



Master of Public Health

Master de Santé Publique

Social economic determinants of HPV Awareness, Uptake, and Intention among parents of adolescents in France

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List of Acronyms

HPV = Human Papillomavirus

STI = Sexually Transmitted Infection

WHO = World Health Organization

HAS = National Authority for Health

GP's = General practitioners

INSERM= French National Institute of Health & Medical Research

IReSP= Institute for Public Health Research

ITMO= Multi-Agency Thematic Institute

AVIESAN= French National Alliance for Life Sciences and Health

RP= referring physician

INCa = French Institute of Cancer

cRCT = Cluster randomized controlled trial

REDCap = Research Electronic Data Capture

KABP-7C = Knowledge, Attitudes, Beliefs, and Practices questionnaire

NR = No response

VC= Vaccination

vs = versus

OR = Odds ratio

CI = Confidence interval

DNK= Do not know

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Abstract (ENGLISH)

Introduction: Human Papillomavirus (HPV) immunization coverage remain <50% in France, particularly among disadvantaged populations. This study aimed to identify socio-economic inequalities on HPV awareness, uptake, and intention among parents of adolescents, and examined if physician visits mitigate these disparities.

Methods: Data from parents of middle school students in France were collected through an anonymous online survey. Multivariable logistic regressions were conducted to explore associations between socioeconomic factors and HPV vaccine awareness, uptake, and intention. Interaction analyses were performed to examine the influence of physician visits on significant socio-economic determinants.

Results: Among the 1,959 participants, French monolingual technicians and service workers (OR= 0.47, 95% CI: 0.25-0.87), farmers, small business owners, factory workers, and inactive (OR= 0.19, 95% CI: 0.10-0.36) had significantly lower odds of vaccine awareness compared to French monolingual executives and professionals. Multilingual individuals (speaking also another language in the family) in those occupational categories exhibited even lower odds: (OR=0.20, 95% CI: 0.08-0.47) and (OR= 0.09, 95% CI: 0.04-0.20), respectively. Parents living in moderate-low (OR=0.52, 95% CI: 0.37-0.74), moderate-high (OR=0.67, 95% CI: 0.47-0.94), and high deprivation areas (OR=0.64, 95% CI: 0.42-0.96) had lower odds of vaccine uptake compared to those in low deprivation. Parents in multilingual families in low-income occupations were less likely to have the intention to vaccinate their child (OR=0.19, 95% CI: 0.07-0.55). Physician visit did not mitigate any socio-economic inequalities in either of the outcomes.

Conclusion: This study provides further evidence on social inequalities on HPV vaccination in France, including awareness and intention, and emphasizes the importance of tailored approaches in HPV vaccination promotion.

Key words: Human papillomavirus, HPV vaccine, Awareness, Vaccination, Intentionality, Socioeconomic status, Parents, PrevHPV

1. Introduction

1.1 Human Papillomavirus

Human Papillomavirus (HPV) is the most common sexually transmitted infection (STI) that impacts millions of people worldwide [1-4]. Approximately 80-90% of sexually active men and women will contract it at some point in their lives through a viral infection that primarily affects the reproductive tract [5]. Most of the HPV infections are asymptomatic and may resolve on their own [2]. However, persistent infections can cause pre-cancerous lesions of the cervix, vagina, vulva, anus, penis, and head and neck, as well as anogenital warts and respiratory papillomatosis, which, if untreated, may lead to the development of certain types of cancers [2,3]. The HPV viruses are classified as a high-risk or low-risk type, with twelve types defined as high-risk (oncogenic), causing the development of cancerous cells in humans [6]. Cervical cancer remains the most common HPV-related type of cancer, mainly caused by two high-risk HPV types (16 and 18) [7,8]. HPV-16 is also the primary causative agent of oropharyngeal cancers, which are among the cancers with the most rapidly rising incidences around the world [11], especially in high-income countries which represents a major public health concern [9,10,11].

1.2 Epidemiology of HPV-associated cancers

HPV is responsible for a significant burden of disease worldwide. Cervical cancer is the fourth most frequent cancer among women in the world, accounting for 604,127 new cases and 341,831 deaths in 2020 [12]. The epidemiologic distribution of HPV infection and its related diseases varies significantly by region and population, ranging from 3.3% to 80.9% [13]. In Europe, it is the cause of almost all cervical cancers and is associated with 87% of anal cancers, 70% of vaginal cancers, 29% of penile cancers, 16% of vulva cancers and 8% of head and neck cancers [14]. Specially in France, there's an estimated 3,379 new cases of cervical cancer diagnosed and about 1,452 deaths related deaths, being also the fourth most common female cancer in women aged between 15 to 44 years [15]. These viruses are also responsible, each year, for more than 100,000 benign genital warts, 30,000 pre-cancerous lesions and 8,000 cancers of the genital, anal and oropharyngeal areas in the French country [13]. To reduce the burden of HPV infection and its related diseases at the population level, between 70% to 90% [13] of all these HPV-attributable cancer cases can be prevented by universal high-coverage HPV immunization [2,3].

1.3 HPV Vaccination

Vaccination is currently the most effective primary strategy for preventing HPV infection and reducing the incidence of related cancers [2-3]. Ideally, HPV vaccines should be

administrated prior to the onset of sexual activity [3]. Females and males can receive the first dose of the vaccine at 9 years of age and continue up to 26 or 45 years, while certain types of approved HPV vaccines can also be inoculated in males throughout their lives [2,16]. Modelling studies suggest that vaccinating both adolescent girls and boys with a 60% coverage can, in the long term, lead to the eradication of cervical cancer [17]. Since the first approved HPV vaccine in 2006 [3], most high-income countries have implemented it in their vaccination schedules for adolescents, girls only or girls and boys, depending on the country [18-19]. Despite national and international health authorities' efforts to improve HPV vaccine uptake [18,20-21] complete HPV vaccination coverage remains suboptimal in many of high-income and European countries [18-19], including France [19, 22-25].

1.3.1 HPV Vaccination in France

HPV vaccination has been recommended and included in the French vaccination calendar since 2007 for girls aged 11-14 years old [26]. The National Authority for Health (HAS) extended the recommendation for boys of the same age group in 2019. [27]. As of January 1, 2021, HPV vaccine for males has then been implemented in the French vaccine schedule as well [26], with a 65% coverage by the French Health Insurance [28]. Despite a slightly increase in HPV vaccination rates in the recent years, France has one of the lowest coverage rates for girls within Europe [19]. At the end of 2021, girls who had been immunized with 1-dose coverage at age 15 and 2-dose coverage at age 16 were 45.8% and 37.4%, respectively; while boys 1-dose coverage aged 15 was estimated at 6% [22,24]. Currently, the French vaccination coverage stood at 41%, a level far from the objectives established by the National Sexual Health Strategy and the ten-year Cancer control Plan of 60% coverage among adolescent girls aged 11 to 19 by 2023, and 80% by 2030 [29-30]. The insufficient vaccination coverage observed in France led the President, Emmanuel Macron, to announce the generalization of vaccination against the infection for all Cinquième (5e) students, free of charge and on a voluntary basis with the consent of both parents, starting on the beginning of the next school year, September 2023 [31]. Mothers and Fathers play a significant role in their child's vaccination, which can lead to social disparities or inequalities in uptake. Previous studies suggest that the main barriers leading to low HPV vaccine uptake in France are lack of parental awareness, lack of vaccine offer and low perceived accessibility, combined with widespread doubts regarding the need for vaccination and its safety [32]. While HPV vaccination coverage is gradually increasing, especially among young girls in France, it remains at moderate levels, particularly in socioeconomically disadvantaged populations [24].

1.4 Social economic determinants of HPV vaccination

Socio-economic and individual determinants of health are essential to understand vaccination uptake among parents. Multiple inequalities regarding HPV immunization among young girls and their parents have been documented in many countries. These inequalities arise from several factors including age, household income, parents' educational level, cultural beliefs, vaccination status for other vaccines, frequency of healthcare utilization, health coverage, as well as the engagement of mothers in gynecological consultations and screening [24,33-35]. In France, several influential factors have been identified, such as, educational level, income, geographic location, and others [13,24,36]. Many studies have found that girls from low-income families are less likely to receive the HPV vaccine, with lower coverage rates observed in rural areas and areas with high poverty levels [24,37-39]. Also, enrollment in a free complementary welfare healthcare program targeting individuals with low incomes [39] and the lack of a complementary private health insurance are associated with lower HPV vaccination rates among girls and lower uptake of screening among French women [38]. Consequently, young girls and women from underprivileged backgrounds have an increased risk of not benefiting from either of the two cervical cancer prevention measures throughout their lifetime [38]. In light of the existing literature, the main hypothesis of this study is that socio-economic factors influence HPV vaccine awareness, uptake, and intention among French parents. Understanding the socio-economic determinants that impact HPV vaccine uptake is crucial to develop targeted interventions addressing immunization disparities and to achieve equitable access to HPV prevention across all socio-economic groups.

1.5 Research aims and objectives

Despite the availability of the HPV-vaccine for both genders, uptake rates in France remain low [23], particularly among individuals from diverse socio-economic backgrounds. To understand the underlying causes of vaccine hesitancy in this population, social determinants must be studied. **Therefore, we aimed to explore socio-economic inequalities that contribute to lower uptake rates, and influence HPV vaccine awareness, child vaccination uptake and parental intention to immunize in France.**

This study sits within the Prev-HPV project conducted in mainland France as a collaborative effort between leaders of eight French research teams, and representatives from various national institutions, including Inserm, IReSP, ITMO Cancer AVIESAN, ITMO Public Health AVIESAN, INCa, Santé Publique France, (French Public Health Agency), Ministry of Health, Ministry of National Education, and the Ile-de-France Regional Health Agency [40]. The

project combines Epidemiology, and Social and Human Sciences approaches on socio-economic determinants of HPV awareness, uptake, attitudes, and intention to get vaccinated among adolescents and their parents to identify barriers leading to low HPV vaccine uptake in France. The focus of this study will be solely on the parents of the adolescents.

The study had the following specific objectives:

1. Examine the association between parent's demographic and socio-economic characteristics with their level of awareness, uptake, and intentionality of HPV vaccination for their adolescent child.
2. Investigate whether referring physician (RP) visits mitigate socio-economic inequalities.
3. Describe knowledge and attitudes items by socio-economic gradients and physician visit with/without vaccine offer.

2. Methodology

2.1. The PrevHPV study

The present study uses data sourced from the Prev-HPV project, which is a nationwide research initiative established by The French Institute of Cancer (INCa) with the aim to increase HPV-vaccination rates among French adolescents. Prev-HPV is a cluster randomized controlled trial (cRCT) in France that aimed to evaluate the impact of a multicomponent intervention on HPV vaccination uptake and promotion campaign among French adolescents and their parents, and GP-training [40]. The target populations of the intervention are adolescents attending secondary school in nine regions of mainland France territory in a total 60 French municipalities, their parents and GP's. The unit of randomization (cluster) is the municipality. Complete details on participation and inclusion are available in the PrevHPV paper by Boquier et al. [40]. The main objective of the national research project is assessing the efficiency, effectiveness, and implementation of a comprehensive intervention, incorporating both school-based and primary care-based components, on the uptake of HPV vaccine among French adolescents.

This research study analyzed the baseline data from 2,008 parents of adolescents in the participating middle-schools via an anonymous online survey published on the REDcap online survey platform, which is a secure web application for building and managing online surveys and databases. The data collection period was from November 22, 2021, until February 8, 2022. The survey gathered information on socio-economic and demographic characteristics and vaccination

related questions, such as awareness, aptitudes, attitudes and knowledge around HPV-related diseases and vaccination, physician visit, discussion and vaccine offered, child HPV vaccination status and intention to vaccinate.

2.2 Variables

Variables collection, coding and analysis follows the protocol of a previous paper on the adolescent participants in this trial (Moffroid et al., submitted).

2.2.1 Outcomes

We analyzed three outcomes regarding HPV, the awareness, vaccine uptake and intention to vaccinate the child on parents of adolescents in France. HPV awareness was evaluated using the question “Have you ever heard of a Human Papillomavirus (HPV) vaccine?” (Yes/No/ I am not sure). Among those aware, vaccination status of the child was then evaluated as “Is your child vaccinated against Human Papillomavirus (HPV)?” Individuals who responded not being sure were included into the unvaccinated group. As for the vaccine intentionality, parents who have an unvaccinated child and had heard of HPV vaccine were categorized as: Refusal (“HPV vaccination is not relevant for me”), Indecision (“I consider HPV vaccination relevant, but I am not sure about getting my child vaccinated”) and Intention (“I plan to make an appointment soon to have my child vaccinated against HPV/ I have made an appointment, or I have a prescription to have my child vaccinated against HPV”).

2.2.2 Socio-demographic and economic determinants

The study provided information of the participants socio-demographic and economic characteristics, including their sex and age range. The language spoken at home was determined by a self-reported question asking if the parent speaks a language other than French fluently with their child at home, with options for French monolingual and multilingual. Parental occupation was categorized into five distinct groups for analysis purposes; 1) farmers/small business owners, which includes farmers, craftsmen, merchants, and business managers with less than 10 employees, 2) executives and professionals, consisting of heads of companies with 10 or more employees, managers, teachers at college, high school or university, researchers, engineers, and those in liberal professions such as doctors or lawyers, 3) technicians and service workers, which included intermediate professions, technicians such as teachers, school teachers, and nurses, and employees such as secretaries, switchboard operators, book keepers, salesmen, bar or restaurant servers, and cashiers, 4) factory workers, or craftsman trades such as agricultural workers, plumbers, electricians, butchers, and road workers, and 5) inactive/others, which included students, apprentices, and others not falling into the previous categories. The living area

characteristics were analyzed regarding the type of area they live in (urban, peri-urban, and rural) and the school area deprivation index, which measures the level of deprivation in the area where the parent's child school is located. For the latter, we used the Fdep index [ref]. Four categories of school areas deprivation level were created: low (index ≤ -1); moderate low (index > -1 to 0); moderate high (index > 0 to 1); and high (index > 1). As for the child characteristics, sex and current grade level were collected, with grade level used to determine the child's age. Refer to Supplemental table 1 (ST1).

2.2.3 Personal Aptitudes and General Attitudes

Personal aptitudes were evaluated on their parental perspective of HPV, vaccination and the social environment around them, ease of finding information concerning HPV, and ease of talking to health professionals and close persons about HPV. Most of the questions had 5-point Likert scale responses, who were then categorized as “unfavorable, undecided and favorable” and “disagree, undecided and Agree”. Others such as “Are you against certain vaccinations in particular?”, “Do you think you are sufficiently informed about the vaccination of adolescents aged 11 to 14?” responses were assessed as “Yes, I don't know, and no) (ST1).

2.2.4 External Influences

External influences were defined as factors outside the individual, such as physician visit, discussions, recommendations, and family and friends HPV vaccination point of view and status. To evaluate the adolescent's recent interaction with a physician, two questions were asked to the parents: "Has your child had a consultation with his doctor during the last twelve months?" and "Has your child's doctor ever offered to vaccinate him against Human Papillomavirus (HPV)?". Other external influences questions also included a discussion about HPV vaccine “Has your child's doctor ever told you or the other parent about Human Papillomaviruses (HPV)?” and family and friends vaccination status showed in (ST1).

2.2.5 Knowledge and Attitude towards HPV vaccination

To evaluate HPV-related knowledge and attitudes, a KABP questionnaire, commonly used in research studies to gather information about people's knowledge, attitudes, beliefs, and practices related to a specific area of interest, was developed for the PrevHPV trial. The aim was to evaluate the effect of intervention components on knowledge, attitudes and behaviors related to seven psychological antecedents (“7C model”) influencing vaccine acceptance, including social conformism and confidence in the healthcare system [41]. Knowledge-based questions on HPV vaccination, diseases, global awareness of HPV, benefits, and risks, among others were included in the analyses as the proportion of respondents who provided a correct, incorrect, and unsure

answer (ST1). As for the individual attitudes towards HPV a 5-point Likert scale was used. The analysis involved determining the percentage of respondents who held favorable, undecided, and unfavorable attitudes towards HPV vaccination.

2.3. Statistical Analysis

All analyses were performed on the STATA software, version 17.

2.3.1 Descriptive Analyses

Baseline characteristics of the population sample were analyzed according to demographic and socio-economic status and stratified by the responding parent's sex. HPV-vaccine related outcomes (Awareness, Vaccine uptake and Intentionality) among included parents of the adolescents in France were described as total and percent's and then stratified and described by: Awareness (Aware/Not aware), Vaccination status (Vaccinated/Not vaccinated), and Intentionality (Refusal/ Indecision/ Intention). The parent's population characteristics were grouped into 3 categories: Socio-demographic and economic factors, Personal Aptitudes and General Attitudes, and External influences. Significant attitudes and knowledge items related to HPV were presented as proportions for parents who had heard about the HPV vaccine, and categorized by socio-economic factors, and physician visit and vaccine offer. Chi-square test of independence was used to evaluate the associations between the study population characteristics, outcomes, and differences in vaccine knowledge and attitudes across these subgroups. The percentages of respondents were rounded to the nearest value, with one decimal place.

2.3.2 Bivariable Analyses

Bivariable analyses were conducted to explore the associations between socio-demographic -economic characteristics, personal aptitudes, general attitudes, and external influences in each outcome of interest. Variables with a p-value of less than <0.20 in logistic regression were considered statistically significant and subsequently included in multivariable logistic and multinomial regression analyses models. This threshold was chosen to identify a wider range of meaningful associations, account for potential interactions and confounding factors, and improve the reliability of parameter estimates.

2.3.3 Multivariable Logistic and Multinomial Regression Analyses

To explore the socio-demographic and economic determinants influencing HPV vaccine awareness (binary), vaccine status (binary), and intentionality (three levels: refusal, indecision,

and intention), multivariable logistic and multinomial regression models were conducted. For multinomial analyses, intentionality (refusal, indecision, and intention) was classified as indecision vs refusal and intention vs refusal, with refusal as the reference category. For each outcome, a socio-demographic –economic model including all variables, and full multivariable and multinomial models were analyzed including all variables associated in bivariable analysis. The occupation and language variables were merged in all outcomes. This was based on the hypothesis that language barriers and parent's occupation/ educational level may contribute to lack of awareness, misconceptions, and vaccine hesitancy. The physician visit and vaccine offer variables were combined for the vaccination status and intentionality outcomes analyses as well. Consequently, parsimonious models were conducted, where the statistical significance was defined as p-value <0.05 to ensure that only statistically significant associations were identified, while also minimizing the risk of false positive findings. The results are presented as odds ratios, p-values, and 95% confidence intervals (95% CI), allowing for a clear interpretation of the associations between the examined factors and each outcome.

2.3.4 Effect modification Analyses

We explored the potential effect modification of physician visit (Visit, no visit) on the associations between the significant socio-economic determinants and the three outcomes of interest by conducting interaction analyses. Significant interactions were defined as those factors with p-values less than <0.05.

2.4 Ethical considerations

The French Ethics Committee "CPP Sud-Est VI" approved the protocol on December 22, 2020 (ID-RCB: 2020-A02031-38), and it was then submitted to ClinicalTrials.gov for registration (NCT04945655). Individual consent is not required for this type of survey in France. However, all participants were informed of their right to choose not to participate or to oppose the gathering of data concerning them.

3. Results

3.1 Population inclusion

A total of 2,008 participants connected to the survey platform, and accepted participation. After excluding 5 individuals with missing characteristics and 44 with missing values for the variable HPV vaccine awareness the final population for analysis was 1,959 individuals (Figure 1).

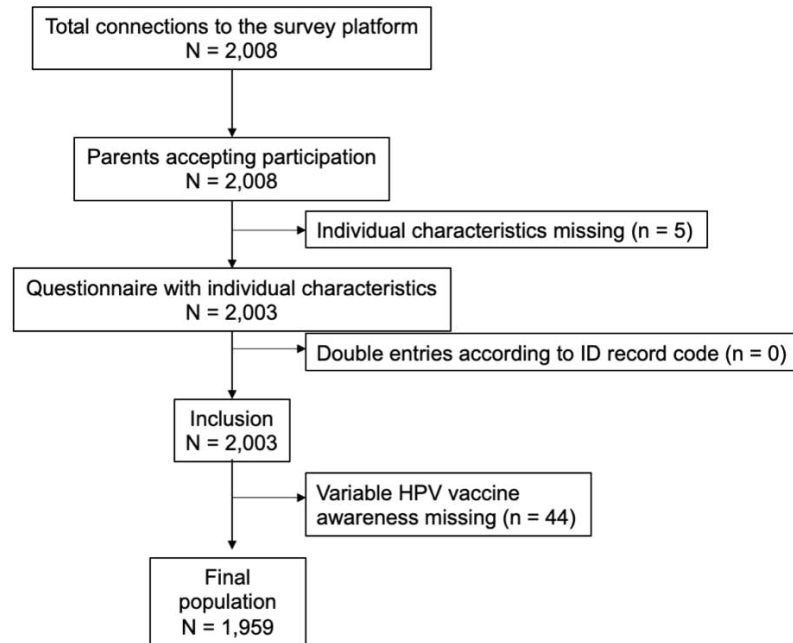


Figure 1. Flowchart of participants inclusion

3.2. Description of the study population

The socio-economic and demographic characteristics of the study population are shown in Table 1, including the overall sample, and disaggregated by the sex of the parent. The total sample size consisted of 1,767 (90.2%) mothers and 192 (9.8%) fathers. The age distribution of participants showed that most parents were between 35 and 44 years old (60.6%, n=1,188), followed by those over 45 years (33.6%, n=659). Only a small proportion were under 35 years old (5.8%, n=112). The occupation of the participants was diverse, most parents work as technicians/ service workers (53.5%, n=1,049), and as executives/ professionals (21.8%, n=426). The remaining population were farmers or small business owners (4.7%, n=92), factory workers (3.9%, n=76), or inactive (16.1%, n=316). Most of the participants are French monolinguals (90.1%, n=1,765), compared to 9.9% (n=194) that responded being multilingual. In terms of socio-economic characteristics, most of the participants lived in urban zones (64.7%, n=1,269), followed by peri-urban (11.2%, n=218) and rural zones (22.2%, n=434). As for the deprivation area, most parents have their child enrolled in a moderate-high (36.4%, n=712) and moderate-low school deprivation area (35.4%, n=694). Only 12.3% (n=241) reported their child attending a school in a low deprivation area. Thirty-eight parents did not provide a response and were consequently excluded from further analysis. As for the adolescents' characteristics, the studied population have slightly more daughters (53.2%, n=1,043) than sons (46.8%, n=916) with a

relatively even distribution across the age groups, but most have a child age between 12-13 years (30.5%, n=598).

