

RESEARCH ARTICLE

Editorial Process: Submission:03/24/2025 Acceptance:03/13/2026 Published:04/07/2026

# Enhancing Cervical Cancer Screening Among Northern Thai Women: Satisfaction with Self-Collected HPV DNA Testing under the National Program

Wiyada Dankai\*, Phutanes Thangvorathum, Kwansuang Pukdee, Phanlapa Aithin, Rawadee Thongbai, Jidapa Noja, Naorn Sriwangdaeng, Suree Lekawanvijit

## Abstract

**Background:** Cervical cancer is a leading cause of cancer-related morbidity and mortality among women in Thailand. Despite the availability of national cervical cancer screening programs, participation rates remain low in Northern Thailand due to barriers such as limited accessibility and discomfort with clinical sample collection. Self-collected HPV DNA testing offers a promising alternative to traditional screening methods by addressing these barriers and improving access to care. **Objective:** Cervical cancer is a major health burden in Thailand, yet participation in national screening programs remains low, particularly in Northern Thailand. This study evaluated satisfaction with self-collected HPV DNA testing and examined factors influencing screening acceptance to inform strategies for increasing uptake. **Methods:** A cross-sectional study was conducted among 299 women aged 30–60 years attending the national cervical cancer screening program at Maharaj Nakorn Chiang Mai Hospital. Participants performed self-collection following a demonstration and completed a five-point Likert scale satisfaction survey. Descriptive statistics and logistic regression were used to assess satisfaction and identify predictors of screening intention. **Results:** Most participants (85.95%) strongly agreed that self-collected HPV DNA testing improved screening accessibility, and 100% found the process easy to follow. Mean satisfaction scores were high for accessibility (4.85/5), effectiveness (4.82/5), and reliability (4.81/5). No invalid samples were reported, and beta-globin Ct values confirmed high-quality sample collection (mean Ct = 29.00 ± 1.70). Education level significantly influenced screening intention (OR = 17.61, p = 0.039). **Conclusion:** Self-collected HPV DNA testing was highly satisfactory and could enhance national screening programs, especially in underserved populations.

**Keywords:** Human papillomavirus- Self-collected HPV DNA testing- cervical cancer screening- satisfaction

*Asian Pac J Cancer Prev*, 27 (4), 1211-1217

## Introduction

Cervical cancer remains a significant global public health issue, ranking as the fourth most common cancer among women worldwide, primarily due to insufficient screening coverage [1]. In 2022, there were 661,021 newly diagnosed cases and 348,189 reported deaths globally [2]. In Thailand, cervical cancer is also the fourth most common cancer among women. There were 8,662 newly reported cases, accounting for 9.3% of all female cancer cases, with an age-standardized incidence rate (ASR) of 14.9 per 100,000 women in 2022. Additionally, cervical cancer caused 4,576 deaths, representing 3.9% of all cancer-related deaths among women, with an age-standardized mortality rate of 6.9 per 100,000 women [3].

Early detection of cervical cancer through regular screening and timely treatment is crucial for effective prevention and control. The World Health Organization recommends human papillomavirus (HPV) detection-based testing as the primary screening method because of its superior sensitivity and objective evaluation. Recently, Thailand has integrated HPV DNA testing into its national cervical cancer screening policy, offering it as a primary screening method alongside traditional methods like the Pap smear and visual inspection with acetic acid [4]. The services are offered free of charge to Thai women through the universal healthcare scheme. However, despite the implementation of a national cervical cancer screening program, participation rates remain low in several areas, particularly in Northern Thailand. Barriers such as cultural norms, limited accessibility, and the discomfort associated

Department of Pathology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand. \*For Correspondence: wdankai@gmail.com. Wiyada Dankai and Suree Lekawanvijit have equal contribution in this study.

with clinical sample collection discourage many women from undergoing regular screening. This highlights the need for strategies that address these obstacles while respecting cultural sensitivities.

