual behaviors. It is classified into low (0-28), moderate (29-37), and high (38-48) risky sexual behaviors.[22]

The Mid-Adult HPV Vaccine Knowledge Scale was developed by Garg et al.[23] to assess HPV knowledge. It consists of 13 items on the HPV knowledge (6 items), HPV vaccine knowledge (3 items), and HPV vaccine misinformation (4 items). The answer choices for most items are True = 1, False, and Don't know = 0. The total score ranges from 0 to 13, with higher scores indicating greater knowledge. It is classified into low (0-6), moderate (7-9), and high (10-13) HPV knowledge.[23]

The Behavioral Intention Scale was developed by Catalano et al.[18] to assess HPV vaccination intention. It has three items starting with "I intend," "I plan," and "I will try." Items are rated 1 (completely disagree) to 7 (completely agree). The total possible score ranges from 3 to 21, with the higher score indicating a higher intention to receive all three doses of the HPV vaccine during the upcoming 12 months. It is classified into low (3-11), moderate (12-16), and high (17-21) regarding HPV vaccination intention.[18]

Data Collection: The PI selected four research assistants (RAs) from four research settings according to the selection criteria: 1) working as a consultant or nurse; 2) working experience with MSM for at least one year; and 3) holding a bachelor's degree or higher. The RAs' responsibilities included recruiting participants, obtaining informed consent, and collecting data. The PI trained the RAs for data collection, study objectives, eligibility criteria, and participant rights. Data were collected from September 2024 to November 2024 after IRB approval, using online questionnaires accessible by scanning the QR code. The RAs were available to assist the participants in completing the questionnaire. Completion of online questionnaires took approximately 15-30 minutes in a consultation room or a health education room in each setting.

Data Analysis: Descriptive statistics were applied to summarize the demographic profile and core study variables. There were no outliers. Assumptions of normality, homoscedasticity, linearity, and absence of multicollinearity were tested, and all were met. The relationships between dependent and independent variables of HPV vaccination intention were examined using Pearson's correlation coefficients (r) with significant values ($p < 0.05$), categorized into three levels of correlation: low ($r = 0.10-0.29$), moderate ($r = 0.30-0.49$), and high ($r = 0.50-1.00$).[25] Structural equation modeling (SEM) was carried out using M-Plus software. Model fit was indicated by degree of freedom (χ^2/df) < 3.0, p-value > 0.05, RMSEA (root mean square error of approximation) ≤ 0.05, standardized root mean square residual (SRMR) ≤ 0.05, comparative fit index (CFI) ≥ 0.95, and Tucker-Lewis fit index (TLI) ≥ 0.95.[25,31]

Results

Demographic characteristics

All 331 participants responded to the questionnaires. There was no missing data. The participants' age ranged from 20 to 45 years. Almost half of them were between 20 and 26 years of age (42.6%), and 39.0% of the participants had a versatile sexual orientation, 26.6% as insertive, the sexual role of penetration during anal sex, 25.1% as receptive, 6.0% as bisexual, and 3.3% as transgender. Their monthly income varied from under 10,000 Thai baht (297.00 USD) to more than 30,000 Thai baht (891.03 USD). Almost half of the participants (42.0%) were private sector employees. They held a bachelor's degree (67.1%) and had no history of STDs (60.4%) **(Table 3)**.

Table 3. Range, mean, and standard deviation of study variables

Variables	Possible range	Actual range	Mean	SD	Level
HPV vaccination intention	3-21	6-21	17.04	2.92	high
Attitude	7-49	26-49	40.59	5.65	high
Subjective norms	4-28	8-28	22.32	3.98	high
Perceived behavioral control	6-42	19-42	32.31	5.51	moderate
Sexual risk behaviors	0-48	6-42	13.62	7.02	low
HPV knowledge	0-13	2-10	6.89	3.45	low