Table 1. Participant characteristics (overall and stratified by sex) among included parents of adolescents in France, 2021-2022 (N=1,959).

Characteristics	Total (N=1,959)	Mothers (N=1,767)	Fathers (N=192)
	N (%)	N (%)	N (%)
Age			
Less than 35 years	112 (5.8)	98 (5.5)	14 (7.3)
Between 35 and 44 years	1,188 (60.6)	1,102 (62.4)	86 (44.8)
More than 45 years	659 (33.6)	567 (32.1)	92 (47.9)
Occupation			
Farmers/small business owners	92 (4.7)	85 (4.8)	7 (3.7)
Executives and professionals	426 (21.8)	353 (20.0)	73 (38.0)
Technicians/service workers	1,049 (53.5)	986 (55.8)	63 (32.8)
Factory workers	76 (3.9)	53 (3.0)	23 (12.0)
Inactive/ others	316 (16.1)	290 (16.4)	26 (13.5)
Language			
Multilingual	194 (9.9)	161 (9.1)	33 (17.2)
French monolingual	1,765 (90.1)	1,606 (91.0)	159 (82.8)
Living Environment			
Urban	1,269 (64.7)	1,133 (65.3)	136 (73.1)
Peri-urban	218 (11.2)	202 (11.6)	16 (8.6)
Rural	434 (22.2)	400 (23.1)	34 (18.3)
NR	38		
School area deprivation index			
Low	241 (12.3)	210 (12.1)	31 (16.7)
Moderate low	694 (35.4)	619 (35.7)	75 (40.3)
Moderate high	712 (36.4)	653 (37.6)	59 (31.7)
High	274 (14.0)	253 (14.6)	21 (11.3)
NR	38		
Child sex			
Girl	1,043 (53.2)	953 (53.9)	90 (46.9)
Boy	916 (46.8)	814 (46.1)	102 (53.1)
Child age			
10-11 years	456 (23.3)	407 (23.0)	49 (25.5)
11-12 years	442 (22.6)	411 (23.3)	31 (16.2)
12-13 years	598 (30.5)	544 (30.8)	54 (28.1)
13-14 years	463 (23.6)	405 (22.9)	58 (30.2)

NR= no response

3.3 Outcomes

Figure 2 shows the HPV-vaccine related outcomes (Awareness, Vaccination status and Intentionality) among the parents of adolescents in France. Of the 1,959 total participants, 88.4% (n=1,733) had heard about the HPV vaccine, while 9.2% (n=178) had not heard about it, and 2.4% (n=48) were not sure. Of those aware of the HPV vaccine, 37.7% (n=664) had vaccinated their child, 61.5% (n=1,082) had not vaccinated it, and only 0.8% (n=14) were not sure. Out of the 1,081 participants who have an unvaccinated child, 55.4% (n=599) had the intention to vaccinate, 32.0% (n=346) were not sure, and 12.6% (n=136) did not intend to vaccinate the child.

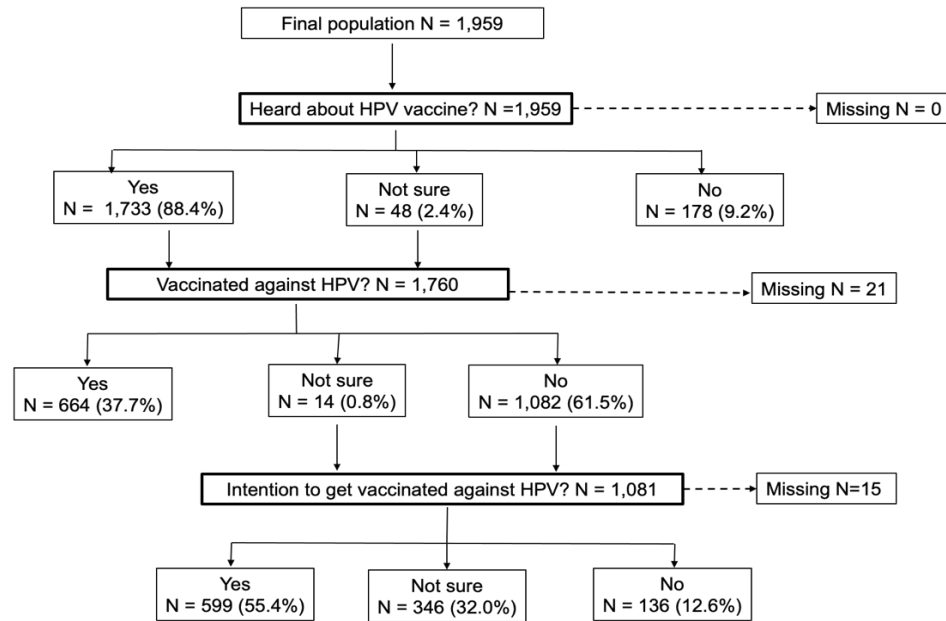


Figure 2. Flowchart HPV-vaccine related outcomes among included parents of adolescents in France, 2021-2022.

3.4 Descriptive Analyses of HPV Awareness

3.4.1 Socio-demographic -economic

Based on the social characteristics of the parents' population, mothers were more aware of HPV and related vaccination (VC) (92.3%, n=1,631) compared to fathers (78.1%, n=150). Among the parents, 91.1% (n=1623) of French monolingual and 81.4% of multilinguals (n=158) responded having heard about HPV. Individuals who were between 35 and 44 years and more than 45 years, were more aware (91.4%, n=1,086 and 91.7%, n=604) than those who were less than 35 years (81.3%, n=91). Parents who are executives/professionals (95.5%, n=407), technicians, and service workers (92.7%, n=972) were the most aware compared to the other groups. While parents that are farmers or small business owners were the least aware group (81.5%, n=75). Residents of rural areas had a slightly higher awareness rate (92.4%, n=401) than those who live in urban (90.6%, n=1,150) and peri-urban (90.9%, n=198). As for the deprivation area, participants that had their child at higher deprivation school area were associated with slightly lower awareness rates (86.6%, n=240) than those in low (91.7%, n=221), moderate low (91.6%, n=636) and moderate high areas (91.6%, n=952). Based on the child characteristics, parents who have a girl had a higher awareness rate (93.5%, n=975) compared to those who

have boys (87.9%, n=806), with those who have children aged between 11-12 and 12-13 years old (both 92.3%, n= 408 and n=552) being more aware about HPV. Refer to Table ST2.

3.4.2 Personal Aptitudes and General Attitudes

More than a half of parents (53.48%, n=960) agreed that it is easy to find information related to HPV. Regarding the general attitudes towards vaccination in general, most parents (88.8%, n=1,739) had a favorable attitude, while 33.38% (n=651) responded being opposed to certain vaccines. Notably, 89.5% (n=1,754) of parents agreed that VC protects the population and most vulnerable people, and 79.8% (n=1,564) believed that there are more benefits than risks associated with getting immunized. While 38% (n=745) disagree that VC may interfere with the development of the body's natural immunity, 33.8% (n=661) is undecided and 28.2% (n=553) think that being vaccinated may change the body's natural immunity response. Furthermore, 65.5% (n=1,284) of parents expressed confidence in the information provided by health professionals. Lastly, based on their family and friends' vaccination point of view, most parents (76.9%, n=1,507) reported a favorable attitude (Table ST2).

3.4.3 External influences

Among the 1,698 (87.6%) parents who had visited a physician, 92.3% (n=1,568) knew about HPV and related vaccine, with only 7.7% (n=130) being unaware. In contrast, of the 203 (10.5%) parents who reported not visiting a physician in the past twelve months, 79.3% (n=203) were aware of HPV. Twenty-one parents didn't respond to this question thus were not included in further analysis (Table ST2).

3.5 Descriptive Analyses of HPV vaccine uptake

3.5.1 Socio-demographic -economic

Based on the 1,760 parents who were aware of HPV and related vaccination, 64.1% (n=93) fathers, and 62.1% (n=1,003) mothers had an unvaccinated child. Of the population, 61.9% (n=994) French monolinguals and 65.4% (n=102) multilingual parents had not immunized the child against HPV. Older parents who were aged between 35 and 44 years old (63.8%, n=685) and over 45 years old (57.8%, n=346), were the groups with most unimmunized children (42.2%, n=253), while younger parents, under 35 years old, were the group with the greatest proportion of unvaccinated child (74.7%, n=65). Regarding the occupation, 77.4% (n=48) factory workers, 65.8% (n=48) farmers and small business owners, and 62.7% of both technicians/ service workers and inactive parents (n=602, n=163) had the highest rate of unvaccinated children. While executives and professionals have slightly less proportion of unvaccinated children (58.1%, n=235). Parents who have their child in moderate low (64.8%, n=410) and high deprivation school

areas (65.1%, n=155) are the ones with higher unvaccinated rates, compared to moderate-high (62.3%, n=401) and low areas (52.1%, n=112). Furthermore, those who live in urban (62.2%, n=709), peri-urban (65.5%, n=129) and rural areas (60.9%, n=240) also responded by having an unvaccinated child. Based on the adolescents' characteristics, out of the 963 parents that had a girl, 49.9% have not immunized them, and 797 parents who had a boy, 77.9% haven't vaccinate them either. Finally, those with younger children aged between 10-11 (72.7%, n=290) and 11-12 years old (69.3%, n=280) are the most unvaccinated groups as shown in Table ST3.

3.5.2 Personal Aptitudes and General Attitudes

Among parents who trusted the school system, 37.9% (n=414) had vaccinated their child, while 62.1% (n=677) had not. Regarding the ease of finding information, 53.8% (n=947) of parents agreed with this statement. Among them, only 42.5% (n=402) had vaccinated their children. Overall, 89.7% (n=1,579) of parents had a favorable attitude towards VC in general. Of those with a favorable attitude, only 39.6% (n=625) had vaccinated their children. Similarly, 90.9% (n=1,600) of parents agreed that vaccination protects the population, but only 38.9% (n=623) had vaccinated their child. Moreover, 81.5% (n=1,435) of parents that believed that there are more benefits than risks associated with getting vaccinated, 40.3% (n=579) had vaccinated the child. Among parents that had the perception that VC may interfere with the development of the body's natural immunity, 72.5% (n=345) had unvaccinated children. Regarding vaccination in general, of the 32.8% (n=575) of parents that declared being opposed to some vaccines, 70.8% (n=407) had not vaccinated their child. Most parents (67.4%, n=1,187) expressed confidence in the information provided by health professionals, of those 43.1% had vaccinated their child. Refer to Table ST3.

3.5.3 External influences

Of the parents who visited a physician (89.1%, n=1,568), 41.1% (n=645) had vaccinated their child, while 58.9% (n=923) had not. Discussing HPV and VC with the child's physician played a role, as parents who had such discussions (63.7%, n=1,121) had a higher percentage of vaccinated children (54.1%, n=607). Conversely, among parents who did not discuss HPV with the physician (34.7%, n=610), the majority (91.8%, n=560) declared having an unvaccinated child. Furthermore, when HPV vaccination was offered by physicians (58.9%, n=1,037), 59.0% (n=612) reported having vaccinated the child, whereas among those who did not receive an offer (39.7%, n=698), the majority (93.3%, n=651) had unvaccinated children. Regarding attitudes towards HPV vaccination in the social environment, of the 63.6% (n=1,120) with favorable attitudes, 43.5% (n=487) had vaccinated the child. Additionally, among parents who were aware of the VC status of family and friends (61.1%, n=1,075), 48.8% (n=525) had vaccinated the child (Table ST3).

3.6 Descriptive Analyses of HPV vaccine intentionality

3.6.1 Socio-demographic -economic

Based on the 1,081 parents who haven't vaccinated their child, 62% (n=57) of fathers and 54.5% (n=542) of mothers expressed the intention to vaccinate their child. More mothers (32.8%, n=324) reported being indecisive compared to fathers (23.9%, n=22). Both French monolinguals (55.9%, n=549) and multilingual parents (50.5%, n=50) expressed a high intention to vaccinate, with a slightly higher percentage of indecision and refusal among multilingual parents compared to French monolinguals (Table ST4). Parents between 35-44 years old had the highest rate of intention to vaccinate (57.8%, n=391), followed by those under 35 (56.5%, n=35). Indecision was relatively consistent across age groups, with approximately 30-35% in each category. Regarding the occupation, farmers/small business owners (66%, n=31) and executives/professionals (63.6%, n=147) had the highest intention to vaccinate, followed by technicians/service workers (54.1%, n=323). Factory workers had similarly distribution among intention (43.8%, n=21), and indecision (43.7%, n=21), while inactive individuals were the group who had the highest proportion of refusal between the groups (22.2%). In terms of school deprivation area, parents who have their child in low (64.7%, n=72) and moderate-high (62.2%, n=248) school deprivation areas had the highest intention to vaccinate, while those in high deprivation areas had less intention (41.6%, n=64). Parents residing in rural areas showed most intention to vaccinate (56.5%, n=135), followed by urban areas (55.9%, n=390) and peri-urban areas (51.6%, n=66). Based on the adolescents' characteristics, most parents of girls expressed the intention to vaccinate (63.4%, n=294), compared to those who have boys (49.4%, n=305), who are the most indecisive (35.2%, n=217). Most parents intended to vaccinate children aged 11-12 (62.3%, n=172), while those with adolescents aged 12-13 were the most indecisive (39.0%, n=130).

3.6.2 Personal Aptitudes and General Attitudes

Based on the attitudes of French parents with unvaccinated children, those who agreed with the school system (61.5%, n=665) had a higher intention to vaccinate their child (57.9%, n=385). Approximately, half of the study population (49.8%, n=538) found it easy to access information about HPV vaccination, and consequently they had a higher intention to vaccinate their child (65.6%, n=353) (Table ST4). Parents with favorable attitude towards vaccination in general (87.1%, n=942) were more likely to intend to vaccinate their child (59.8%, n=563). Additionally, parents who agreed that VC protects the population (89.1%, n=964) also had a higher intention to vaccinate (58.6%, n=565). Similarly, those who believed in the benefits of vaccination (78.3%, n=846) intend to vaccinate their child (61.6%, n=521). Most parents (88.4%,

n=955) agreed that vaccination protects the most vulnerable people. Interestingly, among those who believed that vaccination may interfere with natural immunity (31.5%, n=340), a significant proportion expressed intention to vaccinate (68.7%, n=274). Furthermore, most parents (61.3%, n=661) did not express any vaccine opposition. However, 37.4% (n=403) reported being opposed to some vaccines, and among them 36% (n=145) expressed intention to vaccinate the child. Regarding the perspectives of family and friends on VC, parents who held a favorable opinion of their views (76%, n=822) had the most intention to vaccinate their child (60.5%, n=498). Additionally, parents who had confidence in the information provided by health professionals (61.6%, n=666) also expressed an intention to vaccinate their child (67.1%, n=447). However, many parents remained undecided or disagreed with these attitudes as shown in Table ST4.

3.6.3 External influences

Among parents who visited a physician and had an unvaccinated child (84.3%, n=911), 55.4% intended to vaccinate, while 32.3% were indecisive. Conversely, among parents who did not visit a physician (13.2%, n=143), 53.8% intended to vaccinate and 33.6% were unsure. Those who discussed HPV with physicians (46.8%, n=506) had a higher intention to vaccinate (70.1%). In contrast, among the parents who did not discuss HPV (51.4%, n=556), 41.7% had the intention to vaccinate, and 39% were unsure. Parents who reported being offered the HPV vaccine (38.8%, n=420), showed the most intention to vaccinate (74.5%), while among those who did not receive a vaccine offer (59.6%, n=644), 43.2% intended to vaccinate. Furthermore, parents with favorable attitudes towards HPV VC in the social environment (57.8%, n=625), expressed a higher intention to vaccinate (73.1%), as did those who were aware of the vaccination status of their family and friends' (50.7%, n=548), of which 66.8% have intentions. See Table ST4 for the overall results.

3.7 Regression analyses

3.7.1 Bivariable analyses

3.7.1.1 Social determinants of Awareness

Significant associations were found regarding parental awareness as shown in Table ST2. Being a mother, (father, OR= 0.30, 95% CI: 0.20-0.44), a French monolingual parent (multilingual, OR= 0.38, 95% CI: 0.26-0.57), older than 35 years (between 35-44 years, OR: 2.46, 95% CI: 1.47-4.12 and over 45 years OR= 2.53, 95% CI: 1.46-4.39), and having a high-income occupation, as an executive/professional (OR= 4.86, 95% CI: 2.41-9.77) or technician/service worker (OR= 2.86, 95% CI: 1.61-5.09) was positively associated with being aware. High deprivation area was also associated (OR: 0.64, 95% CI: 0.36-1.14) compared to those in lower areas (reference group). As for the child characteristics, parents that have a girl (OR= 1.96, 95% CI: 1.43-2.69)

and a child between 11-13 years (both OR= 1.44, 11-12 years 95% CI: 0.91-2.29 and 12-13 years, 95% CI: 0.95-2.20) had higher odds of awareness.

3.7.1.2 Social determinants of Vaccine Uptake

Parents aged between 35-44 years (OR=1.68, 95% CI: 1.02-2.76), older than 45 years (OR=2.16, 95% CI: 1.30-3.60), and factory workers (OR=0.52, 95% CI: 0.26-1.21) showed significant associations in vaccine uptake. Furthermore, parents living in higher (OR=0.58, 95% CI: 0.40-0.85), moderate-low (OR=0.59, 95% CI: 0.43-0.81) and moderate-high (OR=0.66, 95% CI: 0.48-0.90) deprivation areas were associated with lower vaccine uptake. Regarding the child's characteristics, those who have girls (OR=3.62, 95% CI: 2.94-4.47), children aged 12-13 years (OR=1.69, 95% CI: 1.28-2.24) and 13-14 years (OR=3.04, 95% CI: 2.26-4.07) had higher odds of vaccinating them as shown in Table ST3.

3.7.1.3 Social determinants of Intentionality

In the analysis of indecision vs refusal among parents with an HPV unimmunized child, occupation was found to be significant for those categorized as Inactive (OR=0.44, p=0.183, 95% CI: 0.13-1.48). Adolescent characteristics, such as having a girl (OR= 1.38, 95% CI: 0.90-2.11), and an adolescent aged 12-13 years (OR= 2.78, 95% CI: 1.62-4.76) and 13-14 years (OR=1.71, 95% CI: 0.95-3.10) were also found significant factors. As for the intention vs refusal analysis, occupation (Inactive, OR=0.28, 95% CI: 0.09-0.87), and school deprivation area (high OR=0.41, 95% CI: 0.19-0.88), (moderate-low, OR=0.59, 95% CI: 0.30-1.17) were significantly associated with the intention to vaccinate. As for the child characteristics, parents that have a female child (OR=2.23, 95% CI: 1.50-3.33), a child aged 11-12 years (OR=1.53, 95% CI: 0.94-2.48) and 12-13 years (OR=2.00, 95% CI: 1.20-3.34) was found significant (Table ST4).

3.7.2. Multivariable and Multinomial Analysis

3.7.2.1 Socio-demographic -economic determinants of HPV Awareness

Based on the socio-demographic and economic model results, HPV vaccine awareness was significantly associated with parents' sex, age, language/occupation, and child sex. Mothers had higher odds of HPV awareness compared to fathers (OR= 0.29, 95% CI: 0.19-0.45). Age was also significant, with individuals aged 35-44 years (OR= 1.80, 95% CI: 1.02-3.20) and above 45 years (OR= 2.22, 95% CI: 1.20-4.09) showing increased odds of awareness. As for language and occupation, parents who are French monolingual and work as technicians and service workers (OR= 0.47, 95% CI: 0.25-0.87), farmers, small business owners, factory workers, or are inactive

(OR= 0.19, 95% CI: 0.10-0.36) had significantly lower odds compared to French monolingual executives and professionals. Similarly, multilingual individuals who are technicians and service workers (OR=0.20, 95% CI: 0.08-0.47) and farmers, small business owners, factory workers, or are inactive (OR= 0.09, 95% CI: 0.04-0.20) exhibited even lower odds of HPV awareness as shown in Table 2. Additionally, having a female child (OR= 1.95, 95% CI: 1.39-2.73) was associated with higher odds of awareness.

After adjusting for attitudes and external influences factors in the full model, it was also found that sex of the parent (male, OR= 0.26, 95% CI: 0.16-0.40), age (35-44 years, OR= 1.79, 95% CI: 0.99-3.23, and above 45 years, OR= 2.19, 95% CI: 1.15-4.14), language/occupation, French monolingual individuals in lower income occupational categories (OR= 0.26 – 0.54, 95% CI: 0.13-0.50, 0.29-1.03), multilingual individuals in two occupational categories (OR= 0.11-0.23, 95% CI: 0.05-0.25, 0.10-0.56), child sex (girl, OR=2.03, 95% CI:1.43-2.86) and RP visit (no visit, OR= 0.34, 95% CI: 0.22-0.52) were significantly associated with HPV awareness. Other significant variables can be seen in Table ST5. To confirm the associations observed in the previous models, ST5 shows that in the parsimonious model, mothers (fathers, OR= 0.26), parents of older age (45 years+, OR=2.33, and between 35 and 44 years, OR=1.91), French and multilingual individuals who have a high income occupation (French and multilingual individuals low income occupation OR=0.51,0.23, 0.20 and 0.11, respectively), have a female child (OR=1.95), those who visit a RP (No visit, OR=0.32) and are aware of the HPV vaccine.

