

# Mothers' acceptance of human papillomavirus (HPV) vaccination for daughters in a country with a high prevalence of HPV

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**Abstract.** Cervical cancer is the second most common cancer among women in Argentina and the mortality rate is not declining despite opportunistic screening. Free-of-charge human papillomavirus (HPV) vaccination of 11-year-old girls was introduced in 2011. Parental acceptance of HPV vaccination is considered to be of great importance for HPV vaccine uptake. However, little is known regarding this factor in Argentina. The aim of the present study was to explore maternal HPV vaccination acceptance, willingness to pay for HPV vaccination and correlates of this willingness, awareness of HPV and HPV-associated disease and behaviors and attitudes associated with HPV vaccination acceptance. A total of 180 mothers of girls aged 9-15 years comprised this quantitative, cross-sectional, survey-based study, conducted at two hospitals in the Mendoza Province. Correlates of willingness to pay for HPV vaccination were obtained using multivariable logistic regression models. Maternal HPV vaccination acceptance was 90%, and 60% of mothers were willing to pay for HPV vaccination. Mothers who were gainfully employed and had a higher disposable household income were significantly more willing to pay for HPV vaccination [odds ratio (OR)=2.54, 95% confidence interval (CI) 1.01-6.38; OR=3.28, 95% CI 1.36-7.94, respectively], as were mothers who were aware of cervical cancer prior to the study (OR=3.22, 95% CI 1.02-10.14). Only one in 10 mothers were informed that HPV vaccination does not offer complete protection against cervical cancer. In conclusion, the present study showed high maternal HPV vaccination

acceptance, although acceptance decreased when vaccination was not free-of-charge. Continuous public education campaigns are needed to improve knowledge of HPV, HPV vaccines and HPV-associated disease.

## Introduction

Cervical cancer is a major cause of death and suffering among women worldwide and particularly afflicts women living in low-resource settings (1). Infection with oncogenic human papillomavirus (HPV) is a necessary cause of cervical cancer and is also involved in the etiology of vulvar, vaginal, anal, penile and oropharyngeal cancer (2). Prophylactic vaccines against HPV have been introduced in many countries for the prevention of cervical cancer. There are two licensed HPV vaccines: a bivalent and a quadrivalent vaccine. The two vaccines contain virus-like particles against HPV16 and 18 (3), which account for around 70% of all cervical cancer worldwide (4), and both vaccines have been found to be safe and highly efficacious against the HPV types they include (3). Cross-protective efficacy against some HPV types not included in the vaccines has also been observed (HPV31 for the quadrivalent vaccine and HPV31, 33 and 45 for the bivalent vaccine), which suggests an even higher protection against cervical cancer (5).

The recognized strategy for HPV vaccination programs is to target adolescent girls prior to the initiation of sexual activity and offer catch-up vaccination to young women (6). In contrast to screening programs, childhood vaccination programs are already in place in most low- and middle-income countries, suggesting that HPV vaccination is feasible in such settings (7). However, there are obstacles to the implementation of global HPV vaccination, such as the high cost of vaccines, the requirement of cold-chain delivery, vaccination acceptance and the completion of a three-dose regimen (8).

The reduction in cervical cancer that can be expected due to HPV vaccination depends largely on the level of HPV vaccine uptake. A study from the United Kingdom showed that a vaccine uptake of 100% would reduce cervical cancer mortality by 76%, while the reduction would be ~60% with a vaccine uptake of 80% (9). Parental acceptance of HPV vaccination is considered one of the most important challenges to

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high HPV vaccine uptake (8). A systematic review of studies on parental acceptance of HPV vaccination from different settings found an acceptance range of 55–100% (10). Suggested predictors of parental HPV vaccination acceptance are confidence in the safety and effectiveness of vaccines in general, recommendation of HPV vaccination by a physician, low education level and awareness of HPV. High vaccination costs and parental concerns that HPV vaccination may promote high-risk sexual behavior have been presented as negative correlates of HPV vaccination acceptance (10,11). However, few of these studies have been conducted in low-resource settings, although women living in such areas have a higher risk of developing cervical cancer (12).

