Cognitions and behaviours of general practitioners in France regarding HPV vaccination: A theory-based systematic review

Geraldine Escriva-Boulley, Olena Mandrik, Marie Préau, Rolando Herrero, Patricia Villain

Journal Pre-proof

Cognitions and behaviours of general practitioners in France regarding HPV vaccination: A theory-based systematic review

Géraldine Escriva-Boulley, Olena Mandrik, Marie Préau, Rolando Herrero, Patricia Villain

PII: S0091-7435(20)30347-9

DOI: https://doi.org/10.1016/j.ypmed.2020.106323

Reference: YPMED 106323

To appear in: *Preventive Medicine*

Received date: 23 January 2020

Revised date: 4 November 2020

Accepted date: 5 November 2020

Please cite this article as: G. Escriva-Boulley, O. Mandrik, M. Préau, et al., Cognitions and behaviours of general practitioners in France regarding HPV vaccination: A theory-based systematic review, *Preventive Medicine* (2020), https://doi.org/10.1016/j.ypmed.2020.106323

Cognitions and behaviours of general practitioners in France regarding HPV vaccination: a theory-based systematic review

Géraldine Escriva-Boulley[1], Olena Mandrik[2], Marie Préau[1], Rolando Herrero[3], Patricia Villain[4]*

[1]Laboratoire GRePS (EA 4163), Université Lyon 2, 69676, Bron, France

[2]The University of Sheffield, School of Health and Related Research (ScHARR), Health Economic and Decision Science (HEDS), Sheffield S1 4DA, United Kingdom

[3]Prevention and Implementation Group, Early Detection and Prevention Section, International Agency for Research on Cancer. World Health Organization (IARC – WHO), 69372, Lyon, France

[4]Screening Group, Early Detection and Prevention Section, International Agency for Research on Cancer. World Health Organization (IARC – WHO), 69372, Lyon, France

*Corresponding author
Dr. Patricia Villain
Screening Group, Early Detection and Prevention Section
International Agency for Research on Cancer (WHO)
150 cours Albert Thomas, 69372 Lyon Cedex 08, France
E-Mail: villainp@iarc.fr, Tel: +33-472738440; fax: +33-472738518

Abstract

Human papillomavirus (HPV) vaccination is safe and efficacious to prevent persistent HPV infection, precancerous anogenital lesions and cervical cancer. However, in countries where vaccination programmes are implemented outside of schools, such as France, reaching high HPV vaccination coverage of the target population is challenging. Many studies have been performed in France to assess cognitions of general practitioners' (GPs) regarding HPV vaccination. However, the evidence is not consistent about which cognitions are key. To provide a comprehensive overview, we performed a systematic review of studies conducted in France on GPs' cognitions regarding HPV vaccination and used the reasoned action approach to extract and synthesize data. The systematic search was performed up to July 2020 in Medline via PubMed, PsycINFO, PsycARTICLES, Embase, CINAHL Plus, Web of Science, Pascal and Francis databases. Grey literature was searched for in the French Public Health Database, Cairn. Info, yahoo.fr, and Google Scholar. Twenty-five scientific publications were selected based on eligibility criteria and assessed for quality. Our qualitative synthesis highlights that although 73% of GPs report recommending HPV vaccination, up to 50% would not recommend it because of concerns, including changes in patients' health behaviours and doubts about safety and/or efficacy. GPs' injunctive norms, i.e. trust in institutional information, were shown to be associated positively with GPs' willingness to recommend HPV vaccination. Parents' fears, girls' age, and potential connection with sexuality do not seem to affect GPs' recommendations. These results will inform the development of a professional educational intervention targeting GPs in France.

Keywords: General Practitioners, Reasoned Action Approach, HPV vaccination, France

Introduction

Human papillomavirus (HPV) vaccination has been shown to be highly effective to reduce the prevalence of persistent infections with targeted HPV types and the incidence of high-grade precancerous cervical lesions. Thus, it is currently being implemented in many countries, though with variable coverage rates [1]. In some high-income settings, such as Canada and the United Kingdom, HPV vaccination coverage can reach more than 80%. It is generally much lower in countries where almost all vaccinations are delivered outside of schools such as the United States and France [1.] In France, where general practitioners (GPs) are responsible for counselling and vaccinating adolescent girls, HPV vaccination coverage of the target population, i.e. girls aged 11-14 year since 2012, has not exceeded 30% since its implementation [2]. Barriers and facilitators to HPV vaccination have been intensely studied in France [3-5]. For French parents and young girls, the main barriers regarding HPV vaccination are concerns about serious side effects [3-5]. Socioeconomic determinants have been shown to influence HPV vaccination uptake with a lower uptake observed in more deprived groups [4]. Similarly to others primary care professionals, the HPV vaccination decision of French parents is driven by the recommendations of their GPs [5-7]. GPs' barriers mainly concern the efficacy and safety of HPV vaccination, and also relate to the national recommendations regarding HPV vaccination age and groups [5,6]. The French National Cancer Institute and/or other national agencies have implemented interventions to address GPs' barriers [8,9]. Changes in the national recommendations regarding the age of girls did not lead to an increase in HPV vaccination uptake and it is too early to report on the efficacy of extending HPV vaccination to boys [9,10]. The provision of information about HPV vaccination to GPs has been reinforced since 2017 [11]. Although they have not been formally evaluated, these actions are speculated to contribute to the upward trend in coverage observed in France since 2015 [9]. The gaps and the apparent contradiction in the evidence suggest that some important determinants regarding French GPs' cognitions might have been missed.

A systematic review focusing on French GPs' cognitions and going beyond only knowledge and attitude, which are usually reported, will fil this research gap [12,13]. Using a behaviour theory as a framework to extract evidence can provide a more comprehensive overview of these cognitions. We chose to conduct a reasoned action approach (RAA) theory-based systematic review of studies performed in France in order to provide a comprehensive overview of French GPs' cognitions related to HPV vaccination. The RAA is the most recent derivative of the theory of planned behaviour, which has been the most used theoretical

framework to explain and predict health practitioners' intentions and behaviours regarding HPV vaccination [14-16]. In addition, the RAA provides a more detailed framework with each of the cognitions of the theory of planned behaviour represented by pairs of distinct, but related, subcomponents, which have been shown to be important in predicting and explaining behaviour [16,17]. The RAA differentiates the following cognitions (Fig. 1):

- Instrumental (i.e. perceived outcomes of behaviour adoption) or experiential (feelings associated with behaviour) attitudes;
- Injunctive (i.e. perceived expectations of important referent individuals or social groups) and descriptive (i.e. perceptions of what important referent individuals or social groups do) norms;
- Perceived behavioural control's capacity (i.e. individuals' confidence, beliefs about the necessary skills and abilities they have to perform the behaviour) and autonomy (i.e. individuals' beliefs that they have control over the behaviour).

We used this framework to (i) report GPs' cognitions and beliefs, and (ii) examine the impacts of these cognitions on GPs' behaviour. The impact of background variables related to GPs, i.e. self-related, contextual, or sociodemographic, was also investigated, because they could be influential to French GPs' cognitions and/or behaviours regarding HPV vaccination (Fig. 1) [12]. The results of this review will inform the design of an educational intervention on HPV vaccination targeting GPs in France.

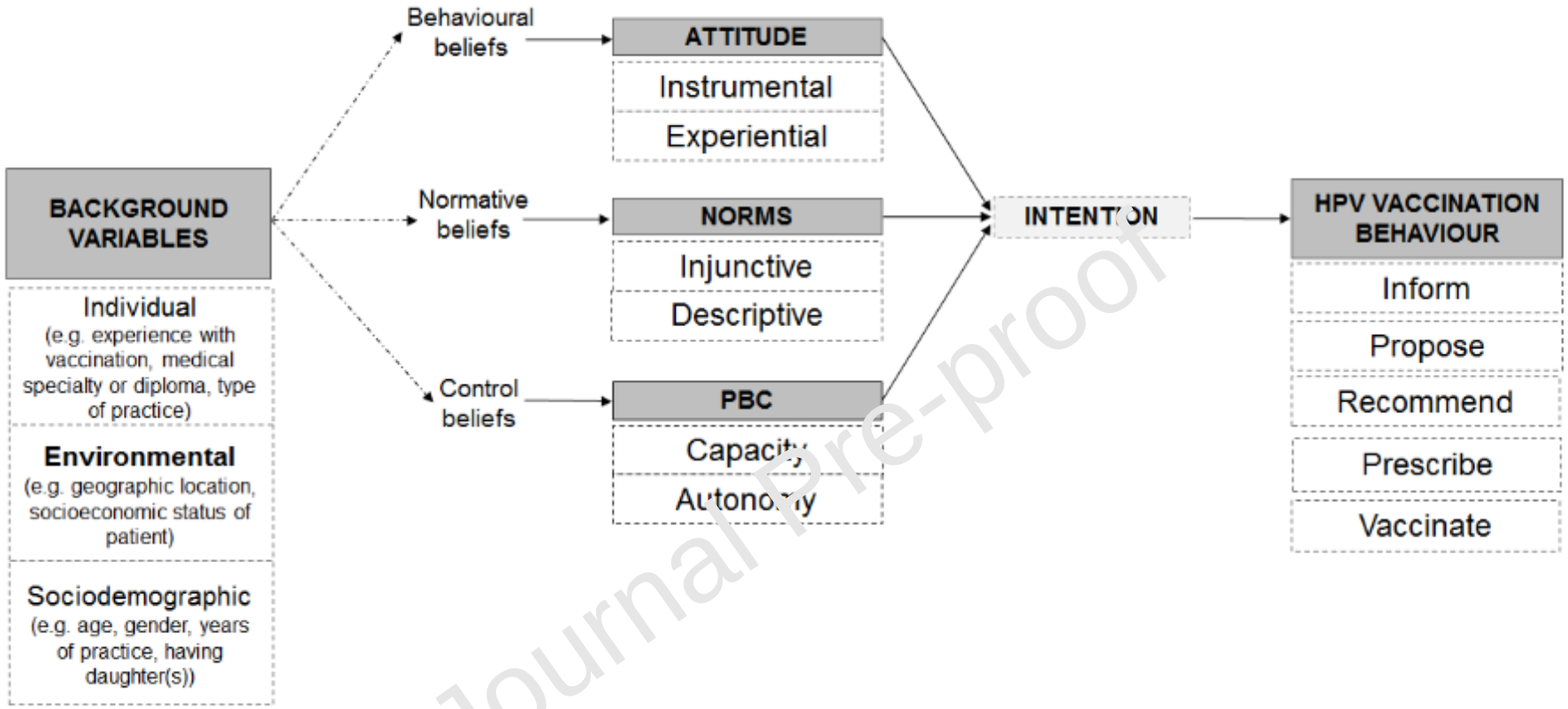

Figure 1. Theoretical framework used in the review based on the reasoned action approach (RAA) [16]. In this theory, behaviour is driven by intention, which in turn is driven by instrumental and experiential attitudes towards the behaviour, injunctive and descriptive norms, and PBC's capacity and autonomy. Intention regarding HPV vaccination was not assessed in the review, because no data were available.