Level of HPV vaccination intention

The initial research objective describes the intention of MSM in Thailand to get the HPV vaccination. The findings indicate a high overall intention to receive the HPV vaccination. The highest percentage of response of participants agreed with the item "I intend to get all three doses of the HPV vaccine" (31.7%), the item "I will try to get all three doses of the HPV vaccine" (33.5%), and the item "I plan to get all three doses of the HPV vaccine" (30.8%) **(Table 4).**

Table 4. Level of HPV vaccination intention

Item	Frequency	Percentage
1. I intend to get all three doses of the HPV vaccine		
Disagree	6	1.8
Neither agree nor disagree	52	15.7
Somewhat agree	83	25.1
Agree	105	31.7
Completely agree	85	25.7
2. I will try to get all three doses of the HPV vaccine		
Disagree	5	1.5
Neither agree nor disagree	54	16.3
Somewhat agree	89	26.9
Agree	111	33.5
Completely agree	72	21.8
3. I plan to get all three doses of the HPV vaccine		
Disagree	6	1.8
Neither agree nor disagree	67	20.2
Somewhat agree	82	24.8
Agree	102	30.8
Completely agree	74	22.4
Overall HPV vaccination intention		
Mean = 17.04 SD = 2.92		

Note. HPV = Human papillomavirus

Correlations among the study variables

Attitudes and subjective norms concerning HPV vaccination were strongly and positively correlated with vaccination intention. Perceived behavioral control also showed a moderate positive correlation. By contrast, both HPV knowledge and sexual risk behavior demonstrated weaker, yet still positive, correlations with vaccination intention (**Table 5**).

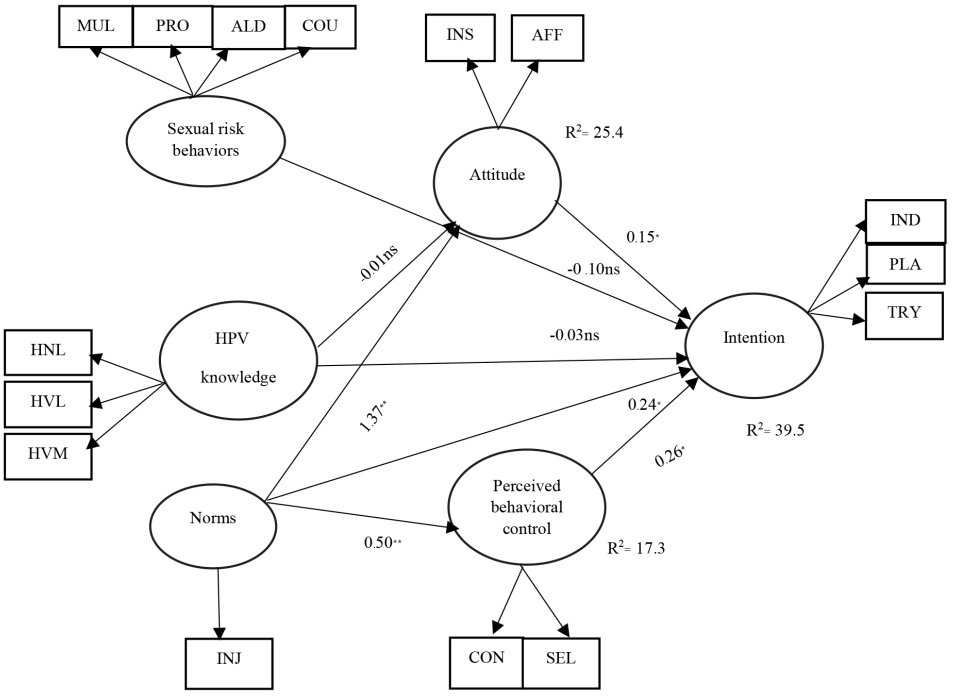
Table 5. Correlations among the study variables (n = 331)

