

# HPV vaccine acceptance is high among adults in Mexico, particularly in people living with HIV

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## Abstract

**Materials and methods.** A total of 1 329 men and women, with and without HIV, participated in one of three intervention studies, offering HPV vaccination, carried out in the states of Morelos, Tlaxcala and Mexico City; either the bivalent (Morelos n=103, Tlaxcala n=127) or quadrivalent HPV-vaccine (Mexico City n=1 099) was offered. **Results.** HPV vaccine was accepted by 80.3% of participants; acceptance was higher in people living with HIV than those without (84.4 vs. 78%,  $p=0.004$ ). Women had greater HPV infection knowledge ( $p<0.0001$ ) than men and slightly higher ( $p=0.4$ ) vaccine acceptance. The main reason for vaccine non-acceptance among HIV-positive participants was their doctor recommended they not get vaccinated. **Conclusion.** Acceptance of HPV-vaccine was high in men and women re-

## Resumen

**Material y métodos.** 1 329 hombres y mujeres con y sin VIH participaron en tres estudios de intervención, realizados en los estados de Morelos, Tlaxcala y Ciudad de México. Se ofreció la vacuna bivalente (Morelos n=103, Tlaxcala n=127) o la cuadrivalente (Ciudad de México n=1 099) contra VPH. **Resultados.** La vacuna fue aceptada por 80.3% de los participantes; la aceptación fue mayor en personas que viven con VIH que en aquellas que no (84.4 vs. 78%,  $p=0.004$ ). Las mujeres ( $p<0.0001$ ) tenían mayor conocimientos sobre VPH que los hombres y una aceptación de la vacuna ligeramente mayor ( $p=0.4$ ). El motivo principal de la no aceptación de la vacuna entre personas con VIH fue que su médico recomendó que no se vacunaran. **Conclusión.** La aceptación de la vacuna contra el VPH fue alta en hombres y mujeres,

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regardless of HIV status. Even higher rates of acceptability may be achieved by educating healthcare providers to recommend HPV vaccine to their patients.

**Keywords:** HPV vaccine; acceptability; people living with HIV; women; male

independientemente del estado de VIH. Se pueden lograr mayores tasas de aceptabilidad educando a los proveedores de atención médica para que recomienden la vacuna contra el VPH a sus pacientes.

**Palabras clave:** vacuna contra HPV; aceptabilidad; personas viviendo con VIH: hombres; mujeres

HPV infection is the most common sexually transmitted infection among men and women worldwide.<sup>1,2</sup> Persistent infection by oncogenic HPV types is associated with cervical, anal and oropharyngeal cancers and precancerous lesions.<sup>1,3</sup> HPV 16/18 are responsible for 70% of invasive cervical cancer cases and 84.3% of anal cancer cases.<sup>4</sup> HPV-related cancers constitute an important disease burden.<sup>5,6</sup> In higher-income countries, for which there are more data available, HPV causes half of all cancers attributable to infection.<sup>2</sup> High rates of cervical cancer in lower- and middle-income countries are due in part to the low quality screening and deficiencies in management of precancerous lesions; this is especially true when there is co-infection with HIV.<sup>7</sup>

Prevalence and incidence of HPV<sup>8</sup> and occurrence of HPV-associate cervical intraepithelial neoplasia (CIN) and anal intraepithelial neoplasia (AIN) are high in people living with HIV, even with the introduction of antiretroviral therapy.<sup>8</sup> The risk of HPV infection and therefore of developing related cancers is high in a variety of vulnerable groups such as men who have sex with men (MSM)<sup>9</sup> and transgender women,<sup>10</sup> as well as sexual abuse victims,<sup>11</sup> and possibly rape victims, regardless of HIV status.