GP= general practitioner; PBC = perceived behavioural control

Methods

We used the PRISMA statement and the checklist to report explicitly and comprehensively all the recommended components [18].

Study search and selection

The systematic search was performed by PV up to December 2018 in the following databases: Medline via PubMed, PsycINFO, PsycARTICLES, Embase, CINAHL plus, Web of Science, Pascal and Francis. The search for grey literature was performed by both GB and PV in the French Public Health Database (Banque de données en santé publique), Cairn.Info, yahoo.fr and Google Scholar. Search updates from December 2018 to July 2020 were conducted by PV. The full research query in Medline via PubMed is available in Appendix, Table A.1.

To be considered for inclusion, titles/abstracts and their full texts were required to meet the following criteria: (a) published in any language (b) the study population was GPs or included GPs, (c) used quantitative (self-reported questionnaire) and/or qualitative (semi-structured interview, focus group) methods (c) reported outcomes related to any information regarding GPs' cognitions and/or behaviours related to HPV vaccination, (d) based in France or included France among other countries and (e) was an original study and either a peer-reviewed article or a medical dissertation. Studies were excluded when (a) focused on psychometric validation of questionnaires, or (b) were review, conference abstract, opinion and/or a published survey that did not provide a full description of the methodology and results or (c) was a medical dissertation whose related results were published in a peer-reviewed article, which was part of the review.

Data extraction

A data extraction form and coding method was developed and tested first with some of the included studies. The variables of interest were those presented in the tables in the Result section or the Appendix. The variables were descriptive and included studies characteristics, GPs' characteristics, GPs' cognitions as reported in the RAA model (Fig. 1) and background variables that have been shown to influence primary care professionals' behaviour regarding HPV vaccination [12] (Fig. 1).

We also extracted all variables to explore a possible relationship or an association between a) GPs' attitudes, norms, perceived behavioural control and either cognitions or behaviour

regarding HPV vaccination b) background variables and either GPs' attitude or behaviour regarding HPV vaccination.

Data from all included full-text publications were identified and extracted by two investigators (GEB and PV). Any disagreement in data extraction was resolved by consensus.

Assessment of study quality

Two of the authors independently assessed the methodological quality of the included articles using the Newcastle-Ottawa quality assessment scale (NOS) for cohort studies adapted for cross sectional studies and the Critical Appraisal Skills Programme (CASP) framework for qualitative articles [13,19,20]. An additional column was added to the NOS tool to highlight articles. Any disagreement in quality grading was resolved by consensus.

Synthesis

Because of heterogeneity in data measurements and the outcomes, qualitative synthesis was applied to synthetize the data [21]. No study was excluded based on its quality. However when synthetized the findings and when appropriate, the research outcomes were evaluated taking into account the quality of the studies involved.

Results

We identified 2361 abstracts through our systematic search and 73 additional through a non-systematic search (Fig. 2). We screened 1512 abstract for eligibility. We assessed 78 records based on full text evaluation. Twenty-five studies were included in the synthesis (Fig. 2).

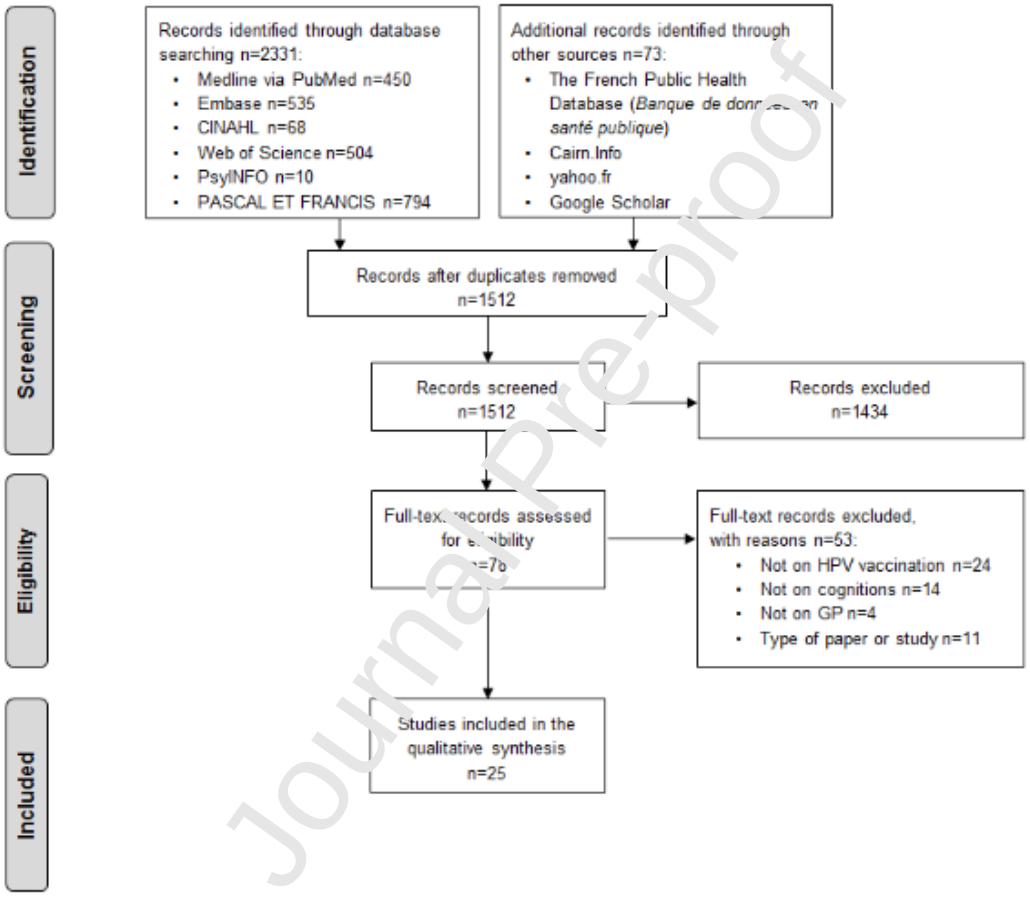

Figure 2. Studies included in the review based on the PRISMA flow diagramme [18]

Description of the included articles

Among the 25 studies identified for this review [22-46], 18 reported quantitative and seven qualitative designs (Table 1). The majority of the studies were conducted either before 2011 [23,29,34,36,39-41,44] with some around 2007-2008 i.e. the period where HPV vaccination was implemented in France [23,29,36,39,40], or over the 2011–2015 period [22,24,25,27,30,32,33,37,38,42,46]. The most recent studies were conducted in 2016 [26,31,35,43] or in 2019 [28,45]. The sample size ranged from ten to 31 GPs in the qualitative studies and from 96 to 1598 in the quantitative studies. Except for five articles in which the participants represented a national panel [22,27,35,44,46], the studies included participants from local panels. Only one study used random sampling to select participants [35].

The quality of the included articles varied widely, with ten articles [24,30,32-34,38,40,42,43,46], considered at low risk (i.e., high-quality studies), six [22,27,36,37,39,44] at moderate risk (i.e., moderate-quality studies), and nine at high risk of bias [23,25,26,28,29,31,35,41,45] (i.e., low-quality studies) (Appendix, Tables A.2 and A.3).

Although the characteristics of the participants were not systematically reported in the articles, those that did report the characteristics described the GP study groups as mainly men (more than 50% in 20 of the 25 articles), middle-aged (mean age range: 42.3–54 years) [23,24,26,28,30,31,33-37,39,40,43-45], with more than 10 years of experience in general practice [24,31,37,41,43], working mainly in urban and suburban areas [23-26,28,30,32-34,36-39,41,43], and with a workload of between 3000 and 6000 consultations per year for more than 50% of GPs [22,27,32,33,42] (Appendix, Table A.4).

Table 1. Characteristics of studies included in the review

Author (publication year) Year(s) of data collection	Document[a]	Study design	Measurement	Participants /Invited[b] (Type of recruitment)	Aim	Risk of bias[c]
Agrinier (2017) [22] 2013–2014	Article	Quantitative	Self-reported questionnaire	1038/1712 (National panel)	To measure discrepancies between vaccination recommendations by GPs for their patients and practices for their children	Moderate
Barjhoux (2009) [23] 2008	Medical dissertation	Quantitative	Self-reported questionnaire	278/1200 (Local panel)	To evaluate the modalities and difficulties encountered by GPs when offering the vaccine to patients	High
Bouvret (2016) [24] 2014–2015	Article	Quantitative	Self-reported questionnaire	96/140 (Local panel)	To assess opinions, practices, and difficulties of GPs regarding HPV vaccination	Low
Casimont (2015) [25] 2014	Medical dissertation	Qualitative	Interview	10 (Local panel)	To describe opinion of GPs about changes in strategies to prevent cervical cancer	High
Chauvet (2016) [26] 2016	Medical dissertation	Quantitative	Self-reported questionnaire	143/495 (Local panel)	To evaluate tools that aim to help GPs to deliver information about HPV vaccination	High

Author (publication year) Year(s) of data collection	Document[a]	Study design	Measurement	Participants /Invited[b] (Type of recruitment)	Aim	Risk of bias[c]
Collange (2016) [27] 2014	Article	Quantitative	Self-reported questionnaire	1598/1712 (National panel)	To study GPs' perceptions of HPV vaccination risks and efficacy and their recommendation behaviour; and the relative importance of factors associated with the frequency of their recommendations	Moderate
Degoue (2019) [28] 2018-2019	Medical dissertation	Quantitative	Self-reported questionnaire	337 (Local panel)	To describe GPs' practice regarding HPV vaccination	High
Erpeldinger (2012) [29] 2009	Article	Quantitative	Self-reported questionnaire	518/1193 (Local panel)	To describe the knowledge of GPs on infection with HPV and Gardasil®, and to determine the impact of training and information on knowledge and the attitude towards this vaccine	High
Gougenheim-Fretin (2014) [30] 2013	Medical dissertation	Qualitative	Interview/focus group	10 (Local panel)	To highlight the reluctance of GPs toward HPV vaccination	Low
Houdjal (2017) [31] 2016	Medical dissertation	Qualitative	Interview	12 (Local panel)	To highlight GP representations of HPV vaccination	High