Self-collected HPV DNA testing is a promising and cost-effective approach for cervical cancer screening, particularly in underserved and remote regions. By addressing barriers to screening uptake, HPV-based cervical screening using self-collected samples has demonstrated feasibility in improving access to care [5-7]. Moreover, self-collection HPV DNA test kits have proven effective in increasing participation rates by reducing obstacles such as embarrassment and discomfort. Studies in the Netherlands [8], the United States [9], and Switzerland [10] demonstrate that these kits empower women to collect samples privately, further enhancing their appeal. Research has demonstrated the effectiveness of self-collected HPV DNA in detecting high-risk HPV strains associated with cervical cancer [11-13]. However, its practical application in Thailand, especially in underserved regions like Northern Thailand, remains underexplored. Understanding women's satisfaction with self-sampling and identifying barriers to its adoption is crucial for successfully integrating this approach into the national program.

Therefore, this study aims to evaluate the satisfaction levels of Northern Thai women with self-collected HPV DNA testing and examine the factors influencing their perceptions. The outcomes of this study are expected to guide improvements in cervical cancer screening strategies, ultimately increasing screening uptake and contributing to the future reduction of cervical cancer incidence in this population.

## Materials and Methods

### Study Population

This study was approved by the institutional ethics committee of the Faculty of Medicine, Chiang Mai University (study code: PAT-2568-0008). This cross-sectional study was conducted at Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand between January to February 2025. Participants were women attending the national cervical cancer screening program at Maharaj Nakorn Chiang Mai Hospital who approached to determine their interest in self-collection for HPV DNA testing and met the following criteria (1) woman aged between 30 to 60 years who are eligible for the national cervical cancer screening program, (2) undergo the self-collected HPV DNA testing, and (3) residents in Northern Thailand. Exclusion criteria were patients with conditions as follows: pregnancy, previous hysterectomy, history of cervical cancer, and inability to perform self-collection due to physical or cognitive impairments. Written informed consent to join the study was obtained from all participating women.

Before participation, all women received detailed information about the study's objectives and procedures. Confidentiality of personal information was ensured, and only those who provided written informed consent were enrolled, upholding a transparent and ethical recruitment

process.

### Self-Sample Collection

Two hundred ninety-nine participants watched a tutorial video and observed a one-on-one demonstration of self-sample collection conducted by the staff until they fully understood the study procedures. Then, they received the self-collection HPV DNA test kit (Roche, Roche Diagnostic GmbH, Germany). Participants collected their samples privately, in a designated room, and then returned them to the clinic staff. Subsequently, they were asked to complete a survey questionnaire regarding their satisfaction with the self-collection process. In cases where participants encountered any issues during self-collection, such as uncertainty regarding the correct procedure, suspected contamination, improper sealing of the sample tube, or delayed specimen return, they were instructed to bring the sample back to the clinic for verification or recollection. Clinic staff provided assistance as needed to ensure sample adequacy and proper submission.

### HPV Testing and Genotyping

Participants performed self-collected HPV DNA testing using a sterile nylon-flocked swab, following step-by-step illustrated instructions provided by trained healthcare staff. After sample collection, specimens were sealed, labeled, and transported to the laboratory for analysis. All self-collected cervicovaginal specimens were tested using the Cobas® HPV DNA Test on the Cobas® 4800 System (Roche Molecular Diagnostics). This assay detects HPV-16 and HPV-18 individually and reports a pooled result for 12 other high-risk HPV (HR-HPV) types, including HPV-31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, and 68. The beta-globin gene served as an internal control to confirm specimen adequacy and the quality of DNA amplification. For each analytical run, both positive and negative controls were processed in accordance with the manufacturer's instructions to ensure accuracy and validity of the assay.

### Data Collection and Statistical Analysis

The survey questionnaire encompassed 2 domains including participant characteristics and satisfaction of the self-collection process. Participant satisfaction was measured using a five-point Likert scale ranging from 1 to 5 as follows: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree. Data analysis was performed using STATA version 16 (STATA Corp., Texas, USA). Descriptive statistics will be reported as mean and standard deviation (SD). Logistic regression analysis was employed to identify factors influencing the intention to use self-collected HPV DNA testing, with statistical significance at a p-value of < 0.05. For clinical interpretation and statistical analysis, HR-HPV results were classified as a binary outcome (positive vs. negative), with all HR-HPV-positive samples considered clinically meaningful positives irrespective of genotype, in accordance with international cervical cancer screening standards.