3.7.2.2 Socio-demographic -economic determinants of HPV Vaccine Uptake

The socio-demographic and economic model, shown in Table 2, revealed significant associations with parents' age, language/occupation, school deprivation area, child sex, and age. Parents who were older than 45 years (OR=1.82, 95% CI: 1.03-3.22) had significantly higher odds of vaccine uptake compared to younger parents (less than 35 years). As for the parent's occupation, French monolingual farmers, small business owners, factory workers, and inactive had significantly lower odds of HPV vaccine uptake compared to the reference group (OR=0.69, 95% CI: 0.49-0.97). Furthermore, parents living in moderate-low (OR=0.52, 95% CI: 0.37-0.74), moderate-high (OR=0.67, 95% CI: 0.47-0.94), and high deprivation areas (OR=0.64, 95% CI: 0.42-0.96) had lower odds of vaccine uptake compared to those in low deprivation areas. Regarding the child characteristics, those who have girls (OR=4.14, 95% CI: 3.31-5.18), a child aged between 12-13 years (OR=2.03, 95% CI: 1.50-2.75) and 13-14 years (OR=3.88, 95% CI: 2.80-5.35) have higher odds of vaccine uptake compared to those with a 10–11-year-old child.

After controlling for attitudes and external influences factors in the full model, the analysis revealed that age (45 years+, OR: 1.96, 95% CI: 0.97-3.96), school deprivation area (moderate-low, OR= 0.55, 95% CI: 0.36-0.84), child sex (female, OR= 2.89, 95% CI: 2.20- 3.82), child age (12-13 years, OR=2.01, 95% CI: 1.39-2.91 ,and 13-14 years (OR=4.03, 95% CI: 2.71-6.04), and RP visit and vaccine offer (Visited and vaccine not offered/unsure, OR=0.10, 95% CI: 0.05-0.17, and no visit, OR=0.08, 95% CI: 0.04-0.15) were significantly associated with HPV vaccine uptake. In order to validate the associations identified in the previous models, Table ST6 shows that in parsimonious, vaccine uptake remained significant for older parents (45 years+, OR=2.00), parents that have a female child (OR=2.85) and those with a child between the ages 12-14yrs (12-13 years, OR=2.04 and 13-14 years, OR=4.05). In contrast, those who live in moderate low deprivation area (OR=0.51, 95%-CI: 0.34 – 0.77) and were not offered the vaccine during RP visit (OR=0.07, 95% CI: 0.04 – 0.12) or did not visit (OR=0.07, 95% CI: 0.05 -0.10) were associated with lower odds of vaccine uptake.

3.7.2.3 Socio-demographic -economic determinants of HPV Intentionality

The determinants of HPV vaccine intentionality differed between intention vs refusal, and indecision vs refusal (Table 2). In the Socio-demographic and economic model, intention vs refusal was significantly associated with language/occupation, child sex and age. Parents who had a girl (OR=2.78, 95%-CI: 1.82-4.26) and a child aged 11 years or older (OR=1.96, 1.97, 2.60) have more odds of intention to vaccinate. In contrast, parents that are French monolingual (OR=0.49, 95% CI: 0.26-0.93) and multilingual OR=0.19, 95% CI: 0.07-0.55) farmers and small business owners, factory workers, and inactive have less odds of intention. For indecision vs refusal, only the child sex (female, OR=1.64, 95%-CI: 1.04-2.56) and age (12-13 years, OR=3.20, 95% CI: 1.82-5.63) (13-14 years, OR=2.07, 95% CI: 1.12-3.85) were significant.

After adjusting for others factors in the full model (Tables ST7-ST8), language/occupation (Multilingual, Farmers and small business owners, Factory workers, and Inactive (others), OR=0.26, 95%-CI: 0.07-0.94), child sex (girl, OR=2.90 95%-CI: 1.76-4.80), child age (OR=2.00, 3.00, 2.60), and RP visit and vaccine offer (Visited and vaccine not offered/unsure, OR=0.25, 95% CI: 0.10-0.62) were found to be significantly associated with the intention to vaccinate. Regarding indecision vs refusal, child age was the only factor that remained significant (12-13 years, OR=3.17, 95% CI: 1.74-5.78) (13-14 years, OR=2.13, 95% CI: 1.10-4.10). Other significant variables can be seen in ST7-ST8. To confirm the associations identified in the previous models, Table ST8 shows that in parsimonious model HPV vaccine intention was found significant with language/occupation (Multilingual, Farmers and small business owners, factory workers, and

inactive, OR=0.23, 95%-CI: 0.07-0.78), child sex (girl, OR=2.70, 95%-CI: 1.66 – 4.41), child age (OR=1.86, 2.65, 2.22) and RP visit and vaccine offer (Visited and vaccine not offered/unsure, OR=0.25, 95% CI: 0.10-0.62). Similarly, child age (13-14 and 12-13 years, OR=1.92-3.12) and Table ST7 remained significant factors for indecision. Although external influences were tested in bivariate, full, and parsimonious models, they were not included in the main regression analyses results shown in this report since they did not directly align with the aim and objectives of our study. Refer to tables ST2-ST8.

Table 2. Determinants of HPV vaccine awareness, uptake, and intention among parents of adolescents in France, 2021-22. (N=1,959)

Socio-demographic -economic characteristics	Awareness		Vaccine uptake (among aware parents)		Intention (among unvaccinated)			
	Heard vs Not Heard		Vaccinated vs Unvaccinated		Indecision vs refusal		Intention vs refusal	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex								
Female (Mothers)	1		1		1		1	
Male (Fathers)	0.29	(0.19-0.45)	0.84	(0.56-1.26)	0.71	(0.33-1.55)	1.24	(0.62-2.50)
Age								
Less than 35 years	1		1		1		1	
Between 35 and 44 years	1.80	(1.02-3.20)	1.52	(0.87-2.65)	0.77	(0.33-2.18)	0.90	(0.37-2.18)
More than 45 years	2.22	(1.20-4.09)	1.82	(1.03-3.22)	0.81	(0.34-2.34)	0.69	(0.27-1.72)
Language/Occupation								
French monolingual, Executives, and professionals	1		1		1		1	
French monolingual, Technicians, and service workers	0.47	(0.25-0.87)	0.82	(0.62-1.09)	1.10	(0.60-2.02)	0.74	(0.42-1.30)
French monolingual, Farmers and small business owners, Factory workers, and Inactive	0.19	(0.10-0.36)	0.69	(0.49-0.97)	0.67	(0.34-1.33)	0.49	(0.26-0.93)
Multilingual, Executives and professionals	0.51	(0.16-1.55)	0.85	(0.43-1.66)	1.91	(0.37-9.03)	1.37	(0.28-6.62)
Multilingual, Technicians and service workers	0.20	(0.08-0.47)	0.77	(0.42-1.41)	2.34	(0.61-9.03)	1.20	(0.32-4.44)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.09	(0.04-0.20)	0.59	(0.27-1.28)	0.39	(0.13-1.15)	0.19	(0.07-0.55)
School area deprivation								
Low	1		1		1		1	
Moderate-low	1.02	(0.57-1.79)	0.52	(0.37-0.74)	1.14	(0.52-2.47)	0.66	(0.32-1.33)
Moderate-high	1.02	(0.58-1.81)	0.67	(0.47-0.94)	1.47	(0.65-3.31)	1.30	(0.62-2.72)
High	0.76	(0.40-1.43)	0.64	(0.42-0.96)	1.34	(0.56-3.18)	0.49	(0.22-1.10)
Child sex								
Female	1.95	(1.39-2.73)	4.14	(3.31-5.18)	1.64	(1.04-2.56)	2.78	(1.82-4.26)
Male	1		1		1		1	
Child age								
10-11 years	1		1		1		1	
11-12 years	1.60	(0.98-2.63)	1.32	(0.95-1.83)	1.24	(0.71-2.16)	1.96	(1.18-3.25)
12-13 years	1.39	(0.88-2.18)	2.03	(1.50-2.75)	3.20	(1.82-5.63)	2.60	(1.51-4.49)
13-14 years	0.99	(0.63-1.55)	3.88	(2.80-5.35)	2.07	(1.12-3.85)	1.97	(1.09-3.56)

Socio-demographic -economic Model Multivariable logistic regressions (95% CI).
Significant determinants in bold.

3.7.3 Stratified analysis

No significant interactions were found between physician visit (visit-not visit) and the socio-economic determinants associated with awareness, uptake, and intentionality. Therefore, physician visit did not mitigate the language/occupation and deprivation inequalities identified in the outcomes. The results are presented in the supplemental tables ST12-ST14.

3.8 Attitudes and Knowledge

Attitudes and Knowledge items among parents aware of the HPV vaccine varied across the socio-demographic subgroups (Supplementary Figures 1-4 A-B). However, the strongest

gradients were observed on the school deprivation area, occupation and physician visit and vaccine offer categories (Figures 3-5 A-B). Most (90%) of the parents in the occupational groups, executives/ professionals compared to factory workers ($p = 0.028$) and RP visit, parents who visited and were offered the vaccine compared to those who did not receive the offer ($p < 0.001$) correctly identified at least one HPV-related disease. Similarly, a significant majority knew the recommended age range for HPV vaccine administration in the occupational, deprivation (low compared to high), and RP visit groups, ($p < 0.001$). In contrast, less than half of the parents' population in all groups lacked knowledge regarding HPV infection in sexually active individuals (occupation: $p = 0.035$, deprivation: $p = 0.030$ and RP visit: $p = 0.021$) and the impact of HPV VC on young adolescents and the elimination of HPV-related cancers, except for the 52.6% of executives and professionals that were aware. Regarding attitudes, a significant proportion (over 80%) of parents in all occupations and RP visit categories held favorable attitudes toward discussing HPV VC with the child and healthcare professional ($p < 0.001 - p = 0.019$). Also, in terms of the importance of the HPV vaccine's ability to prevent transmission, more than 80% of parents in both socio-economic and RP visit groups, except for the 78.1% of parents that did not visit the physician and found it more difficult to discuss HPV with their child, were found significant ($p < 0.001$). Additionally, 77.8% factory workers expressed less favorable attitudes towards the vaccine ability to prevent transmission compared to the other occupational groups.

3.8.1 Knowledge by socio-economic factors

Significant knowledge gaps were observed particularly among those who live in moderate-high and high deprivation areas and are factory workers or inactive individuals. In deprivation groups, the HPV vaccine recommendation for both genders' correct responses varied between low (87.6%) and high (75.4%) ($p = 0.021$). As for the occupational groups, executives and professionals (86.7%) were more aware than factory workers (62%) ($p < 0.001$), who displayed the lowest level of awareness (Figures 3-4 B). Regarding the knowledge of HPV vaccination and better immune response before the age of 14 years, significant associations were found in the occupational groups were inactive individuals (50.6%) were the less aware compared to the 68.5% of executives/professionals who had more correct answers ($p = < 0.001$). Furthermore, knowledge about the impact of HPV vaccination on young people and cancer elimination, was significant in both socio-economic groups ($p < 0.001$), varying between 43.5%, 44.3%, 34.7% and 29.1%, in low, low-medium, medium high and high deprivation groups, respectively. Similar variations were observed in the occupational groups were only 11.1% of factory workers and 25.7% of inactive individuals were aware compared to executives and professionals (52.6%). As for the HPV vaccine benefits versus risks for both genders, 71.5% of parents who live in low and

52.9% who live in high deprivation areas knew the correct answer ($p = 0.001$). Several gradients were observed in the occupational groups varying between, 51.3%, 74.9%, 60.5%, 33.3% and 42.9%, respectively, across farmers/small business owners, executives/professionals, technicians and service workers, factory workers and those inactive ($p < 0.001$). Lastly, regarding the free HPV vaccination for the child knowledge item, parents who are executives/professionals (83.5%), and farmers and small business owners (80%), were the most significant aware groups compared to factory workers (66.7%) ($p < 0.001$).

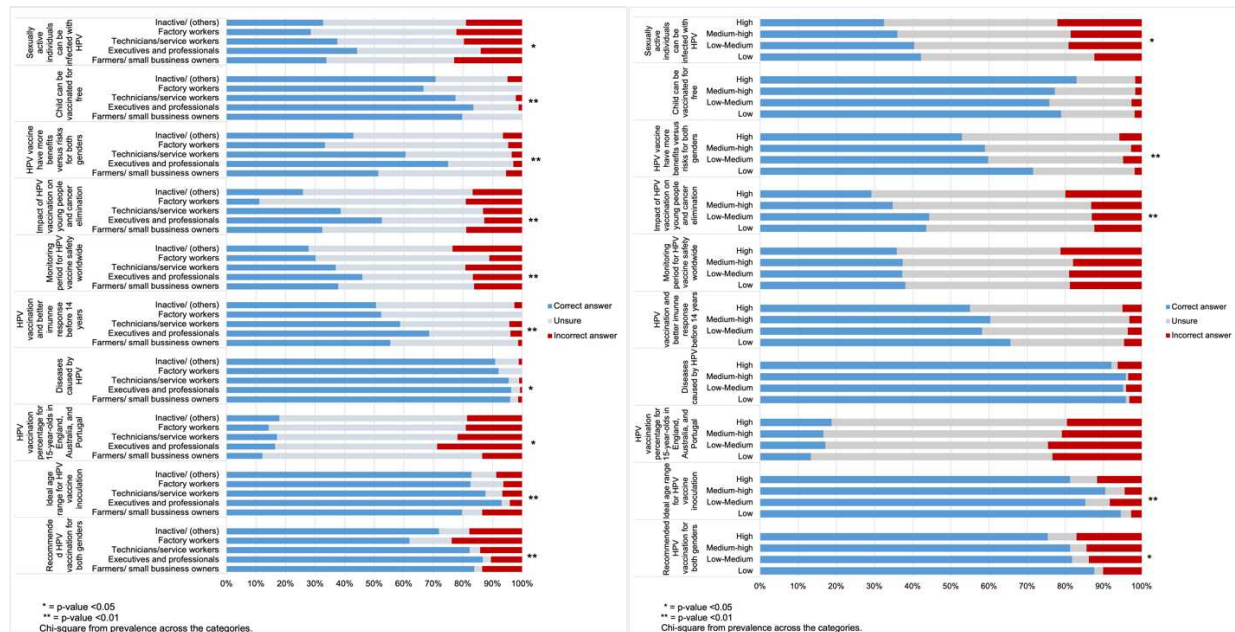


Figure 3-4. Distribution of knowledge (B) items regarding HPV vaccination among parents who have heard about HPV vaccination, by occupation and school deprivation area. France, 2021-22 (N=1,781).

3.8.2 Attitudes by socio-economic factors

We found significant differences in perception of the HPV vaccine safety across occupational and deprivation levels ($p < 0.001$). The low deprivation group had the highest percentage of parents with favorable attitudes (83.8%), while the high deprivation group had the lowest (64%). Regarding occupation, favorable attitudes varied across farmers/small business owners (71.2%), executives/professionals (80.5%), technicians/service workers (71.2%), factory workers (58.3%), and inactive parents (60.9%). Similar variations were observed in other attitudes, such as ease of getting the child vaccinated against HPV and perceived usefulness of HPV vaccination (both items: $p < 0.001$), where the least favorable attitudes were found among those living in low-medium and high-deprivation areas, as well as in the factory workers and

inactive parents compared to those in low-deprivation and who work as executives/professionals. (Figures 3-4 A). In terms of perceived difficulty in finding time to vaccinate the child, only occupation was found to be significantly associated ($p = 0.003$), factory workers (73%), farmers and small business owners (75.3%), and executives/professionals (78.8%) expressed less favorable attitudes than technicians/service workers and those inactive (both 84%). Additionally, factory workers (58.7%) had the least favorable attitudes regarding the child being too young to be vaccinated against HPV, while those who are executives/professionals have a better attitude (79.3%) ($p < 0.001$). As for the deprivation groups, parents in high-deprivation areas had the lowest proportion of favorable attitudes (61.9%), compared to those in low deprivation (79.6%) ($p < 0.001$). Similarly, in terms of balance of benefits and risks of the HPV vaccine, 64.8% of parents in the high deprivation had less favorable attitudes compared to 81% in the low deprivation group ($p = 0.003$). Favorable attitudes varied across occupational groups, 79.3%, 83.9%, 71.5%, 58.7%, and 61.7%, respectively, where factory workers had the least favorable attitudes ($p < 0.001$).

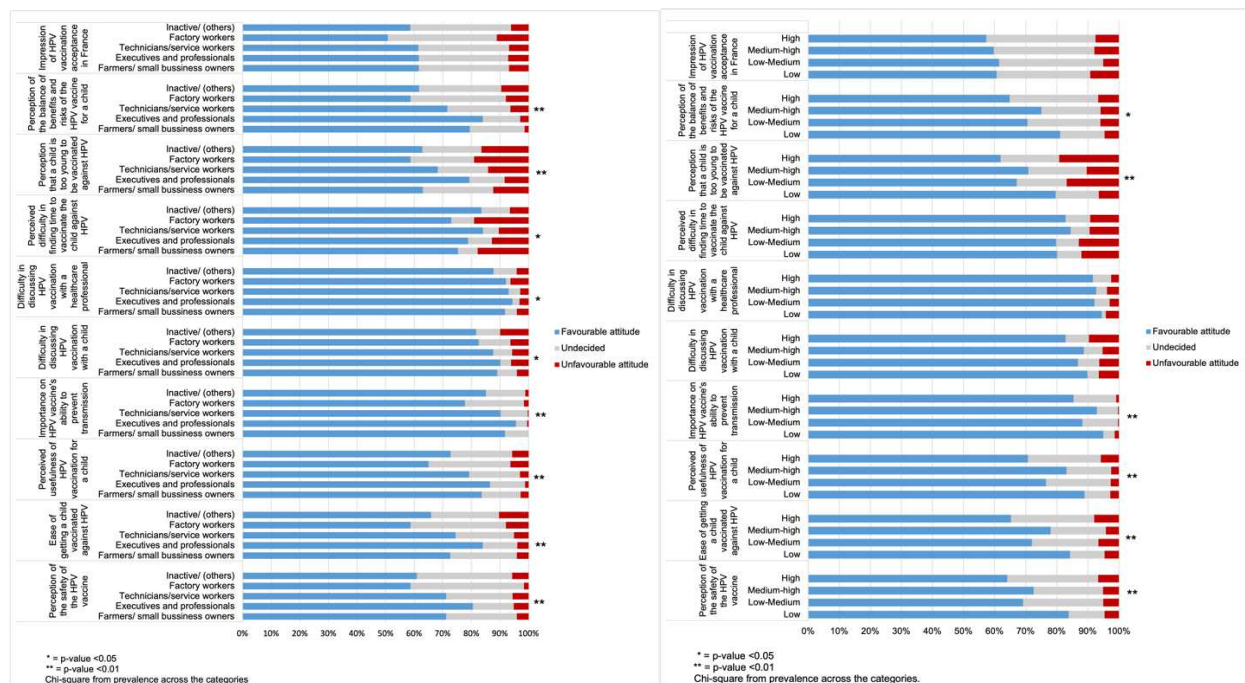


Figure 3-4. Distribution of attitude (A) items regarding HPV vaccination among parents who have heard about HPV vaccination, by occupation and school deprivation area. France, 2021-22 (N=1,781)

3.8.3 Knowledge and Attitudes by physician visit and vaccine offer

Significant associations were observed in all the following knowledge and attitudes items ($p < 0.001$), with a higher rate of correct answers and favorable attitudes among parents who visited and were offered the HPV vaccine. These groups of parents were more aware of the HPV vaccine recommendation for both girls and boys (88.6%), compared to parents who did not visit (69.3%). Regarding the recommended age range for HPV vaccine administration, parents who visited but were not offered the vaccine had the lowest percentage of correct answers (76.9%), while almost all the parents who were offered the vaccine (95.9%) knew the age for immunizing their child. Furthermore, we found notable gradients in terms of HPV vaccine benefits vs risks. Among those who visited and were offered the vaccine, 70.3% were aware of its benefits, compared to 46.3% who visited but were not offered the vaccine, and 50.5% of those who did not visit an RP recently. Similarly, those who were offered the vaccine (69.4%) were aware of HPV VC and better immune response prior to 14 years, while those that were not offered the vaccine were less aware (46.7%). Refer to Figure 5B.

As for the attitudes, a significantly higher proportion of parents who were offered the vaccine had a favorable attitude (80.8%) towards the perception of vaccine safety and effectiveness, compared to those without an offer (58.4%). Similar gradients were observed for attitudes towards the ease of getting a child vaccinated and the perceived usefulness of the HPV vaccine between the categories previously mentioned (Figure 5A). Parents that were offered the vaccine also had more favorable attitudes towards finding time for vaccination (88.1%) compared to non-visitors (67.7%), and those who were not offered the vaccine (76.5%). As for the perception that a child is too young to be vaccinated against HPV, knowledge varied across the groups, 84.1%, 48.4% and 58.3%, who visited and were offered the vaccine, visited, and didn't receive an offer and did not visit, respectively. Similarly, for the perception of the balance of benefits and risks of the HPV vaccine for a child (81.4%, 59.4% and 68.7%). Parents who were not offered the vaccine had the least favorable attitudes among all groups. Finally, over half of the parents had a positive impression of HPV vaccine acceptance in France.