Variables	1	2	3	4	5	6
Attitudes	1.00					
Subjective norms	0.57**	1.00				
Perceived behavioral control	0.64**	0.58**	1.00			
Sexual risk behaviors	0.70	0.17**	0.21**	1.00		
HPV knowledge	0.11*	0.18**	0.16**	0.17**	1.00	
HPV vaccination intention	0.50**	0.55**	0.48**	0.12*	0.13*	1.00

Note. *p < 0.05, **p < 0.01

Model testing

Initial structural equation modeling indicated that the hypothesized model did not meet acceptable fit standards (χ^2 = 112.64, df = 79, (χ^2/df) = 1.42, p-value = < 0.001, CFI = 0.98, TFI = 0.97, RMSEA = 0.03, SRMR = 0.04). Thus, we modified the model by adding a path between injunctive norms and affective attitude, and incorporating double-headed arrow pathways to enable error correlation using the modification indices, taking into account the constructs with the highest error values, followed by the pair of errors with the next greatest value until the model's indices satisfied the criteria (χ^2 = 96.04, df = 78, (χ^2/df) = 1.23, p-value = 0.04, CFI = 0.99, TFI = 0.98, RMSEA = 0.02, SRMR = 0.04). From all rounds of model modification, paths with double-headed arrows between 1 pair of errors were added. The final model fitted the empirical data (χ^2 = 84.98, df = 77, (χ^2/df) = 1.10, p-value = 0.24, CFI = 0.99, TFI = 0.99, RMSEA = 0.02, SRMR = 0.04) (**Figure 2**).



χ^2 = 84.98, df = 77, (χ^2/df) = 1.10, p-value = 0.24, CFI = 0.99, TFI = 0.99, RMSEA = 0.02, SRMR = 0.04
Note. *p < 0.05, **p < 0.01, ns = non-significant

Figure 2. The final model of HPV vaccination intention

The final model revealed that HPV vaccination intention was significantly and positively predicted by attitude, subjective norms, and perceived behavioral control. Subjective norms emerged as the most influential predictor, exerting both direct and indirect effects through attitude and perceived behavioral control. Sexual risk behavior did not significantly predict vaccination intention. Similarly, HPV knowledge had no significant direct or mediated effect, though it was modeled as influencing attitude (**Table 6**).

Table 6. The total effect, indirect effect, and direct effect of the influencing factors of HPV vaccination intention

Endogenous variables	R^2	Independent variables	DE	IE	TE
HPV vaccination intention	0.395	Attitude	0.15*		0.15*
		Subjective norms	0.24*	0.33*	0.57*
		Perceived behavior control	0.26*		0.26*
		Sexual risk behaviors	-0.10		-0.10
		HPV knowledge	-0.03	-0.01	-0.04
Attitude	0.254	Subjective norms	1.37**		1.37**
		HPV knowledge	-0.01		-0.01
Perceived behavior control	0.173	Subjective norms	0.50**		0.50**

Note. *p < 0.05, **p < 0.01, TE = total effect, IE = indirect effect, DE = direct effect

Discussion

The findings indicated that MSM in this study demonstrated a high level of intention to receive HPV vaccination, aligning with earlier research conducted among MSM populations in Thailand[10] and in China.[19] In the final model, HPV vaccination intention was positively influenced directly by attitude, subjective norms, and perceived behavioral control. These findings corroborate previous studies in MSM.[11,13,14,19] MSMs are more likely to receive HPV vaccination if they perceive the vaccine as beneficial, believe their significant others expect them to do so, and believe it is within their control.[11,13,14,19] In this study, attitude had a direct positive effect on HPV vaccination intention among MSM in Thailand. The findings correspond with earlier research.[11,19,21] Attitude was the most powerful determinant of behavioral intention. By reducing concerns about adverse effects and boosting confidence in the psychological and physical benefits of vaccination, attitudes toward HPV can be positively altered. Experience-based beliefs, such as feeling protected from HPV and reducing the anxiety related to sexual activity, were among the beliefs most strongly linked to attitude toward the HPV vaccine.[11] Therefore, if MSM consider that the HPV vaccination is beneficial and effective in preventing HPV infection, the probability of a robust intention to vaccinate against HPV increases. Hence, the study's finding provides empirical data to support the conclusion that there is a direct positive effect between attitude and HPV vaccination intention.