Argentina is a middle-income country, in which cervical cancer remains a major public health issue. The cervical cancer prevention program in Argentina is managed at the provincial level; thus screening policies vary across the 24 provinces. Cervical cancer screening is mainly opportunistic, is deficient in quality control and often deviates from the national recommendations in terms of target age and screening interval. Some provinces lack an official framework for their particular cervical cancer prevention program (13). Consequently, the burden of cervical cancer varies considerably throughout the country, with age-standardized mortality rates ranging from a low 3.9/100,000 in the capital of Buenos Aires, to 18.9/100,000 in the northern Formosa Province (14). It has also been reported that women with low socioeconomic status are screened less frequently in Argentina and that this social gradient is increasing in provinces with the highest burden of cervical cancer (15).

HPV prevalence is high in Latin America compared to the global average (16.1 vs. 11.7%, respectively) (16). Some studies from low-resource settings in Argentina have presented even higher figures, with an HPV prevalence ranging from 38.0–40.6% in Misiones Province (17,18) to 46.7% in Formosa Province (19). HPV vaccination (using the bivalent vaccine) was included in the national vaccination program in Argentina in 2011 and is now offered free-of-charge to 11-year-old girls (20). The prevalence of HPV16 and 18 in high-grade squamous intraepithelial lesions and in invasive cervical cancer in Argentina is among the highest in Latin America (65.4 and 77.1%, respectively) (21) and HPV vaccination has been projected to be a cost-effective way to decrease cervical cancer incidence and mortality in the country (22,23).

Despite the important potential for disease prevention among women living in areas with a high burden of cervical cancer, the only existing study from Argentina on HPV vaccination acceptance was carried out in the capital (24), which has the lowest incidence of cervical cancer in the country (14). To the best of our knowledge, no study has assessed parental HPV vaccination acceptance in an area with a higher burden of cervical cancer. Thus, the aim of the present study was to determine maternal acceptance of HPV vaccination in a non-metropolitan region of Argentina. Furthermore, since there is no subsidized catch-up vaccination for adolescents in Argentina, the present study investigated willingness to pay for HPV vaccination and correlates of this willingness. Additionally, awareness of HPV and HPV-associated disease and behaviors and attitudes associated with HPV vaccination acceptance was assessed.

## Materials and methods

*Study design and sampling strategy.* A quantitative survey design was chosen for this hospital-based study, which was conducted from 1 February to 30 April, 2012, at the Diego Paroissien Public Hospital in Maipú and Private Italian Hospital (Mendoza Province, Argentina). Women attending the obstetrics/gynecology ward or the outpatient gynecology clinic of the two hospitals who had at least one daughter aged 9–15 years were invited to participate in the present study. Women who were admitted to the hospital with cervical cancer were not eligible for inclusion in the present study. Questionnaires were completed independently by respondents or administered orally by one of the investigators (S. Gustafsson), according to the participant's preference. Approval was obtained from the Ethical Committees of the Diego Paroissien Public Hospital and the Private Italian Hospital, and all participants provided oral consent prior to participation.

There were no validated questionnaires on HPV vaccination acceptance at the time of the present study. Therefore we used a questionnaire that was essentially identical to that used in a large, nationwide study in Sweden (11). The Swedish questionnaire was piloted among laywomen to ensure understanding and logic of question-flow. The pilot study revealed no evidence of bias or misunderstanding. The questionnaire was translated for the present study and slightly modified in terms of design and linguistic expressions, however, the fundamental part was left unchanged. The questionnaire consisted of 42 questions divided into five sections: i) demographics; ii) awareness of HPV and HPV-associated disease; iii) attitudes toward vaccination in general; iv) maternal acceptance of vaccination for daughters; and v) perceptions regarding daughter's sexual activity. The natural history of HPV and cervical cancer were briefly explained to all participants before answering the questions in section 4, i.e., after receiving replies to all the questions on awareness of HPV and HPV-associated disease, as was carried out in the Swedish study (11).

