

Factors associated with non-vaccination against Human Papillomavirus (HPV) among adolescents in São Paulo

Fatores da não vacinação contra o Papilomavírus Humano (HPV) em adolescentes de São Paulo

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ABSTRACT This study aimed to analyze factors associated with non-vaccination against Human Papillomavirus (HPV) among adolescents in São Paulo, Brazil. This is an epidemiological study with a cross-sectional design, developed using data from the National School Health Survey. For this particular study, responses from girls and boys, aged 13 to 17 years, from the municipality of São Paulo were analyzed, totaling 4,179 questionnaires. The dependent variable was non-vaccination against HPV. For multivariate analysis, a logistic regression model was applied. All estimates were calculated using the survey module of the Statistical Software for Professionals, version 17.0. The prevalence of unvaccinated adolescents was 17%, with male sex, older age, and not seeking health services in the previous 12 months being the main factors associated with a lack of vaccination. The results of this study are innovative as they elucidate factors associated with non-vaccination against HPV among adolescents in the state of São Paulo, the second most populous state in the country. Therefore, these findings will be highly useful in supporting strategies to restore vaccination coverage, particularly targeted at adolescents, a population with specific healthcare needs.

KEYWORDS Adolescents. Human Papilomavírus. Epidemiology. Vaccination.

RESUMO *Objetivou-se analisar os fatores associados à não vacinação contra o Papilomavírus Humano (HPV) em adolescentes de São Paulo, Brasil. Trata-se de um estudo epidemiológico, com delineamento transversal, desenvolvido a partir de dados da Pesquisa Nacional de Saúde do Escolar. Para este estudo em particular, foram analisadas as respostas de meninas e meninos com idades entre 13 e 17 anos do município de São Paulo, totalizando 4.179 questionários. A variável dependente foi a não vacinação contra o HPV. Para a análise multivariada, aplicou-se o modelo de regressão logística. Todas as estimativas foram calculadas no módulo survey do pacote estatístico Statistical Software for Professionals, versão 17.0. A prevalência de adolescentes não vacinados foi de 17%, sendo o sexo masculino, a idade mais avançada e a não procura por serviços de saúde nos últimos 12 meses os principais fatores associados à ausência de vacinação. Os resultados deste estudo são inovadores por elucidar fatores associados à não vacinação contra o HPV em adolescentes no estado de São Paulo, o segundo mais populoso do País. Desse modo, serão bastante úteis para subsidiar estratégias para a reconquista das coberturas vacinais mais direcionadas aos adolescentes, um público com necessidades específicas de cuidado.*

PALAVRAS-CHAVE *Adolescentes. Papilomavírus Humano. Epidemiologia. Vacinação.*

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Introduction

Human Papillomavirus (HPV) infection is the most prevalent type of Sexually Transmitted Infection (STI) in the reproductive tract worldwide. More than 200 HPV viral subtypes have been identified, with at least 14 of them classified as high-risk due to their oncogenic potential^{1,2}. According to the World Health Organization (WHO), approximately 14 million new cases of HPV infection are recorded annually. In this context, the risk of a person acquiring one or more subtypes of the virus during their lifetime exceeds 90%, with approximately two-thirds of women contracting the infection in the first two years after the onset of their sexual life^{1,2}.

Although HPV infection is often transient, its persistence is strongly associated with the development of cervical cancer, which represents a significant public health problem today due to its high incidence³. In Brazil, cervical cancer is the third most common type among women⁴. The HPV vaccine and cytological examination are the most effective strategies for controlling this infection. The WHO recommends achieving 90% HPV vaccination coverage in girls up to 15 years of age, in addition to ensuring that 70% of women between 35 and 45 years of age undergo high-performance screening. It is also essential that women identified with precursor lesions or cancer receive early and effective treatment⁵.

In Brazil, the HPV vaccine was incorporated into the National Immunization Program (Programa Nacional de Imunizações – PNI) schedule in 2014, initially intended for female adolescents and later expanded to include boys, as part of a universal protection strategy. The vaccine is offered free of charge by the Unified Health System (SUS). Until March 2014, the adopted schedule consisted of two doses, with a six-month interval between them. As of April 2024, a single-dose schedule began to be used, in accordance with the recommendations of the WHO⁶ and the Pan American Health Organization (PAHO)^{6,7}. In

July 2024, the Ministry of Health expanded the offer of the vaccine to new groups, including people with Recurrent Respiratory Papillomatosis (RRP), people living with HIV/AIDS, solid organ or bone marrow transplant recipients, cancer patients, individuals using Pre-Exposure Prophylaxis (PrEP) for HIV, and victims of sexual violence⁷.