Subjective norms were the strongest predictor of HPV vaccination intention, a finding that echoed another study in college males.[32] MSM who recognized heightened support or encouragement for vaccination from their partners or peers displayed stronger vaccination intentions. Social influences from health professionals, friends, and sexual partners fostered a sense of responsibility and collective health that endorsed an intention to get HPV vaccination among MSM[33] by enhancing confidence and motivation to get vaccinated.[34] Therefore, if MSM perceive that their important person approved of HPV vaccination, they are more likely to form a positive intention toward vaccination. The empirical data supported a direct positive effect of subjective norms on HPV vaccination intention.

Moreover, subjective norms indirectly influenced intention via their effects on both attitude and perceived behavioral control. Earlier studies consistently revealed the effect of subjective norms on attitude toward vaccination intention[11,13] and perceived behavioral control[14] in MSM. For MSM, subjective norms cultivate pleasant attitudes toward HVP vaccination due to its benefits in reducing infections,[35] as well as provide external encouragement and approval, which reduce perceived barriers (e.g., vaccine safety concerns),[35] thereby making MSM feel more capable of getting vaccinated. These mediated links highlight the importance of leveraging social influences, including peer support and healthcare provider recommendations, to enhance attitudes and perceived behavioral control, thereby increasing intentions to vaccinate against HPV. Healthcare providers should develop trustworthy, non-judgmental relationships with MSM to increase the intention to receive HPV vaccines.[36]

Perceived behavioral control also had a direct and positive association with intention to receive HPV vaccination among MSM. In accordance with previous research findings.[11,13] When people believe they can carry out a behavior they intend to accomplish, they are more inclined to remain committed to it.[16] In this study, perceived behavioral control about HPV vaccination was defined as MSM's beliefs that they had the ability to obtain the vaccination and could successfully do it within time constraints. Therefore, if MSM had confidence in their capability to get the HPV vaccination, there would be a solid intent to take the vaccination. This suggested the direct impact of perceived behavioral control on HPV vaccination intention. As a result, the empirical data supported the hypotheses of the present study.

In this study, the two background variables, HPV knowledge and sexual risk behavior, emerged as significant direct predictors of HPV vaccination intention, based on a literature review, in the extended TPB model. While these variables are not part of the original TPB framework, our review found they may play a more influential and direct role than previously hypothesized. In our original conceptualization, we expected these background factors to act primarily through the core TPB constructs (attitude, subjective norms, and perceived behavioral control). However, sexual risk behaviors did not have a significant effect on HPV vaccination intention, corroborating a previous MSM study.[14,37] A possible explanation is that almost two-thirds of the participants had no history of STDs (60.4%), and exhibiting low levels of sexual risk behaviors precludes the ability to predict the intention to receive the HPV vaccine in Thai MSM. Thus, MSM with low sexual risk may consider themselves at low susceptibility to HPV infection, especially in contrast to other sexually transmitted diseases like HIV, as MSM who received HIV or STD testing and counseling were more open to receiving the HPV vaccine.[19] A low level of perception of one's risk of getting infected with HPV was the most predominant reason for not receiving the vaccine.[38] A thorough comprehension of one's own risky sexual behaviors will augment the intention to obtain the HPV vaccination in MSM populations.[41]