*Statistical analysis.* Descriptive statistics and frequency distribution of variables were calculated using SPSS (IBM version 20.0; IBM, Armonk, NY, USA). In a descriptive analysis, the outcome variable, maternal acceptance of HPV vaccination, was classified into three levels: i) unsure/unwilling to vaccinate even if HPV vaccination was free; ii) willing to vaccinate only if HPV vaccination was free; iii) willing to vaccinate even if HPV vaccination was not free. To determine the correlates of HPV vaccination acceptance, a binomial logistic regression model was performed in SAS® (System 9.4; SAS Institute, Cary, NC, USA). Since few mothers were unwilling to accept free HPV vaccination for their daughters, we restricted the analysis to investigate correlates of willingness to pay for HPV vaccination, compared to willingness to vaccinate only if HPV vaccination was free. Thus, mothers who replied they were unsure/unwilling to vaccinate even if HPV vaccination was free were excluded from the analysis ( $n=18$ ). All potential correlates were examined individually in univariate models and those statistically significantly associated with the outcome were retained in a mutually-adjusted multivariable model. P-values were based on the Wald Chi-square test, where  $<0.05$  was considered to indicate a statistically significant result.

Table I. Demographic characteristics of the 180 study women attending the obstetrics/gynecology ward and outpatient gynecology clinic of the Diego Paroissien Public Hospital and the Private Italian Hospital, Mendoza Province, Argentina.

Variables	No. of participants in the analysis	n	%
Median age (years)	170	37	
Age (years)	170		
26-40		112	65.9
41-45		26	15.3
46-59		32	18.8
Marital status	178		
Married/in a relationship		141	79.2
Single		37	20.8
Occupation	180		
Full-time employee		24	13.3
Part-time employee		37	20.6
Housewife		102	56.7
Other		17	9.4
Education level	180		
<High school		132	73.3
High school		24	13.3
>High school		24	13.3
Disposable household income (euro/month)	156		
<263		63	40.4
263-437.5		26	16.7
438-1,050		45	28.8
>1,050		22	14.1
No. of children residing at home	180		
0-2		53	29.4
3		46	25.6
4-5		59	32.8
≥6		22	12.2

## Results

**Study sample.** A total of 211 mothers were invited to the present study and of these, 20 (9.5%) declined to participate. Another 11 (5.2%) were excluded due to inadequately completed questionnaires. Thus, the final study sample consisted of 180 mothers (85.3%), 155 (86.1%) of whom were recruited at the Diego Paroissien Public Hospital; the remaining 25 (13.8%) were recruited from the Private Italian Hospital. The median age of participants was 37 years. The majority of mothers (79.2%) were married or in a relationship and 56.7% were housewives. Less than one-third (26.6%) had a high school education or above and nearly half (45.0%) had four children or more in their household (Table I).

**Maternal HPV vaccine acceptance.** Among the mothers in the present study, 90.1% stated that they would accept HPV

Table II. Maternal acceptance of human papillomavirus (HPV) vaccination in relation to cost.

Factors	N (179)	%
Would you accept to vaccinate your daughter against HPV?		
Unsure/unwilling, even if vaccination was free (total) <sup>a</sup>	18	10.1
Willing only if vaccination was free	54	30.3
Willing even if vaccination was not free	107	59.8
<sup>a</sup> Unsure n=15, (8.3%); unwilling n=3 (1.7%).		

vaccination for their daughter. Acceptance was high (59.8%) even if HPV vaccination was not free. Only three mothers said they were unwilling to vaccinate even if HPV vaccination was free (Table II). The mean price that respondents were willing to pay for HPV vaccination was 23.20 euro, with a range of 0.70-128.60 euro/dose (data not shown). Notably, a total of 21 mothers expressed that they were willing to vaccinate their daughter regardless of the cost (data not shown).