Author (publication year) Year(s) of data collection	Document[a]	Study design	Measurement	Participants /Invited[b] (Type of recruitment)	Aim	Risk of bias[c]
Killian (2016) [32] 2013–2014	Article	Quantitative	Self-reported questionnaire	693/2839 (Local panel)	Comparison of GPs' HPV immunization practices for their patients and their children	Low
Lamirand (2015) [33] 2015	Medical dissertation	Qualitative	Interview	11 (Local panel)	To describe impacts of the media and new recommendations about HPV vaccination on GPs' practice	Low
Lasset (2014) [34] 2010	Article	Quantitative	Self-reported questionnaire and interview	271/290 (Local panel)	To investigate the evolution of practices and opinions regarding HPV vaccination among GPs	Low
Leicht (2016) [35] 2016	Medical dissertation	Quantitative	Self-reported questionnaire	171/350 (National panel)	To identify obstacles of GPs in France for HPV vaccination	High
Lutringer-Magnin (2011) [36] 2007–2008	Article	Quantitative	Self-reported questionnaire and interview	279/5973 (Local panel)	To examine the perceptions, attitudes, and practices of GPs in relation to HPV vaccination	Moderate
Manolitsi (2012) [37]	Medical	Quantitative	Self-reported	145/932	To examine and to understand the obstacles of	Moderate

Author (publication year) Year(s) of data collection	Document[a]	Study design	Measurement	Participants /Invited[b] (Type of recruitment)	Aim	Risk of bias[c]
2012	dissertation		questionnaire	(Local panel)	GPs regarding HPV vaccination	
Martinez (2016) [38] 2013	Article	Qualitative	Interview/focus group	36/622 (Local panel)	To conduct an exploratory qualitative study with GPs to identify determinants of their commitment to vaccination	Low
Pelissier (2008) [39] 2007	Article	Quantitative	Self-reported questionnaire	252/543 (Local panel)	To describe prevention behaviours and to examine perceptions of HPV vaccination	Moderate
Piana (2009) [40] 2008	Article	Quantitative	Self-reported questionnaire	359/1000 (Local panel)	To assess the standpoint of GPs regarding HPV vaccination and to evaluate the factors associated with a favourable standpoint	Low
Plessis (2012) [41] 2009–2010	Article	Qualitative	Interview/focus group	16/19 (Local panel)	To better understand GPs' decisions about HPV vaccination and their role in cervical cancer	High
Raude (2016) [42] 2013-2014	Article	Quantitative	Self-reported questionnaire	1582/1712 (Local panel)	To improve the understanding of the role of institutional trust in practices related to vaccination	Low

Author (publication year) Year(s) of data collection	Document[a]	Study design	Measurement	Participants /Invited[b] (Type of recruitment)	Aim	Risk of bias[c]
Sadki (2016) [43] 2016	Medical dissertation	Qualitative	Interview	17/28 (Local panel)	To highlight GPs' opinions and practices about HPV vaccination and their attitude toward reluctance to vaccination	Low
Thierry (2016) [44] 2010	Article	Quantitative	Self-reported questionnaire	363/706 (National panel)	To evaluate the vaccine coverage, according to eligibility for vaccination in a sample of girls who were seen in general practices in France	Moderate
Tutala (2019) [45] 2018-2019	Medical dissertation	Quantitative	Self-reported questionnaire	216/414 (Local panel)	To evaluate the role of health practitioners regarding HPV vaccination in Occitanie region	High
Verger (2015) [46] 2013–2014	Article	Quantitative	Self-reported questionnaire	1582/1712 (National panel)	To assess the prevalence of vaccine hesitancy among GPs through the frequency of their vaccine recommendations, and the determinants of these recommendations	Low

GP = general practitioner; HPV = human papillomavirus
[a]Peer-reviewed article or medical dissertation
[b]Invited to participate in the study, where available
[c]Appendix, Tables A.2 and A.3

GPs' attitudes, norms, perceived behavioural control, and underlying beliefs regarding HPV vaccination

GPs' cognitions regarding HPV vaccination are summarized in table 2. Attitudes [23-25,27-31,34-46] and perceived behavioural control towards HPV vaccination [23-26,28,30,31,33-46] were evaluated in a total of 21 studies each, whereas norms were examined in only 11 articles [24,25,31,34,36,38,40-43,46]. None of the articles distinguished between the subcomponents of each cognition when reporting the results.

Attitudes and underlying beliefs

Among the 21 studies reporting GPs' attitudes, we identified that one reported GPs' experiential attitudes only [25], nine reported instrumental attitudes only, [23,27,35,38,39,41,42,44,46] and 11 reported both [24,28-31,34,36,37,40,43,45] (Table 2). Experiential attitudes were reported mostly in terms of favourable versus unfavourable opinions towards HPV vaccination, confidence versus concern, worry or doubt, and/or enthusiasm [24,25,28-31,34,36,37,40,43,45]. Instrumental attitudes were reported in terms of trust regarding efficacy and security, perceptions of the efficacy of HPV vaccination, its benefits, its usefulness and/or its risks represented by fear of side effects, especially in relation to autoimmune diseases [23,24,27-31,35-38,40,42-46]. Instrumental attitudes were also reported by assessing beliefs related to the impact of HPV vaccination on other health behaviours, i.e., cervical cancer screening, condom use, and/or sexual behaviours [24,30,31,34,35,37,40,41].

The results showed that GPs found HPV vaccination to be useful and necessary [27,28,31,42-44,46]. When assessed, and independently of study quality, more than 74% of GPs were in favour of or approved of HPV vaccination [24,25,28,31,34,36,37,40,43,45]. When study quality was taken into account, i.e. reported percentage adjusted to reflect overall quality of the studies, 21%–35% of GPs reported doubts about the clinical benefits or efficacy of HPV vaccination [23,24,27,37] and about 30–50% reported worries or concerns about side effects [24,27,28,30,35-37,40,44]. More specifically, rates of GPs with worries and concerns were 19–50% in high-quality studies [24,30,40], 23–60% in moderate-quality studies[27,36,37,44], and 23–34% in low–quality studies [28,35]. The date of study did not seem to explain these results. Three low-quality studies reported that up to 10% of GPs even considered HPV vaccination to be dangerous [23,28,31]. In studies performed before 2015, for up to 61% of GPs these doubts about efficacy and benefits/risks

were linked to the "novelty" of HPV vaccination and the relatively short period since the introduction of the vaccine [23,24,27,37,39,41]. Irrespective of study quality and date, 16–29% of GPs believed that HPV vaccination would decrease patients' participation in cervical cancer screening [24,30,31,37,40], 16–24% of GPs reported that HPV vaccination would decrease the use of condoms [24,30,37,40,41] and 5-10% that it would lead to taking sexual risks and/or encourage premature sexuality [30,34,35,40]. Furthermore, in five articles mostly with high [23,25,29,41] to moderate [39] risk of bias, GPs reported that screening and/or condom use are more effective than HPV vaccination[23,25,29,39,41].

Norms and underlying beliefs

Regarding norms, influence of pairs was approached in two studies [31,38] and injunctive norms were mainly assessed [24,25,31,34,36,38,40-43,46] (Table 2) These norms included GPs' perceptions of their role in public health policies, the need to follow health authorities' recommendations, and trust in institutional information. Overall, 81–94.5% of GPs trusted that institutional information (i.e., from the ministry of health, health agencies, scientific sources, and the opinions of scientists and specialist physician colleagues) about the benefits and risks of immunization was reliable [24,25,31,34,36,38,40-43,46]. HPV vaccination was seen as a requirement for preventive medicine and a benefit for public health [34,36,38,41]. For instance, the beneficial effects of vaccination on primary prevention of HPV and public health were highlighted by 60% of GPs [34,36]. GPs emphasized their role in public health, which consisted of informing patients about recommended vaccines, explaining, convincing, and justifying the vaccination recommendations, addressing discussions about sexuality, and vaccinating their patients [38,41]. GPs also stated that they vaccinated their patients to be in line with recommendations [25,31,40,41,43].

Table 2. General practitioners' cognitions regarding HPV vaccination

Type	Subcomponents [a]
Attitude	Experiential attitudes [24,25,28-31,34,36,37,40,43,45] ➢ In favour or approve HPV vaccination [24,25,28,31,34,36,37,40,43,45] : > 74% ➢ Prudent, enthusiast, doubt, worried [29,30] Instrumental attitudes [23,24,27-31,34-46] ➢ Trust in efficacy and safety [45]: 81% ➢ Useful and necessary [27,28,31,42-44,46] : 75% ➢ Doubt about clinical benefits or efficacy [23,24,27,37]: 21% -35% ➢ Worried about potential side effects and risks [24,27,28,30,35-37,40,44] : 30% -50% ➢ HPV vaccine is dangerous [23,28,31]: < 10% ➢ Other consequences [24,30,31,34,35,37,40,41] o Decrease of cervical cancer screening [24,30,31,37,40] : 16% -29% o Decrease of condom use [24,30,37,40,41]: 16%-24% o Encourage riskier sexual behaviour or premature sexual relation [30,34,35,40]: 5%-10%
Norms	Injunctive norms [24,25,31,34,36,38,40-43,46] ➢ GP's role regarding public health policies[38,41] ➢ Need to follow health authorities' recommendations[25,31,40,41,43] ➢ Trust in institutional information provided by official sources [24,25,31,34,36,38,40-43,46] : 81–94.5% ➢ Public health [34,38,43,41] : 60% Descriptive norms ➢ Rely on pair opinion and practice to decide to vaccinate [31,38]
Perceived Behavioural Control	Capacity [24,25,30,35,39,40,42,44-46] ➢ Have enough information about HPV vaccination and related subjects [24,30,35,39,40,45] : > 68% ➢ Feel confident to inform about HPV vaccination [26,39,42,45,46] : 19% to 88% ➢ Feel able to implement recommendations [39]: 70% ➢ Feel comfortable with adolescents care [44]: 95% Autonomy (essentially barriers) [23-25,28,30,31,33,34,36-38,41,43,45] ➢ Parents [28] : 56% ➢ Parents' fear of side effects [24,25,28,30,31,36,37,43]: > 60% ➢ Age of girls [23,25,30,31,33,34,36,37,43] ➢ Scarcity of pre-adolescents or adolescents' consultations [30,33,34,43] ➢ Socio-cultural characteristics of patients as barriers [23,24,30,33,37,41]: 17.5% to 25% ➢ Lack of time [23,25,30,38,43,45]

HPV= human papillomavirus

[a] Percentage of general practitioners was reported when available

Perceived Behavioural control and underlying beliefs

Capacity

Except for one study, which did not indicate rates [30], more than 68% of GPs felt that they were well-informed about HPV and HPV vaccination [24,30,35,39,40,45]. GPs felt confident in justifying vaccine recommendations and in explaining the utility of the vaccine (up to 88%) and its safety (up to 77%) [26,39,42,45,46]. However, this rate was lower (up to 58%), when confidence in explaining the role of vaccine adjuvants was investigated [26,42,45,46]. GPs reported being comfortable with having adolescents as patients [44].