HPV vaccines are a strategic tool for efficient prevention of chronic HPV infection, genital warts<sup>12</sup> and related cancers in adults.<sup>13</sup> Research shows that efficacy of the HPV vaccine varies for preventing precancerous conditions including CIN 2-3, but in women with no evidence of oncogenic HPV infection, vaccine efficacy reaches 90%<sup>14</sup> with up to 100% efficacy for prevention of HPV 6/11/16/18-related CIN3.<sup>15,16</sup> In some studies, per protocol efficacy of preventing anal intraepithelial neoplasia (AIN) grades 1-3 reaches 77.5%.<sup>17</sup> Importantly, HPV vaccines can be used in people living with HIV/AIDS as well as those without HIV, given their high safety and immunogenicity profile.<sup>16,18-23</sup> HPV vaccines have been approved in the US<sup>24</sup> and Australia<sup>25</sup> for women 9 to 45 and for men 9 to 26 years of age.

Studies show acceptability of the HPV vaccine in both men and women in higher-income countries is high, ranging from 66 to 86%.<sup>26-32</sup> In low- and middle-income countries diverse groups, including parents of adolescents and MSM, have shown moderate to high HPV vaccine acceptability.<sup>33-37</sup> Health education and vaccine promotion that is considered understandable, pertinent and that addresses rumors or incorrect information as well as social mobilization supporting HPV vaccine implementation are important factors related to HPV vaccine acceptability in low and middle-income countries.<sup>38-41</sup> Worldwide, healthcare provider recommendation is one of the most important facilitators of HPV vaccine acceptability and uptake.<sup>42-45</sup> Also important are healthcare user attitudes towards the HPV vaccine, including perceptions of vaccine efficacy<sup>46</sup> and beliefs in the benefits of getting vaccinated.<sup>47</sup> Studies on acceptability provide evidence on barriers and facilitators to vaccination in different populations that can be used to improve HPV vaccine policy development and implementation, such as designing vaccine promotion materials and providing healthcare providers with information about what they can say when having conversations with patients about the HPV vaccine.<sup>36</sup> In the current analysis, our objective was to measure HPV vaccine acceptance in diverse Mexican adult populations, taking into account HIV status.

## Materials and methods

This analysis is based on three intervention studies that focused on HPV vaccination and related issues in the states of Morelos, Tlaxcala and Mexico City, in Mexico. All three studies were approved by the Ethics, Biosecurity and Research committees of the National Institute of Public Health of Mexico; additional approval was obtained by the state Ministry of Health in Morelos and Tlaxcala, and by the Specialized Condesa-Iztapalapa Clinics in Mexico City. The study was presented to the healthcare providers from the clinics involved prior to

recruitment, as was information about the effectiveness and safety of HPV vaccines for adults with and without HIV. Written informed consent was obtained for all participants in all states, including signatures by two witnesses.

### Participants and data collection

In Morelos and Tlaxcala, healthcare users of the local Ambulatory Care Centers for Prevention and Treatment of AIDS and Sexually Transmitted Infections (CAPA-SITS, by its acronym in Spanish) were recruited. Men and women living with HIV age 18 to 45 were asked to complete paper questionnaires and were offered the bivalent HPV vaccine as part of a voluntary study (separate from their normal clinical care), in 2016. In Mexico City, men and women (including transgender women) 18 to 45 years old, including individuals with and without HIV, were recruited at the Specialized Condesa-Iztapalapa Clinic in 2018; they completed questionnaires using computer-assisted personal interviewing and were offered the quadrivalent HPV

vaccine, also as part of a voluntary study that was not part of their clinical care. All questionnaires collected socio-demographic data (age, years of education, sex assigned at birth; table I). The questionnaires applied in Morelos and Tlaxcala also included items about HPV-related knowledge and attitudes (with yes/no answers; table II). The questionnaire applied in Mexico City did not collect data on HPV-related knowledge or attitudes but did ask about which gender the person currently identified with. After completing the questionnaires, study participants were provided with information about the association between HPV and cervical and anal cancer, information about HPV vaccine, and any questions they had were answered.