**Correlates of willingness to pay for HPV vaccination.** In the univariate regression models, having a high school education or more, gainful employment, a disposable household income of 438-1,050 euro/month and being aware of cervical cancer prior to the study were all statistically significantly associated with willingness to pay for HPV vaccination. Mothers who were ≥41 years and mothers who were aware of HPV prior to the study appeared to be more willing to pay for HPV vaccination (OR=2.04, 95% CI 0.95-4.37; p=0.0658 and OR=1.08, 95% CI 0.93-3.50; p=0.0807, respectively). Additionally, being unsure about vaccine safety in general appeared to correlate negatively with willingness to pay for HPV vaccination (OR=0.57, 95% CI 0.29-1.10; p=0.0940). However, none of these correlates reached formal significance and thus they were not included in the mutually adjusted model. In the mutually adjusted model, a significant positive association remained between willingness to pay for HPV vaccination and gainful employment (OR=2.54, 95% CI 1.01-6.38; p=0.0473), higher disposable household income (OR=3.28, 95% CI 1.36-7.94; p=0.0085) and awareness of cervical cancer prior to the study (OR=3.22, 95% CI 1.02-10.14; p=0.0462) (Table III). However, after adjustment for employment, disposable household income and awareness of cervical cancer, education level was no longer significant.

**Perceptions and concerns concerning HPV vaccination.** Over half (52.2%) of the mothers in our study considered that HPV vaccination should be administered at age 14 or below, with a median of 11 years and a range of 0-18 years (data not shown). Almost half the mothers (45.6%) considered their daughter to be completely protected against cervical cancer after HPV vaccination, while only one out of 10 mothers (10.0%) correctly thought that this was not the case. Moreover, three of four mothers (73.9%) thought it was also necessary to vaccinate boys (Table IV).

Table III. Correlates of willingness to vaccinate even if human papillomavirus (HPV) vaccination was not free (n=108), compared to only if HPV vaccination was free (n=52).<sup>a</sup>

N=162	Unadjusted OR (95% CI)	P-value	Mutually adjusted <sup>b</sup> OR (95% CI)	P-value
Age (years)				
<41	1			
≥41	2.04 (0.95-4.37)	0.0658		
Education				
<High school	1		1	
≥High school	<b>2.50 (1.10-5.67)</b>	0.0285	1.15 (0.43-3.12)	0.7783
Employment				
Not gainfully employed	1		1	
Gainfully employed	<b>3.39 (1.55-7.43)</b>	0.0023	<b>2.54 (1.01-6.38)</b>	0.0473
Disposable household income (euro/month)				
<263-437.5	1		1	
438-1,050	<b>4.02 (1.79-9.05)</b>	0.0008	<b>3.28 (1.36-7.94)</b>	0.0085
Marital status				
Married/in a relationship	1			
Single	0.50 (0.22-1.15)	0.1034		
No. of children				
0-3	1			
≥4	0.89 (0.46-1.73)	0.7361		
Heard of HPV prior to study				
No	1			
Yes	1.08 (0.93-3.50)	0.0807		
Heard of cervical cancer prior to study				
No	<b>1</b>		<b>1</b>	
Yes	<b>3.22 (1.26-8.22)</b>	<b>0.0145</b>	<b>3.22 (1.02-10.14)</b>	0.0462
Heard of condyloma (genital warts) prior to study				
No	1			
Yes	1.51 (0.76-2.99)	0.2384		
Believes vaccination in general to be an effective way to prevent disease				
Very or fairly effective	1			
Not so effective, ineffective or do not know	0.61 (0.31-1.22)	0.1655		
Believes vaccination in general to be a safe method to prevent disease				
Very or fairly safe	1			
Not so safe, unsafe or do not know	0.57 (0.29-1.10)	0.0940		
Believes daughter to have had boyfriend				
No or do not know	1			
Yes	1.33 (0.54-3.26)	0.5374		
Believes daughter is sexually active				
No or do not know	1			
Yes	0.89 (0.25-3.17)	0.8505		
Concerned daughter will have more sexual partners/unsafe sex if vaccinated against HPV				
No or do not know	1			
Yes	0.96 (0.48-1.92)	0.9114		

<sup>a</sup>Those unwilling to vaccinate or unsure if willing to vaccinate even if vaccination was free were excluded (n=18). <sup>b</sup>All four odds ratios are mutually adjusted for the three other variables in this analysis. OR, odds ratio; CI, confidence interval. Statistically significant ORs and CIs are marked in bold.