Autonomy

Parents' fear of side effects of HPV vaccination is one of the most important barriers, reported by more than 60% of GPs [24,25,28,30,31,36,37,43].

GPs explained these fears by the relatively short period since the introduction of the vaccine [24,43] and controversies about vaccination in general or about specific vaccines, such as those against hepatitis B virus, H1N1 influenza virus, and HPV [24,25,30,31,39,41]. Independently of their quality, studies reported high variability in the rate of GPs who considered the socio-cultural characteristics of patients and their parents (e.g., religion and personal conviction) to be important barriers (17.5–25%) [23,24,30,37,39,41].

The main practice-related barriers reported were the age of girls [23,25,30,31,33,34,36,37,43] and the scarcity of consultations with adolescents [30,33,34,43]. Before 2012, when vaccination was recommended for girls aged 14 years, 28–72% of GPs would have preferred to vaccinate against HPV at as young an age as possible (i.e., 11–14 years) to avoid having to discuss sexually transmitted infections and sexuality [23,36]. Indeed, addressing sexually transmitted infections was reported as an issue for 11–31% of GPs [23,34,36,37]. After 2012, when HPV vaccination became recommended for girls aged 11–14 years, GPs no longer felt an obligation to discuss sexuality, and therefore they perceived this change as beneficial [33,43] . Nevertheless, some GPs continued to address sexuality as part of the information on HPV vaccination or to satisfy parents' expectations and requests [31,33,43]. This did not seem to be a barrier anymore [45]. Meanwhile, new issues were reported by GPs regarding younger ages of patients: girls being too young to be concerned [25,31,33], having to rely on parents negative decision as reported by 56% of GPs [28], and parents being insecure to talk about sexuality at such young age and/or frightened of encouraging premature sexuality [25,31,33,43]. These issues

affected GPs' practice as both parents and GPs had the tendency to delay HPV vaccination to older ages (i.e. 14) [31,43].

The scarcity of consultations with adolescents was perceived as a serious obstacle [30,33,34,43]. Therefore, any reason for consultation (i.e., medical consultation other than vaccination, certificate of fitness for sport) was reported to be used to propose the vaccine [25,30,43].

GPs' behaviours regarding HPV vaccination

Main results are presented in Fig. 3 and in details in Appendix (Table A.5). In the more recent studies of moderate to high quality and with larger number of participants, 73% of GPs reported either always (46%) or often (27%) recommending HPV vaccination to the target population [27,46], and 72.9% of GPs reported proposing to vaccinate these girls against HPV [24].

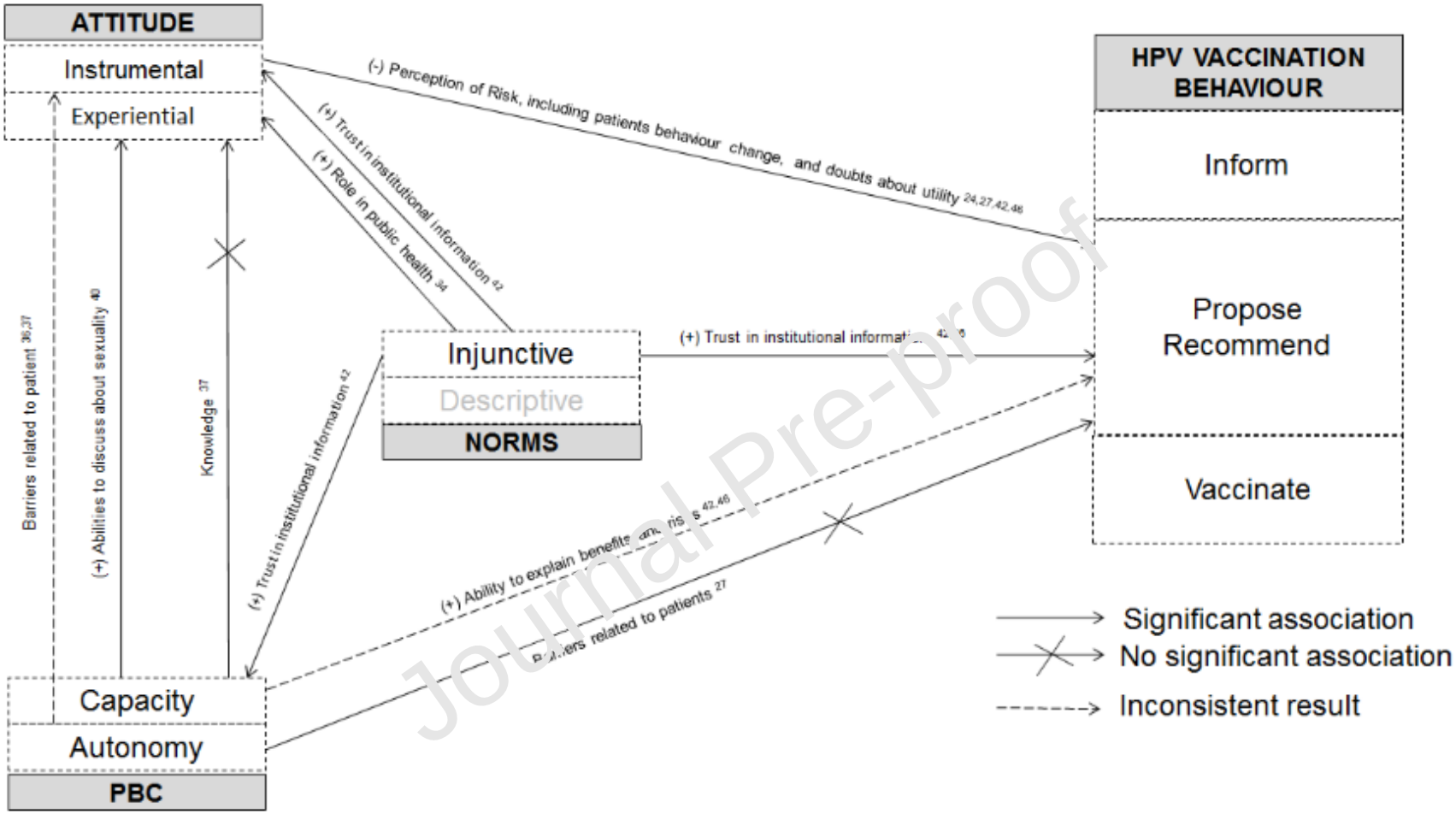

Figure 3. Association between general practitioners' cognitions and behaviour variables assessed in the review. Sens of arrow reflects which variable was used as dependent vs independent in the studies. Association was either not significant (X) or significant and either positive (+) or negative (-). Descriptive norms were not assessed. PBC = perceived behavioural control; HPV = human papillomavirus

Impact of cognitions

Five articles used quantitative methods to examine the effects of specific cognitions on the behaviour of interest, essentially to recommend or propose [24,26,27,42,46] . Five articles examined the links between cognitions and dependent variables, i.e., experiential attitudes [34,36,37,40], vaccine hesitancy [42], or perceived behavioural control [42].

Importance of instrumental attitudes

Among attitudes tested, GPs' perceptions of risks, including change in patients' health behaviour and doubts about vaccine utility/efficacy, were shown to be negatively associated with proposing and recommending HPV vaccination [24,27,42,46]. GPs' concerns about side effects of HPV vaccination were shown to be negatively associated with favourable (experiential) attitudes [37,40] .

Importance of injunctive norms

Results from three studies of either moderate quality [27] or high quality [42,46] were in favour of a positive and significant association between trust and recommending HPV vaccination. GPs' trust in institutional information showed a positive and significant association with HPV vaccination recommendation, either directly [46] or indirectly and mediated through a decrease in vaccine hesitancy [42]. Trust was also positively correlated with ability to explain the utility, safety, and adverse events of vaccination [42]. Beneficial effects of vaccination in public health and its role in primary prevention were positively correlated with favourable (experiential) attitudes [34].

Perceived behavioural control: inconsistent results

The impact of abilities on behaviour was contradictory from two high-quality studies. Confidence in GPs' ability to explain the utility of vaccines, the safety of vaccines, and the role of adjuvants in general (including HPV) was reported to be either associated (positively) or not associated with recommendation of the vaccines [42,46]. Ability to talk about sexuality was positively associated with favourable opinions about HPV vaccination [40], but HPV vaccine knowledge, by itself, seemed not to have effect on experiential attitudes [37].

When autonomy, i.e., barriers related to either patients or practice (i.e., reason for consultation, age for vaccination, questions asked by patients, parents' presence and reluctance to address sexuality, and necessity to address the issue of sexually transmitted

infections) were examined, they were not associated with GPs' recommendation [27] and it is not clear if it is associated with GPs' attitudes [36,37].

Impact of background variables on behaviours and experiential attitudes regarding HPV vaccination

Ten articles reported effects of background variables on behaviours and/or experiential attitudes (i.e., favourable opinion), with age and gender being the most studied variables [22-24,26,27,29,32,34,36,40] (Appendix, Table A.6).