## Results

The study included a total of 299 participants, with the majority being women aged 30–39 years (46.49%, 139/299), followed by those aged 40–49 years (28.76%, 86/299) and 50–60 years (24.75%, 74/299). In terms of marital status, over half of the participants were married (51.51%), while 32.44% were single, 14.05% were widowed or divorced, and 2.01% did not report their marital status. The majority identified as Buddhists (94.31%), with smaller proportions identifying as Christians (3.01%) and Muslims (1.00%). Approximately 1.67% of participants did not disclose their religious affiliation.

Regarding education, 61.21% of participants held a bachelor's degree, followed by those with a master's degree (15.38%), high school education (8.70%), vocational education (6.35%), and primary education (3.68%). Additionally, 2.34% held a doctoral degree, while another 2.34% did not specify their educational background. In terms of income, 53.85% reported a monthly income exceeding 20,000 Baht, 28.09% earned between 10,000 and 20,000 Baht, 10.37% earned less than 10,000 Baht, and 7.69% did not disclose their income. Regarding cervical cancer screening history, 54.05% of participants reported prior screening, such as a Pap smear, while 45.95% had no history of cervical cancer screening (Table 1).

### *Satisfaction Levels with Self-Collected HPV DNA Testing*

The participant's satisfaction with self-collected HPV DNA testing was evaluated in seven questions, as shown in Table 2. This study revealed high levels of participant satisfaction with self-collected HPV DNA testing across various dimensions, including accessibility, barrier reduction, ease of use, effectiveness, reliability, discomfort, and overall satisfaction. This study demonstrated that the self-collected HPV DNA testing would be a potential alternative to traditional cervical cancer screening methods. Participants unanimously agreed on the ease of the self-collection process, with no reports of discomfort. The method was widely perceived as accessible, effective, and reliable, with a significant majority endorsing its ability to reduce barriers such as cost and time.

Participants overwhelmingly appreciated the accessibility of self-collected HPV DNA testing, with 85.95% strongly agreeing that it simplifies health screening. Most (79.93%) also strongly agreed that self-collected HPV DNA testing reduces barriers, and all participants (100%) affirmed the ease of the process. Furthermore, the reliability and effectiveness of the method received high satisfaction scores, with over 80% of participants strongly agreeing on both dimensions. Notably, 100% reported no discomfort, reinforcing the method's acceptability.

Given these high satisfaction levels, 95.65% (286/299) of participants expressed a willingness to encourage others to use self-collected HPV DNA testing in the future, while only 4.35% (13/299) preferred conventional physician-collected methods. Moreover,

Table 1. Demographic Characteristics of Participants (n = 299)

Demographics	n (%)
Age (years)	
Median (IQR)	41 (IQR: 35-50)
30-39	139 (46.49)
40-49	86 (28.76)
50-60	74 (24.75)
Marital status	
Single	97 (32.44)
Marriage	154 (51.51)
Widowed/Divorced	42 (14.05)
Not specified	6 (2.00)
Religion	
Buddhism	282 (94.31)
Christianity	9 (3.01)
Islam	3 (1.00)
Not disclosed	5 (1.67)
Education	
Primary education	11 (3.68)
High school	26 (8.70)
Vocational Education	19 (6.35)
Bachelor's degree	183 (61.21)
Master's degree	46 (15.38)
Doctoral degree	7 (2.34)
Not specified	7 (2.34)
Income (Baht)	
<10,000	31 (10.37)
10,000-20,000	84 (28.09)
>20,000	161 (53.85)
Not disclosed	23 (7.69)
Previously undergone any cervical cancer screening (e.g., Pap smear)	
Yes	160 (54.05)
No	136 (45.95)

98.66% (295/299) of participants stated that they would recommend self-collected HPV DNA testing to a friend or relative, with only 1.34% (4/299) responding negatively. This strong endorsement highlights the potential of self-collected HPV DNA testing as an alternative to traditional cervical cancer screening methods.