Table IV. Perceptions and concerns about human papillomavirus (HPV) vaccination.

Questions and possible replies	n	%
At what age do you think HPV vaccination should begin (years)?		
0-11	60	33.3
12-14	34	18.9
15-17	15	8.3
≥18	2	1.1
Do not know	55	30.6
Age is of no importance	10	5.6
Did not want to answer/missing	4	2.2
Do you believe your daughter will be fully protected against cervical cancer after HPV vaccination?		
Yes	82	45.6
No	18	10.0
Do not know	80	44.5
Do you believe it is necessary to also vaccinate boys?		
Yes	133	73.9
No	6	3.3
Do not know	41	22.8
What concerns do you have about HPV vaccination?		
More than one alternative possible		
If the vaccine really offers protection	86	40.6
If the vaccine has adverse effects	58	27.4
If the vaccination has to be repeated	35	16.5
Other	4	1.9
I do not have any concerns	3	1.4
Do not know	26	12.3
Which of the concerns above would make you abstain from vaccinating your daughter against HPV?		
More than one alternative possible		
If the vaccine really offers protection	59	32.6
If the vaccine has adverse effects	44	24.3
If the vaccination has to be repeated	10	5.5
Other	2	1.2
I would have the vaccination regardless of concerns	33	18.2
Do not know	33	18.2
Are you concerned that your daughter would have more sexual partners or practice more unsafe sex (i.e., not use a condom) if she was vaccinated against HPV?		
Yes	71	39.4
No	65	36.1
Do not know	19	10.6
Do not want to answer	25	13.9
Would the concern above make you abstain from vaccinating your daughter against HPV?		
Yes	20	11.1
No	115	63.9
Do not know	24	13.3
Do not want to answer	21	11.7

More than half of the mothers thought vaccines in general were safe (53.6%) and effective (64.8%), whereas 12.3% thought vaccines in general were not so safe/unsafe and 4.55% thought they were not so effective/ineffective (data not shown). In regards to HPV vaccination, 40.6% of the present study sample expressed concerns regarding HPV vaccine effi-

cacy, one-third (27.4%) regarding adverse effects and 16.5% expressed concerns with regard to whether the vaccination had to be repeated. Mothers said they would abstain from HPV vaccination for their daughters if the vaccine did not provide full protection against cervical cancer (32.6%), if there were adverse effects (24.3%) and if vaccination had to be repeated

Table V. Awareness of human papillomavirus (HPV)-associated disease.

Characteristics of awareness	n	%
Heard of cervical cancer prior to study		
Yes	150	83.3
No	29	16.7
Heard of condyloma (genital warts) prior to study		
Yes	70	38.9
No	109	61.1
Heard of HPV prior to study		
Yes	101	56.4
No	78	43.6
Believes that HPV can cause cervical cancer <sup>a</sup>		
Yes	65	64.4
No	0	0.0
Do not know	36	35.6

<sup>a</sup>Subgroup analysis among women who were aware of HPV prior to study.

(5.5%). Many mothers (39.4%) expressed concerns that their daughter would have more sexual partners or practice unsafe sex after HPV vaccination. Nevertheless, the majority (63.9%) did not consider this a sufficient reason to abstain from vaccinating their daughter (Table IV).

**Awareness of HPV and HPV-associated disease.** The majority (83.3%) of mothers were aware of cervical cancer prior to the present study, while less than half were informed regarding condyloma (genital warts). HPV awareness was reported by 56.4% of the study sample and among those 64.4% believed it to cause cervical cancer; the remaining were unsure whether HPV could cause cervical cancer (Table V).

## Discussion

We assessed maternal HPV vaccination acceptance following the implementation of HPV vaccination in the national vaccination program in Argentina. To the best of our knowledge, it is one of few studies on HPV vaccination acceptance from the country and provides important data from a previously unstudied region of Argentina. The present study also investigated the perceptions of and concerns related to HPV vaccination among mothers in Argentina.