When study quality was taken into account, results from studies assessing age of GPs [23,24,26,27,29,36,40] showed that younger GPs were more favourable to proposing vaccination and to vaccinating against HPV [24,36,40]. The results showed no significant association between gender and behaviours or attitudes [23,24,26,27,29,36], except in one high-quality article in which men were more prone to have favourable opinions [40]. Practice-related variables (workload reported as consultations or visits >100/week or >3000/year, consultation duration <20 minutes, seeing more women or children/teenagers) were positively associated with favourable opinions and recommendation/vaccination [27,36,40]. HPV vaccination behaviour was not affected by practice of alternative medicine (e.g., homeopathy, acupuncture), practice of Pap smear or gynaecology, or recommendation of other vaccines, although these variables were shown to affect favourable opinions towards HPV vaccination [24,26,29,36,40]. Variables that were not related to behaviours or attitudes were type of practice (i.e., solo/group), number of years of practice, cost of vaccine, and number of injections [24,26,32,36].

Discussion

The use of the RAA theoretical framework to extract and analyse data offers new insights into French GPs' cognitions and behaviours regarding HPV vaccination. Our review shows that, in terms of attitude, these are fears of risks (i.e., concerns about safety and change of behaviour) and doubts about utility/efficacy regarding HPV vaccination, which drive GPs' decisions about whether to recommend HPV vaccination [24,27,42,46]. Taking into account that very strong ethical norms are in place in GPs as a professional group, including the precautionary principle, which is very well embedded in norms in France regarding public health [47], it is more likely that GPs with concerns and doubts, i.e., 30- 50% of GPs [23,24,27,28,30,35-37,40,44] will neither propose nor recommend HPV vaccination to girls. This figure may even be underestimated, because GPs' responses are potentially biased due to social desirability (GPs respond what they think they should say) and/or wishful thinking (GPs respond what they would like to be true). It is worth noting that the percentage of GPs with concerns and doubts is very high and in line with the rate of unvaccinated adolescent girls in France, i.e. about 70% in 2019 [2].

Although up to 88% of GPs report confidence in explaining the safety and efficacy of HPV vaccination [26,39,42,45,46], the percentage of GPs who will be able to answer related specific questions is probably much lower, as reported in France and in other settings [45,48]. This result together with the fact that up to 50% of GPs reports doubts and concerns regarding HPV vaccination is intriguing. Indeed, reliable information related to HPV vaccination safety and efficacy is easily accessible to GPs through authoritative health websites [11]. It is possible that French GPs, who have been reported to work at least 50 hours a week, may not have time to both access HPV vaccination-related information and attend continuing education [49]. Another possibility, which might be also related to their heavy workload, is that GPs use heuristics to process HPV-related information. These are mental shortcuts that enable them to make decisions and process information more rapidly and based on incomplete, uncertain, or/and peripheral information [50]. Heuristics have been shown to be part of health practitioners' practice and driven by constraints such as time[51]. Moreover, it has been shown that heuristics-based information is less resistant to counter-argument and less predictive of behaviour than systematic processing [50]. It is thus possible that GPs when facing parents would not be able to address parents' arguments and even recommend HPV vaccination, which is a driver for parents to vaccinate [5-7]. This may explain the discrepancy between the GP-reported recommendation/vaccination rate (i.e. 70%) [24,27,46] and actual HPV vaccination rates (of less

than 30%), which is also reported in other settings [12,52]. The positive effect of higher (>3000 consultations/year) workload on GPs behaviour [27] seems to contradict our hypothesis on time constraints stated above. This threshold may be underestimated according to the average number of consultations per GP per year i.e. 5100 -5800 [49,53]. Thus, instead of considering a positive effect of high workload, we may assume that GPs with a workload lower than average (e.g. semi-retired, working part-time or as substitutes), recommend less HPV vaccination, what may be explained by seeing less patients including girls.
Our results suggest that the ways in which HPV vaccination-related information is currently provided to GPs in France are not adequate. Vaccination teaching in the French medical curriculum has shown some limitations [54]. Continuing medical education is not mandatory, eventhough completing at least one training is part of the GPs' annual performance scheme. Information tools, including continuing education, should be developed to favour less heuristic processing of information and take into account GPs' constraints.

Our review highlights the central place of injunctive norms, i.e., trust in institutional information, in positively affecting GPs' beliefs and behaviours regarding HPV vaccination [42,46]. This is understandable because GPs are recognized as a professional group with shared strong professional norms. Regarding descriptive norms, to the best of our knowledge, no studies have yet explored in details the role of these norms in GPs' behaviours regarding HPV vaccination, although they have been shown to be a driver in physicians' practice [55]. Future work is needed in this field. Both the importance of HPV vaccination and the role of GPs in public health should be highlighted when developing information tools and education modules on HPV vaccination.

Parents' fear of side effects of HPV vaccination is reported by more than 60% of GPs as one of the most important barriers to recommend and vaccinate [24,25,28,30,31,36,37,43]. Despite the change of the target age group from 14 years to 11–14 years, the age of girls remains an issue for GPs, raising even more concerns. The main reason is that HPV vaccination remains strongly connected to sexuality or sexual behaviour, as reported in other settings, such as the United States and Canada [12,52]. However, age/sexuality/parents fears does not seem to impact GPs' recommendation decision regarding HPV vaccination (in our review). Vaccination might be an issue due to girls' parents but GPs have a strategy in place i.e. vaccinate girls later, at around age 14 years, which is also highlighted in other reviews [12,52]. This is interesting as research has been developed in recent years focusing on patients as a barrier and

developing interventions to improve the abilities of health providers to recommend HPV vaccination. Interventions using this approach have been shown to be effective [56,57] ; however neither sustainability of these interventions nor their effects on GPs' cognitions have been shown so far [58]. Moreover if motivational interviewing seems to be promising, time required to do it properly and based on ethical principles render it difficult to be integrated in GPs' busy schedule [59].

Our results suggest that these are actually GPs themselves that could be considered as a barrier to HPV vaccination and that research should centre on how HPV vaccination information is effectively conveyed to them. While this study included only GP-related interventions, the findings will be applicable to other primary care professionals (e.g. nurses), in healthcare systems where the patient consultations are not limited to GPs [60]. Moreover, taking into account that HPV vaccination of girls aged 11–14 years often seems to be delayed to older ages and that sexuality always seems to be connected to this vaccination whatever the age of the girl, one option to facilitate HPV vaccination would be to increase the age of the target group to 15–18 years. This is supported by recent scientific evidence obtained by our group showing efficacy of HPV vaccination for this age group with a two-dose schedule [61], but should be balanced against the possibility of missing opportunities to vaccinate before sexual debut among early initiators.

Our study has the usual limitations of synthesising evidence from retrospective surveys based on self-reporting, including recall bias, social desirability bias, and wishful thinking bias. It should be highlighted that taking into account the nature of the population surveyed, i.e., GPs, social desirability and wishful thinking may be particularly important. The included studies covered a twelve year period (Table 1), over which GP's cognitions regarding HPV vaccination might have changed. This was not formally assessed in our analysis.

The quality of this review can be acknowledged regarding the accuracy of the literature research and the use of recommended review guidelines and tools to assess bias. Compared with other literature reviews that explore cognitions related to HPV vaccination and focus on attitudes and knowledge, our review goes further by (a) using the RAA theoretical framework (b) addressing methodological differences between studies, (c) providing an overview of the impacts of all these cognitions on vaccination behaviour, and (d) focusing on only one type of health providers, i.e., GPs. The results of this review could easily be used and adapted in countries that have similar health policies and similar HPV vaccination issues.

Conclusion

To our knowledge, no GP-level interventions have been successful in improving HPV uptake rates in France. Our results will inform the development of a professional educational intervention on HPV vaccination targeting GPs in France. HPV vaccination is one of the main pillars of the recently launched WHO initiative to eliminate cervical cancer around the world and removing barriers to vaccination in different settings and from different perspective including health professionals is of paramount importance for success.

Conflicts of interests

None to declare.

Funding information

P. Villain/IARC obtained funding from the French National Cancer Institute (INCa, grant nr. 2016-009) and Métropole de Lyon / Cancéropôle Lyon Auvergne-Rhône-Alpes (CLARA). The sponsors had no involvement in the study design, collection, analysis and interpretation of data, the writing of the manuscript, or the decision to submit the manuscript for publication.

Acknowledgements

The authors are grateful to Dr. Karen Muller who helped to stylistically edit the manuscript and to K. Pitaksaringkarn who helped in the manuscript submission. The authors are also grateful to their colleagues from IARC, especially Dr P. Basu, and GRePS, who kindly reviewed the protocol and provided constructive comments.

References

1. Bruni L, Diaz M, Barrionuevo-Rosas L, Herrero R, Bray F, Bosch FX, et al. Global estimates of human papillomavirus vaccination coverage by region and income level: a pooled analysis. The Lancet Global health. 2016;4(7):e453-63.

2. Santé Publique France. HPV vaccination coverage in France by age group. https://www.santepubliquefrance.fr/determinants-de-sante/vaccination/articles/donnees-de-couverture-vaccinale-papillomavirus-humains-hpv-par-groupe-d-age. Accessed 07.04.2020.

3. Verrier F, Gautier A, Quelet S, Bonmarin I, et le groupe Baromètre de Santé publique France 2016. Infections à papillomavirus humain : influence des perceptions de la maladie et du vaccin sur le statut vaccinal. (Influence of perceptions of disease and vaccine on immunization status). Bull Epidémiol Hebd. 2019; 22-23: 450-56. https://www.santepubliquefrance.fr/revues/beh/bulletin-epidemiologique-hebdomadaire. Accessed 11/03/2020.

4. Blondel C, Barret AS, Pelat C, Lucas E, Fonteneau L, Lévy-Bruhl D. Influence des facteurs socioéconomiques sur la vaccination contre les infections à HPV chez les adolescentes en France.