### Analysis

The survey data were entered (single data entry for paper questionnaires) into an excel worksheet or transferred from the file created by the computer-assisted personal interviewing program and analyzed using STATA v.13 statistical software. We used t-test for age

**Table I**  
**CHARACTERISTICS OF MEN AND WOMEN WITH AND WITHOUT HIV PARTICIPATING IN HPV VACCINE ACCEPTABILITY STUDIES, MORELOS\*, TLAXCALA\*, AND MEXICO CITY.‡ MEXICO, 2016 AND 2018**

Characteristics	Total <sup>§</sup> n = 1 329	Women <sup>#</sup> n = 465 (35%)	Men n = 864(65%)	P value <sup>&amp;</sup>
Age (Mean ± SD)				
Mean age Morelos	34.8±10.2	38.1±11.4	33.6±9.5	<0.0001
Mean age Tlaxcala	37.6±9.5	37.6±9.5	--	
Mean age Mexico City	28.7±7.6	30.0±8.2	28.1±7.3	
Place of residence n(%)				
Tlaxcala	127 (9.5)	127 (27.3)	0	<0.0001
Morelos	103 (7.7)	28 (6.0)	75 (6.2)	
Mexico City	1099 (82.6)	310 (66.7)	789 (65.9)	
Education n (%)				
Elementary school	139 (10.4)	92 (19.7)	47 (5.4)	<0.0001
Junior high school	198 (14.8)	116 (24.9)	82 (9.4)	
High school	316 (23.7)	102 (21.9)	214 (24.7)	
Undergraduate/college	496 (37.3)	114 (24.5)	382 (44.2)	
Graduate studies	180 (13.5)	41 (8.8)	139 (16)	

\* Study participants in Morelos and Tlaxcala were healthcare users of Ambulatory Care Center for Prevention and Treatment of AIDS and sexually transmitted infections (CAPACITS, in Spanish: *Centro Ambulatorio para la Prevención y Atención en SIDA e Infecciones de Transmisión Sexual*)

‡ Study participants in Mexico City were healthcare users of the Specialized Condesa and Condesa-Iztapalapa Clinics (*Clinica Especializada Condesa y Clinica Especializada Condesa-Iztapalapa Dr. Jaime Sepúlveda Amor*)

§ The total sample was made up of 1 329 men and women, including 103 men and women living with HIV in Morelos and 127 women living with HIV in Tlaxcala, and 1 099 people in Mexico City (789 men and 310 women of whom 108 were transgender women, and of those in Mexico City in all 275 were people living with HIV and 824 without)

# Women: 202 cisgender (non transgender) women and 108 transgender women

& For comparisons, we used t-test for age and Chi square test for categorical variable

SD= Standard deviation

**Table II**  
**HPV KNOWLEDGE AND ATTITUDES AMONG MEN AND WOMEN LIVING WITH HIV**  
**IN MORELOS AND TLAXCALA STATES. MEXICO, 2016**

Item		Total n=230	Women n=155 (67.4 %)	Men n=75 (32.6 %)	P*
Do you think that HPV can be transmitted from one person to another through sexual contact? n (%)	No	18(7.89)	9(5.88)	9(12)	0.1
	Yes	210(92.11)	144(94.12)	66(88)	
Do you think HPV can cause cervical or anal cancer? n (%)	No	36(15.79)	14(9.15)	22(29.33)	<0.0001
	Yes	192(84.21)	139(90.85)	53(70.67)	
Do you think that HPV can disappear on its own, without treatment? n (%)	No	180(79.3)	108(71.05)	72(96)	<0.0001
	Yes	47(20.7)	44(28.95)	3(4)	
Compared with other people, do you think your risk of getting HPV is greater? n (%)	No	94(41.23)	34(22.22)	60(80)	<0.0001
	Yes	134(58.77)	119(77.78)	15(20)	
Do you know whether there is a vaccine that prevents HPV infections that are associated with cancer? n (%)	No	37(16.23)	13(8.5)	24(32)	<0.0001
	Yes	191(83.77)	140(91.5)	51(68)	
Do you think the HPV vaccine can be applied to men and women? n (%)	No	80(35.09)	44(28.76)	36(48)	<0.0001
	Yes	148(64.91)	109(71.24)	39(52)	

\* For comparisons, we used Chi square test for categorical variables.

and Chi square test for categorical variables. Descriptive statistics were used to examine age, education, gender and HPV knowledge and attitudes. HPV vaccine acceptability was defined as receiving the first dose of the vaccine. Comparisons were done using Chi square test for categorical variables, to assess variable association with vaccine reception and refusal.