Although the vaccine was offered free of charge to the target population in 2022, HPV vaccination coverage in Brazil among adolescents was 52.16% for boys and 75.81% for girls⁸. Furthermore, a national study based on data from a representative sample of the Brazilian population, from the National School Health Survey (Pesquisa Nacional de Saúde do Escolar – PeNSE), revealed that 45.54% (95% Confidence Interval – 95% CI – 52.88-53.06) of participants reported a lack of knowledge about the HPV vaccine. In the state of São Paulo, this percentage was 44.42%⁹.

It is important to note that there is a significant lack of studies that provide an in-depth analysis of the factors associated with non-vaccination at the state level, especially in the sociodemographic context and regarding access to health. The study by Silva et al.⁹, for example, highlighted vaccination coverage from a broader perspective, while that of Melo, Pereira, and Silva¹⁰ addressed the influence of access to health among Brazilian adolescents in general, without the regional focus or the specific variables analyzed in our study. Thus, the present study assumes unique relevance in seeking to elucidate the specific determinants of non-vaccination in the state of São Paulo, the second most populous in the country, providing crucial data for the development of more targeted and effective strategies to regain vaccination coverage.

Understanding the factors associated with non-vaccination against HPV is important to support the formulation of more effective public health strategies. The analysis of these factors enables the identification of specific barriers to adherence, including individual aspects, such as knowledge about the vaccine

and risk perception, and social factors, such as the role of parents and access to health services. Considering that adolescence represents a critical phase for preventive interventions, given the importance of this life cycle in the formation of health behaviors and the acceptance of immunization strategies, this study aims to analyze the factors associated with non-vaccination against HPV in adolescents from São Paulo, Brazil.

Material and methods

This is an epidemiological study, with a cross-sectional design, guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) tool, developed based on PeNSE data.

PeNSE was conducted by the Brazilian Institute of Geography and Statistics (IBGE), in partnership with the Ministry of Health and with support from the Ministry of Education, focusing on school-age adolescents. This survey is part of the Surveillance of Risk and Protective Factors for Noncommunicable Diseases (NCDs) in Brazil. PeNSE is recognized as the first national initiative to comprehensively explore various aspects of adolescents' daily lives, including their health care. The survey sampling was carried out using a cluster approach, divided into two stages: initially, schools were selected as the first sampling level, followed by the classes of enrolled students as the second level. For the selection, all students in the classes of the schools drawn to participate in this study were considered eligible. The sample size was defined with the objective of estimating population parameters for students, aged 13 to 17 years, enrolled in and attending both public and private schools, covering different geographic levels: the entire national territory, the five main regions, the states, the capitals, and the Federal District. The PeNSE questionnaire is self-administered and has specific guidelines for its completion¹¹.

The participants in PeNSE are adolescents, aged 13 to 17 years, regularly enrolled in and attending 7th to 9th grades of elementary school, as well as the 1st to 3rd grades of high school. Students from technical courses integrated with high school and from normal/teacher training courses are also included, covering all shifts and both public and private schools throughout Brazil¹¹.

In 2019, data were collected from 4,242 schools and 6,612 classes, totaling 189,857 enrolled students and 183,264 students present. Among them, 159,245 questionnaires were considered valid, that is, those in which students completed the Informed Consent Form (ICF) and reported their sex and age. Of this total, 125,123 questionnaires were analyzed¹¹.

The sample weights were calculated considering the schools, classes, and students, with adjustments made based on data from the School Census. For this particular study, the answers from girls and boys, aged 13 to 17 years, from the municipality of São Paulo were analyzed, totaling 4,179 questionnaires¹¹.

The analysis included the school questionnaire, whose respondent was the principal or person in charge of the institution (n = 4,242). The dependent variable was non-vaccination against HPV, as determined by the questionnaire question: 'Have you been vaccinated against the HPV virus?' (yes, no).