(Influence of socioeconomic factors on human papillomavirus vaccine uptake in adolescent girls in France). Bull Epidémiol Hebd. 2019;22-23:441-50.
https://www.santepubliquefrance.fr/revues/beh/bulletin-epidemiologique-hebdomadaire. Accessed 11/03/2020.
5. Institut National du Cancer (INCa). Enquete-de-perception-aupres-des-medecins-generalistes-et-des-parents. https://www.e-cancer.fr/Actualites-et-evenements/Actualites/Vaccination-contre-les-HPV-enquete-de-perception-aupres-des-medecins-generalistes-et-des-parents. Accessed 07/04/2020.
6. Karafillakis E, Simas C, Jarrett C, Verger P, Peretti-Watel P, Dib F, et al. HPV vaccination in a context of public mistrust and uncertainty: a systematic literature review of determinants of HPV vaccine hesitancy in Europe. Human vaccines & immunotherapeutics. 2019;15(7-8):1615-27.
7. Newman PA, Logie CH, Lacombe-Duncan A, Baiden P, Tepjan S, Rubincam C, et al. Parents' uptake of human papillomavirus vaccines for their children: a systematic review and meta-analysis of observational studies. BMJ open. 2018;8(4):e019206.
8. Campana V, Cousin L, Terroba C, Alberti C. Interventions permettant d'augmenter la couverture vaccinale du vaccin contre les papillomavirus humains. (Interventions to increase HPV vaccination coverage). Bull Epidémiol Hebd. 2019; 22-23: 431-40
https://www.santepubliquefrance.fr/revues/beh/bulletin-epidemiologique-hebdomadaire. Accessed 11/03/2020.
9. Fonteneau L, Barret AS, Lévy-Bruhl D. Évolution de la couverture vaccinale du vaccin contre le papillomavirus en France –2008-2018. (HPV vaccination coverage in France -2008-2018). Bull Epidémiol Hebd. 2019; 22-23:424-30. https://www.santepubliquefrance.fr/revues/beh/bulletin-epidemiologique-hebdomadaire. Accessed 11/03/2020.
10. HPV vaccination recommandation to be extended to boys. https://www.has-sante.fr/jcms/p_3116022/fr/recommandation-sur-l-elargissement-de-la-vaccination-contre-les-papillomavirus-aux-garcons. Accessed 07/04/2020
11. Ministère des Solidarités et de la Santé, Santé publique France, Informations sur la vaccination pour les profesionnels de sante, France. https://professionnels.vaccination-info-service.fr/Mentions-Legales. Accessed 07/04/2020.
12. Rosen BL, Shepard A, Kahn JA. US Health Care Clinicians' Knowledge, Attitudes, and Practices Regarding Human Papillomavirus Vaccination: A Qualitative Systematic Review. Academic Pediatrics. 2018; S53-S65
13. Herzog R, Álvarez-Pasquin MJ, Díaz C, Del Barrio JL, Estrada JM, Gil Á. Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? a systematic review. BMC Public Health. 2013;13:154
14. Ferrer HB, Audrey S, Trotter C, Hickman M. An appraisal of theoretical approaches to examining behaviours in relation to Human Papillomavirus (HPV) vaccination of young women. Preventive medicine. 2015;81:122-31.
15. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991;50:179-211.
16. Fishbein M, Ajzen I. Predicting and changing behaviour: The reasoned action approach. New York: Psychology Press. 2010:538.
17. McEachan R, Taylor N, Harrison R, Lawton R, Gardner P, Conner M. Meta-Analysis of the Reasoned Action Approach (RAA) to Understanding Health Behaviors. Annals of Behavioral Medicine. 2016;50:592-612.
18. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ. 2009;339:b2535-b.
19. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. European journal of epidemiology. 2010;25(9):603-5.
20. Singh J. Critical appraisal skills programme. Journal of pharmacology and Pharmacotherapeutics. 2013;4(1):76.

21. Seers K. Qualitative systematic reviews: their importance for our understanding of research relevant to pain. British journal of pain. 2015;9(1):36-40.
22. Agrinier N, Le Maréchal M, Fressard L, Verger P, Pulcini C. Discrepancies between general practitioners' vaccination recommendations for their patients and practices for their children. Clinical Microbiology and Infection. 2017;23:311-7.
23. Barjhoux A, Glatigny S. Vaccination contre les infections à papillomavirus humains : pratique et difficultés des médecins généralistes isérois (Vaccination against human papillomavirus infections: practice and difficulties of general practitioners from Isère). [Medical dissertation]. Grenoble, France: Université de Grenoble Alpes; 2009.
24. Bouvret P, Mougin C, Pretet JL, Meurisse A, Bonnetain F, Fiteni F. [Practices and attitudes regarding HPV vaccination among general practitioners from Besancon]. Journal de gynecologie, obstetrique et biologie de la reproduction. 2016;45(8):972-8.
25. Casimont L. Opinion des médecins généralistes sur les nouvelles stratégies de prevention du cancer du col de l'uterus. Particularités départementales du Maines et Loire (Opinion of general practitioners on new strategies for cervical cancer prevention. Specificities of "Maines et Loire"). [Medical dissertation]. Nantes, France: Université de Nantes; 2015.
26. Chauvet C. Vaccination anti-HPV : évaluation de la pertinence d'outils d'aide a l'information vaccinale enquête aupres des médecins généralistes de Côte d'Or. [HPV vaccination: evaluation of information tools used by general practitioners from Côte d'Or). [Medical dissertation]. Dijon, France: Université de Bourgogne; 2016.
27. Collange F, Fressard L, Pulcini C, Sebbah R, Peretti-Watel P, Verger P. General practitioners' attitudes and behaviors toward HPV vaccination: A French national survey. Vaccine. 2016;34:762-8.
28. Degoue M. Place de la vaccination anti-HPV dans la pratique des médecins généralistes (HPV vaccination in general practionners' practice). [Medical dissertation]. Grenoble, France: Université de Grenoble Alpes; 2019.
29. Erpeldinger S R-HV, Boussageon R, et al. Vaccination contre les infections à papillomavirus en médecine générale. La décision de vacciner par le Gardasil® est-elle un choix éclairé? Enquête auprès de 518 MG du Rhône. Médecine (Vaccination against papillomavirus infections in general medicine. Is the decision to vaccinate with Gardasil® an informed choice? Survey with 518 general practitioners from Rhône). Médecine 8(4):185-9.
30. Gougenheim-Fretin L SM. Réticences vis-à-vis du vaccin contre le Human Papillomavirus et solutions envisagées à partir d'une étude qualitative réalisée auprès de médecins traitants et de parents d'adolescentes. (Barriers to Human Papillomavirus vaccine and solutions based on a qualitative study conducted with general practioners and parents of adolescent girls). [Medical dissertation]. Lille, France: Université du Droit et de la Santé-Lille 2; 2014.
31. Houdjal L. Approche des représentations des médecins généralistes sur la vaccination anti-HPV à l'aide d'un modèle évaluant les opinions, les pratiques et les informations délivrées aux patients (General practitioners' representations regarding HPV vaccination using a model evaluating opinions, practices and information provided to patients). [Medical dissertation]. Paris, France: Université Pierre et Marie Curie; 2017.
32. Killian M, Detoc M, Berthelot P, Charles R, Gagneux-Brunon A, Lucht F, et al. Vaccine hesitancy among general practitioners: evaluation and comparison of their immunisation practice for themselves, their patients and their children. European Journal of Clinical Microbiology and Infectious Diseases. 2016;35:1837-43.
33. Lamirand S. Vaccination anti-papillomavirus humain (HPV): influence des nouvelles recommandations et des médias sur la pratique des médecins généralistes. [Medical dissertation]. Nancy, France: Université de Lorraine; 2015.
34. Lasset C, Kalecinski J, Regnier V, Barone G, Leocmach Y, Vanhems P, et al. Practices and opinions regarding HPV vaccination among French general practitioners: evaluation through two cross-sectional studies in 2007 and 2010. International journal of public health. 2014;59(3):519-28.

35. Leicht A. Quels sont les freins des médecins généralistes à la vaccination contre les papillomavirus ?(What are general practitioners'barriers to vaccinate against HPV?). [Medical dissertation]. Lille, France: Université du Droit et de la Santé-Lille 2; 2016.
36. Lutringer-Magnin D, Kalecinski J, Barone G, Leocmach Y, Regnier V, Jacquard AC, et al. Human papillomavirus (HPV) vaccination: Perception and practice among French general practitioners in the year since licensing. Vaccine. 2011;29:5322-8.
37. Manolitsi T. Exploration des freins des médecins généralistes des Yvelines par rapport à la vaccination anti-HPV (Exploration of the obstacles of general practitioners in Yvelines with regard to anti-HPV vaccination). [Medical dissertation]. Versailles, France: Université de Versailles; 2012.
38. Martinez L, Tugaut B, Raineri F, Arnould B, Seyler D, Arnould P, et al. The commitment of French general practitioners to vaccination: the DIVA study (Determinants of vaccination intentions). Sante Publique. 2016;28(1):19-32.
39. Pelissier G, Bastides F. HPV vaccine and cervical cancer prevention in general practice. Survey conducted among general practitioners in the French departments of Eure-et-Loir and Cher. La Revue du praticien. 2008;58(19 Suppl):25-31.
40. Piana L, Noel G, Uters M, Laporte R, Minodier P. Standpoint and practice concerning the human Papillomavirus vaccine among French family physicians. Medecine et maladies infectieuses. 2009;39:789-97.
41. Plessis A BC, Ducancelle A, Moulévrier P, Fanello S. Vaccination contre le papillomavirus et médecins généralistes. Une enquête qualitative en Pays-de-Loire (Vaccination against papillomavirus and general practitioners. A qualitative survey in Pays-de-Loire.) Médecine. 2012;8(9):26-30.
42. Raude J, Fressard L, Gautier A, Pulcini C, Peretti-Watel P, Verger P. Opening the 'Vaccine Hesitancy' black box: how trust in institutions affects French GPs' vaccination practices. Expert Review of Vaccines. 2016;15:937-48.
43. Sadki M. Vaccination anti-papillomavirus : perception du vaccin par les médecins généralistes et attitudes adoptées face aux réticences qu'il suscite (HPV vaccination: general practitioners' perceptions and attitudes towards patients' reluctance). [Medical dissertation]. Amiens, France: Université de Picardie; 2016.
44. Thierry P, Lasserre A, Rossignol L, Kermeis S, Blaizeau F, Stheneur C, et al. Human Papillomavirus vaccination in general practice in France, three years after the implementation of a targeted vaccine recommendation based on age and sexual history. Human vaccines & immunotherapeutics. 2016;12(2):528-33.
45. Tutala M. Evaluation de l'impact des praticiens sur la couverture vaccinale HPV en Occitanie (Evaluation of General practitioners' impact in HPV vaccination coverage in Occitanie) [Medical dissertation]: Toulouse, France: Université de Toulouse III Paul Sabatier; 2019.
46. Verger P, Fressard L, Collange F, Gautier A, Jestin C, Launay O, et al. Vaccine Hesitancy Among General Practitioners and Its Determinants During Controversies: A National Cross-sectional Survey in France. EBioMedicine. 2015;2:891-7.
47. David G. Risques et principe de précaution en matière médicale. Les Cahiers du Centre Georges Canguilhem. 2009;3(1):107-17.
48. McSherry LA, O'Leary E, Dombrowski SU, Francis JJ, Martin CM, O'Leary JJ, et al. Which primary care practitioners have poor human papillomavirus (HPV) knowledge? A step towards informing the development of professional education initiatives. PloS one. 2018;13(12):e0208482.
49. Chaput H, Monziols M, Fressard L, Verger P, Ventelou B, Zaytseva A. Deux tiers des médecins généralistes libéraux déclarent travaillerau moins 50 heures par semaine (Two-thirds of GPs report working at least 50 hours a week). Études et résultats. 2019; 1113. https://drees.solidarites-sante.gouv.fr/etudes-et-statistiques/publications/etudes-et-resultats/article/deux-tiers-des-medecins-generalistes-liberaux-declarent-travailler-au-moins-50_Accessed 11/03/2020.
50. Stroebe W. Social psychology and health: McGraw-Hill Education (UK); 2011.
51. Marewski JN, Gigerenzer G. Heuristic decision making in medicine. Dialogues in clinical neuroscience. 2012;14(1):77-89.