### *Sampling Efficiency of Self-Collection*

The efficiency of the self-collection process was assessed using the Ct value of the beta-globin gene, serving as a measure of sample adequacy, and the quality of extraction and amplification (internal control). All self-collected samples demonstrated high efficiency, with no invalid samples reported. The Ct values for the beta-globin gene ranged from 26.20 to 38.80, with a mean value of  $29.00 \pm 1.70$  (the cutoff value for the beta-globin gene in the Cobas 4800 HPV DNA test is set at 40.00). These findings confirm the high quality of the self-collection process across all participants, ensuring

Table 2. Satisfaction Levels with Self-Collected HPV DNA Testing

Questions	Level of satisfaction					Score Mean (SD)
	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	
1. Do you think self-collection makes health screening easier to access?	257 (85.95)	40 (13.38)	2 (0.67)	0 (0.00)	0 (0.00)	4.85 (0.37)
2. Do you think self-collection helps reduce barriers (e.g., cost, time, or access) to screening?	239 (79.93)	58 (19.4)	2 (0.67)	0 (0.00)	0 (0.00)	4.79 (0.42)
3. Do you feel that the self-collection process is easy to follow?	299 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	5 (-)
4. Do you think self-collection is an effective method for health screening	248 (82.94)	49 (16.39)	2 (0.67)	0 (0.00)	0 (0.00)	4.82 (0.4)
5. Do you believe that self-collection HPV DNA testing is as reliable as traditional screening methods (e.g., Pap smear)?	244 (81.6)	52 (17.39)	3 (1.01)	0 (0.00)	0 (0.00)	4.81 (0.42)
6. Do you not experience any pain, irritation, or discomfort after performing self-collection?	0 (0)	299 (100)	0 (0.00)	0 (0.00)	0 (0.00)	4 (-)
7. How satisfied are you with your overall experience of self-collection HPV DNA testing?	256 (85.67)	41 (13.76)	1 (0.34)	0 (0.00)	0 (0.00)	4.85 (0.36)

reliable sample integrity for HPV DNA detection. High-risk HPV (HR-HPV) testing was performed for all 299 valid self-collected samples. Among the 299 participants included in the analysis, 25 women tested positive for HR-HPV, yielding an overall positivity rate of 8.36%, while 274 women (91.64%) tested negative. Of the HR-HPV positive cases, 23 women (7.69% of the total population) were positive for the pooled 12 other HR-HPV types, 1 woman (0.33%) was positive for HPV-16 only, and 1 woman (0.33%) demonstrated co-infection with HPV-16 and other HR-HPV types. Among the 25 HR-HPV positive cases, 23 (92.0%) were positive for the pooled 12 other HR-HPV types, 1 (4.0%) was positive for HPV-16 only, and 1 (4.0%) showed co-infection with HPV-16 and other HR-HPV types. The predominance of non-16 HR-HPV types highlights the importance of screening approaches that detect a broad range of oncogenic HPV genotypes to support effective cervical cancer prevention strategies in this population.

#### *Factors Influencing the Intention to Use Self-Collection HPV DNA Testing*

Logistic regression analysis was conducted to evaluate factors potentially influencing participants' intention to use self-collection HPV DNA testing in the future (Table 3). Univariate analysis revealed no statistically significant association between age groups (30–39, 40–49, and 50–60 years) and the intention to adopt self-collection HPV DNA testing. Similarly, marital status, whether married or widowed/divorced, showed no significant influence compared to being single. Education level showed a marginally significant result, with participants holding a bachelor's degree demonstrating a potential association (Odds ratio (OR) = 4.861,  $p = 0.066$ ), while other education levels were not significantly associated. Additionally, income above 10,000 Baht/month and a