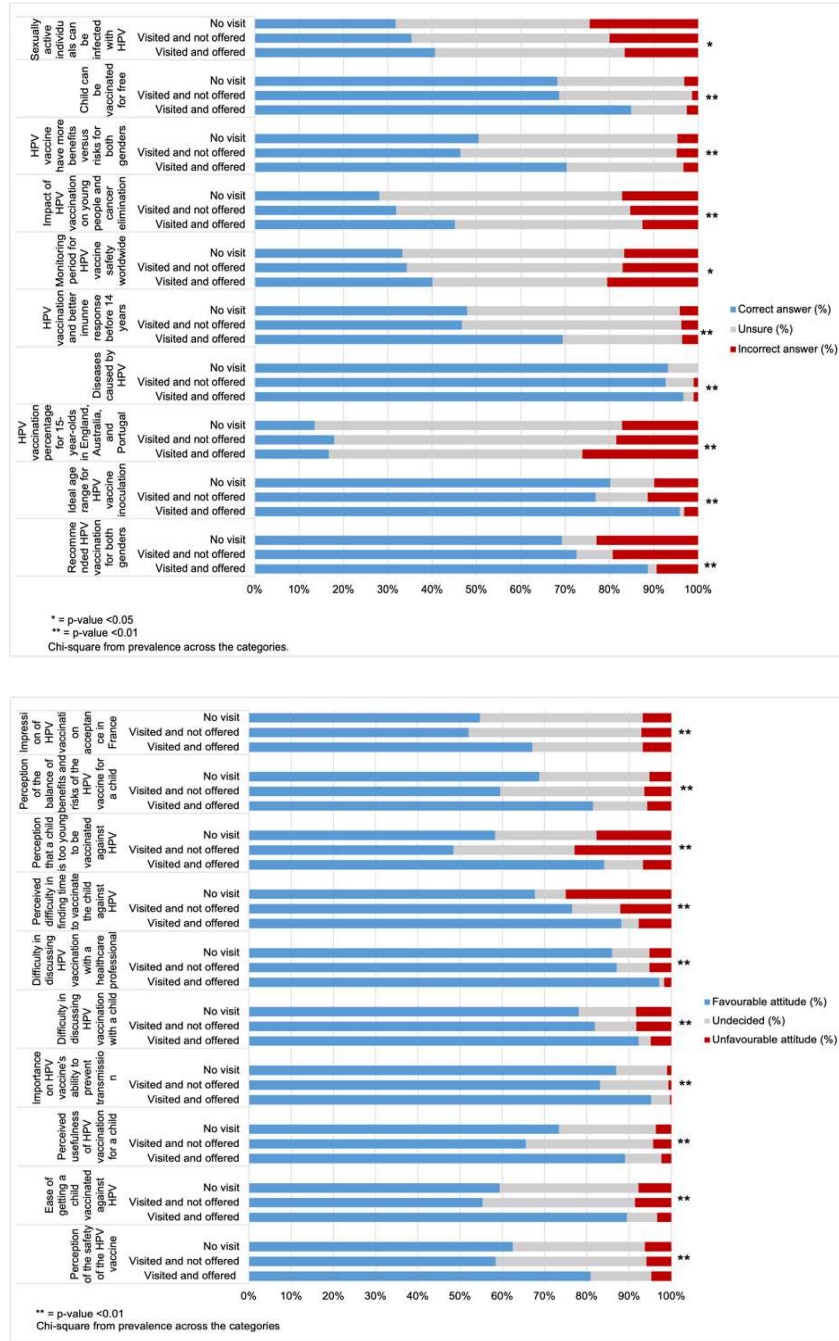


Figure 5 (A-B). Distribution of attitude (A) and knowledge (B) items regarding HPV vaccination among parents who have heard about HPV vaccination, by physician visit during the last 12 months with/without vaccine offer. France, 2021-22 (N=1,760).

4. Discussion

4.1. Summary

HPV infection and vaccine uptake remains a significant Public Health issue in France, particularly among disadvantage groups. The present study contributes to the existing literature by providing evidence on the socio-economic determinants of HPV vaccine awareness, attitudes, uptake, and intention among parents of middle school students in France. We found socio-economic inequalities in HPV-vaccine awareness and intentionality, with worse outcomes among parents of multilingual families who have a low-income occupation. We also identified a deprivation area influence in the vaccine uptake. Despite most parents' being aware and having favorable attitudes towards HPV, there is still a knowledge gap and unfavorable attitudes regarding HPV vaccine information and perceptions, particularly among parents residing in high-deprivation areas and specific occupational groups, such as factory workers and those who are inactive. Recent RP visits did not mitigate the socio-economic inequalities found in the HPV vaccine awareness, uptake, and intentionality outcomes.

4.1.1. Main results

Previous research has emphasized the crucial role of parents in HPV vaccination decision-making in France [42], which is influenced by their knowledge and beliefs. Our study reveals that most of the parents are aware of HPV and related vaccination. This was evident from their correct responses to knowledge items, particularly among parents in lower deprivation areas, with high-income occupations, and that were offered the HPV vaccine during a RP consultation. However, we found that fathers, French monolinguals, and multilinguals, and those with a low-income occupation (technicians, service workers, farmers, small business owners, factory workers, and inactive individuals) had lower awareness. In line with previous research conducted within the French territory [43-45], we found notable knowledge gaps and some misconceptions about HPV vaccination among specific socio-economic subgroups, particularly those living in moderate-high and high-deprivation areas, as well as factory workers and inactive individuals. These gaps included knowledge about the impact of HPV vaccination on young individuals and cancer elimination, with more than half of the parents' population being unsure or providing an incorrect answer. Furthermore, there was a lack of awareness regarding the HPV vaccine benefits and risks, and the better immune response before the age of 14. Also, although most of the parents were aware of the HPV vaccine recommendation for both genders and the recommended age range for vaccination, differences in knowledge were found particularly among those in high deprivation, who work as factory workers, and among those who visited the physician, but the

HPV vaccine was not offered. An important and concerning finding is that less than half of the parent population, regardless of their socio-economic status or recent visit or not to the physician, were unaware that all sexually active individuals are at high risk of being infected with HPV.

Overall, we observed favorable attitudes toward HPV vaccination among parents across all socio-economic groups. However, factory workers, inactive individuals and parents living in high-deprivation areas exhibited more unfavorable attitudes and were more undecided, particularly regarding the perceptions of the safety, and benefits vs risks of the HPV vaccine. Approximately thirty to forty percent of factory workers and inactive parents expressed doubts about the safety of the vaccine, these findings are close to ones from a previous study conducted in France (38%) [43]. We also found differences in attitudes regarding the perception of a child being too young for vaccination between those in high-deprivation areas and factory workers. Additionally, these groups expressed having more difficulty in finding time to immunize their child and in discussing HPV with them, which aligns with existing research conducted in the country [23]. Furthermore, parents who visited a physician and were offered the HPV vaccine demonstrated more favorable attitudes since they have a greater willingness to discuss HPV with the healthcare professional and have less difficulty in finding time to get the child immunized against HPV. However, parents who were not offered the vaccine, and particularly those who did not visit a physician, held less favorable attitudes and were more undecided, regarding the balance of benefits and risks, the perception of a child being too young to be vaccinated against HPV, and the ease of getting their child vaccinated. These findings align with previous studies [44,46] which demonstrate the influential role of physicians in mothers' decision-making processes and their further intention to vaccinate.

We found that more than half (55.4%) of parents with an unvaccinated child have the intention to immunize it. This estimation is consistent with findings from other studies conducted in various countries investigating HPV vaccination intention and subsequent vaccination rates, which revealed that 38 to 57% of parents follow through with their intention to vaccinate their child [47-48]. Similar to previous studies that highlighted the significant influence of socioeconomic determinants on HPV vaccination intention [49-51] we identify an association between parental language and occupation. Parents who are multilingual and have low-income occupations such as farmers, small business owners, factory workers, and those who are inactive, were less likely to have the intention to vaccinate their children. This can be attributed to factors such as lower education levels, misconceptions (e.g., the belief that vaccination may interfere with the development of the body's natural immunity), and unfavorable attitudes regarding the vaccine

safety and perceived risk – which we illustrated in descriptive analyses. Furthermore, we found that the attitudes and opinions of the social environment, such as the relatives and physicians, regarding HPV vaccination, influenced vaccine indecision and intention among parents with unvaccinated children, consistent with existing literature [52]. Parents who were aware that their family and friends were either unvaccinated or don't know the vaccination status have less intention to vaccinate. Therefore, our results highlight the importance of addressing socioeconomic disparities, misconceptions, concerns, and unfavorable attitudes to promoting HPV awareness and enhancing uptake across diverse groups, as seen in other studies [53-54].

Despite the general parental awareness and intention regarding HPV vaccination, the actual uptake rates remain low. Most of the parents in France and in our study have an HPV-unvaccinated child, which is consistent with the national coverage estimations of 2021 [22,24]. Our findings reveal that a significant proportion of parents (44.6%) are either indecisive or refuse to vaccinate their children. Conversely, among those who have immunized their child (38%), HPV vaccine uptake rates were higher among young females (50.7%) and males (22.1%), exceeding the coverage rates of 2021. This increase can be attributed to the vaccine offer during recent visits to the GP, awareness of free HPV immunization programs, promotional campaigns that have effectively reached the target population throughout the country in recent years, and a positive impression of HPV vaccination acceptance in France among those who visited and discuss HPV with the GP. While previous research has shown a relationship between socioeconomic status, particularly income and educational level, regarding HPV knowledge [55] vaccine uptake, and intention [56], we did not identify great social gradients in vaccine uptake. This can be explained by the fact that this analysis only included parents who were already aware of HPV vaccination - consequently, the social gradient of awareness does not manifest in this particular analysis. Nevertheless, we can confirm that parents living in low-deprivation areas, who possess higher levels of income and have greater access to physician consultations have more vaccinated children.

As seen in our study, social influences like healthcare providers are a vital determinant in promoting awareness and HPV immunization among all populations while reducing disparities [57-59]. Consistent with other studies, parent's confidence in the information provided by physicians and the vaccine offers [60] significantly increases vaccine acceptance and uptake in our population, which is crucial to reach the objective of 80% HPV vaccine coverage by 2030 in the country [29,30]. However, as seen in other studies, physicians who do not offer the vaccine, and limited access or infrequent visits to GPs remain significant barriers to HPV vaccine intention

and uptake among parents in France [61-62]. Furthermore, we found that RP visits did not mitigate the persistent socio-economic inequalities in awareness and intention, nor did they have an impact on the deprivation area in relation to vaccine uptake.

4.2. Strengths and limitations

The findings should be interpreted considering several limitations. Firstly, the participants included in the study are not a representative sample of parents in France, as their inclusion depended on the agreement of school directors from only 90 municipalities and the individual acceptance to participate. This may limit the generalizability of the findings to the entire population and to populations of other geographic areas. Furthermore, the data collected for the study was based on self-reporting, which introduces the possibility of recall bias and responses that are influenced by socially desirability or acceptability. Additionally, although the study had a relatively large sample size, the limited number of participants in specific subgroups limited some further mitigation and stratified analyses to detect associations in all outcomes.

Nevertheless, the sample included parents from a wide range of geographical, socio-demographic, and economic backgrounds, which allowed a broad analysis of determinants. This inclusion contributes to a relatively comprehensive understanding and generalizability of the identified factors associated with HPV vaccination uptake. Moreover, the study estimates of parents with an HPV unvaccinated child (62%) align closely with the national estimates for 2021, where the French vaccination coverage stood at 41%. [22,24]. It also adds to the broader understanding of the socio-psychological (attitudes and knowledge) and economic factors that shape vaccination behaviors in French parents. Overall, our study adds valuable insights to the existing literature and has the potential to inform French national authorities in their efforts to effectively target and increase HPV vaccination rates among disadvantaged and marginalized populations in the upcoming years.

4.3 Implications for Public Health and the PrevHPV program

We identified some specific areas for improvement and implications for public policy to reduce the impact of socio-economic risk factors on HPV infection and enhance vaccination. To promote accurate understanding, informed decision-making and emphasize the importance of HPV vaccination among parents, more educational campaigns should be implemented, with a focus on the vaccine benefits, effectiveness, safety evaluation, potential for cancer elimination, and the quasi-systematic nature of HPV infection among sexually active individuals. These interventions should particularly target parents from high-deprivation areas, low-income occupational groups, fathers, and parents with limited language proficiency. Therefore, it is

crucial to facilitate easier access to vaccination in multiple locations. School-based vaccination programs have demonstrated promising results in increasing coverage and reducing socio-economic inequalities, as observed in other countries [63-65]. In France, the upcoming National School-based vaccination campaign for all 5th graders, boys, and girls, is expected to inform and immunize 800,000 students annually against HPV [66]. National authorities may also consider lowering the eligibility threshold for HPV vaccination in the general population from 11 down to 9 years, as recommended by the WHO and already implemented in some high-income countries' vaccination calendars [3, 67]. Strengthening GP training and involvement in recommending HPV vaccination is also essential, as they are the most trusted source of information for parents in France, as well as the internet, which French mothers had been found helpful to make decisions about HPV vaccination [23]. Therefore, implementing social media campaigns and utilizing electronic or postal reminders for physicians and parents can also serve as effective strategies to enhance vaccine coverage and mitigate socio-economic inequalities within the population. Given the persistent disparities in HPV vaccination in France [38], further research is needed with larger sample sizes and in specific populations, such as low-income families, ethnic minorities, immigrant, and international communities to detect, validate and strengthen these and other findings. By addressing these research gaps and implementing evidence-based policies and interventions, equitable access to HPV education and vaccination uptake can be ensured across all socio-economic populations, thereby reducing the burden of HPV-related diseases in mainland France and its territories.

5. Conclusion

Beyond individual determinants, this study has identified socio-economic inequalities in the HPV vaccine awareness, uptake, intention, and attitudes among parents in France. The findings emphasize the importance of considering occupation, educational level, and deprivation in HPV awareness initiatives, as well as the important role of healthcare providers in educating and facilitating vaccine access to the population. Urgent attention must be given to addressing the persistently low vaccination uptake and awareness gaps, as well as parental misconceptions and hesitations to achieving higher uptake rate and reducing socio-economic health disparities in vaccination coverage among the French population. This research provides valuable evidence and underscores the importance of adopting comprehensive and inclusive approaches in HPV vaccination initiatives by emphasizing the need to focus on specific socio-economic determinants and implement tailored interventions to ensure equitable access to HPV information and immunization.

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Table ST1. Key questionnaire items

French question		English Question	Answering Schematic	Coded Schematic
Sociodemographic variables				
Sex	Vous êtes?	You are?	1. Woman 2. Men	/
Age	Quel âge avez-vous?	How old are you?	1. Less than 35 years 2. Between 35 and 44 years 3. Between 45 and 54 years 4. Between 55 and 64 years 5. More than 65	1: less than 35 years 2: Between 35-44 3+4+5: More than 45 years
Multilingualism	Parlez-vous couramment une autre langue que le français avec votre enfant?	Do you speak a language other than French fluently with your child?	1. No, just French 2. Yes, another language	1: French 2: Multilingual
Occupation	Quelle est votre profession actuelle? (Renseignez votre dernière profession si vous êtes actuellement sans activité: sans emploi, retraité, etc.)	What is your current occupation? (Fill in your last occupation if you are currently unemployed: unemployed, retired, etc.)	1. Farmer operating 2. Craftsman, merchant, business manager with less than 10 employees 3. Head of company with 10 or more employees 4. Manager, teacher (college, high school, university), researcher, engineer, liberal profession	1+2: "Farmers and small business owners" 3+4: "Executives and professionals" 5+6+8: "Technicians and service workers" 7: "Factory workers" 9: "Inactive (others)"

			(doctor, lawyer, etc.) 5. Intermediate profession, technician (teacher, school teacher, nurse, etc.) 6. Employee (secretary, switchboard operator, bookkeeper, salesman, bar or restaurant server, cashier, etc.) 7. Worker (in a factory or at a craftsman: agricultural worker, plumber, electrician, butcher, hair, road worker, etc.) 8. student, apprentice 9. Other	
Child sex	Quel est le sexe de votre enfant?	What is the gender of your child?	1. Boy 2. Girl	/

Child age based on school grade	En quelle classe est votre enfant? Si vous avez plusieurs enfants au collège, nous vous prions de répondre en pensant au plus âgé.	What grade is your child in? If you have several children in college, please answer with the oldest in mind.	1. 6th 2. 5th 3. 4th 4. 3rd	1: 10-11 years 2: 11-12 years 3: 12-13 years 4: 13-14 years
Personal Aptitudes and General Attitudes				
Trust in School system	Êtes-vous d'accord avec la phrase suivante: « Le système scolaire répond aux besoins de mon enfant »?	Do you agree with the following sentence: "The school system meets the needs of my child"?	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree
Easy finding information	Êtes-vous d'accord avec l'affirmation suivante : "Je pense qu'il est facile de trouver des informations claires sur le vaccin contre les HPV."?	Do you agree with the following arming: "I think it is easy to find clear information about the HPV vaccine."?	1. Quite unfavorable 2. Unfavorable 3. Undecided 4. Favorable 5. Quite favorable	1+2: Unfavorable 3: Unsure 4+5: Favorable
Vaccination in general	En ce qui concerne la vaccination en général, vous y êtes :	As far as vaccination in general is concerned, you are	1. Quite unfavorable 2. Unfavorable 3. Undecided 4. Favorable 5. Quite favorable	1+2: Unfavorable 3: Unsure 4+5: Favorable

Vaccine opposition	Êtes-vous défavorable à certaines vaccinations en particulier?	Are you against certain vaccinations in particular?	1. No 2. Yes, some 3. Yes, all 4. NR	1: No 2: To some 3: Yes 4: NR
Family/ friends vaccination point of view	Votre entourage proche (famille, amis) est-il favorable à la vaccination en général?	Is your close circle of family and friends in favor of vaccination in general?	1. Quite unfavorable 2. Unfavorable 3. Skeptical and favorable opinions are equally represented 4. Favorable 5. Quite favorable	1+2: Unfavorable 3: Unsure 4+5: Favorable
Vaccination protects the population	La vaccination protège la population.	Vaccination protects the population.	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree
Confidence in the information provided by the health professionals	J'ai confiance dans les informations données par les autorités de santé sur la vaccination.	I have confidence in the information given by the health authorities on vaccination.	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree
More benefits than risks of getting vaccinated	Il y a plus de bénéfices que de risques à se faire vacciner	There are more benefits than risks of getting vaccinated.	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree

Vaccination protection of the most vulnerable people	La vaccination permet la protection des personnes les plus vulnérables.	Vaccination allows the protection of the most vulnerable people.	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree
Vaccination may interfere with the development of the body's natural immunity	Je m'inquiète que la vaccination puisse interférer avec le développement de l'immunité naturelle de l'organisme	I worry that vaccination may interfere with the development of the body's natural immunity.	1. Not agree at all 2. Rather disagree 3. Undecided 4. Somewhat agree 5. Totally agree	1+2: Disagree 3: Undecided 4+5: Agree
External influences				
Physician visit in last 12 months	Votre enfant a-t-il eu une consultation avec son médecin pendant les douze derniers mois?	Has your child had a consultation with his doctor during the last twelve months?	1. Yes 2. No 3. I don't know	1. Visited 2. No visit 3. Don't remember
HPV discussion with physician	Le médecin de votre enfant vous a-t-il déjà parlé, à vous-même ou l'autre parent, des Papillomavirus Humains (HPV)?	Has your child's doctor ever told you or the other parent about Human Papillomaviruses (HPV)?	1. Yes 2. No 3. I don't know	/
HPV vaccine offer by physician	Le médecin de votre enfant vous a-t-il déjà proposé de le vacciner contre	Has your child's doctor ever offered to vaccinate her/him against	1. Yes 2. No 3. I don't know	/

	les Papillomavirus Humains (HPV) ?	Human Papillomavirus (HPV)?		
Attitude on HPV vaccination in social environment	Dans votre entourage proche, comment décrieriez-vous l'opinion majoritaire sur la vaccination contre les HPV?	In your close circle, how would you describe the majority opinion on HPV vaccination?	1. Quite unfavorable 2. Unfavorable 3. Skeptical and favorable opinions are equally represented 4. Favorable 5. Quite favorable	1+2: Unfavorable 3: Unsure 4+5: Favorable
Vaccination status of family and friends	Avez-vous des proches (famille, amis) qui ont vacciné leur enfant contre les HPV ?	Do you have relatives (family, friends) who have vaccinated their child against HPV?	1. Yes 2. No 3. I don't know	1: Vaccinated 2: Not vaccinated 3: Do not know

Supplemental Table 2 (ST2). Determinants of having heard about HPV and related vaccination among parents of adolescents in France, 2021-22 (N=1,959). HPV vaccine awareness determinants descriptive and Bi-variable analysis.