Maternal acceptance of HPV vaccination was extremely high in the present study, with nine out of 10 mothers accepting free HPV vaccination for their daughter. On a promising note, high rates of acceptance have also been reported in other low- and middle-resource settings (25-27) and in other Latin American countries (28,29). For example, maternal vaccination acceptance was 84% in a metropolitan area of Mexico (28) and 98% in a Peruvian study (29), which reflects our results. On the other hand, a study carried out in Buenos Aires found HPV vaccination acceptance to be somewhat

lower (74%) (24). This difference may be due to demographic differences among study participants, or to the lower burden of cervical cancer in Buenos Aires. The women included in our study had a lower education level, which has been found to correlate with high HPV vaccination acceptance in several studies (10,11,30). Another probable contributing factor is that information on the causal relationship between HPV and cervical cancer was provided to the mothers prior to obtaining their responses to questions on HPV vaccination acceptance. Nevertheless, our findings on HPV vaccination acceptance are encouraging. Uptake of childhood vaccines [polio, diphtheria-tetanus-pertussis (DTP) and measles-mumps-rubella (MMR)] is high in Argentina, between 91-97%, which suggests a successful delivery of HPV vaccination should be achievable as well (31).

We also investigated mothers' willingness to pay for HPV vaccination for their daughter, considering that catch-up vaccination of adolescent girls is not subsidized in Argentina. It was found that 60% of mothers would vaccinate their daughter even if vaccination was not free. In a Peruvian study, a similar number (58%) of women stated their intention to finance their own HPV vaccination (29). These figures are comparable to findings from Sweden, where 63% of parents said they would vaccinate their daughter against HPV even if of out-of-pocket payment was required (11). However, there were discrepancies between the Swedish study and this study in terms of willingness to pay; 83% of Swedish parents who accepted HPV vaccination were prepared to pay for it, compared to 67% in the present study, which may suggest that cost is a larger obstacle in the Argentinian setting. This may not be so surprising, given that our study sample represents women with less economic means, and a higher household income has been correlated with willingness to pay for HPV vaccination (30). Higher disposable household income was also a significant correlate in the present study, as was being gainfully employed.

In the present study, the question on HPV vaccination acceptance even if vaccination was not free only investigated a mother's willingness to pay 'something'. It is therefore possible that many Argentinean mothers would not have said they were willing to pay for HPV vaccination if the actual price had been listed. It should be noted that the majority of mothers were housewives with no personal income and consequently may not be the ones to determine whether or not the household income should finance HPV vaccination. Contrary to expectations, as many as 21 mothers stated that they were willing to vaccinate their daughter regardless of cost, a finding that may have to be interpreted with some caution. Regardless of this latter finding, it can be argued that affordability of vaccines is crucial for catch-up vaccination in Argentina, corroborating the conclusions of Franco *et al* (31) and Winkler *et al* (32).

Disbelief in vaccine safety in general has previously been found to be an important barrier to vaccination acceptance (10,11,30). In the present study, when HPV vaccination was not free there was a tendency towards lower vaccination acceptance among mothers who were unsure about vaccination safety in general, although this was not found to be statistically significant, likely due to power limitations. However, almost half the study sample expressed concerns regarding HPV vaccine efficacy and more than a quarter of mothers expressed concerns regarding adverse effects. Thus, informa-

tion on the safety and effectiveness of HPV vaccination needs to be provided to the general public and misunderstandings need to be addressed in order to maximize the HPV vaccine uptake. An issue that is under discussion involves whether vaccination would promote high-risk sexual behavior among young women, which potentially poses an obstacle to parental HPV vaccination acceptance (10,11). In the present study, an unexpectedly high percentage (39%) of mothers expressed this concern when asked directly. Equally high findings (42%) have been reported from Finland (33), although two previous systematic reviews only found this concern among 6-12% (10) and 1-18% of parents (34). Nevertheless, only 11% of mothers in the present study said that their concern over high-risk sexual behavior would keep them from vaccinating their daughter against HPV. However, recent data have not found any evidence of altered sexual behavior among HPV-vaccinated women, suggesting that this fear has been somewhat exaggerated (35-39).