history of previous cervical cancer screening were not significantly linked to the intention to use self-collection HPV DNA testing. In multivariate analysis, education emerged as a significant factor influencing the intention to adopt self-collection testing. Participants with a bachelor's degree were significantly more likely to express this intention (OR = 17.61,  $p = 0.039$ ). Although holding a master's degree showed a strong effect (OR = 18.77), it did not reach statistical significance ( $p = 0.065$ ). Other variables, including age, marital status, income, and previous cervical cancer screening, remained non-significant in the multivariate model. These findings highlight the potential role of educational attainment in shaping participants' preferences for self-collection HPV DNA testing.

## **Discussion**

The present study demonstrated high satisfaction and efficiency of self-collected HPV DNA testing among Northern Thai women, supporting its potential as a viable alternative to traditional cervical cancer screening methods. Participants unanimously agreed on the ease of the self-collection process with no reports of pain or discomfort. The majority found it accessible, effective, and reliable, reinforcing its acceptability. Additionally, the efficiency of self-collection was supported by the beta-globin gene Ct values, which indicated high-quality sample collection across all participants. No invalid samples were reported, suggesting that the self-sampling method can provide reliable test results comparable to physician-collected samples.

These findings align with previous research conducted in Thailand and internationally, demonstrating that self-collected HPV DNA testing is a feasible alternative to clinician-based collection. In addition to demonstrating

Table 3. Factors Influencing the Intention to Use Self-Collection HPV DNA Testing.

Demographics	Univariate		Multivariate	
	Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value
Age (years)		0.7338		
30-39	Reference	-	Reference	-
40-49	0.604 (0.170 - 2.152)	0.437	0.507 (0.123 - 2.091)	0.348
50-60	0.883 (0.205 - 3.802)	0.867	0.696 (0.132 - 3.653)	0.668
Marital status		0.89		
Single	Reference	-	Reference	-
Marriage	1.341 (0.398 - 4.520)	0.636	2.032 (0.481 - 8.590)	0.335
Widowed/Divorced	1.08 (0.202 - 5.840)	0.923	1.174 (0.184 - 7.500)	0.866
Education		0.2524		
Primary education	Reference	-	Reference	-
High school	1.000	-	1.000	-
Vocational Education	1.000	-	1.000	-
Bachelor's degree	4.861 (0.899 - 26.295)	0.066	17.611 (1.155 - 268.456)	0.039
Master's degree	3.185 (0.463 - 21.902)	0.239	18.775 (0.833 - 423.076)	0.065
Doctoral degree	1.000	-	1.000	-
Income (Baht)		0.1227		
<10,000	Reference	-	Reference	-
10,000-20,000	5.724 (0.500 - 65.503)	0.161	2.531 (0.157 - 40.905)	0.513
>20,000	1.041 (0.217 - 5.002)	0.96	0.355 (0.026 - 4.925)	0.44
Previously undergone any cervical cancer screening (e.g., Pap smear)		0.9786		
No	Reference	-	Reference	-
Yes	1.01 (0.333 - 3.097)	0.979	1.034 (0.271 - 3.948)	0.961

high acceptability, self-collected HPV DNA testing also addresses key barriers associated with traditional screening methods. These findings align with prior research conducted at the National Cancer Institute, Thailand, which reported over 70% of participants found self-collection easy, less embarrassing, and not painful [14]. The ability to perform self-sampling in a private setting likely contributes to its higher acceptance, particularly among women who may avoid clinician-based screening due to concerns about discomfort, embarrassment, or cultural beliefs. Similar studies in Chulabhorn Hospital, Thailand, also support this, with over 90% of participants rating self-collection as convenient, comfortable, and safe [15].

Beyond Thailand, international studies in the Netherlands and the United States have consistently shown that self-collected HPV DNA testing increases screening participation rates. Research in these countries suggests that self-sampling empowers women by reducing psychological barriers associated with physician-collected methods [8, 9]. A study in Switzerland also demonstrated that offering self-sampling kits to non-attendees significantly increased screening uptake, reinforcing its role in overcoming accessibility issues [10]. These findings collectively support the potential for self-collection to enhance screening coverage, particularly in underserved populations.

