

# Vaccine hesitancy among general practitioners: evaluation and comparison of their immunisation practice for themselves, their patients and their children

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**Abstract** To gain knowledge about vaccine hesitancy among general practitioners (GPs), we conducted a survey to compare their vaccination attitudes for themselves, their children and their patients. A questionnaire survey was sent to GPs working in private practice in the Rhône-Alpes region, France, between October 2013 and January 2014. GPs' immunisation practices for diphtheria–tetanus–poliomyelitis (DTP), measles–mumps–rubella (MMR), pneumococcal, pertussis, hepatitis B (hepB), human papillomavirus (HPV), seasonal and H1N1 influenza and meningococcal C (menC) vaccines were considered. Divergence was defined by the presence of at least one different immunisation practice between their patients and their children. A total of 693 GPs answered the questionnaire. When considering all investigated vaccines, 45.7 % of divergence was found. Individually, divergence was highest for the newest and more controversial, i.e. HPV

(11.8 %), hepB (13.1 %), menC (23.7 %) and pneumococcal (19.8 %) vaccines. Only 73.9 % of GPs declared that they recommended HPV vaccine for their daughters. After multivariate analysis, older age was associated with higher risk of divergence. According to the French 2012 recommendations, GPs were insufficiently immunised, with 88 % for DTP and 72 % for pertussis. GPs declared to recommend vaccination against DTP, pertussis and MMR for their patients and their children in more than 95 % of cases. The declared rates of recommendation were lower than 90 % for other vaccines. These results bring new insight about vaccine hesitancy. GPs have divergent immunisation attitudes toward their relatives and their patients, especially when considering the newest and most controversial vaccines, with HPV vaccine being the main focus of controversies.

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## Introduction

Vaccination is one of the greatest and cost-effective successes of modern medicine, saving countless lives and preventing many disabilities, even now [1]. Despite the existence of an overwhelming flow of evidences pleading for vaccines' efficacy, it seems to have disappeared from the collective memory. This apparent memory loss, associated to the emergence of several vaccine controversies empowered by mass media [2], have created an atmosphere of mistrust toward immunisation matters in the general population during the last 15 years [3].

A new concept called 'vaccine hesitancy' has emerged during these past years and has become a growing focus of concern because of its great potential of harm. To address this important issue, a specific Working Group on Vaccine Hesitancy was established in 2012 within the Strategic Advisory Group of Experts (SAGE) on immunisation, which is the main advisory group to the World Health Organization (WHO) in the field of

vaccines. The experts developed a definition for this notion: “Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place, and vaccines. It is influenced by factors such as complacency, convenience and confidence” [4]. As stated in this definition, vaccine hesitancy is a worldwide problem, affecting low- and high-income countries alike [5]. It is important to understand that vaccine hesitancy encompasses vaccine refusal, whose participation in lowering vaccine coverage is difficult to measure, but also vaccine acceptance with doubts about its safety and/or benefits. This second part is harder to detect, can eventually lead to vaccine refusal depending on the context and vaccine hesitancy’s evaluation requires complex survey tools anyway [6]. Because of the difficulties in evaluating vaccine hesitancy itself, its real impact is even harder to measure, but many recent outbreaks of vaccine-preventable diseases have been linked to undervaccinated or non-vaccinated communities [7]. In France, doubts and questions were raised about the reliability of information provided by authorities and the safety of specific vaccines, such as hepatitis B (hepB) [8] or human papillomavirus (HPV) [9], as well as aluminium-based adjuvants [10].

General practitioners (GPs), by their recommendations and administration of vaccines to their patients, play a major role in vaccination. They notably influence their patients’ vaccination behaviour [11, 12]. On the other hand, as individual persons or parents, physicians are free to choose their own vaccination practice, for themselves and for their children, in accordance with their own beliefs. Although physicians are generally favourable to vaccination, previous studies have reported growing prevalence rates of doubts about vaccine harmlessness and utility [13, 14]. Hesitant physicians were shown to be less convincing relays to recommend vaccines to their patients [13, 15, 16].

To gain insight on the complex issue that is vaccine hesitancy among GPs, the aim of our study was to compare vaccine policies of GPs for themselves, their children and their patients.

## Materials and methods

An invitation to complete a Web-based survey (hosted on GoogleDrive®) about vaccination was sent by e-mail to GPs working in private practice in the Rhône-Alpes region, France. In October 2013, the questionnaire was sent by the medical councils of 6 out of 8 counties (Loire, Ardèche, Drôme, Isère, Savoie and Haute-Savoie) in the region, to their affiliated GPs. A second e-mail was sent in January 2014, by the regional union of healthcare professionals (URPS Rhône-Alpes) to their 2839 GP adherents (representing almost 50 % of the GPs in the region) in Rhône-Alpes. Data were collected between October 2013 and February 2014.