## Results

In all, 1 329 men and women were included in this analysis, with 103 men and women living with HIV in Morelos, 127 women living with HIV in Tlaxcala, and 1 099 people (789 men and 310 women, including 108 transgender women, of whom in all 275 were people living with HIV and 824 without), at the Condesa and Condesa-Iztapalapa clinics (table I). Of the total sample, 65% were men and 35% women, with older average ages in Morelos and Tlaxcala and younger average age for participants from Mexico City. More women had only an elementary or junior high school education as compared to men, and more men had at least some college education, or graduate studies than women. All these differences are statistically significant.

For most questions on HPV-related knowledge, correct responses ranged from 65 to 92% (table II). Among the respondents who were asked questions about HPV-related knowledge (all of whom were people living with HIV), there were relatively high levels of knowledge about HPV being sexually transmitted, that HPV causes anal and cervical cancer and that an anti-HPV vaccine

exists with somewhat fewer people reporting that the HPV vaccine can be applied to both men and women and only a fifth of participants (mostly women) knowing HPV can disappear without treatment. Women living with HIV had greater knowledge in all areas than men living with HIV, and also had much higher risk perception about acquiring HPV (78% for women versus 20% for men). All these differences were statistically significant (table II).

Vaccine acceptance (agreeing to—including providing signed, informed consent- and getting the application of the first dose of the HPV vaccine) was 80.3% in the total sample (table III). Acceptance was 96.8% in women from Tlaxcala (the sample included only women living with HIV), 84.5% in people from Morelos (including men and women living with HIV), and 78% in Mexico City (including men and women with and without HIV). These differences were statistically significant. Acceptance of the vaccine was slightly higher in women compared to men (81.5 and 80% respectively, but this difference was not statistically significant). Similar proportions of cisgender\* and transgender women living in Mexico City accepted the HPV vaccine (data not shown). More people living with HIV accepted the vaccine as compared to those without HIV (84.4 vs. 78.0%) and this

\* Cisgender is a term used to refer to people whose gender identity and the gender assigned at birth agree (people who were labeled as female at birth and identify as women or who were labeled as male at birth and identify as men). That is, people who are not transgender.

**Table III**  
**HPV VACCINE ACCEPTANCE AMONG MEN AND WOMEN WITH AND WITHOUT HIV PARTICIPATING IN HPV VACCINE ACCEPTABILITY STUDIES, MORELOS,\* TLAXCALA,\* AND MEXICO CITY.‡ MEXICO, 2016 AND 2018**

Characteristics	Accepted the first dose of the HPV vaccine n=1 067 (80.3%)	Did not accept the first dose of the HPV vaccine n=262 (19.7%)	p§
Place of residence			
Tlaxcala	122 (96.8)	5 (3.2)	<0.0001
Morelos	87 (84.5)	16 (15.5)	
Mexico City	858 (78.0)	241 (22)	
Gender#			
Women	379 (81.5)	86 (18.5)	0.4
Men	688 (79.6)	176 (20.3)	
Living with HIV&			
Not living with HIV	641 (77.7)	183 (22.2)	0.004
Living with HIV	426 (84.3)	79 (15.6)	

\* Study participants in Morelos and Tlaxcala were healthcare users of Ambulatory Care Center for Prevention and Treatment of AIDS and sexually transmitted infections (CAPACITS, in Spanish: *Centro Ambulatorio para la Prevención y Atención en SIDA e Infecciones de Transmisión Sexual*)

‡ Study participants in Mexico City were healthcare users of the Specialized Condesa and Condesa-Iztapalapa Clinics (*Clinica Especializada Condesa y Clinica Especializada Condesa-Iztapalapa Dr. Jaime Sepúlveda Amor*)

§ For comparisons, we used Chi square test for categorical variables

# Gender: Since we included transgender women (n=108) in the sample (under women), this category refers to gender and not sex

& Study participants living with HIV or those without HIV were distributed as follows: Tlaxcala: 127 people living with HIV; Morelos: 103 people living with HIV; Mexico City: 275 people living with HIV and 824 people without HIV

difference was statistically significant. Among study participants living with HIV and receiving treatment at CAPACITS in Morelos and Tlaxcala, those who decided not to receive the vaccine gave as their principal reason for doing so that their physician recommended they not get vaccinated (data not shown).