Importantly, this study identified education level as a

key factor influencing the intention to use self-collected HPV DNA testing. Participants with a bachelor's degree were significantly more likely to express a willingness to adopt this method in the future. This finding suggests that health literacy and awareness may play a crucial role in shaping attitudes toward self-screening. Similar studies have reported that women with higher education levels are more proactive in preventive healthcare and are more receptive to new screening approaches [7, 11, 9, 14].

Given the strong endorsement of self-collection by participants, integrating this method into Thailand's national cervical cancer screening program could help address barriers such as embarrassment, lack of time, and geographic inaccessibility. Future efforts should focus on expanding access to self-sampling kits, especially among women with lower education levels or those in rural areas, to maximize participation rates and improve cervical cancer prevention nationwide.

This study has several limitations that must be considered. First, it was conducted in a single healthcare setting in Northern Thailand, which may limit the generalizability of the findings to other regions or populations with different cultural or socioeconomic characteristics. Further research in diverse populations and healthcare settings is necessary to validate these results. Second, the reliance on self-reported data regarding satisfaction and intention to use self-collection introduces the possibility of response bias, as participants may have

been influenced by interactions with healthcare providers. Future studies should incorporate objective measures, such as actual uptake rates of self-collection, to strengthen the validity of these findings. Lastly, this study assessed only short-term outcomes, focusing on satisfaction and intention to use self-collection. Longitudinal research is necessary to evaluate sustained usage, long-term acceptability, and the impact of self-collection on cervical cancer incidence and mortality. Additionally, logistical issues, such as kit distribution and integration into existing national programs, should be addressed in future investigations.

In conclusion, this study demonstrates the high acceptability and efficiency of self-collected HPV DNA testing among Northern Thai women, supporting its potential as an alternative to traditional cervical cancer screening. Education level significantly influenced the intention to use self-collection, highlighting the role of health literacy in screening participation. Integrating self-collected HPV DNA testing into Thailand's national screening program could help overcome key barriers and increase participation rates. Future research should assess long-term outcomes, cost-effectiveness, and logistical challenges to facilitate nationwide implementation and enhance cervical cancer prevention.

### Author Contribution Statement

WD conceptualized and designed the study, conducted data collection, performed data analysis and interpretation, drafted the initial manuscript, and approved the final version for publication; JN, KP, NS, PA, PT, and RT conducted data collection and contributed to data management; SL conducted data analysis and interpretation, critically reviewed, revised, and edited the manuscript to its final version. All authors reviewed the results and approved the final version for publication.

### Acknowledgements

The authors gratefully acknowledge the Faculty of Medicine, Chiang Mai University, in completing this study.

#### Ethical Approval

This study was approved by the Institutional Ethics Committee of the Faculty of Medicine, Chiang Mai University, Thailand (Study Code: PAT-2568-0008). All participants provided written informed consent prior to enrollment.

#### Author Disclaimer

The views and opinions expressed in this paper are solely those of the authors and do not necessarily reflect those of any affiliated institutions or funding bodies.

#### Study Registration

Not applicable, as this study did not involve a clinical trial, systematic review, guideline development, or meta-analysis requiring prior registration.

### Conflict Of Interest

The authors declare no conflict of interest.