The independent variables analyzed included individual characteristics, such as sex (female and male); age group (13 to 15 years and 16 to 17 years); race (white, black, brown and other – yellow/indigenous); maternal education (no schooling to complete elementary school, incomplete high school and complete high school, incomplete higher education, and complete higher education); living with mother or father (yes or no); smoking (yes or no); alcohol consumption (yes or no); and physical activity (active or sedentary). In addition, the variables cover social and infrastructure characteristics, such as school dependency (public or private), possession of a cell phone or laptop, and internet at home

(yes or no). Finally, access to health services is considered, assessed by the demand for these services in the last 12 months (yes or no).

The questionnaire for school principals or administrators analyzed such aspects as the institution's participation in the School Health Program (Programa Saúde na Escola – PSE) (answer 'yes' or 'no') and the implementation of vaccination support actions in the last 12 months (answer 'yes' or 'no').

Analysis of results and statistics

The prevalence of unvaccinated individuals against HPV was calculated according to the criteria defined in this study. For the significance test of the study, the crude model was used to analyze the associations of the variables with the outcome, considering a significance level of 0.05 and a 95% CI.

For the multivariate analysis, the logistic regression model was applied, testing variables with $p \leq 0.20$ in the unadjusted analyses and retaining, at the end, those that presented $p < 0.05$, with a 95% CI. All estimates were calculated in the survey module of the Statistical Software for Professionals (Stata) statistical package, version 17.0.

Ethical aspects

For this study, a secondary database, publicly and freely accessible, was used, respecting the confidentiality of participants and waiving prior approval from an Ethics and

Research Committee. It should be noted that the PeNSE complies with the Guidelines and Regulatory Standards for Research with Human Beings and received approval from the National Ethics Committee in Research of the Ministry of Health (Comissão Nacional de Ética em Pesquisa do Ministério da Saúde – CONEP/MS), with Certificate of Presentation for Ethical Appraisal (CAAE) No. 07508818.5.0000.0008 and opinion No. 3,249,268, dated April 8, 2019.

Results

The sample for this study consisted of 4,179 adolescents; of these, 17% (CI = 15.4-18.6) had not received the HPV vaccine in the state of São Paulo, Brazil. The sample predominantly consisted of adolescents, aged 13 to 15 years (63.7%), with a balanced distribution between the sexes. The majority attended public schools (81.4%), and 47.8% self-identified as white. Regarding maternal education, 39.4% had completed or partially completed high school, with the majority of participants residing with their mother (91%), while 60.5% also lived with their father. In terms of infrastructure, 95.4% had internet access, and 91.8% owned a cell phone. It was observed that 30.9% reported smoking, and 47.4% consumed alcohol. Only 30.5% were considered physically active, and 37.9% sought health services in the last year (*table 1*).

Table 1. Characteristics of the study participants. São Paulo, Brazil

Characteristics	% (95% CI)
Sex	
Female	50.1 (47.8-52.4)
Male	49.9 (47.6-52.1)
Age	
13 to 15 years	63.7 (58.2-68.9)
16 to 17 years	36.8 (31.1-41.8)

Table 1. Characteristics of the study participants. São Paulo, Brazil

Characteristics	% (95% CI)
Race	
White	47.8 (45.2-50.4)
Black	11.1 (09.9-12.4)
Brown	35.4 (33.2-37.7)
Other	05.7 (05.0-06.5)
Mother's Educational Level	
No schooling to complete elementary school	26.5 (24.0-29.1)
Incomplete high school and complete high school	39.4 (36.7-42.2)
Incomplete higher education and complete higher education	34.1 (32.0-36.2)
Lives with mother	
Yes	91.0 (89.6-92.2)
No	09.0 (07.8-10.4)
Lives with father	
Yes	60.5 (58.0-62.9)
No	39.5 (37.1-42.0)
School dependency	
Public	81.4 (79.6-83.0)
Private	18.6 (17.0-20.3)
Owns a cell phone	
Yes	91.8 (90.3-93.2)
No	08.2 (06.8-09.7)
Laptop	
Yes	69.9 (66.7-72.9)
No	30.1 (27.1-33.3)
Internet at home	
Yes	95.4 (94.3-96.4)
No	04.6 (03.6-05.7)
Smoking	
Yes	30.9 (26.4-35.8)
No	69.1 (64.2-73.6)
Alcohol consumption	
Yes	47.4 (44.7-50.1)
No	52.6 (49.9-55.2)
Physical activity	
Active	30.5 (27.9-33.2)
Sedentary	69.5 (66.8-72.1)
Looking for work in the last 12 months	
Yes	37.9 (35.5-40.4)
No	62.1 (59.6-64.5)

Source: Prepared by the authors.