Characteristics	Having heard of HPV			Bi-variable (p-value)	95% CI
	Total (column %) N = 1,959	No (n, row %) N = 178 (9.1%)	Yes (n, row %) N = 1781 (90.9%)		
Sex					
Female (Mothers)	1,767 (90.9)	136 (7.7)	1,631 (92.3)	1	
Male (Fathers)	192 (9.1)	42 (21.9)	150 (78.1)	0.30 (<0.001)	(0.20 - 0.44)
Language					
French monolingual	1,765 (90.1)	142 (8.1)	1,623 (91.1)	1	
Multilingual	194 (9.9)	36 (18.6)	158 (81.4)	0.38 (<0.001)	(0.26 - 0.57)
Age					
Less than 35 years	112 (5.8)	21(18.7)	91 (81.3)	1	
Between 35 and 44 years	1,188 (60.6)	102 (8.6)	1,086 (91.4)	2.46 (<0.001)	(1.47 - 4.12)
More than 45 years	659 (33.6)	55 (8.3)	604 (91.7)	2.53 (<0.001)	(1.46 - 4.39)
Occupation					
Farmers/small business owners	92 (4.7)	17 (18.5)	75 (81.5)	1	
Executives and professionals	426 (21.8)	19 (4.5)	407 (95.5)	4.86 (<0.001)	(2.41 - 9.77)
Technicians/service workers	1,049 (53.5)	77 (7.3)	972 (92.7)	2.86 (<0.001)	(1.61 - 5.09)
Factory workers	76 (3.9)	13 (17.1)	63 (82.9)	1.10 (0.817)	(0.50 - 2.43)
Inactive (others)	316 (16.1)	52 (16.5)	264 (83.5)	1.15 (0.649)	(0.63 - 2.11)
Living Environment					
Urban	1,269 (64.7)	119 (9.4)	1,150 (90.6)	0.80 (0.264)	(0.53 - 1.19)
Peri-urban	218 (11.2)	20 (9.1)	198 (90.9)	0.81 (0.489)	(0.46 - 1.46)
Rural	434 (22.2)	33 (7.6)	401(92.4)	1	
NR	38				
School area deprivation index					
Low	241 (12.3)	20 (8.3)	221 (91.7)	1	
Moderate-low	694 (35.4)	58 (8.4)	636 (91.6)	0.99 (0.977)	(0.58 - 1.69)
Moderate-high	712 (36.4)	60 (8.4)	652 (91.6)	0.98 (0.951)	(0.58 - 1.67)
High	274 (14.0)	34 (12.4)	240 (86.6)	0.64 (0.131)	(0.36 - 1.14)
NR	38				

Child sex					
Female	1,043 (53.2)	68 (6.5)	975 (93.5)	1.96 (<0.001)	(1.43 - 2.69)
Male	916 (46.8)	110 (12.1)	806 (87.9)	1	
Child age based on school grade					
13-14 years	463 (23.6)	49 (10.6)	414 (89.4)	1.02 (0.936)	(0.67 - 1.55)
12-13 years	598 (30.5)	46 (7.7)	552 (92.3)	1.44 (0.088)	(0.95 - 2.20)
11-12 years	442 (22.6)	34 (7.7)	408 (92.3)	1.44 (0.116)	(0.91 - 2.29)
10-11 years	456 (23.3)	49 (10.7)	407 (89.3)	1	
Personal Aptitudes					
<u>Trust in School system</u>					
Agree	1,212 (61.9)	107 (60.1)	1,105 (62.0)	0.91 (0.668)	
Undecided	401 (20.5)	43 (24.2)	358 (20.1)	0.73 (0.223)	
Disagree	346 (17.6)	28 (15.7)	318 (17.9)	1	
<u>Easy Finding information</u>					
Agree	960 (53.5)	3 (0.3)	957 (99.7)	3.31 (0.244)	
Unsure	543 (30.2)	8 (1.5)	535 (98.5)	0.69 (0.592)	
Disagree	292 (16.3)	3 (1.0)	289 (99.0)	1	
NR	164				
<u>Vaccination in general</u>					
Unfavorable	78 (3.9)	11 (14.1)	67 (85.9)	1	
Unsure	142 (7.3)	23 (16.2)	119 (83.8)	0.85 (0.681)	(0.39 - 1.85)
Favorable	1,739 (88.8)	144 (8.3)	1,595 (91.7)	1.82 (0.076)	(0.94 - 3.52)
<u>Vaccine opposition</u>					
Yes	30 (1.5)	2 (6.7)	28 (93.3)	1.31 (0.710)	
To some	651 (33.4)	65 (10.0)	586 (90.0)	0.85 (0.314)	
No	1,269 (65.1)	109 (8.6)	1,160 (91.4)	1	

NR	9				
<u>Family/ friends vaccination point of view</u>					
Unfavorable	50 (2.6)	7 (14.0)	43 (86.0)	1	
Unsure	402 (20.5)	50 (12.4)	352 (87.6)	1.15 (0.754)	(0.49 - 2.69)
Favorable	1,507 (76.9)	121 (8.0)	1,386 (92.0)	1.86 (0.136)	(0.82 - 4.23)
<u>Vaccination protects the population</u>					
Disagree	63 (3.2)	12 (19.1)	51 (80.9)	1	
Undecided	142 (7.3)	28 (19.7)	114 (80.3)	0.96 (0.911)	(0.45 - 2.03)
Agree	1,754 (89.5)	138 (7.9)	1,616 (92.1)	2.76 (0.002)	(1.43 - 5.29)
<u>Confidence in the information provided by the health professionals</u>					
Disagree	211 (10.8)	31 (14.7)	180 (85.3)	1	
Undecided	464 (23.7)	59 (12.7)	405 (87.3)	1.18 (0.484)	(0.74 - 1.89)
Agree	1,284 (65.5)	88 (6.8)	1,196 (93.2)	2.34 (<0.001)	(1.51 - 3.63)
<u>More benefits than risks of getting vaccinated</u>					
Disagree	70 (3.6)	10 (14.3)	60 (85.7)	1	
Undecided	325 (16.6)	52 (16.0)	273 (84.0)	0.88 (0.721)	(0.42 - 1.82)
Agree	1,564 (79.8)	116 (7.4)	1,448 (92.6)	2.08 (0.039)	(1.04 - 4.17)

Vaccination protection of the most vulnerable people

Disagree	58 (2.9)	8 (13.8)	50 (86.2)	1	
Undecided	148 (7.6)	22 (14.9)	126 (85.1)	0.91 (0.845)	(0.38 - 2.19)
Agree	1,753 (89.5)	148 (8.4)	1,605 (91.6)	1.74 (0.158)	(0.81 - 3.73)

Vaccination may interfere with the development of the body's natural immunity

Disagree	745 (38.0)	40 (5.4)	705 (94.6)	1	
Undecided	661 (33.8)	71 (10.7)	590 (89.3)	0.47 (<0.001)	(0.32 - 0.71)
Agree	553 (28.2)	67 (12.1)	486 (87.9)	0.41 (<0.001)	(0.27 - 0.62)

External influences

Physician visit in last 12 months

No visit	203 (10.5)	42 (20.7)	161 (79.3)	0.32 (<0.001)	(0.22 - 0.47)
Don't Remember	37 (1.9)	6 (16.2)	31 (83.8)	0.43 (0.063)	(0.18 - 1.05)
Visited	1,698 (87.6)	130 (7.7)	1,568 (92.3)	1	
NR	21				

* DKN= does not know

* NR=no response

Supplemental Table 3 (ST3). Determinants of HPV vaccine uptake among parents of adolescents in France, 2021-22, who have heard about HPV vaccination (N=1,760). HPV vaccine uptake determinants descriptive and Bi-variable analysis.

Characteristics	Vaccination Status				
	Total (column %)	No (n, row %)	Yes (n, row %)	Bi-variable (p-value)	95% CI
	N = 1,760	N = 1,096 (62.2%)	N = 664 (37.8%)		
Sex					
Female (Mothers)	1,615 (91.8)	1,003 (62.1)	612 (37.9)	1	
Male (Fathers)	145 (8.2)	93 (64.1)	52 (35.9)	0.92 (0.629)	(0.20-0.44)
Language					
French monolingual	1,604 (91.1)	994 (61.9)	610 (38.1)	1	
Multilingual	156 (8.9)	102 (65.4)	54 (34.6)	0.86 (0.401)	(0.61 - 1.22)
Age					
Less than 35 years	87 (5.0)	65 (74.7)	22 (25.29)	1	
Between 35 and 44 years	1,074 (61.0)	685 (63.8)	389 (32.2)	1.68 (0.041)	(1.02 - 2.76)
More than 45 years	599 (34.0)	346 (57.8)	253 (42.2)	2.16 (0.003)	(1.30 - 3.60)
Occupation					
Farmers/small business owners	73 (4.1)	48 (65.8)	25 (34.2)	1	
Executives and professionals	405 (23.0)	235 (58.1)	170 (41.9)	1.39 (0.217)	(0.82 - 2.34)
Technicians/service workers	960 (54.6)	602 (62.7)	358 (37.3)	1.14 (0.604)	(0.69 - 1.88)
Factory workers	62 (3.5)	48 (77.4)	14 (22.6)	0.52 (0.138)	(0.26 - 1.21)
Inactive (others)	260 (14.8)	163 (62.7)	97 (37.3)	1.14 (0.632)	(0.66 - 1.97)
Living Environment					
Urban	1,139 (65.8)	709 (62.2)	430 (37.8)	0.95 (0.638)	
Peri-urban	197 (11.4)	129 (65.5)	68 (34.5)	0.82 (0.280)	
Rural	394 (22.8)	240 (60.9)	154 (39.1)	1	
NR	30				
School area deprivation index					
Low	215 (12.4)	112 (52.1)	103 (47.9)	1	
Moderate-low	633 (36.6)	410 (64.8)	223 (35.2)	0.59 (<0.001)	(0.43 - 0.81)
Moderate-high	644 (37.2)	401 (62.3)	243 (37.7)	0.66 (0.009)	(0.48 - 0.90)

High NR	238 (13.8) 30	155 (65.1)	83 (34.9)	0.58 (0.005)	(0.40 - 0.85)
Child sex					
Girl	963 (54.7)	475 (49.3)	488 (50.7)	3.62 (<0.001)	(2.94 - 4.47)
Boy	797 (45.3)	621 (77.9)	176 (22.1)	1	
Child age based on school grade					
10-11 years	399 (22.7)	290 (72.7)	109 (27.3)	1	
11-12 years	404 (22.9)	280 (69.3)	124 (30.7)	1.18 (0.292)	(0.87 - 1.60)
12-13 years	548 (31.1)	335 (61.1)	213 (38.9)	1.69 (<0.001)	(1.28 - 2.24)
13-14 years	409 (23.2)	191 (46.7)	218 (53.3)	3.04 (<0.001)	(2.26 - 4.07)
Personal Aptitudes					
<u>Trust in School system</u>					
Agree	1,091(62.0)	677 (62.1)	414 (37.9)	0.90 (0.410)	(0.70 - 1.16)
Unsure	353 (20.1)	231 (65.4)	122 (34.6)	0.78 (0.113)	(0.57 - 1.06)
Disagree	316 (17.9)	188 (59.5)	128 (40.5)	1	
<u>Easy finding information</u>					
Agree	947 (53.8)	545 (57.5)	402 (42.5)	1.29 (0.061)	(0.99 - 1.71)
Unsure	526 (29.9)	368 (70.0)	158 (30.0)	0.76 (0.071)	(0.56 - 1.02)
Disagree	287 (16.3)	183 (63.8)	104 (36.2)	1	
General Attitudes					
<u>Vaccination in general</u>					
Unfavorable	65 (3.7)	44 (67.7)	21 (32.3)	1	
Unsure	116 (6.6)	98 (84.5)	18 (15.5)	0.38 (0.010)	(0.19 - 0.79)
Favorable	1,579 (89.7)	954 (60.4)	625 (39.6)	1.38 (0.241)	(0.81 - 2.33)
<u>Vaccine opposition</u>					
Yes	28 (1.6)	16 (57.1)	12 (42.9)	1.05 (0.906)	(0.49 - 2.23)
To some	575 (32.8)	407 (70.8)	168 (29.2)	0.58 (<0.001)	(0.46 - 0.71)
No	1,150 (65.6)	670 (58.3)	480 (41.7)	1	
NR	7	-	-		
<u>Family/ friends vaccination point of</u>					

<u>view</u>					
Unfavorable	40 (2.3)	27 (67.5)	13 (32.5)	1	
Unsure	346 (19.7)	235 (67.9)	111 (32.1)	0.98 (0.957)	
Favorable	1,374 (78.0)	834 (60.7)	540 (39.3)	1.34 (0.387)	
<u>Vaccination protects the population</u>					
Disagree	49 (2.8)	33 (67.3)	16 (32.6)	1	
Undecided	111 (6.3)	86 (77.5)	25 (22.5)	0.60 (0.178)	(0.28 - 1.26)
Agree	1,600 (90.9)	977 (61.1)	623 (38.9)	1.32 (0.375)	(0.72 - 2.41)
<u>Confidence in the information provided by the health professionals</u>					
Disagree	175 (9.9)	142 (81.1)	33 (18.9)	1	
Undecided	398 (22.6)	279 (70.1)	119 (29.9)	1.84 (0.006)	(1.19 - 2.84)
Agree	1,187 (67.4)	675 (56.9)	512 (43.1)	3.26 (<0.001)	(2.20 - 4.85)
<u>More benefits than risks of getting vaccinated</u>					
Disagree	58 (3.3)	47 (81.0)	11 (19.0)	1	
Undecided	267 (15.2)	193 (72.3)	74 (27.7)	1.64 (0.172)	(0.81 - 3.33)
Agree	1,435 (81.5)	856 (59.7)	579 (40.3)	2.89 (0.002)	(1.49 - 5.62)
<u>Vaccination protection of the most vulnerable people</u>					
Disagree	48 (2.7)	38 (79.2)	10 (20.8)	1	
Undecided	123 (7.0)	91 (74.0)	32 (26.0)	1.34 (0.480)	(0.60 - 2.99)
Agree	1,589 (90.3)	967 (60.9)	622 (39.1)	2.44 (0.013)	(1.21 - 4.94)
<u>Vaccination may interfere with the development of the body's natural immunity</u>					
Disagree	703 (39.9)	404 (57.5)	299 (42.5)	1	
Undecided	581 (33.0)	347 (59.7)	234 (40.3)	0.91 (0.414)	(0.73 - 1.14)
Agree	476 (27.1)	345 (72.5)	131 (27.5)	0.51 (<0.001)	(0.40 - 0.66)
External influences					
<u>Physician visit in last 12 months</u>					
No visit	161 (9.1)	145(90.1)	16(9.9)	0.16 (<0.001)	(0.09 - 0.27)
Don't Remember	31 (1.8)	28 (90.3)	3 (9.7)	0.15 (0.002)	(0.05 - 0.51)
Visited	1,568 (89.1)	923 (58.9)	645 (41.1)	1	

HPV discussion with physician

Yes	1,121 (63.7)	514 (45.9)	607 (54.1)	1	
No	610 (34.7)	560 (91.8)	50 (8.2)	0.08 (<0.001)	(0.06 - 0.10)
Unsure	29 (1.6)	22 (75.9)	7 (24.1)	0.27 (0.003)	(0.11 - 0.64)

HPV vaccine offer by physician

Yes	1,037 (58.9)	425(41.0)	612 (59.0)	1	
No	698 (39.7)	651 (93.3)	47 (6.7)	0.05 (<0.001)	(0.04 - 0.07)
Unsure	25 (1.4)	20 (80.0)	5 (20.0)	0.17 (<0.001)	(0.06 - 0.47)

Attitude on HPV vaccination in social environment

Unfavorable	74 (4.2)	60 (80.1)	14 (18.9)	1	
Unsure	566 (32.2)	403 (71.2)	16 3(28.8)	1.73 (0.077)	(0.94 - 3.19)
Favorable	1,120 (63.6)	633 (56.5)	487 (43.5)	3.29 (<0.001)	(1.82 - 5.97)

Vaccination status of family and friends

Not vaccinated	292 (16.6)	259 (88.7)	33 (11.3)	0.13 (<0.001)	(0.09 - 0.20)
DNK	393 (22.3)	287 (73.0)	106 (27.0)	0.39 (<0.001)	(0.30 - 0.50)
Vaccinated	1,075 (61.1)	550 (51.2)	525 (48.8)	1	

*DKN= does not know

*NR= no response

Supplemental Table 4 (ST4). Determinants of HPV vaccine intentionality among parents of adolescents with an HPV unvaccinated child in France, 2021-22, (N=1,081). HPV vaccine intention determinants descriptive and Bi-variable analysis.

Characteristics	Intentionality							
	Total (n, %)	Refusal (n, row %)	Indecision (n, row %)	Intention (n, row %)	Bi-variable (p-value)			
	N = 1,081	N = 136 (12.6)	N = 346 (32.0)	N = 599 (55.4)	Indecision vsRefusal	95% CI	Intention vs Refusal	95% CI
Sex								
Female (Mothers)	989 (91.5)	123 (12.4)	324 (32.8)	542 (54.8)	1		1	
Male (Fathers)	92 (8.5)	13 (14.1)	22 (23.9)	57 (62.0)	0.64 (0.226)		0.99 (0.988)	
Language								
French Monolingual	982 (90.8)	121 (12.3)	312 (31.8)	549 (55.9)	1		1	
Multilingual	99 (9.2)	15 (15.2)	34 (34.3)	50 (50.5)	0.88 (0.694)		0.73 (0.322)	
Age								
Less than 35 years	62 (5.8)	8 (12.9)	19 (30.6)	35 (56.5)	1		1	
Between 35 - 44 years	677 (62.6)	82 (12.1)	204 (30.1)	391 (57.8)	1.05 (0.916)		1.09 (0.834)	
More than 45 years	342 (31.6)	46 (33.8)	123 (35.6)	173 (28.9)	1.13 (0.795)		0.86 (0.722)	
Occupation								
Farmers/small business owners	47 (4.4)	4 (8.5)	12 (25.5)	31(66.0)	1		1	
Executives and professionals	231 (21.4)	23 (10.0)	61 (26.4)	147 (63.6)	0.88 (0.844)	(0.26 - 3.02)	0.82 (0.738)	(0.27 - 2.55)
Technicians/service workers	597 (55.2)	68 (11.4)	206 (34.5)	323 (54.1)	1.01 (0.987)	(0.32 - 3.24)	0.61 (0.371)	(0.21 - 1.79)
Factory workers	48 (4.4)	6 (12.5)	21 (43.7)	21 (43.8)	1.17 (0.835)	(0.27 - 4.98)	0.45 (0.259)	(0.11 - 1.80)
Inactive (others)	158 (14.6)	35 (22.2)	46 (29.1)	77 (48.7)	0.44 (0.183)	(0.13 - 1.48)	0.28 (0.027)	(0.09 - 0.87)
Living Environment								
Urban	698 (65.5)	93 (13.3)	215 (30.8)	390 (55.9)	0.69 (0.265)		0.75 (0.240)	
Peri-urban	128 (12.1)	17 (13.3)	45 (35.1)	66 (51.6)	0.79 (0.531)		0.69 (0.291)	
Rural	239 (22.4)	24 (10.0)	80 (33.5)	135 (56.5)	1		1	
NR	16							

School area deprivation index								
Low	111 (10.4)	12 (10.8)	27 (24.3)	72 (64.9)	1		1	
Moderate-Low	401 (37.6)	58 (14.5)	136 (33.9)	207 (51.6)	1.04 (0.914)	(0.49 - 2.20)	0.59 (0.133)	(0.30 - 1.17)
Moderate-High	399 (37.5)	38 (9.5)	113 (28.3)	248 (62.2)	1.32 (0.479)	(0.61 - 2.86)	1.09 (0.814)	(0.54 - 2.19)
High	154 (14.5)	26 (16.8)	64 (41.6)	64 (41.6)	1.09 (0.830)	(0.48 - 2.48)	0.41 (0.022)	(0.19 - 0.88)
NR	16	-	-					
Child sex								
Girl	464 (42.9)	41 (8.8)	129 (27.8)	294 (63.4)	1.38 (0.141)	(0.90 - 2.11)	2.23 (<0.001)	(1.50 - 3.33)
Boy	617 (57.1)	95 (15.4)	217 (35.2)	305 (49.4)	1		1	
Child age based on school grade								
10-11 years	284 (26.3)	49 (17.2)	82 (28.9)	153 (53.9)	1		1	
11-12 years	276 (25.5)	36 (13.0)	68 (24.7)	172 (62.3)	1.13 (0.659)	(0.66 - 1.93)	1.53 (0.084)	(0.94 - 2.48)
12-13 years	333 (30.8)	28 (8.4)	130 (39.0)	175 (52.6)	2.78 (<0.001)	(1.62 - 4.76)	2.00 (0.008)	(1.20 - 3.34)
13-14 years	188 (17.4)	23 (12.2)	66 (35.1)	99 (52.7)	1.71 (0.074)	(0.95 - 3.10)	1.38 (0.258)	(0.79 - 2.40)
Personal Aptitudes								
<u>Trust in School system</u>								
Agree	665 (61.5)	81 (12.2)	199 (29.9)	385 (57.9)	0.73 (0.280)		0.95 (0.853)	(0.56 - 1.63)
Undecided	229 (21.2)	35 (15.3)	80 (34.9)	114 (49.8)	0.68 (0.240)		0.65 (0.170)	(0.36 - 1.29)
Disagree	187 (17.3)	20 (10.7)	67 (35.8)	100 (53.5)	1		1	
<u>Easy finding information</u>								
Agree	538 (49.8)	56 (10.4)	129 (24.0)	353 (65.61)	0.73 (0.296)		1.41 (0.223)	(0.81 - 2.44)
Unsure	362 (33.5)	59 (16.3)	151 (41.7)	152 (42.0)	0.81 (0.485)		0.58 (0.053)	(0.33 - 1.01)
Disagree	181 (16.7)	21 (11.6)	66 (36.5)	94 (51.9)	1		1	
General Attitudes								
<u>Vaccination in general</u>								
Unfavorable	43 (4.0)	9 (20.9)	20 (46.5)	14 (32.6)	1		1	
Unsure	96 (8.9)	18 (18.8)	56 (58.3)	22 (22.9)	1.40 (0.487)		0.79 (0.651)	(0.28 - 2.23)
Favorable	942 (87.1)	109 (11.6)	270 (28.6)	563 (59.8)	1.11 (0.795)		3.32 (0.006)	(1.40 - 7.86)
<u>Vaccine opposition</u>								
Yes	14 (1.3)	1 (7.1)	4 (28.6)	9 (64.3)	1.88 (0.576)	(0.21 - 17.12)	1.42 (0.739)	(0.18 – 11.42)
To some	403 (37.4)	65 (16.1)	193 (47.9)	145 (36.0)	1.39 (0.103)	(0.94 - 2.08)	0.35 (<0.001)	(0.24 - 0.52)