### References

- Cohen PA, Jhingran A, Oaknin A, Denny L. Cervical cancer. *Lancet*. 2019;393(10167):169-82. [https://doi.org/10.1016/S0140-6736\(18\)32470-X](https://doi.org/10.1016/S0140-6736(18)32470-X).
- Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: Globocan estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2024;74(3):229-63. <https://doi.org/10.3322/caac.21834>.
- Cancer IAfRo. Thailand fact sheet: Global cancer observatory. 2022. Available from: <https://gco.iarc.who.int/media/globocan/factsheets/populations/764-thailand-fact-sheet.pdf>. Accessed 22 December 2024.
- Ploysawang P, Rojanamatin J, Prapakorn S, Jamsri P, Pangmuang P, Seeda K, et al. National cervical cancer screening in thailand. *Asian Pac j cancer prev*. 2021;22(1):25-30. <https://doi.org/10.31557/APJCP.2021.22.1.25>.
- Ogilvie GS, Mitchell S, Sekikubo M, Biryabarema C, Byamugisha J, Jeronimo J, et al. Results of a community-based cervical cancer screening pilot project using human papillomavirus self-sampling in kampala, uganda. *Int J Gynaecol Obstet*. 2013;122(2):118-23. <https://doi.org/10.1016/j.ijgo.2013.03.019>.
- Mitchell S, Ogilvie G, Steinberg M, Sekikubo M, Biryabarema C, Money D. Assessing women's willingness to collect their own cervical samples for hpv testing as part of the aspire cervical cancer screening project in uganda. *Int J Gynaecol Obstet*. 2011;114(2):111-5. <https://doi.org/10.1016/j.ijgo.2011.01.028>.
- Yeh PT, Kennedy CE, de Vuyst H, Narasimhan M. Self-sampling for human papillomavirus (hpv) testing: A systematic review and meta-analysis. *BMJ global health*. 2019;4(3):e001351. <https://doi.org/10.1136/bmjgh-2018-001351>.
- Bais AG, van Kemenade FJ, Berkhof J, Verheijen RH, Snijders PJ, Voorhorst F, et al. Human papillomavirus testing on self-sampled cervicovaginal brushes: An effective alternative to protect nonresponders in cervical screening programs. *Int J Cancer*. 2007;120(7):1505-10. <https://doi.org/10.1002/ijc.22484>.
- Des Marais AC, Zhao Y, Hobbs MM, Sivaraman V, Barclay L, Brewer NT, et al. Home self-collection by mail to test for human papillomavirus and sexually transmitted infections. *Obstet Gynecol*. 2018;132(6):1412-20. <https://doi.org/10.1097/AOG.0000000000002964>.
- Vassilakos P, Poncet A, Catarino R, Viviano M, Petignat P, Combescure C. Cost-effectiveness evaluation of hpv self-testing offered to non-attendees in cervical cancer screening in switzerland. *Gynecol Oncol*. 2019;153(1):92-9. <https://doi.org/10.1016/j.ygyno.2019.01.021>.
- Costa S, Verberckmoes B, Castle PE, Arbyn M. Offering hpv self-sampling kits: An updated meta-analysis of the effectiveness of strategies to increase participation in cervical cancer screening. *Br J Cancer*. 2023;128(5):805-13. <https://doi.org/10.1038/s41416-022-02094-w>.
- Parker SL, Amboree TL, Bulsara S, Daheri M, Anderson ML, Hilsenbeck SG, et al. Self-sampling for human papillomavirus testing: Acceptability in a u.s. safety net health system. *Am J Prev Med*. 2024;66(3):540-7. <https://doi.org/10.1016/j.amepre.2023.10.020>.
- Wong HY, Wong EL. Invitation strategy of vaginal hpv self-sampling to improve participation in cervical cancer screening: A systematic review and meta-analysis of

- randomized trials. *BMC public health*. 2024;24(1):2461. <https://doi.org/10.1186/s12889-024-19881-0>.
14. Ploysawang P, Pitakkarnkul S, Kolaka W, Ratanasrithong P, Khomphaiboonkij U, Tipmed C, et al. Acceptability and preference for human papilloma virus self-sampling among thai women attending national cancer institute. *Asian Pac j cancer prev*. 2023;24(2):607-12. <https://doi.org/10.31557/APJCP.2023.24.2.607>.
  15. Phoolcharoen N, Kantathavorn N, Krisorakun W, Taepisitpong C, Krongthong W, Saeloo S. Acceptability of self-sample human papillomavirus testing among thai women visiting a colposcopy clinic. *J Community Health*. 2018;43(3):611-5. <https://doi.org/10.1007/s10900-017-0460-2>.



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.