Regarding knowledge, the study revealed no significant direct impact on intention. This finding was both consistent[14] and inconsistent[10,11,19,37] with earlier studies. HPV knowledge in this study reflects an accurate understanding of HPV and might not be enough to influence intention. Knowledge is typically assessed by asking individuals whether they believe a statement about a disease is true or false, which may not encourage the formation of an intention to prevent it.[39] Besides possessing the necessary knowledge, individuals must be motivated to engage in the activity influenced by their beliefs. Additionally, HPV knowledge did not indirectly affect HPV vaccination intention through attitudes. Attitudes are often driven by emotions rather than rational knowledge.[16] An individual may know the facts but remain unmotivated if the behavior does not evoke emotional engagement. In the current study, a mean HPV knowledge score indicated a deficient understanding of HPV and the HPV vaccine. Moreover, if knowledge does not strongly influence attitudes, its influence on intention diminishes.[40] For instance,

a person might know about HPV and the vaccine's benefits but still feel ambivalent or neutral about vaccination due to conflicting beliefs or misinformation. Therefore, the inadequate knowledge of HPV and the HPV vaccine did not influence the attitudes or intentions towards HPV vaccination among MSM.

Limitations

This study contained some limitations. The participants were MSM aged 20-45 years, selected from four clinical settings throughout four provinces in Thailand, which may limit the generalizability of the findings to MSM in other age groups. Moreover, proxy indicators for vaccine intention restrict the extent to which the comprehensive TPB may be thoroughly examined.

Despite the noted limitations, this study has several important strengths. First, it is one of the few theory-driven investigations to utilize the extended TPB framework in explaining HPV vaccination intention among MSM in Thailand, a population that remains underrepresented in behavioral health research. Second, the use of structural equation modeling (SEM) allowed robust statistical tests to enhance the validity of the model testing. Third, the study employed validated instruments with acceptable internal consistency and theoretical alignment, ensuring the reliability and relevance of the measured constructs. Lastly, the inclusion of context-specific variables such as HPV knowledge and sexual risk behavior reflects a meaningful attempt to adapt the model for a high-risk group, contributing to the advancement of culturally responsive and population-specific behavioral models.

Conclusions and Implications for Nursing Practice

The results demonstrated that attitude, subjective norms, and perceived behavioral control were significant determinants of HPV vaccination intention among Thai MSM. Among these, subjective norms emerged as the most influential factor, exerting both direct effects and mediating influence via attitude and perceived behavioral control. These key variables, which directly and indirectly influence intention, provide partial empirical support for the extended Theory of Planned Behavior. The final MFE-HPVI model accounted for 39.5% of the total variance in HPV vaccination intention, confirming its adequacy in capturing behavioral predictors.

Nursing interventions should enhance favorable attitudes, foster supportive subjective norms, and augment perceived behavioral control. In addition, nurses must promote positive attitudes among MSM to encourage them to exhibit caring and support for fellow MSM, thereby enhancing their access to and comprehension of health information. Furthermore, nurses should promote social engagement among MSM with the appropriate information, as such participation may facilitate interactions with individuals, as part of a peer group or through norms, who can positively influence their intention to receive HPV vaccinations.

Recommendations for Future Research

The recommendations for further study suggest that subsequent studies should examine the HPV vaccination intentions of MSM in alternative contexts. Moreover, this study focused solely on HPV vaccination intentions, highlighting the necessity for a longitudinal study to directly evaluate vaccine uptake among MSM in Thailand.

Author Contributions

Conceptualization and design of the study: W.L., C.I.
Data collection, analysis, and interpretation: C.I, W.L.
Initial manuscript draft: C.I.
Revised and edited the manuscript and corresponded with the Editor-in-Chief: W.L.
Approving the final version for submission: W.L., C.I., P.K., A.U.