No NR	661 (61.3) 3	70 (10.6) -	149 (22.5) -	442 (66.9)	1		1	
<u>Family/ friends vaccination point of view</u>								
Unfavorable	25 (20.0)	5 (3.7)	9 (36.0)	11 (44.0)	1		1	
Unsure	234 (21.7)	45 (19.2)	99 (42.3)	90 (38.5)	1.22 (0.732)		0.91 (0.867)	(0.30 - 2.76)
Favorable	822 (76.0)	86 (10.4)	238 (28.9)	498 (60.5)	1.54 (0.452)		2.63 (0.079)	(0.89 - 7.76)
<u>Vaccination protects the population</u>								
Disagree	32 (3.0)	8 (25.0)	14 (43.8)	10 (31.2)	1		1	
Undecided	85 (7.9)	19 (22.4)	42 (49.4)	24 (28.2)	1.26 (0.655)		1.01 (0.985)	(0.33 – 3.06)
Agree	964 (89.1)	109 (11.3)	290 (30.1)	565 (58.6)	1.52 (0.360)		4.15 (0.003)	(1.60 - 10.74)
<u>Confidence in the information provided by the health professionals</u>								
Disagree	140 (13.0)	23 (16.4)	75 (53.6)	42 (30.0)	1		1	
Undecided	275 (25.4)	44 (16.0)	121(44.0)	110 (40.0)	0.84 (0.565)	(0.47 - 1.51)	1.37 (0.318)	(0.74 - 2.54)
Agree	666 (61.6)	69 (10.4)	150 (22.5)	447 (67.1)	0.67 (0.146)	(0.39 - 1.15)	3.55 (<0.001)	(2.01 - 6.26)
<u>More benefits than risks of getting vaccinated</u>								
Disagree	45 (4.1)	7 (15.5)	26 (57.8)	12 (26.7)	1		1	
Undecided	190 (17.6)	32 (16.9)	92 (48.4)	66 (34.7)	0.77 (0.588)		0.58 (0.318)	1.08 (0.903)
Agree	846 (78.3)	97 (11.5)	228 (26.9)	521 (61.6)	0.63 (0.301)		0.44 (0.149)	0.82 (0.747)
<u>Vaccination protection of the most vulnerable people</u>								
Disagree	36 (3.3)	9 (25.0)	18 (50.0)	9 (25.0)	1		1	
Undecided	90 (8.3)	18 (20.0)	39 (43.3)	33 (36.7)	1.08 (0.872)		1.83 (0.275)	(0.62 - 5.44)
Agree	955 (88.4)	109 (11.4)	289 (30.3)	557 (58.3)	1.33 (0.506)		5.11 (<0.001)	(1.98 - 13.17)
<u>Vaccination may interfere with the development of the body's natural immunity</u>								
Disagree	399 (36.9)	36 (9.0)	89 (22.3)	274 (68.7)	1		1	
Undecided	342 (31.6)	50 (14.6)	93 (27.2)	199 (58.2)	0.75 (0.281)		0.52 (0.006)	(0.33 - 0.83)

Agree	340 (31.5)	50 (14.7)	164 (48.2)	126 (37.1)	1.33 (0.268)		0.33 (<0.001)	(0.21 - 0.53)
External Influences								
<u>Physician visit in last 12 months</u>								
No visit	143 (13.2)	18 (12.6)	48 (33.6)	77 (53.8)	1.02 (0.958)	(0.57 – 1.82)	0.95 (0.852)	
Don't Remember	27 (2.5)	6 (22.2)	4 (14.8)	17 (63.0)	0.25 (0.036)	(0.07 - 0.92)	0.63 (0.339)	
Visited	911 (84.3)	112 (12.3)	294 (32.3)	505 (55.4)	1		1	
<u>HPV discussion with physician</u>								
Yes	506 (46.8)	27 (5.3)	122 (24.1)	357 (70.1)	2.23 (<0.001)	(1.38 - 3.59)	6.10 (<0.001)	(3.88 - 9.60)
No	556 (51.4)	107 (19.2)	217 (39.0)	232 (41.7)	1	1	1	
Unsure	19 (1.8)	2 (10.5)	7 (36.9)	10 (52.6)	1.73 (0.501)	(0.35 - 8.45)	2.31 (0.501)	(0.50 – 10.71)
<u>HPV vaccine offer by physician</u>								
Yes	420 (38.8)	17 (4.1)	90 (21.4)	313 (74.5)	1		1	
No	644 (59.6)	116 (18.0)	250 (38.8)	278 (43.2)	0.41 (0.002)	(0.23 - 0.71)	0.13 (<0.001)	(0.08 - 0.22)
Unsure	17 (1.6)	3 (17.7)	6 (35.2)	8 (47.1)	0.38 (0.197)	(0.09 - 1.66)	0.14 (0.007)	(0.04 - 0.60)
<u>Attitude on HPV vaccination in social environment</u>								
Unfavorable	59 (5.5)	21 (35.6)	25 (42.4)	13 (22.0)	1		1	
Unsure	397(36.7)	60 (15.1)	208 (52.4)	129 (32.5)	2.91 (<0.001)	(1.52 - 5.56)	3.47 (<0.001)	(1.63 - 7.40)
Favorable	625 (57.8)	55 (8.8)	113 (18.1)	457 (73.1)	1.73 (0.107)	(0.89 - 3.35)	13.42(<0.001)	(6.37 - 28.30)
<u>Vaccination status of family and friends</u>								
Not vaccinated	255 (23.6)	44 (17.3)	122 (47.8)	89 (34.9)	0.99 (0.978)		0.27 (<0.001)	(0.17 - 0.42)
DNK	278 (25.7)	44 (15.8)	90 (32.4)	144 (51.8)	0.73 (0.212)		0.43 (<0.001)	(0.27 - 0.67)
Vaccinated	548 (50.7)	48 (8.8)	134 (24.4)	366 (66.8)	1		1	

*DKN= does not know

* NR= no response

Supplemental Table 5 (ST5). Analysis of HPV vaccine awareness among parents of adolescents in France, 2021-22 (N=1,959). Socio-demographic - economic, Full and Parsimonious models.

	Socio-demographic -economic model			Full model			Parsimonious model		
	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Sex									
Female (Mothers)	1			1			1		
Male (Fathers)	0.29	<0.001	(0.19 - 0.45)	0.26	<0.001	(0.16 - 0.40)	0.26	<0.001	(0.17-0.40)
Age									
Less than 35 years	1			1			1		
Between 35 and 44 years	1.80	0.042	(1.02 - 3.20)	1.79	0.055	(0.99 - 3.23)	1.91	0.023	(1.09-3.33)
More than 45 years	2.22	0.011	(1.20 - 4.09)	2.19	0.016	(1.15 - 4.14)	2.33	0.005	(1.28-4.22)
Language/Occupation									
French monolingual, Executives, and professionals	1			1			1		
French monolingual, Technicians, and service workers	0.47	0.017	(0.25 - 0.87)	0.54	0.061	(0.29 - 1.03)	0.51	0.037	(0.27-0.96)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.19	<0.001	(0.10 - 0.36)	0.26	<0.001	(0.13 - 0.50)	0.23	<0.001	(0.12-0.44)
Multilingual, Executives and professionals	0.51	0.233	(0.16 - 1.55)	0.53	0.284	(0.17 - 1.68)	0.44	0.134	(0.15-1.29)
Multilingual, Technicians and service workers	0.20	<0.001	(0.08 - 0.47)	0.23	<0.001	(0.10 - 0.56)	0.20	<0.001	(0.09-0.47)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.09	<0.001	(0.04 - 0.20)	0.11	<0.001	(0.05 - 0.25)	0.11	<0.001	(0.05-0.25)
School area deprivation index									
Low	1			1					
Moderate-low	1.02	0.959	(0.57 - 1.79)	1.20	0.549				
Moderate-high	1.02	0.942	(0.58 - 1.81)	1.15	0.643				
High	0.76	0.394	(0.40 - 1.43)	0.90	0.762				
Child sex									
Female	1.95	<0.001	(1.39 - 2.73)	2.03	<0.001	(1.43 - 2.86)	1.95	<0.001	(1.39-2.72)
Male	1			1			1		

Child age

10-11 years	1			1	
11-12 years	1.60	0.061	(0.98 - 2.63)	1.48	0.129
12-13 years	1.39	0.159	(0.88 - 2.18)	1.28	0.305
13-14 years	0.99	0.963	(0.63 - 1.55)	0.94	0.800

Personal Aptitudes & Attitudes

Trust in School system

- Agree
- Undecided
- Disagree

Easy finding information

- Agree
- Unsure
- Disagree
- General Attitudes

Vaccination in general

Unfavorable				1	
Unsure				1.00	0.999
Favorable				1.28	0.552

Vaccine opposition

- Yes
- To some
- No

Family/ friends vaccination point of view

- Unfavorable
- Unsure
- Favorable

Vaccination protects the population

Disagree				1	
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Undecided	1.04	0.925				
Agree	1.38	0.466				
Confidence in the information provided by the health professionals						
Disagree	1					
Undecided	0.69	0.232				
Agree	0.77	0.459				
More benefits than risks of getting vaccinated						
Disagree	1					
Undecided	0.95	0.918				
Agree	1.43	0.446				
Vaccination protection of the most vulnerable people						
Disagree						
Undecided						
Agree						
Vaccination may interfere with the development of the body's natural immunity						
Disagree	1			1		
Undecided	0.58	0.020		0.48	0.001	
Agree	0.61	0.05		0.47	0.001	
External influences						
Physician visit in last 12 months						
No visit	0.34	<0.001	(0.22 - 0.52)	0.32	<0.001	(0.21 -0.48)
Don't Remember	0.45	0.115		0.53	0.195	
Visited	1			1		

*Socio-economic model containing all variables.

*Full model containing all variables that demonstrated stat sign (P<0.20) in Bivariable analyses.

*Parsimonious model containing all variables that demonstrated stat sign (P<0.05) in Full model analysis.

Supplemental Table 6 (ST6). Analysis of HPV vaccine uptake among aware parents of adolescents in France, 2021-22 (N=1,760). Socio-demographic -economic, Full and Parsimonious models.

	Socio-demographic -economic model			Full model			Parsimonious model		
	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Sex									
Female (Mothers)	1			1					
Male (Fathers)	0.84	0.397	(0.56 - 1.26)	0.96	0.877	(0.59 - 1.57)			
Age									
Less than 35 years	1			1			1		
Between 35 and 44 years	1.52	0.140	(0.87 - 2.65)	1.32	0.425	(0.67 - 2.62)	1.36	0.376	(0.69 - 2.66)
More than 45 years	1.82	0.039	(1.03 - 3.22)	1.96	0.062	(0.97 - 3.96)	2.00	0.05	(1.00 - 4.01)
Language/Occupation									
French monolingual, Executives and professionals	1			1			1		
French monolingual, Technicians and service workers	0.82	0.169	(0.62 - 1.09)	1.08	0.669	(0.77 - 1.51)	1.03	0.870	(0.74 - 1.43)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.69	0.034	(0.49 - 0.97)	1.15	0.512	(0.75 - 1.77)	1.11	0.609	(0.73 - 1.69)
Multilingual, Executives and professionals	0.85	0.636	(0.43 - 1.66)	1.15	0.730	(0.52 - 2.53)	1.06	0.889	(0.49 - 2.29)
Multilingual, Technicians and service workers	0.77	0.395	(0.42 - 1.41)	1.14	0.729	(0.54 - 2.41)	1.00	0.995	(0.48 - 2.10)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.59	0.179	(0.27 - 1.28)	1.3	0.582	(0.51 - 3.29)	1.16	0.759	(0.45 - 2.97)

School area deprivation index

Low	1			1			1		
Moderate-low	0.52	<0.001	(0.37 - 0.74)	0.55	0.006	(0.36 - 0.84)	0.51	0.001	(0.34 - 0.77)
Moderate-high	0.67	0.020	(0.47 - 0.94)	0.74	0.168	(0.49 - 1.13)	0.72	0.127	(0.48 - 1.10)
High	0.64	0.033	(0.42 - 0.96)	0.77	0.309	(0.46 - 1.28)	0.7	0.169	(0.42 - 1.16)

Child sex

Female	4.14	<0.001	(3.31 - 5.18)	2.89	<0.001	(2.20 - 3.82)	2.85	<0.001	(2.18 - 3.75)
Male	1			1			1		

Child age based on school grade

10-11 years	1			1			1		
11-12 years	1.32	0.94	(0.95 - 1.83)	1.07	0.733		1.05	0.785	(0.72 - 1.55)
12-13 years	2.03	<0.001	(1.50 - 2.75)	2.01	<0.001	(1.39 - 2.91)	2.04	<0.001	(1.42 - 2.93)
13-14 years	3.88	<0.001	(2.80 - 5.35)	4.03	<0.001	(2.71 - 6.04)	4.05	<0.001	(2.73 - 5.99)

Personal Aptitudes & Attitudes**Trust in School system**

Agree				0.62	0.010		0.63	0.013	
Unsure				0.73	0.165		0.73	0.160	
Disagree				1			1		

Easy finding information

Agree				0.76	0.149				
Unsure				0.72	0.122				
Disagree				1			1		

Vaccination in general

Unfavorable				1			1		
Unsure				0.46	0.128		0.45	0.100	
Favorable				1.29	0.519		1.38	0.404	

Vaccine opposition

Yes				0.86	0.793				
To some				0.82	0.221				

No	1				
Family/ friends vaccination point of view					
Unfavorable					
Unsure					
Favorable					
Vaccination protects the population					
Disagree					
Undecided					
Agree					
Confidence in the information provided by the health professionals					
Disagree	1		1		
Undecided	1.88	0.049	1.98	0.022	
Agree	2.43	0.008	2.87	<0.001	
More benefits than risks of getting vaccinated					
Disagree	1				
Undecided	2.32	0.098			
Agree	1.92	0.174			
Vaccination protection of the most vulnerable people					
Disagree	1				
Undecided	0.74	0.605			
Agree	0.59	0.338			
Vaccination may interfere with the development of the body's natural immunity					
Disagree	1				
Undecided	0.93	0.67			
Agree	0.68	0.041			

External influences

Physician visit and vaccine offered

Visited and vaccine offered	1			1		
Visited and vaccine not offered/unsure	0.10	<0.001	(0.05 - 0.17)	0.07	<0.001	(0.04 - 0.12)
No visited	0.08	<0.001	(0.05 - 0.15)	0.07	<0.001	(0.05 -0.10)

HPV discussion with physician

Yes	1					
No	0.66	0.16				
Unsure	1.41	0.566				

Attitude on HPV vaccination in social environment

Unfavorable	1					
Unsure	1.36	0.483				
Favorable	1.60	0.282				

Vaccination status of family and friends

Not vaccinated	0.16	<0.001	(0.01 - 0.25)	0.15	<0.001	
DNK	0.57	0.001	(0.41 - 0.80)	0.55	<0.001	
Vaccinated	1			1		

DNK= Do not know

*Socio-economic model containing all variables.

*Full model containing all variables that demonstrated stat sign (P<0.20) in Bivariable analyses.

*Parsimonious model containing all variables that demonstrated stat sign (P<0.05) in Full model analysis.

Supplemental Table 7 (ST7). Analysis of HPV vaccine indecision among parents of adolescents with an HPV unvaccinated child in France, 2021-22 (N=1,081). Indecision vs Refusal Socio-demographic -economic, Full and Parsimonious models.

Indecision vs Refusal	Socio-demographic -economic model			Full model			Parsimonious model		
	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Sex									
Female (Mothers)	1			1					
Male (Fathers)	0.71	0.396	(0.30-1.55)	0.89	0.783				
Age									
Less than 35 years	1			1					
Between 35 and 44 years	0.77	0.583	(0.33-2.18)	0.70	0.491				
More than 45 years	0.81	0.670	(0.34 - 2.34)	0.81	0.695				
Language/Occupation									
French monolingual, Executives and professionals	1			1			1		
French monolingual, Technicians and service workers	1.10	0.754	(0.60-2.02)	1.28	0.455	(0.67 - 2.43)	1.22	0.532	(0.65 - 2.28)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.67	0.256	(0.34-1.33)	0.78	0.515	(0.37 - 1.65)	0.74	0.407	(0.36 - 1.52)
Multilingual, Executives and professionals	1.91	0.442	(0.37-9.03)	1.51	0.630	(0.28 - 8.20)	1.59	0.588	(0.30 - 8.40)
Multilingual, Technicians and service workers	2.34	0.216	(0.61-9.03)	2.46	0.212	(0.60-10.14)	1.82	0.390	(0.46 - 7.17)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.39	0.088	(0.13-1.15)	0.53	0.297	(0.16-1.75)	0.45	0.165	(0.14 - 1.39)
School area deprivation index									
Low	1			1			1		
Moderate-low	1.14	0.745	(0.52-2.47)	1.15	0.74	(0.50-2.63)	1.20	0.664	(0.53 - 2.68)

Unfavorable	1			
Unsure	0.65	0.561		
Favorable	1.32	0.698		
Vaccination protects the population				
Disagree	1			
Undecided	1.00	0.998		
Agree	1.64	0.434		
Confidence in the information provided by the health professionals				
Disagree	1			
Undecided	0.83	0.650		
Agree	0.64	0.326		
More benefits than risks of getting vaccinated				
Disagree	1			
Undecided	0.52	0.279		
Agree	0.43	0.181		
Vaccination protection of the most vulnerable people				
Disagree	1			
Undecided	1.77	0.354		
Agree	2.57	0.114		
Vaccination may interfere with the development of the body's natural immunity				
Disagree	1		1	
Undecided	0.71	0.256	0.69	0.192
Agree	1.12	0.711	1.10	0.743
External influences				

Physician visit and vaccine offered				
Visited and vaccine offered	1		1	
Visited and vaccine not offered/unsure	0.61	0.284	0.65	0.371
No visited	0.64	0.381	0.65	0.383
HPV discussion with physician				
Yes	1.68	0.178	1.74	0.137
No	1		1	
Unsure	1.70	0.532	1.55	0.604
Attitude on HPV vaccination in social environment				
Unfavorable	1		1	
Unsure	3.39	0.001	3.34	0.001
Favorable	2.01	0.082	2.25	0.036
Vaccination status of family and friends				
Not vaccinated	0.94	0.828	0.97	0.91
DNK	0.83	0.494	0.83	0.495
Vaccinated	1		1	

DNK= Do not know

*Socio-economic model containing all variables.

*Full model containing all variables that demonstrated stat sign (P<0.20) in Bivariable analyses.

*Parsimonious model containing all variables that demonstrated stat sign (P<0.05) in Full model analysis.

Supplemental Table 8 (ST8). Analysis of HPV vaccine intention among parents of adolescents with an HPV unvaccinated child in France, 2021-22 (N=1,081). Intention vs Refusal Socio-demographic -economic, Full and Parsimonious models.

Intention vs Refusal	Socio-demographic -economic model			Full model			Parsimonius model		
	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Sex									
Female (Mothers)	1			1					
Male (Fathers)	1.24	0.544	(0.62-2.50)	1.38	0.450				
Age									
Less than 35 years	1			1					
Between 35 and 44 years	0.90	0.811	(0.37-2.18)	0.47	0.174				
More than 45 years	0.69	0.422	(0.27-1.72)	0.42	0.132				
Language/Occupation									
French monolingual, Executives and professionals	1			1			1		
French monolingual, Technicians and service workers	0.74	0.298	(0.40-1.30)	1.04	0.911	(0.55 - 1.96)	0.96	0.907	(0.52 - 1.79)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.49	0.028	(0.26-0.93)	0.92	0.828	(0.43 - 1.95)	0.82	0.598	(0.40 - 1.69)
Multilingual, Executives and professionals	1.37	0.695	(0.28-6.62)	1.09	0.920	(0.20 - 5.95)	1.31	0.753	(0.25 - 6.94)
Multilingual, Technicians and service workers	1.20	0.786	(0.32-4.44)	2.00	0.352	(0.47 - 8.54)	1.60	0.512	(0.39 - 6.58)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.19	0.002	(0.07-0.55)	0.26	0.041	(0.07 - 0.94)	0.23	0.019	(0.07 - 0.78)
School area deprivation index									
Low	1			1			1		

Moderate-low	0.66	0.245	(0.32-1.33)	0.72	0.418	(0.32 - 1.61)	0.72	0.415	(0.33 - 1.59)
Moderate-high	1.30	0.486	(0.62-2.72)	1.68	0.227	(0.72 - 3.92)	1.74	0.188	(0.76 - 3.98)
High	0.49	0.082	(0.22-1.10)	0.51	0.158	(0.20 - 1.30)	0.52	0.162	(0.21 - 1.30)
Child sex									
Female	2.78	<0.001	(1.82-4.26)	2.90	<0.001	(1.76 - 4.80)	2.7	<0.001	(1.66 - 4.41)
Male	1			1			1		
Child age based on school grade									
10-11 years	1			1			1		
11-12 years	1.96	0.010	(1.18-3.25)	2.00	<0.001	(1.09 - 3.65)	1.86	0.040	(1.03 - 3.35)
12-13 years	2.60	0.001	(1.51-4.49)	3.00	0.001	(1.61 - 5.62)	2.65	0.002	(1.45 - 4.86)
10-11 years	1.97	0.025	(1.09-3.56)	2.60	0.008	(1.28 - 5.01)	2.22	0.018	(1.15 - 4.30)
Personal Aptitudes & General Attitudes									
Trust in School system									
Agree				0.45	0.022				
Unsure				0.48	0.054				
Disagree				1					
Easy finding information									
Agree				0.87	0.688		0.85	0.635	
Unsure				0.44	0.021		0.43	0.014	
Disagree				1			1		
General Attitudes									
Vaccination in general									
Unfavorable				1			1		
Unsure				1.39	0.642		0.99	0.984	
Favorable				2.74	0.107		2.70	0.061	
Vaccine opposition									
Yes				2.78	0.403		3.31	0.334	
To some				0.50	0.014		0.51	0.009	

No	1		1
Family/ friends			
vaccination point of view			
Unfavorable	1		
Unsure	0.41	0.274	
Favorable	0.71	0.662	
Vaccination protects the population			
Disagree	1		
Undecided	1.06	0.945	
Agree	1.09	0.908	
Confidence in the information provided by the health professionals			
Disagree	1		
Undecided	0.77	0.559	
Agree	1.14	0.786	
More benefits than risks of getting vaccinated			
Disagree	1		
Undecided	1.50	0.581	
Agree	1.12	0.881	
Vaccination protection of the most vulnerable people			
Disagree	1		
Undecided	1.44	0.624	
Agree	1.70	0.453	
Vaccination may interfere with the development of the body's natural immunity			
Disagree	1		1

Undecided	0.74	0.297		0.69	0.179	
Agree	0.55	0.066		0.5	0.024	
External influences						
Physician visit and vaccine offered						
Visited and vaccine offered	1			1		
Visited and vaccine not offered/unsure	0.25	0.003	(0.10- 0.62)	0.25	0.003	(0.10 - 0.62)
No visited	0.41	0.075		0.39	0.059	
HPV discussion with physician						
Yes	3.06	0.004		2.84	0.006	
No	1			1		
Unsure	2.17	0.369		2.29	0.334	
Attitude on HPV vaccination in social environment						
Unfavorable	1			1		
Unsure	3.35	0.010		3.42	0.007	
Favorable	8.69	<0.001		10.22	<0.001	
Vaccination status of family and friends						
Not vaccinated	0.36	<0.001		0.40	0.001	
DNK	0.61	0.078		0.64	0.097	
Vaccinated	1			1		

DNK=Do not know

*Socio-economic model containing all variables.