The majority of Argentinian mothers believed that HPV vaccination should be initiated at or before age 14 years and many answered that this age should be 11 years, which is the target age in Argentina. It may be that Argentinean mothers have understood the importance of completing HPV vaccination prior to the initiation of sexually activity. Additionally, advertising in connection with the launch of the HPV vaccination program has likely influenced awareness of the target age. It should also be noted that the mean age of daughters included in the present study was 10 years and our results may be a reflection of this.

Three of four (74%) mothers thought it was also necessary to vaccinate boys against HPV, whereas only 3% considered it unnecessary, which was a noteworthy finding as there has not been any advertisement promoting HPV vaccination of boys in the country. Regardless, the figures in our study are higher than those in Europe, where there is an ongoing debate regarding HPV vaccination of boys. A contributing factor to our findings may be that we informed the mothers that HPV is a sexually transmitted infection that causes disease in both sexes. However, the exact same information was revealed in Sweden in 2007, where only a little more than half of parents thought it was necessary to vaccinate boys against HPV (11).

Almost half of the mothers (46%) in the present study believed their daughter to be fully protected against cervical cancer after HPV vaccination, while only one out of 10 mothers (10%) understood that HPV vaccination would not offer complete protection. This issue needs to be addressed at the time of vaccination, along with information for adolescents and their parents regarding the importance of future participation in cervical cancer screening.

Eighty-three percent of mothers were aware of cervical cancer prior to the present study and prior awareness of cervical cancer correlated with willingness to pay for HPV vaccination, which emphasizes the importance of health education. A total of 56% of mothers were aware of HPV prior to the study. This is extremely high compared to an overall HPV awareness of 42% in a systematic review from the US (10). A study conducted in 2008 in Argentina (40) found an HPV awareness of 30% for previously unscreened and 47% for previously screened women. Among those aware of HPV in that study, 14% believed HPV to cause cervical cancer. In the present

study, as many as 64% of individuals considered HPV to cause cervical cancer and none of the mothers thought that HPV did not cause cervical cancer. This suggests a promising tendency towards higher HPV awareness among the general public, perhaps at least in part due to the introduction of HPV vaccine campaigns, which is important since several studies (11,30,33) have shown HPV awareness to correlate with HPV vaccination acceptance. We found a possible corroborating tendency in the present study, although the point estimate was only 8% higher and not statistically significant. Health care providers have been found to be the most reliable source of information for parents regarding HPV vaccination and vaccination in general (10,32) and it is therefore crucial that they provide adequate information. A study on almost 900 gynecologists from Argentina found that 80% had knowledge of and were in favor of HPV vaccination. However, as many as 30% were unaware of the causal relationship between HPV and cervical cancer. Continuous educational campaigns and future knowledge evaluations are needed for physicians, as well as the general public.

The limitations of the present study include its non-randomized, cross-sectional nature and the small sample size. There was also an uneven distribution of study participants, with 86% coming from the public and 14% from the private hospital. However, this may be fairly representative, as women of low socioeconomic status constitute a large part of the population of Mendoza Province. Generally speaking, the non-participation rate is an important factor to consider in regard to study limitations, yet in our case the participation rate was high at 85%. Therefore we do not consider the non-participation rate to be a limitation. Moreover, only three mothers said they would not accept HPV vaccination for their daughter and only 15 were unsure as to whether to vaccinate, which precluded analyses on correlates of non-acceptance even if vaccination was free.

In conclusion, the present study showed high HPV vaccination acceptance among Argentinean mothers, which is of great importance for a country with low cervical cancer screening coverage and high cervical cancer mortality. Furthermore, HPV vaccination acceptance was high even if mothers had to pay for vaccination. However, the actual price of HPV vaccination is high, and cost could likely pose an obstacle to catch-up vaccination in Argentina. Our results show that mothers with lower disposable household income and mothers who were not gainfully employed were less willing to pay for HPV vaccination, which may lead to significant social inequalities in HPV vaccine uptake in a country where cervical screening is already suboptimal (13). Decision-makers should address this as well as the confusion regarding the level of protection conferred by HPV vaccination. Additionally, continuous education campaigns are needed to improve knowledge of HPV and HPV-associated diseases among the general public and health care providers.

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