Bivariate analysis revealed a statistically significant association between sex, age, and seeking health services in the last 12 months

and non-vaccination against HPV, suggesting that these characteristics influence vaccination behavior (*table 2*).

Table 2. Association between demographic, socioeconomic, and educational variables of adolescents not immunized against HPV, São Paulo, Brazil

Characteristics	HPV		OR (95% CI)	p-value
	Yes	No		
	83.0 (81.4-84.5)	17.0 (15.4-18.6)		
Sex			< 0.0000	< 0.001
Female	89.6 (88.1-90.9)	10.4 (09.0-11.9)	-	
Male	74.4 (70.3-78.0)	25.6 (21.9-29.7)	2.98 (2.22-3.99)	
Age			0.045	0.045
13 to 15 years	84.1 (81.9-86.0)	15.9 (13.9-18.1)	-	
16 to 17 years	81,3 (79.3-83.1)	18.7 (16.9-20.7)	1.22 (1.00-1.48)	
Race			0.7506	
White	83.0 (80.5-85.2)	17.0 (14.8-19.5)	-	
Black	80.8 (75.4-85.2)	19.2 (14.8-24.6)	1.16 (0,79-1.70)	0.434
Brown	83.9 (80.9-86.5)	16.1 (13.5-19.1)	0.94 (0.72-1.21)	0.611
Other (Asian/Indigenous)	83.3 (75.2-89.2)	16.6 (10.8-24.8)	0.97 (0.58-1.65)	0.923
Mother's Educational Level			0.3823	
No schooling	80.2 (66.7-89.2)	19.8 (10.8-33.3)	-	
Primary (incomplete/complete)	83.3 (79.2-86.7)	16.7 (13.2-20.8)	0.81 (0.40-1.66)	0.569
Secondary (incomplete/complete)	81.1 (77.8-84.0)	18.9 (16.0-22.2)	0.95 (0.44-2.02)	0.885
Higher education (incomplete/complete)	84.3 (81.6-86.8)	15.7 (13.2-18.4)	0.75 (0.36-1.57)	0.452
Lives with mother			0.183	
Yes	83.5 (81.9-84.9)	16.5 (15.1-18.0)	0.76 (0.50-1.14)	0.184
No	79.3 (71.8-82.2)	20.7 (14.7-28.2)	-	
Lives with father			0.9309	
Yes	83.1 (81.3-84.7)	16.9 (15.3-18.7)	0.99 (0.80-1.22)	0.931
No	82.9 (80.1-85.5)	17.1 (14.5-19.9)	-	
School dependency			0.1971	
Public	82.6 (80.7-84.5)	17.3 (15.5-19.3)	1.15 (0.93-1.43)	0.197
Private	84.6 (82.2-86.7)	15.4 (13.3-17.8)	-	
Owns a cell phone			0.199	
Yes	83.3 (81.8-84.7)	16.7 (15.3-18.2)	0.79 (0.55-1.13)	0.2
No	79.77 (72.8-85.3)	20.2 (14.7-27.2)	-	

Table 2. Association between demographic, socioeconomic, and educational variables of adolescents not immunized against HPV, São Paulo, Brazil

Characteristics	HPV		OR (95% CI)	p-value
	Yes	No		
Laptop			0.647	
Yes	82.8 (81.0-84.5)	17.2 (15.4-19.0)	3.10 (2.47-4.68)	< 0.001
No	83.5 (80.8-85.8)	16.5 (14.1-19.2)	-	
Internet at home			0.4511	0.452
Yes	82.9 (81.2-84.5)	17.1 (15.5-18.8)	1.23 (0.71-2.14)	
No	85.7 (77.8-91.1)	14.3 (08.9-22.2)	-	
Smoking			0.1435	0.144
Yes	84.9 (78.5-89.6)	15.1 (10.3-21.55)	0.74 (0.49-1.100)	
No	80.7 (76.9-84.0)	19.3 (16.0-23.1)	-	
Alcohol consumption			0.085	0.085
Yes	83.7 (80.1-86.8)	16.3 (13.2-19.9)	0.78 (0.58-1.03)	
No	80.0 (77.8-82.1)	20.0 (17.9-22.2)	-	
Physical activity			0.9691	0.969
Active	83.1 (79.1-86.4)	16.9 (13.6-20.9)	1.00 (0.75-1.34)	
Sedentary	83.0 (81.2-84.6)	17.0 (15.4-18.8)	-	
Looking for work in the last 12 months			0.0001	< 0.001
Yes	85.4 (83.8-86.9)	14.6 (13.1-16.2)	1.56 (1.25-1.95)	
No	78.9 (75.5-82.0)	21.0 (18.2-45.0)	-	

Source: Prepared by the authors.