*Full model containing all variables that demonstrated stat sign (P<0.20) in Bivariable analyses.

*Parsimonious model containing all variables that demonstrated stat sign (P<0.05) in Full model analysis.

Supplemental Table 9 (ST9). Social determinants of HPV vaccine awareness among parents of adolescents in France 2021-22 (N=1,959). Multivariable regression analysis including only socio-demographic and economic factors.

Demographic and socio-economic characteristics	OR	p-value	95% CI
Sex			
Female (Mothers)	1		
Male (Fathers)	0.29	<0.001	(0.19 - 0.45)
Age			
Less than 35 years	1		
Between 35 and 44 years	1.80	0.042	(1.02 - 3.20)
More than 45 years	2.22	0.011	(1.20 - 4.09)
Language/Occupation			
French monolingual, Executives, and professionals	1		
French monolingual, Technicians, and service workers	0.47	0.017	(0.25 - 0.87)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.19	<0.001	(0.10 - 0.36)
Multilingual, Executives and professionals	0.51	0.233	(0.16 - 1.55)
Multilingual, Technicians and service workers	0.20	<0.001	(0.08 - 0.47)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.09	<0.001	(0.04 - 0.20)
School area deprivation			
Low	1		
Moderate-low	1.02	0.959	(0.57 - 1.79)
Moderate-high	1.02	0.942	(0.58 - 1.81)
High	0.76	0.394	(0.40 - 1.43)
Child sex			
Female	1.95	<0.001	(1.39 - 2.73)
Male	1		
Child age			
10-11 years	1		
11-12 years	1.60	0.061	(0.98 - 2.63)
12-13 years	1.39	0.159	(0.88 - 2.18)
13-14 years	0.99	0.963	(0.63 - 1.55)

OR= odds ratio

CI= confidence interval

Supplemental Table 10 (ST10). Social determinants of HPV vaccine uptake among aware parents of adolescents in France, 2021-22 (N=1,760). Multivariable regression analysis including only socio-demographic and economic factors.

Demographic and socio-economic characteristics	OR	p-value	95% CI
Sex			
Female (Mothers)	1		
Male (Fathers)	0.84	0.397	(0.56 - 1.26)
Age			
Less than 35 years	1		
Between 35 and 44 years	1.52	0.140	(0.87 - 2.65)
More than 45 years	1.82	0.039	(1.03 - 3.22)
Language/Occupation			
French monolingual, Executives, and professionals	1		
French monolingual, Technicians, and service workers	0.82	0.169	(0.62 - 1.09)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.69	0.034	(0.49 - 0.97)
Multilingual, Executives and professionals	0.85	0.636	(0.43 - 1.66)
Multilingual, Technicians and service workers	0.77	0.395	(0.42 - 1.41)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.59	0.179	(0.27 - 1.28)
School area deprivation			
Low	1		
Moderate-low	0.52	<0.001	(0.37 - 0.74)
Moderate-high	0.67	0.020	(0.47 - 0.94)
High	0.64	0.033	(0.42 - 0.96)
Child sex			
Female	4.14	<0.001	(3.31 - 5.18)
Male	1		
Child age			
10-11 years	1		
11-12 years	1.32	0.94	(0.95 - 1.83)
12-13 years	2.03	<0.001	(1.50 - 2.75)
13-14 years	3.88	<0.001	(2.80 - 5.35)

OR= odds ratio

CI= confidence interval

Supplemental Table 11 (ST11). Social determinants of HPV vaccine intentionality among parents of adolescents with an HPV unvaccinated child in France, 2021-22, (N=1,081). Multivariable regression including only socio-demographic and economic factors.

Demographic and socio-economic characteristics	Indecision vs Refusal			Intention vs Refusal		
	OR	p-value	95% CI	OR	p-value	95% CI
Sex						
Female (Mothers)	1			1		
Male (Fathers)	0.71	0.396	(0.33-1.55)	1.24	0.544	(0.65-2.50)
Age						
Less than 35 years	1			1		
Between 35 and 44 years	0.77	0.583	(0.33-2.18)	0.90	0.811	(0.37-2.18)
More than 45 years	0.81	0.670	(0.34-2.34)	0.69	0.422	(0.27-1.72)
Language/Occupation						
French monolingual, Executives, and professionals	1			1		
French monolingual, Technicians, and service workers	1.10	0.754	(0.60-2.02)	0.74	0.298	(0.42-1.30)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.67	0.256	(0.34-1.33)	0.49	0.028	(0.26-0.93)
Multilingual, Executives and professionals	1.91	0.442	(0.37-9.03)	1.37	0.695	(0.28-6.62)
Multilingual, Technicians and service workers	2.34	0.216	(0.61-9.03)	1.20	0.786	(0.32-4.44)
Multilingual, Farmers and small business owners, Factory workers, and Inactive	0.39	0.088	(0.13-1.15)	0.19	0.002	(0.07-0.55)
School area deprivation						
Low	1			1		
Moderate-low	1.14	0.745	(0.52-2.47)	0.66	0.245	(0.32-1.33)
Moderate-high	1.47	0.349	(0.65-3.31)	1.30	0.486	(0.62-2.72)
High	1.34	0.509	(0.56-3.18)	0.49	0.082	(0.22-1.10)
Child sex						
Female	1.64	0.032	(1.04-2.56)	2.78	<0.001	(1.82-4.26)
Male	1			1		
Child age						
10-11 years	1			1		
11-12 years	1.24	0.447	(0.71-2.16)	1.96	0.010	(1.18-3.25)
12-13 years	3.20	<0.001	(1.82-5.63)	2.60	0.001	(1.51-4.49)
13-14 years	2.07	0.021	(1.12-3.85)	1.97	0.025	(1.09-3.56)

OR= odds ratio; CI= confidence interval

Supplemental table 12 (ST12). Socio-demographic and –economic determinants of HPV vaccine awareness among parents, by referring physician visit in the last 12 months. France, 2021-22 (N=1,959). No significant interaction with recent physician visit was found.

Characteristics	Total	Physician visit during last 12 months			
	N=1,959	No visit N= 203	Visited N= 1,698		
	OR (p-value)	OR (p-value)	95% CI	OR (p-value)	95% CI
Sex					
Female (Mothers)	1	1		1	
Male (Fathers)	0.29 (<0.001)	0.40 (0.096)	(0.18-1.18)	0.25 (<0.001)	(0.15-0.41)
Age					
Less than 35 years	1	1		1	
Between 35 and 44 years	1.80 (0.042)	1.36 (0.646)	(0.37-5.03)	2.03 (0.036)	(1.05-3.95)
More than 45 years	2.22 (0.011)	3.84 (0.076)	(0.87-16.90)	2.01 (0.050)	(1.00-4.05)
Language/Occupation					
French monolingual, Executives, and professionals	1	1		1	
French monolingual, Technicians, and service workers	0.47 (0.017)	0.35 (0.191)	(0.67-1.68)	0.55 (0.090)	(0.27-1.10)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.19 (<0.001)	0.13 (0.015)	(0.03-0.67)	0.21(<0.001)	(0.11-0.43)
Multilingual, Executives and professionals	0.51 (0.233)	0.59 (0.721)	(0.02-10.44)	0.52 (0.306)	(0.15-1.81)
Multilingual, Technicians and service workers	0.20 (<0.001)	0.12 (0.04)	(0.01-0.91)	0.23 (0.003)	(0.08-0.61)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.09 (<0.001)	0.08 (0.015)	(0.01-0.61)	0.1 (<0.001)	(0.04-0.24)
School area deprivation					
Low	1	1		1	
Moderate-low	1.02 (0.959)	2.09 (0.259)	(0.58-7.50)	1.00 (0.990)	(0.50-1.97)
Moderate-high	1.02 (0.942)	4.65 (0.029)	(1.17-18.52)	0.76 (0.423)	(0.39-1.49)
High	0.76 (0.394)	2.35 (0.263)	(0.53-10.45)	0.61 (0.201)	(0.29-1.30)
Child sex					
Female	1.95 (<0.001)	1.37 (0.381)	(0.68-2.79)	2.17 (<0.001)	(1.46-3.22)
Male	1	1		1	
Child age					
10-11 years	1	1		1	
11-12 years	1.60 (0.061)	2.77 (0.076)	(0.90-8.50)	1.39 (0.258)	(0.78-2.47)
12-13 years	1.39 (0.159)	1.54 (0.417)	(0.54-4.39)	1.23 (0.436)	(0.73-2.08)
13-14 years	0.99 (0.963)	0.98 (0.979)	(0.40-2.45)	0.99 (0.957)	(0.57-1.69)

OR= odds ratio; CI= confidence interval

Supplemental Table 13 (ST13). Socio-demographic and –economic determinants of HPV vaccine uptake among parents, by referring physician visit in the last 12 months. France, 2021-22 (N=1,760). No significant interaction with recent physician visit was found.

Characteristics	Total N=1,760	Physician visit during last 12 months			
		No visit N= 161			Visited N= 1,568
	OR (p-value)	OR (p-value)	95% CI	OR (p-value)	95% CI
Sex					
Female (Mothers)	0.84 (0.397)	1.92 (0.563)	(0.21-17.54)	0.81 (0.322)	(0.53-1.23)
Male (Fathers)	1	1		1	
Age					
Less than 35 years	1	1		1	
Between 35 and 44 years	1.52 (0.140)	1.85 (0.460)	(0.36-9.47)	1.57 (0.121)	(0.89-2.76)
More than 45 years	1.82 (0.039)	1	-	1.96 (0.023)	(1.10-3.51)
Language/Occupation					
French monolingual, Executives, and professionals	1	1		1	
French monolingual, Technicians, and service workers	0.82 (0.169)	3.93 (0.263)	(0.36-43.13)	0.80 (0.136)	(0.60-1.07)
French monolingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.69 (0.034)	7.24 (0.139)	(0.53-99.54)	0.68 (0.035)	(0.48-0.97)
Multilingual, Executives and professionals	0.85 (0.636)	0.91 (0.973)	(0.00-212.83)	0.86 (0.673)	(0.43-1.73)
Multilingual, Technicians and service workers	0.77 (0.395)	2.20 (0.674)	(0.06-86.21)	0.72 (0.321)	(0.38-1.37)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.59 (0.179)	1	-	0.66 (0.238)	(0.27-1.38)
School area deprivation index					
Low	1	1		1	
Moderate-low	0.52 (<0.001)	0.01 (0.020)	(0.00-0.49)	0.60 (0.005)	(0.42-0.86)
Moderate-high	0.67 (0.020)	0.04 (0.077)	(0.00-1.41)	0.71 (0.063)	(0.50-1.02)
High	0.64 (0.033)	1	-	0.70 (0.109)	(0.46-1.08)
Child sex					
Female	4.14 (0.001)	1	-	4.00 (<0.001)	(3.17-5.03)
Male	1	1		1	
Child age based on school grade					
10-11 years	1	1		1	
11-12 years	1.32 (0.94)	1	-	1.36 (<0.001)	(0.97-1.91)
12-13 years	2.03 (<0.001)	12.53 (0.039)	(1.14-138.31)	1.97 (<0.001)	(1.44-2.69)
13-14 years	3.88 (<0.001)	42.78 (0.004)	(3.27-560.55)	3.89 (<0.001)	(2.78-5.45)

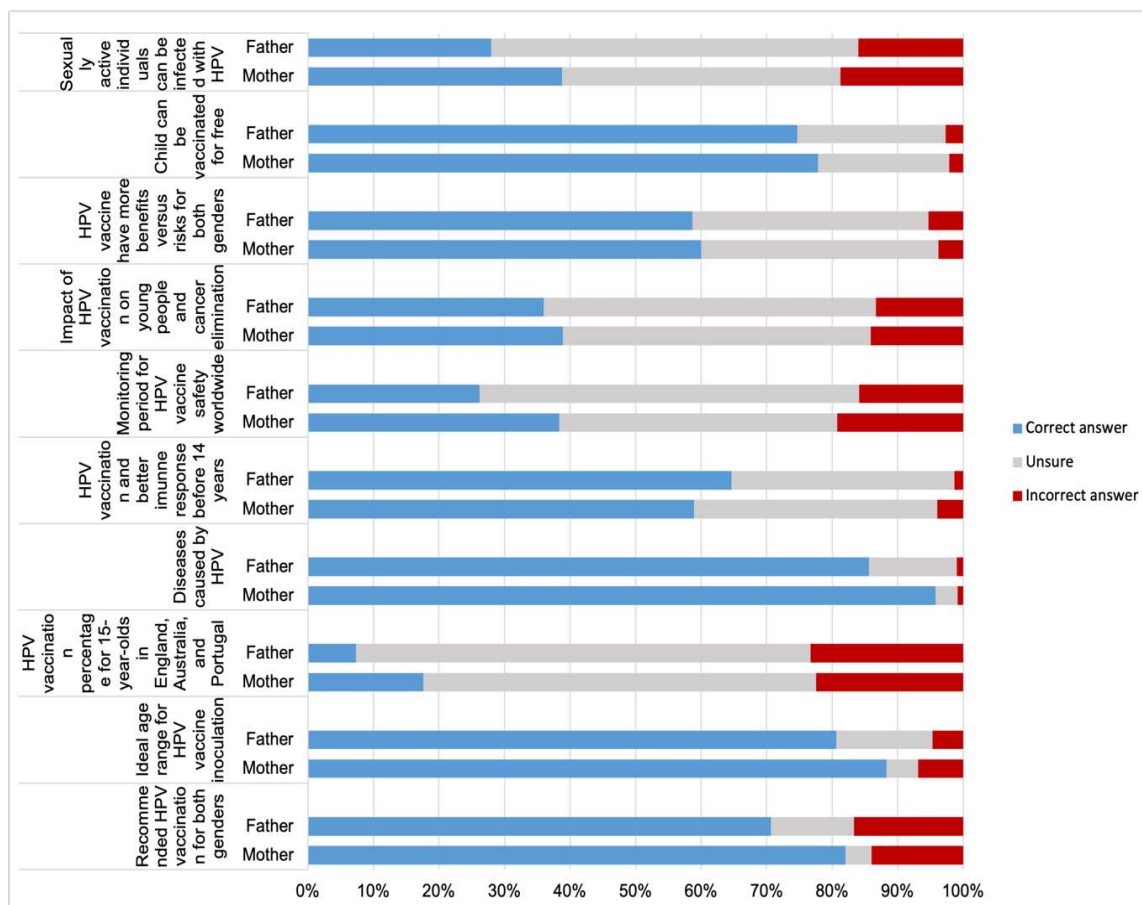
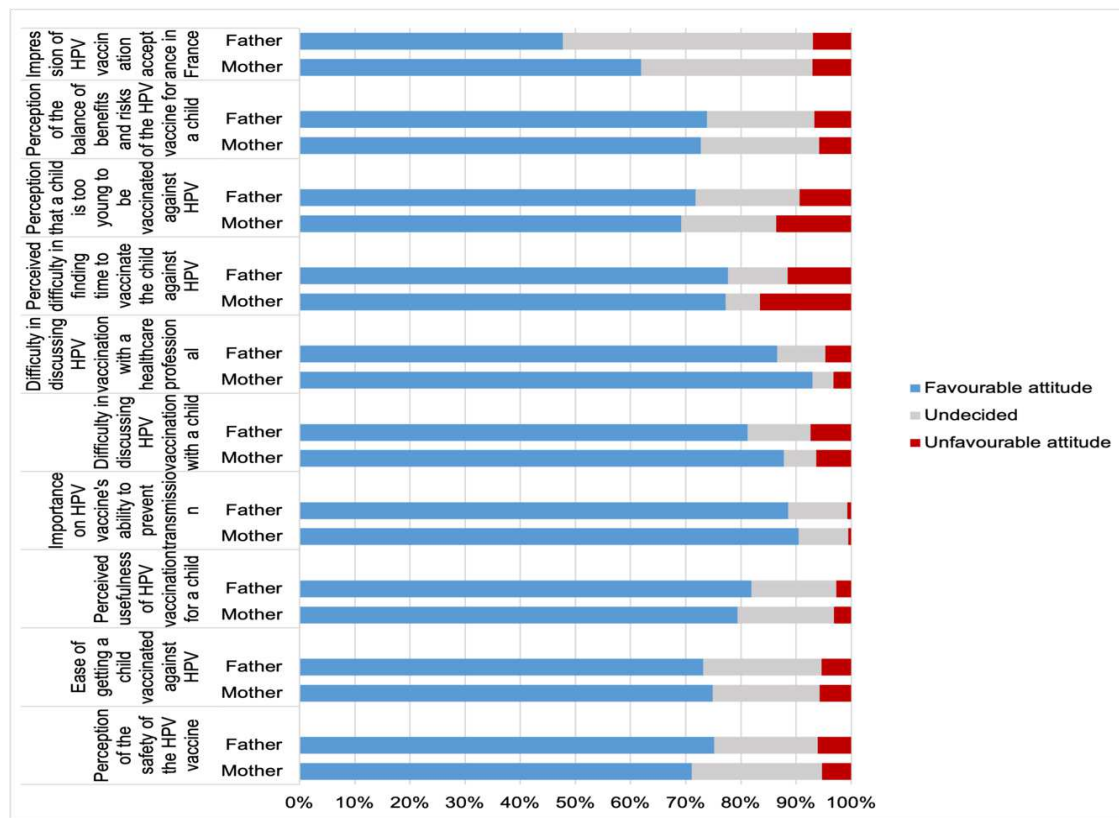
OR= odds ratio; CI= confidence interval