52. Vollrath K, Thul S, Holcombe J. Meaningful Methods for Increasing Human Papillomavirus Vaccination Rates: An Integrative Literature Review. Journal of pediatric health care : official publication of National Association of Pediatric Nurse Associates & Practitioners. 2018;32(2):119-32.
53. Jakoubovitch S, Bournot MC, Cercier E, Tuffreau. Les emplois du temps des medecins generalistes. Études et résultats [Internet]. 2012; 797. https://drees.solidarites-sante.gouv.fr/etudes-et-statistiques/publications/etudes-et-resultats/article/les-emplois-du-temps-des-medecins-generalistes. Accessed 07/04/2020.
54. Kernéis S, Jacquet C, Bannay A, May T, Launay O, Verger P, Pulcini C; EDUVAC Study Group. Vaccine Education of Medical Students: A Nationwide Cross-sectional Survey. Am J Prev Med. 2017 ;53(3):e97-e104.
55. Keating NL. Peer Influence and Opportunities for Physician Behavior Change. Journal of the National Cancer Institute. 2017;109(8).
56. Brewer NT, Hall ME, Malo TL, Gilkey MB, Quinn B, Lathren C. Announcements Versus Conversations to Improve HPV Vaccination Coverage: A Randomized Trial. Pediatrics. 2017;139(1).
57. Reno JE, O'Leary S, Garrett K, Pyrzanowski J, Lockhart S, Campagna E, et al. Improving Provider Communication about HPV Vaccines for Vaccine-Hesitant Parents Through the Use of Motivational Interviewing. Journal of health communication. 2018;23(4):313-20.
58. Malo TL, Hall ME, Brewer NT, Lathren CR, Gilkey MB. Why is announcement training more effective than conversation training for introducing HPV vaccination? A theory-based investigation. Implement Sci. 2018;13(1):57.
59. Passmore J. Motivational interviewing: reflecting on ethical decisions in MI. Source: The Coaching Psychologist. 2013;9(2):2.
60. Malo TL, Ali KN, Sutton SK, Perkins RB, Giuliano AR, Vadaparampil ST. The content and context of physicians' communication with males about human papillomavirus vaccination. Human vaccines & immunotherapeutics. 2016;12(6):1511-8.
61. Basu P, Muwonge R, Bhatla N, Nene BM, Joshi S, Esmy PO, et al. Two-dose recommendation for Human Papillomavirus vaccine can be extended up to 18 years - updated evidence from Indian follow-up cohort study. Papillomavirus research (Amsterdam, Netherlands). 2019;7:75-81.

Highlights

- A majority of general practitioners in France report recommending HPV vaccination
- In reality, up to 50% of general practitioners do not recommend HPV vaccination
- The reason for this is concerns about vaccine efficacy, harms, and impact
- Patient-related barriers do not affect general practitioners' recommendations
- Ways should be found to effectively convey HPV vaccination information to doctors

APPENDIX

Table A.1 Research query conducted up to July 2020 in Medline via PubMed (450 records retrieved).

"Pediatricians"[Mesh:NoExp]) OR "Primary Health Care"[Majr:NoExp])) OR (("General Practitioners"[Mesh] OR "General Practice"[Mesh] OR General Practi*[tiab] OR GP[tiab] OR GPs[tiab] OR Physician*[tiab] OR gynaecologist*[tiab] OR paediatrician*[tiab] OR Family physician*[tiab] OR Medecin*[tiab] OR paediatrician*[tiab] OR gynaecologist*[tiab]))))) AND ((France[tiab] OR french[tiab] OR francais*[tiab] OR "France"[Mesh]))) AND (("Vaccines"[Mesh] OR "Immunization"[Mesh] OR vaccin*[tiab] OR immunization[tiab] OR immunisation*[tiab]

Table A.2 Risk of bias of the quantitative studies included in the review (the highest is the score (max.11), the lowest is the risk of bias). We used the Newcastle-Ottawa quality assessment scale (NOS) for cohort studies adapted for cross sectional studies to assess the quality of the studies.

Author (year)	Selection				Comparability	Outcomes		Peer-reviewed[a]	Score[b]
	Representativeness of the sample	Sample size	Non-respondents	Ascertainment of the exposure (risk factor)	Design and analysis	Assessment of the outcome	Statistical test		
Agrinier (2017) [22]	*	*		*		*	*	*	6
Barjoux (2009) [23]	*			*		*			3
Bouvret (2016) [24]	**	*		*		**	*	*	8
Chauvet (2016) [26]	*			*		*			3
Collange (2016) [27]		*		*		*	*	*	5
Degoue [28]		*		*		*			3
Erpeldinger (2012) [29]	*			*		*			3
Killian (2016) [32]	*	*		**		**	*	*	8
Lasset (2014) [34]	*	*	*	*		**	*	*	8
Leicht (2016) [35]	*			*		*			3
Lutringer-Magnin (2011) [36]	*	*		*		*	*	*	6
Manolitsi (2012) [37]	*			*		**	*		5
Pélissier (2008) [39]	*			*		*		*	4

Author (year)	Selection				Comparability	Outcomes		Peer-reviewed[a]	Score[b]
	Representativeness of the sample	Sample size	Non-respondents	Ascertainment of the exposure (risk factor)	Design and analysis	Assessment of the outcome	Statistical test		
Piana (2009) [40]	*	*	*	*	*	**	*	*	9
Raude (2016) [42]	*	*		**		*	*	*	7
Thierry (2016) [44]	*	*				**		*	5
Tutala (2019) [45]		*	*			*			3
Verger (2015) [46]	*	*	*	*		*	*	*	7

[a] Article received a star
[b] Total of stars; scores of 0–3 are high risk of bias, of 4–6 are moderate risk of bias, and of more than 6 are low risk of bias

Table A.3 Risk of bias of the qualitative studies included in this review (the highest is the score (max.10), the lowest is the risk of bias). We used the Critical Appraisal Skills Programme (CASP) framework to assess the quality of the studies.

Author (year)	Was there a clear statement of the aims of the research?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Was the data collected in a way that addressed the research issue?	Has the relationship between researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	How valuable is the research?	Score [a]
Casimont (2015) [25]	yes	yes	yes	no	no	no	no	no	no	no	3
Gougenheim-Fretin (2014) [30]	yes	yes	yes	no	yes	no	no	no	yes	no	5
Houdjal (2017) [31]	no	no	no	no	no	no	no	no	yes	no	1
Lamirand (2015) [33]	yes	yes	yes	yes	yes	no	no	yes	yes	no	7
Martinez et (2016) [38]	yes	yes	no	no	yes	no	yes	yes	yes	yes	6
Plessis (2012) [41]	no	no	no	no	yes	no	no	no	yes	no	2
Sadki (2016) [43]	yes	yes	no	no	yes	no	no	yes	yes	no	5

[a]Total of "yes"; scores of 0–4 are high risk of bias, and of 5–10 are low risk of bias

Table A.4 General practitioners' characteristics

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
Agrinier (2017) [22]	Men=64.5% <50 years = 45.2%, 50–58 years = 40.4%, >58 years = 14.4%	66%	NA	36.8%/63.2%/11.9%	NA/NA/NA	Vaccination training = 44.7%	N: <3067 =21.2%; 3067–6028 =53%; >6028 =25.8%
Barjhoux (2009) [23]	Men=59.9% Mean age= 48.67 years	NA	NA	NA/NA/6.2%	85.5%/NA/14.5%	NA	Women < 23 years = 38%; for 50.6% of GPs most of their patients are women, N<1500 = 51.8%
Bouvret (2016) [24]	Men=43.7% Mean = 54 years	NA	M = 18.8 years	50%/45.83%/NA	100%/NA/NA	gynaecological training: 4.2%	63.5% Pap smears
Casimont (2015) [25]	Men=40% 60% >50 years	NA	NA	NA/NA/NA	40%/40%/20%	NA	NA
Chauvet (2016) [26]	Men=57.3%	NA	NA	36.43%/63.57%/NA	38.5%/40.6%/21%	NA	NA

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
	Mean = 42.3 years						
Collange (2016) [27]	Men=68% <50 years = 34%, 50–58 years = 35.1%, >58 years = 30.8%	32.9%	NA	41.9%/58.1%/12.1%	NA/NA/NA	NA	N<3067= 22.1%; N=3067–6028 = 51.4%; N >6028 = 26.05%
Degoue (2019) [28]	Men=41% Mean = 44.4 years	NA	9 [IQR: 3-22]	NA	45.4%/40.1%/14.5%	NA	Gynecologic consultations per week: ≤1=49.3%; >1 =50.7%
Erpeldinger (2012) [29]	Men=66.80%	NA	NA	NA/NA/NA	NA/NA/NA	38.8% medical continuous training, 35% medical visitor, 23.5% scientific articles.	63.8% regularly practice gynaecology
Gougenheim-Fretin (2014) [30]	Men=70% Mean = 46.7 years	NA	NA	NA/NA/NA	30%/40%/30%	NA	NA
Houdjal (2017) [31]	Men=50%	NA	M = 18 years	NA	NA	NA	NA