Table 3 presents the estimated association based on the questions from the school questionnaire, answered by the principal/responsible party (n = 4,242). Among the items analyzed, two key variables were used: i) whether the school participates in the PSE;

and ii) whether the school carried out any action to support vaccination in the last 12 months. It was observed that, in schools with the presence of the PSE, there were higher rates of HPV vaccination.

Table 3. Association between school administrators' participation and HPV non-vaccination, São Paulo, Brazil

School participates in the PSE	HPV		OR (95% CI)	p-value
	Yes	No		
School participates in the PSE			0.0388	
Yes	86.0 (82.8-88.7)	14.0 (11.3-17.2)	0.75 (0.57-0.98)	0.039
No	82.1 (79.8-84.2)	17.9 (15.8-20.2)	-	

Table 3. Association between school administrators' participation and HPV non-vaccination, São Paulo, Brazil

	HPV		OR (95% CI)	p-value
	Yes	No		
In the last 12 months, which of the following actions has the school developed? Support for student vaccination			0.7963	
Yes	85.8 (82.5-88.5)	14.2 (11.5-17.5)	1.04 (0.76-1.43)	0.796
No	85.2 (83.1-87.2)	14.7 (12.8-16.9)	-	

Source: Prepared by the authors.

In *table 4*, after logistic regression, it was found that sex, age, and seeking healthcare services in the last 12 months continued to be associated with non-vaccination against HPV. Being male increased the chances of not being vaccinated against HPV by 2.97-fold.

Adolescents, aged 16 to 17 years, are 1.35-fold more likely not to be vaccinated against HPV. Finally, not seeking healthcare services increases the chances of not being vaccinated against HPV by 1.41-fold.

Table 4. Model adjusted for factors associated with HPV non-vaccination in adolescents, São Paulo, Brazil, 2019

Variables	OR (95% CI)	p-value*
Sex		< 0.001
Female	-	
Male	2.97 (2.21-4.00)	
Age		
13 to 15 years	-	0.004
16 to 17 years	1.35 (1.10-1.65)	
Searched for the service in the last 12 months		0.002
Yes	-	
No	1.41 (1.13-1.76)	

Source: Prepared by the authors.

OR = Odds Ratio; 95% CI = 95% confidence interval.

Discussion

The current study, analyzing data from PeNSE in the state of São Paulo, identified that about one-fifth of the students were not vaccinated, with male sex, age of 16-17 years, and not seeking health services in the last 12 months being the main factors associated with the absence of vaccination.

The study pointed to persistent and multifaceted challenges related to HPV vaccination among adolescents, especially in the context of an important state in the Southeast region.

Although HPV vaccination for boys was only implemented in 2017 in Brazil, the findings of this study highlight the disparity in vaccination coverage between the sexes and the deeply ingrained gender stereotypes¹².

The HPV vaccine was initially associated with the prevention of cervical cancer, reinforcing the idea that its main relevance would be for women. This may have limited the reach of educational campaigns aimed at boys and their families¹².

The higher probability of non-vaccination among male adolescents was also highlighted by Silva, Vasconcelos, and Almeida¹², who investigated HPV vaccine coverage in Brazil and observed that male adherence was significantly lower than female adherence, even after the introduction of vaccination for boys. This phenomenon was attributed to the misconception that HPV only affects women, reinforcing the need for awareness campaigns that address the risks for both sexes¹².

International authors have also observed similar barriers in high-income countries, indicating that cultural and educational factors impact the vaccination of boys¹³. In this sense, the integration of information about HPV into school curricula has proven to be an effective intervention in some contexts, as is the gender-neutral approach to HPV vaccination, which has been effective in increasing male coverage, especially when campaigns have emphasized the universal benefits of the vaccine, such as the prevention of genital warts and the reduction of community transmission¹⁴. These data highlight the need for specific strategies to increase vaccination coverage in this population, especially considering that misinformation about the importance of the vaccine for boys is still a significant obstacle. In this scenario, strengthening educational campaigns and actions directed at families, schools, and communities can reduce vaccine hesitancy and increase adherence^{12,13}.