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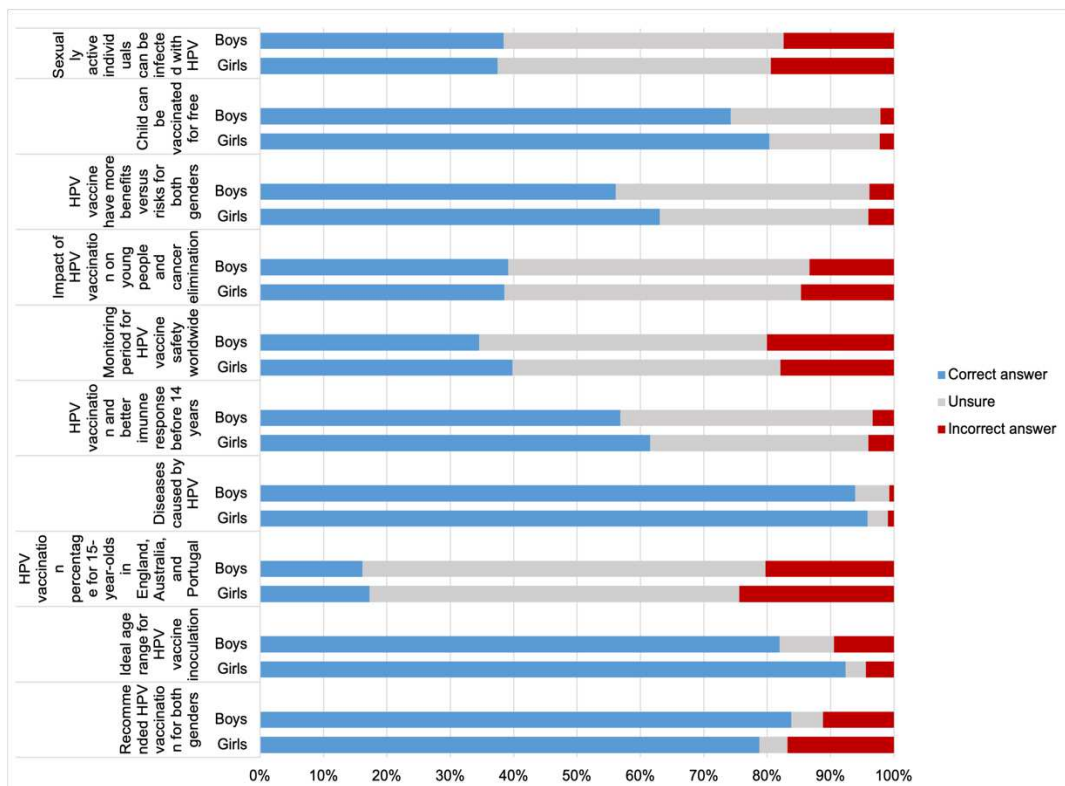
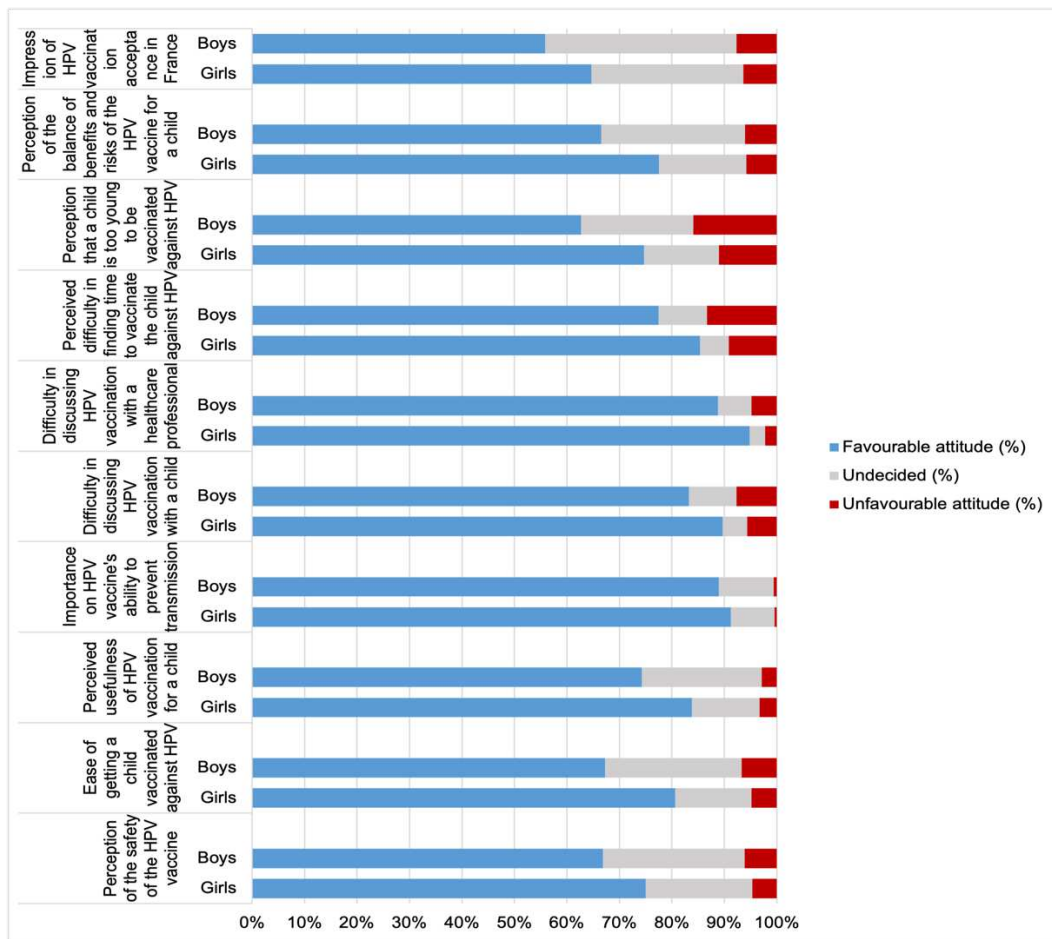
Supplemental table 14 (ST14). Socio-demographic and –economic determinants of HPV vaccine intention among parents with an HPV unvaccinated child, by referring physician visit in the last 12 months. France, 2021-22 (N=1,081). No significant interaction with recent physician visit was found.

Characteristics	Total N=1,081	Physician visit during last 12 months			
		No visit N= 77		Visited N= 505	
	OR (p-value)	OR (p-value)	95% CI	OR (p-value)	95% CI
Sex					
Female (Mothers)	1	1		1	
Male (Fathers)	1.24 (0.544)	2.97 (0.357)	(0.29-29.96)	1.07 (0.851)	(0.51-2.25)
Age					
Less than 35 years		1		1	
Between 35 and 44 years	0.90 (0.811)	0.62 (0.721)	(0.04-8.54)	0.97 (0.949)	(0.37-2.52)
More than 45 years	0.69 (0.422)	0.33 (0.423)		0.80 (0.672)	(0.30-2.19)
Language/Occupation					
French monolingual, Executives, and professionals	1	1		1	
French monolingual, Technicians, and service workers	0.74 (0.298)	1.11 (0.887)	(0.28-4.38)	0.74 (0.337)	(0.39-1.38)
French monolingual, Farmers and small business owners, Factory workers, and Inactive	0.49 (0.028)	0.58 (0.526)	(0.11-3.10)	0.49 (0.046)	(0.24-0.99)
Multilingual, Executives and professionals	1.37 (0.695)	19.98 (0.994)	0	1.09 (0.917)	(0.22-5.50)
Multilingual, Technicians and service workers	1.20 (0.786)	14.21 (0.992)	0	1.00 (0.996)	(0.26-3.82)
Multilingual, Farmers and small business owners, Factory workers, and Inactive (others)	0.19 (0.002)	0.25 (0.375)	(0.01-5.47)	0.17 (0.003)	(0.06-0.54)
School area deprivation index					
Low	1	1		1	
Moderate-low	1 (0.245)	0.4 (0.445)	(0.04-4.14)	0.69 (0.331)	(0.33-1.46)
Moderate-high	0.66 (0.486)	1.02 (0.984)	(0.09-11.07)	1.32 (0.495)	(0.60-2.90)
High	1.30 (0.082)	0.57 (0.662)	(0.05-7.12)	0.45 (0.070)	(0.19-1.07)
Child sex					
Female	2.78 (<0.001)	2.92 (0.049)	(1.01-8.46)	2.91(<0.001)	(1.82-4.67)
Male	1	1		1	
Child age based on school grade					
10-11 years	1	1		1	
11-12 years	1.96 (0.010)	1.3 (0.691)	(0.36-4.63)	2.21 (0.006)	(1.25-3.89)
12-13 years	2.60 (0.001)	2.33 (0.24)	(0.57-9.54)	2.87 (0.001)	(1.57-5.25)
13-14 years	1.97 (0.025)	5.18 (0.051)	(0.99-27.08)	1.66 (0.122)	(0.87-3.14)

OR= odds ratio; CI= confidence interval

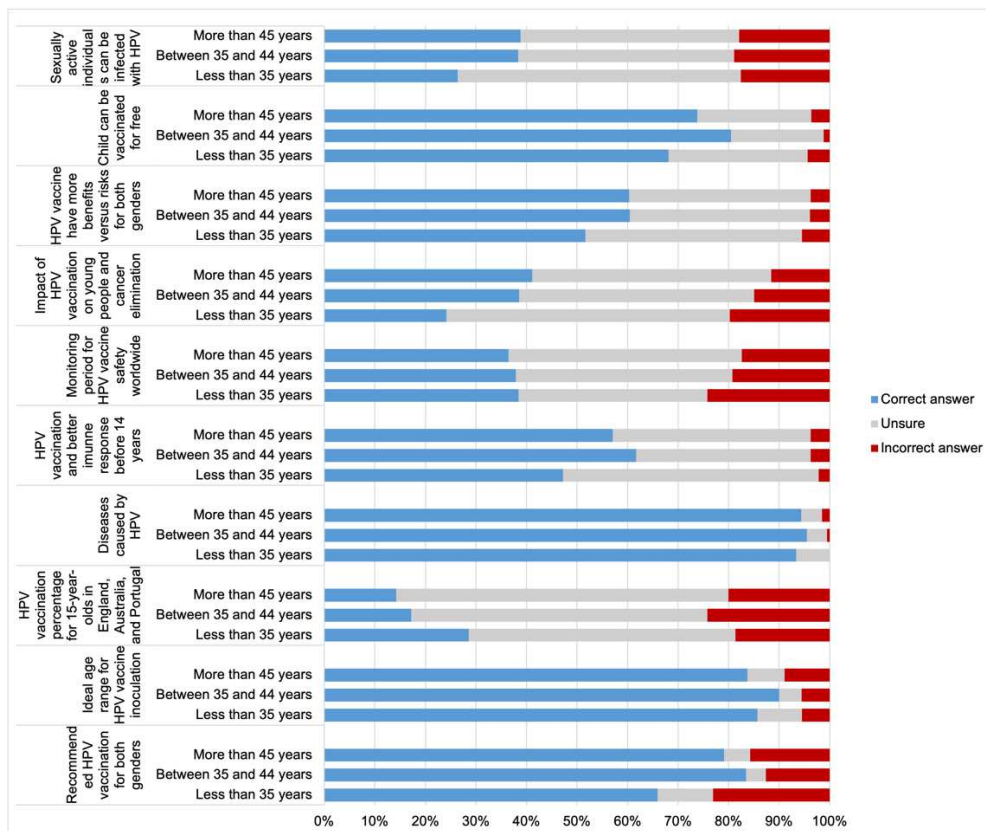
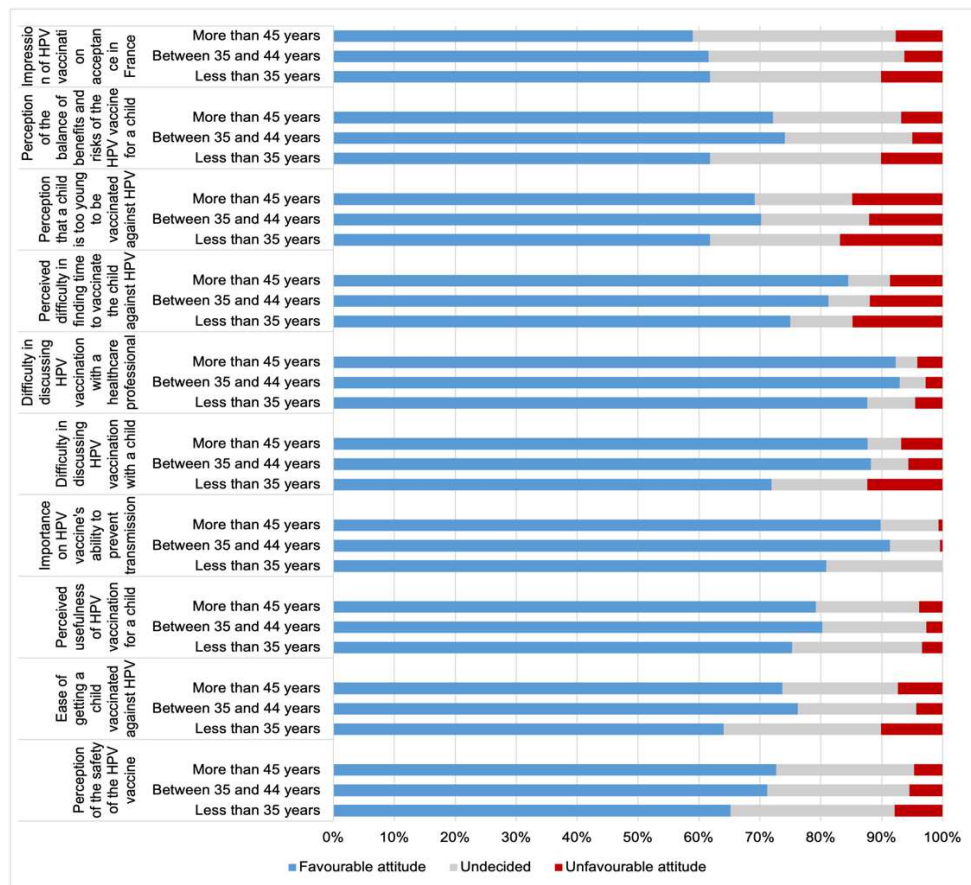


Supplemental Figure 1 (A-B). Distribution of attitude (upper graph) and knowledge (lower graph) items regarding HPV vaccination among parents who have heard about HPV vaccination, by **sex**. France, 2021-22 (N=1,781).

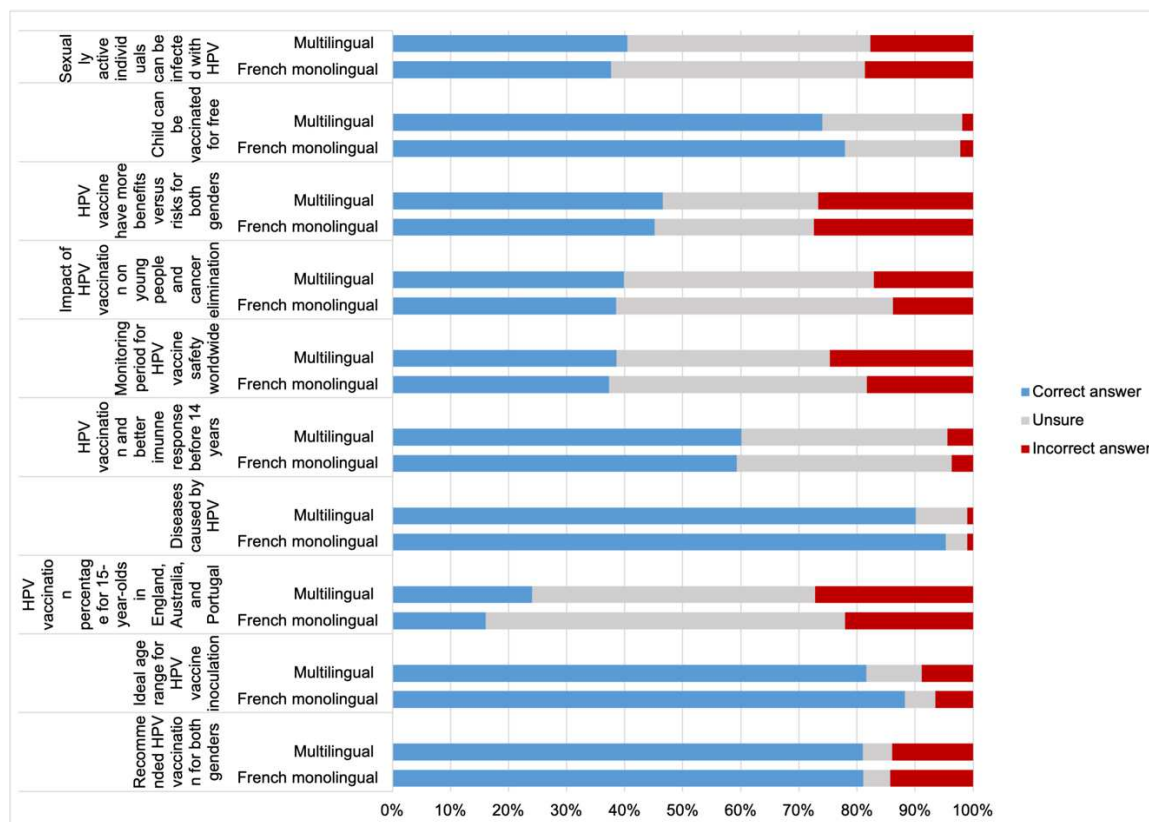
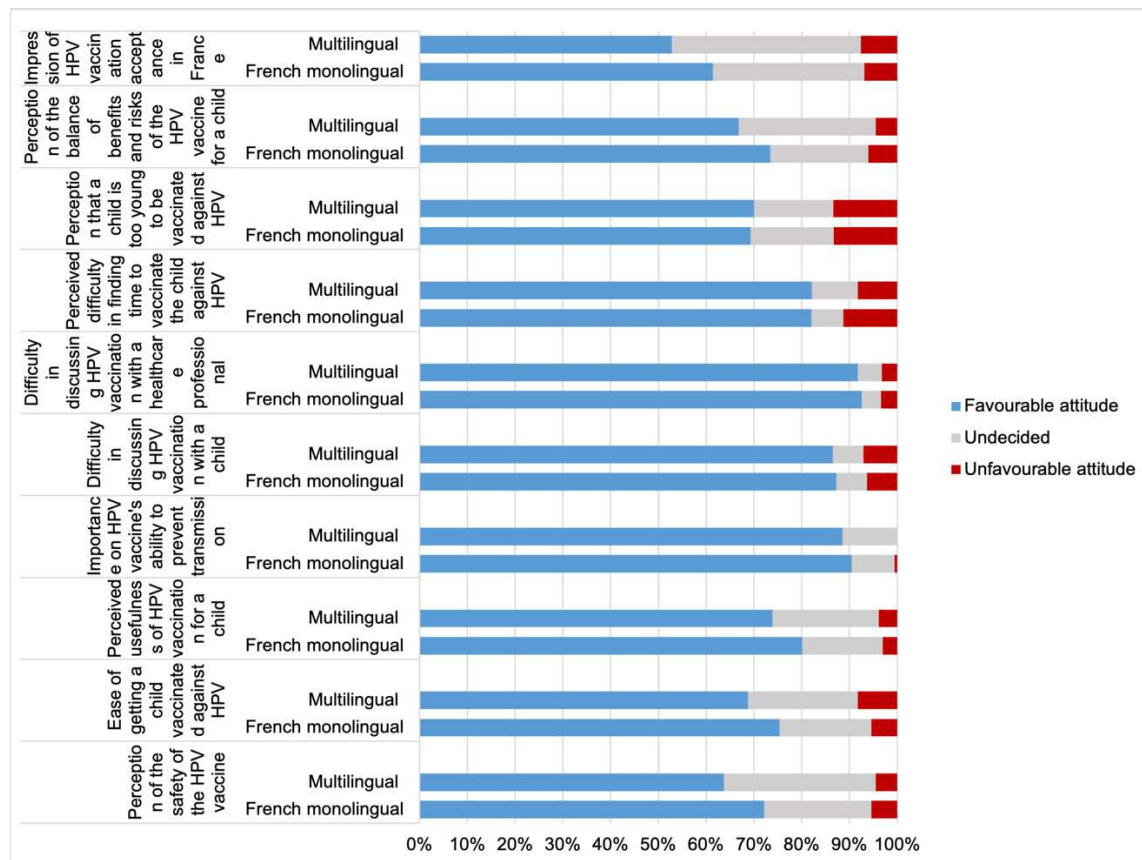


Supplemental Figure 2 (A-B). Distribution of attitude (upper graph) and knowledge (lower graph) items regarding HPV vaccination among parents who have heard about HPV vaccination, by **sex of the child**.

France, 2021-22 (N= 1,781).



Supplemental Figure 3 (A-B). Distribution of attitude (upper graph) and knowledge (lower graph) items regarding HPV vaccination among parents who have heard about HPV vaccination, by **parent age**. France, 2021-22 (N= 1,781).



Supplemental Figure 4 (A-B). Distribution of attitude (upper graph) and knowledge (lower graph) items regarding HPV vaccination among parents who have heard about HPV vaccination, by **language**. France, 2021-22 (N= 1,781).

Resumé (Français)

Titre: Déterminants socio-économiques de la sensibilisation, de l'adoption et de l'intention d'adopter le VPH chez les parents d'adolescents en France.

Contexte: La couverture vaccinale contre le papillomavirus humain (HPV) reste inférieure à 50 % en France, en particulier dans les populations défavorisées. Cette étude visait à identifier les inégalités socio-économiques en matière de connaissance, d'adhésion et d'intention de vaccination contre le papillomavirus chez les parents d'adolescents, et à examiner si les visites chez le médecin atténuaient ces disparités.

Méthodes: Les données des parents d'élèves de collège en France ont été recueillies par le biais d'une enquête en ligne anonyme. Des régressions logistiques multivariées ont été effectuées pour explorer les associations entre les facteurs socio-économiques et la connaissance, l'adoption et l'intention de se faire vacciner contre le VPH. Des analyses d'interaction ont été effectuées pour examiner l'influence des visites chez le médecin sur les déterminants socio-économiques significatifs.

Résultats: Parmi les 1 959 participants, les techniciens et les travailleurs des services unilingues français (RC = 0,47, IC à 95 % : 0,25-0,87), les agriculteurs, les propriétaires de petites entreprises, les travailleurs d'usine et les inactifs (RC = 0,19, IC à 95 % : 0,10-0,36) avaient des chances significativement plus faibles d'être sensibilisés au vaccin que les cadres et les professionnels unilingues français. Les personnes multilingues (parlant également une autre langue dans la famille) appartenant à ces catégories professionnelles présentaient des probabilités encore plus faibles : (OR=0,20, IC à 95 % : 0,08-0,47) et (OR= 0,09, IC à 95 % : 0,04-0,20), respectivement. Les parents vivant dans des zones moyennement défavorisées (OR=0,52, IC à 95 % : 0,37-0,74), moyennement défavorisées (OR=0,67, IC à 95 % : 0,47-0,94) et très défavorisées (OR=0,64, IC à 95 % : 0,42-0,96) avaient une probabilité plus faible de se faire vacciner que ceux vivant dans des zones faiblement défavorisées. Les parents de familles multilingues occupant des emplois à faible revenu étaient moins susceptibles d'avoir l'intention de faire vacciner leur enfant (OR=0,19, IC à 95 % : 0,07-0,55). La visite du médecin n'a pas atténué les inégalités socio-économiques pour aucun des résultats.

Conclusion: Cette étude apporte des preuves supplémentaires des inégalités sociales en matière de vaccination contre le HPV en France, notamment en ce qui concerne la sensibilisation et l'intention de vaccination, et souligne l'importance d'approches personnalisées dans la promotion de la vaccination contre le HPV.