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
	Mean = 46.6 years						
Killian (2016) [32]	Men=54.4% <40 years=26.3%, 40–60 years=55.7%, >60 years = 18%	NA	NA	NA/NA/10.5%	40.3%/34.3%/25.4%	NA	N<3000= 20.9%; N =3000–4000 = 28.3%; N = 4000–5000 = 25%; N > 5000 = 25.9%
Lamirand (2015) [33]	Men=45.45% Mean = 51 years	NA	NA	45.5%/27.3%/45.5%	54.5%/18.2%/27.3%	Gynaecological training: 6.4% Continuing medical education: 3.6%	Number of consultation per week=60-130
Lasset (2014) [34]	Men=67.9% Mean = 51.6 years	21.3 %	NA	NA/NA/11.8%	69.4%/11.8%/18.8%	NA	NA
Leicht (2016) [35]	Men=53% Mean = 46.4 years	NA	NA	NA	42%/NA/58%	NA	NA
Lutringer-Magnin (2011) [36]	Men=69.8% Mean =50.4 years	NA	NA	NA	68%/11.5%/20.1%	NA	67 women /week (38 women aged 18–48 years and

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
							29 aged 50–70 years).
Manolitsi (2012) [37]	Men=71.03% / Mean = 54 years	NA	*M* =23 years	NA	87.41%/NA/12.59%	NA	NA
Martinez (2016) [38]	Men=66.6% 28–67 years	NA	NA	NA/NA/14%	86%/14% suburban and rural	Vaccination training: 36%	NA
Pélissier (2008) [39]	Men=52.6% Mean =50 years	NA	NA	NA	20.2%/21.3%/29.2%	NA	NA
Piana (2009) [40]	Men=70.1% Mean =47.5 years for women; Mean=52.4 years for men	NA	NA	NA	NA	NA	>5 medical visitors/ week=45.5% ; <20 minutes consults=80.8%
Plessis (2012) [41]	Men=50% NA	NA	50% >10 years	NA/NA/NA	50%/31%/19%	NA	NA
Raude (2016) [42]	Men=68% <50 years = 34%,	NA	NA	41.7%/58.3%/12.0%	NA/NA/NA	Continuing medical	N <3067 = 22.1%; N =3067–

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
	50–58 years = 35.1%, >58 years = 30.8%					education on vaccination: none = 56.16%, 1–5 = 41.6%, >5 = 2.22%	6028 = 51.4%; N >6028 = 26.05%
Sadki (2016) [43]	Men=64% Mean = 53 years	NA	M = 22.11 years	18%/53%/5.9%	47%/29%/24%	NA	NA
Thierry (2016) [44]	Men=80% Mean =53.5 years	NA	NA	NA	NA	NA	NA
Tutala (2019) [45]	Mean=40.7% 49 [IQR:37-59]	NA	NA	NA	NA	NA	NA
Verger (2014) [46]	Men=64.1% <50 years=36.7%, 50–58 years=36.2%, >58 years=27.1%	NA	NA	41.3%/58.7%/11.3%	NA	NA	Proportion of patients aged <16 years (quartiles): [0–16] = 23.3% [17–21] = 24.7% [22–25] =26.6%

Author (year)	% of men Age	With children[a]	Professional experience	Type of practice Solo/Group/ Alternative medicine	Localization Urban/Suburban /Rural	Training	Practice[b]
							[26–50] = 25.5% Proportion of patients aged >70 years (quartiles): [0–8] = (29.5%) [9–12] = (25.2%) [13–17] = (23.4%) [18–67] = (21.8%)

[a]Between 2 and 25 years

[b]N= number of consultations per year

NA = not available

Table A.5 Association between general practitioners' attitudes, norms, perceived behavioural control and either cognitions or behaviour regarding HPV vaccination

Author (year)	Dependent variables		Independent variables[a]
	Cognitions	Behaviour	Cognitions
Bouvret (2016) [24]		Propose	Attitude: (-) Risks/benefits of vaccination: lack of hindsigh unknown duration of protection, real benefits in te necessity to pursue cervical cancer scree (-) Concerns about behavioural consequences of va condom $p<.001$, fear of stopping pap sm (-) Past hepatitis B vaccination controve
Chauvet (2016) [26]		Inform	PBC, capacity: (+) confidence to explain usefulness, safety, si
		vaccinate	PBC, capacity: (+) confidence to explain usefulness, safety, si
Collange (2016) [27]		Recommend	Attitude: (-)unfavourable opinion about risks/benefits bala utility $p < .05$ PBC, autonomy: (NS) perceived barriers (Parents' presence and re sexuality issues) Norms: (NS) trust in information from officia
Lasset (2014) [34]	Favourable		Norms: Beneficial effects of vaccine on public health an prevention $p = .04$
Lutringer-Magnin (2011) [36]	Favourable		PBC, autonomy: (NS) Perceived barriers: reason for medical consult vaccination, questions asked by patients and nece

Author (year)	Dependent variables		Independent variables[a]
	Cognitions	Behaviour	Cognitions
			issue
Manolitsi (2012) [37]	Favourable		Attitude: (-)Fear of long term side effect (p = (NS) lack of hindsight, (-) polemic about hepatitis b vaccine (NS) risk of new disease PBC, capacity: (NS) knowledge PBC, autonomy: (-)Barriers express by parents and patien (-) polemic about hepatitis b vaccine (NS) risk of new disease
Piana (2009) [40]	Favourable		Attitude: (+) Favourable to general vaccination and other v Hepatitis B) (p < .001) (+) favourable to mandatory vaccination (-) fear of a decrease in condom use ((-) fear of side effect (p < .001 (-) think it will give a negative image of sexu (-) will decrease screening PBC, capacity: (+) talk about sexuality with patient ((+) talk about HPV without talking al

Author (year)	Dependent variables		Independent variables[a]
	Cognitions	**Behaviour**	**Cognitions**
Raude (2016) [42]	Attitude: Vaccine hesitancy Risk/benefit balance: concerns about safety and complacency (too much vaccine, vaccines are useless)		(-) Norm: trust in institutional sources (
	PBC, capacity: confidence in their ability to explain the benefits, utility and the role of adjuvant to their patients		(+) Norm trust in institutional sources
		Recommend	Attitude: (-) Vaccine hesitancy (concerns about safety and co PBC, capacity: (NS) confidence in ability to explain vaccine safety and the role of adjuvants
Verger (2015) [46]		Vaccines recommendation (including HPV)	Attitude: (-) Perception of potential severe adverse effects, ar utility ($p < .05$) PBC, capacity: (+) confidence in their ability to explain the safe vaccines and the role of adjuvant to their pa Norms: (+) trust in the reliability of the information provid ($p < .05$)

[a]Association was either not significant (NS) or significant and either positive (+) or negative (-)
PBC = perceived pehavioural control

Table A.6 Association between background variables and either general practitioners' attitude or behaviour regarding HPV vaccination

	Dependent variables		Independent variables[a]				
Author (year)	**Attitude**	**Behaviour**	**Age**	**Gender**	**Children/ daughter**	**Practice**	**Training**
Agrinier (2017) [22]		Discrepancies/divergence[b]	NS	(+)men (p < .05)		(+) solo practice (p < .05) (+) Practice of alternative medicine (p < .05) (NS)Workload (NS)City size	(NS) infectious disease and vaccination
Barjoux (2009) [23]		Propose	(+) Less 40 years (P < .001)	NS		(+) town <20 000 residents (p < .001)	
Bouvret (2016) [24]	Favourable		(+) less 54 years p = 0,04	NS		(NS)Years of practice (NS)Type of practice (solo, group) (NS)Pap smears practice	(NS) gynaecology
		Propose	(+) less 54 years (p = .01)	NS		(NS)Years of practice (NS)Type of practice (NS)Pap smears practice	(NS) gynaecology

Author (year)	Dependent variables		Independent variables[a]				
	Attitude	Behaviour	Age	Gender	Children/ daughter	Practice	Training
						(NS)cost (NS)Number of injection	
Chauvet (2016) [26]		Inform	NS	NS		(NS)Group vs. solo practice (NS) Localization (NS)Practice of Pap smears	
		Vaccinate	NS	NS		(NS) group vs. solo practice (NS) Localization (NS)Practice of Pap smears	
Collange (2016) [27]		Recommend	NS	NS	(-)GPs without daughter aged 11–25 or refuse to vaccinate their daughter. (P < .05)	(+) More 3067 visits/consults (P < .05) (+)Experience with patients with cervical cancer in the past five years (P < .05) (NS) practice of alternative medicine	
Erpeldinger (2012)[29]		Prescribe	NS			(NS)Practice of gynaecology	NS
	Enthusi		NS	NS			Enthusiastic

Author (year)	Dependent variables		Independent variables[a]				
	Attitude	Behaviour	Age	Gender	Children/ daughter	Practice	Training
	astic, prudent, doubt						GP: trained by medical visitor, prudent GP trained by continuous training, GP who have doubt trained by medical article (ps < .01)
Killian (2016)[32]		Discrepancies/divergence[b]	(-) less than 40 years (p < .001)	NS		(NS) Practice area (NS) Workload (+)Alternative medicine (homeopathy and acupuncture; ps < .05)	
Lasset (2014)[34]	Main justification for favourable opinion						(+)Advances of medicine (p = .03)
Lutringer-Magnin (2011)[36]	Favourable		(+) less 55 years (p = .04)	NS		(+)More 50 women/week (p = .002), (+) routinely recommending Haemophilus B and Hepatitis B) (p <.01)	Source of knowledge on HPV vaccination: (+)from medical journal and laboratory sales representativ

Author (year)	Dependent variables		Independent variables[a]				
	Attitude	Behaviour	Age	Gender	Children/ daughter	Practice	Training
						(NS) Practice area, prevention advises regarding tobacco, nutrition, physical activities, alcohol screening (breast cancer or colorectal cancer), at least one Pap smear taken during the month preceding the survey	es (ps < .001) and (NS) from health authorities and others
Piana (2009) [40]	Favourable		(+) less 45 years (p = .04)	(+) men (p = .004)		(-)Alternative medicine (p < .001), (+) more 100 consult/week (p < .026) (+) more 10 children and adolescents in consult/week: (p < .001), (+) consult duration less than 20 minutes: (p < .001), (+) consultations or visits >100/week (*p* < .026), (+) more 5 medical visitors/week (p < .001)	

[a]Association was either not significant (NS) or significant and either positive (+) or negative (-)

[b]data from Roddier-Herlant medical dissertation
[c]different vaccination practice for their patients compare to their own children