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โมเดลปัจจัยอธิบายความตั้งใจในการฉีดวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมาของชายที่มีเพศสัมพันธ์กับชายในประเทศไทย : การศึกษาภาคตัดขวาง

โชติระวี อินจำปา วันชัย เลิศวัฒนวิลาศ พิมพาภรณ์ กลั่นกลิ่น อะเคื้อ อุณหเลขกะ*

บทคัดย่อ เชื้อไวรัสฮิวแมนแพพพิลโลมาเป็นสาเหตุสำคัญของโรคติดต่อทางเพศสัมพันธ์ทั่วโลก โดยเฉพาะในชายที่มีเพศสัมพันธ์กับชาย การได้รับวัคซีนเป็นการป้องกันการติดเชื้อดังกล่าวที่มีประสิทธิภาพมากที่สุด แต่ความรู้เกี่ยวกับปัจจัยที่มีอิทธิพลต่อความตั้งใจในการฉีดวัคซีนในกลุ่มนี้ยังมีจำกัด การวิจัยสหสัมพันธ์เชิงพรรณนาแบบภาคตัดขวางนี้ศึกษาโมเดลปัจจัยอธิบายความตั้งใจในการฉีดวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมาโดยใช้แบบจำลองทฤษฎีพฤติกรรมตามแผนแบบขยาย ประกอบด้วย ทัศนคติการคล้อยตามกลุ่มอ้างอิง การรับรู้การควบคุมพฤติกรรม พฤติกรรมเสี่ยงทางเพศ และความรู้เรื่องเชื้อไวรัสฮิวแมนแพพพิลโลมา กลุ่มตัวอย่างเป็นชายที่มีเพศสัมพันธ์กับชายที่อาศัยอยู่ใน 4 จังหวัดใน 4 ภาคของประเทศไทย จำนวน 331 คน คัดเลือกโดยการสุ่มแบบหลายขั้นตอน เก็บข้อมูลโดยใช้แบบสอบถามออนไลน์ ประกอบด้วย แบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามทัศนคติต่อการฉีดวัคซีน แบบสอบถามการคล้อยตามกลุ่มอ้างอิงในการฉีดวัคซีน แบบสอบถามการรับรู้การควบคุมพฤติกรรม แบบสอบถามพฤติกรรมเสี่ยงทางเพศ แบบสอบถามความรู้เรื่องเชื้อไวรัสฮิวแมนแพพพิลโลมา และแบบสอบถามความตั้งใจในการฉีดวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมา วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา สถิติสหสัมพันธ์ของเพียร์สัน และสถิติการวิเคราะห์โมเดลสมการโครงสร้าง

ผลการศึกษาพบว่ากลุ่มตัวอย่างมีความตั้งใจในการฉีดวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมาในระดับสูง ทัศนคติ การคล้อยตามกลุ่มอ้างอิง และการรับรู้การควบคุมพฤติกรรม สามารถอธิบายความแปรปรวนของความตั้งใจได้ร้อยละ 39.5 โดยการคล้อยตามกลุ่มอ้างอิงเป็นตัวแปรที่มีอิทธิพลมากที่สุด โดยมีผลทั้งทางตรงและทางอ้อมผ่านทัศนคติและผ่านการรับรู้การควบคุมพฤติกรรม ส่วนพฤติกรรมเสี่ยงทางเพศและความรู้เรื่องเชื้อไวรัสฮิวแมนแพพพิลโลมาไม่สามารถทำนายความตั้งใจได้อย่างมีนัยสำคัญ ข้อค้นพบสามารถใช้เพื่อพัฒนาโปรแกรมเพื่อเพิ่มความตั้งใจในการฉีดวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมา โดยการเสริมสร้างทัศนคติเชิงบวก สร้างการคล้อยตามกลุ่มอ้างอิง เช่น กลุ่มเพื่อน และส่งเสริมการรับรู้การควบคุมพฤติกรรมในการรับวัคซีนป้องกันเชื้อไวรัสฮิวแมนแพพพิลโลมา อย่างไรก็ตาม ควรมีการทดสอบโปรแกรมนี้ก่อนนำไปใช้ในทางปฏิบัติจริง

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คำสำคัญ : เชื้อไวรัสฮิวแมนแพพพิลโลมา ความตั้งใจ ชายที่มีเพศสัมพันธ์กับชาย การวิเคราะห์โมเดลสมการโครงสร้าง ทฤษฎีพฤติกรรมตามแผน การฉีดวัคซีน

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