## Discussion

Among adult residents of three states in Mexico, acceptance of the HPV vaccine in general is high, without significant differences due to sex/gender (between cisgender men and women or between cisgender women and transgender women) or HIV status. In the study populations included in this analysis, a high level of acceptance of the HPV vaccine was observed among people living with HIV, as has been found in other studies.<sup>28-39</sup> A number of studies have also found that high HPV vaccine acceptability in men who have sex with men (with or without HIV) was 75%.<sup>33,46</sup> As for women, in a cohort of young female sex workers living with HIV, 100% agreed to apply the first dose of vaccine, while 79% completed the 3-dose schedule.<sup>48</sup> Our results therefore suggest that it would be feasible to introduce

a vaccination program against HPV between adults in Mexico, including among people living with HIV, who are at high-risk of developing HPV-associated cancers.<sup>2,8</sup>

Women and men living with HIV are disproportionately affected by HPV infection and associated diseases.<sup>49,50</sup> In their vaccination recommendations, the Centers for Disease Control and Prevention (CDC) have proposed the introduction of the HPV vaccine for people living with HIV, irrespective of the CD4 lymphocyte count.<sup>51</sup> In Mexico, the National Center for the Prevention and Control of HIV and AIDS (Censida, by its acronym in Spanish) is studying the possibility of universal introduction of vaccination against HPV in people living with HIV. In order to make this public policy decision, it is essential to consider acceptability of the vaccine among healthcare users,<sup>29,34,35,38,39,48</sup> logistical aspects of vaccine implementation<sup>42,52-54</sup> as well as the need for providing current, accurate information to healthcare professionals about the safety and efficacy of HPV vaccination among adults in general and specifically those living with HIV.<sup>55-58</sup> Although our findings must be interpreted with care given the cross-sectional design, they indicate, as other studies have shown, that healthcare provider recommendation is an extremely

important factor for encouraging HPV vaccination among people living with or without HIV.<sup>45,53,55,56</sup> This is especially important if healthcare providers are to support such public policies by recommending the HPV vaccine to their patients.<sup>45,53,55,56</sup>

Knowledge about HPV was high; in our study, 84% of participants knew that HPV can cause cancer, which compares favorably to another study of women living with HIV where only 50% knew about this association.<sup>59</sup> The Mexican men in this study also had more knowledge than that observed in others, such a study of heterosexual, gay and bisexual men, which found that among those who had heard of HPV, less than a third correctly responded that HPV can cause oral, anal and penile cancers.<sup>34</sup> In addition, knowledge about HPV was higher among women than men, even though women had significantly lower levels of formal education. This seems to indicate that women have acquired their knowledge about HPV through interaction with healthcare providers, in spite of a lack of formal education. These findings support the need for providing healthcare personnel with the resources they need in order to promote HPV knowledge and especially to recommend HPV vaccination among their patients.<sup>53-56</sup>

A limitation of this analysis is that given that data on knowledge and attitudes regarding vaccination against HPV were not collected among participants from Mexico City, the analysis cannot provide a complete view on the relationship between these aspects and the acceptance of the first dose of HPV vaccine, even for this study population. Also, information was not collected from healthcare users about whether their healthcare providers recommended they get the HPV vaccine, nor was data collected from the healthcare providers themselves. Data are only available for the application of the first dose of vaccine but not for subsequent doses, although more than one vaccine dose was applied in some of the study locations. In addition, the results of this study are not generalizable because they are based on non-representative samples.

Acceptance of the HPV vaccine was high among adult men and women in Mexico with and without HIV. Even higher rates of acceptability can most likely be achieved by providing healthcare workers with a variety of resources so they can be proficient at recommending the HPV vaccine to their adult patients irrespective of HIV status. Healthcare personnel should be provided with educational experiences that support them in developing greater knowledge, self-efficacy and readiness for change in relation to recommending HPV vaccination as well as specific resources for providing patient counseling and education about HPV vaccination.<sup>58,59</sup>

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