Furthermore, vaccine hesitancy among parents of boys, often driven by the false perception that my son doesn't need it, is a critical issue that must be addressed. Research by Karafillakis and Larson¹⁵ shows that personalized educational interventions can help demystify vaccines and increase parental confidence¹⁴. Thus, strategies based on clear

communication and support from community leaders have been crucial in combating this problem^{16,17}.

Adolescents, aged 16 and 17 years, were also more likely (1.35-fold) not to get vaccinated when compared to younger adolescents, just as an international study highlighted that missed vaccination opportunities often occur during adolescence due to a lack of vaccine follow-up during educational transitions and a decrease in health interventions as adolescents approach adulthood¹⁸.

The higher probability of non-vaccination among older adolescents suggests a structural problem in maintaining vaccination coverage throughout adolescence: as adolescents transition between educational cycles, such as from primary to secondary school, health monitoring often becomes fragmented¹⁸.

The integration between schools and health units is a strategy identified as effective in mitigating these gaps. In the United Kingdom, for example, programs that use schools as vaccination points and reinforce ongoing engagement through reminders have achieved high vaccination coverage rates among older adolescents¹⁹.

Similarly, Markowitz et al.²⁰ reported that focusing on campaigns aimed at younger adolescents may result in gaps in vaccination coverage among older adolescents, suggesting the need for approaches that include boosters and ongoing outreach strategies²⁰.

In this study, the absence of seeking health services in the last 12 months was associated with a 1.41-fold increase in the chance of non-vaccination, which shows that adolescents who frequent health services less often are less exposed to recommendations from health professionals concerning immunization¹⁰. This data reinforces the relevance of public policies that promote continuous access to health services, especially for adolescents. Being present in health units can not only increase vaccination opportunities, but it can also improve adolescents' knowledge about the benefits of immunization, helping to mitigate

the risks of misinformation and hesitancy^{10,21}.

Regarding the findings on misinformation and vaccine hesitancy, studies also show that evidence-based educational campaigns, especially those using social media, can increase acceptance of the HPV vaccine. Trust in the vaccine, an understanding of its benefits, and the debunking of myths are crucial elements for overcoming barriers to vaccination, especially among adolescents²².

The relationship between seeking health services and vaccination highlights the importance of regular access to health systems. In Brazil, adolescents living in areas with low health service coverage face greater barriers to accessing vaccination. These challenges are exacerbated by regional, economic, and educational inequalities¹⁰.

Community-based actions, such as mobile vaccination campaigns or the integration of health services into community events, have proven effective in similar contexts^{23,24}.

Thus, the importance of discussing the need for integrated strategies involving schools, health units, and families to improve vaccination rates among adolescents is clear. The PSE, for example, is an effective tool for expanding access to immunization and raising awareness about the importance of vaccination²⁴⁻²⁶.

The main limitation of this study lies in the use of the PeNSE database, which is restricted to collecting information from adolescents enrolled in school. Consequently, the study does not include the adolescent population that is outside of school, a group that frequently faces greater social vulnerabilities and barriers to accessing health services. It is therefore presumed that the proportion of unvaccinated individuals in this unstudied population may be higher than that found among schoolchildren, which implies that the results may underestimate the true magnitude of HPV non-vaccination in the 13-17 age group in the municipality of São Paulo. However, a

rigorous methodology was used, and the importance of using PeNSE data is highlighted, as it is recognized as the first national initiative to comprehensively explore various aspects of adolescents' lives and habits. Furthermore, other HPV target groups were not evaluated here.

Final considerations

This study fulfilled its objective by elucidating the crucial factors associated with HPV non-vaccination among adolescents in the state of São Paulo, the second most populous in the country. The prevalence of unvaccinated adolescents was 17%. The findings indicate that male sex, older age (16 to 17 years), and not seeking health services in the last 12 months are the main determinants of HPV non-vaccination. These results reinforce the urgent need for more targeted public health strategies. Such strategies should focus on awareness campaigns with a gender-neutral approach, combating the misconception that HPV is exclusively a female issue. Furthermore, effective integration between health units and schools, such as through the PSE, is essential to guaranteeing access to and maintaining vaccination coverage throughout adolescence. Thus, the findings of this study are extremely useful to support strategic actions aimed at regaining vaccination coverage, addressing the specific care needs of this population.

Authorship contributions

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