A total of 41 questions were asked to GPs, the main topic being their immunisation practice for their patients as healthcare provider (HCP), for themselves and for their children. The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) statement [17] was followed, when applicable. All questions were previously validated and tested by general medicine and infectious diseases specialists involved in the study. Vaccines against diphtheria–tetanus–poliomyelitis (DTP), measles–mumps–rubella (MMR), *Streptococcus pneumoniae*, pertussis, hepB, HPV and meningococcal C meningitis (menC) were considered according to recommendations for each category (GPs, patients, children). For each vaccine, GPs were asked if they recommended it to their patients and if they had followed the official recommendations for their children. For HPV, if none of their children were concerned or if they were childless, their hypothetical immunisation practice was questioned (i.e. “have you vaccinated or would you vaccinate your daughter against HPV?”).

Seasonal and pandemic H1N1 influenza vaccines’ coverage was only explored for GPs. Recommendations provided by French authorities in 2012 [18] were chosen as reference because the 2013 version had just been published at the time of the survey. Divergence between their immunisation practice as HCP and parents was defined by the presence of at least one different immunisation practice between their patients and their children. The presence of two or more different immunisation practices was also examined. All responses were anonymous and declarative.

The questionnaire was validated by the local ethics committee of the University Hospital of Saint-Etienne and by the French national commission for data protection (Commission Nationale Informatique et Libertés).

Differences between proportions were analysed by the chi-squared test or Fisher’s exact test, and the Kruskal–Wallis test was used to compare quantitative data. Chi-squared test for trend was used to test whether there was a linear trend between divergence and GPs’ characteristics. A  $p$ -value below 0.05 was considered to be statistically significant. To adjust for confounding factors, we conducted a multivariate analysis to test associations between the divergence of GPs’ declared immunisation practice for their patients and their children and the explicative variables with a  $p$ -value below the 0.2 significance level in the univariate analysis. The software used for the collection of the recorded data was Microsoft Excel. SPSS software, version 20.0 (Chicago, IL, USA) was used for statistical analysis.

## Results

A total of 693 GPs accepted to fulfil the entire questionnaire, corresponding to a response rate of 12.5 %.

The main characteristics of responding GPs are summarised in Table 1. Among these, 73 % were older than 40 years of age and the sex ratio (women/men) was 0.81. Two-thirds of the physicians practised exclusively general medicine, 8.9 % practised homeopathy and 1.6 % practised acupuncture. GPs mainly monitored vaccination status by using the health booklet (Carnet de Santé) for their paediatric patients (99.3 %) and their children (91.9 %). For adult patients, the medical file (86.6 %) and the vaccination card (83.0 %) were more frequently cited than the health booklet (53.1 %). For themselves, 64 (9.2 %) GPs declared not to use any means to monitor their vaccination status, whereas only 8 (1.1 %) declared using no record for their adult patients' vaccination status.

GPs' vaccination coverage for DTP, pertussis, seasonal and pandemic H1N1 influenza was evaluated among the 693 responders. According to the French 2012 recommendations [18], GPs declared for themselves to be correctly immunised for DTP in 88 % of cases ( $n = 610$ ), for pertussis in 72 % of cases ( $n = 499$ ) and for seasonal Influenza in 79.1 % of cases ( $n = 548$ ). Five hundred and fourteen (74.2 %) declared that they have been vaccinated in 2009 against the pandemic flu. Their vaccination coverage was not evaluated for hepB in the questionnaire. However, 75.9 % of the panel declared that they would accept a booster dose if their anti-HBs antibody titre was found to be undetectable.

**Table 1** Demographic and professional characteristics of the panel population

	$n = 693$	
Gender		
Male	377	54.4 %
Age, years		
<40	182	26.3 %
40–60	386	55.7 %
>60	125	18.0 %
Workload (number of procedures in 2012)		
<3000	145	20.9 %
3000–4000	196	28.3 %
4000–5000	173	25.0 %
>5000	179	25.9 %
Place of practice		
Urban	279	40.3 %
Mixed	238	34.3 %
Rural	176	25.4 %
Type of practice		
General medicine exclusively	458	66.1 %
Homeopathy	62	8.9 %
Acupuncture	11	1.6 %
Sports medicine	82	11.8 %
Others	80	11.5 %

Table 2 summarises, for each vaccine, the recommendations claimed by GPs for their patients and their own children. GPs' recommendations for DTP, pertussis, MMR and menC were not different between both groups. For the other vaccines, GPs declared that they recommended more pneumococcal and HPV vaccine to their patients when compared to their children, whereas it was the other way round for hepB (see Table 2). About a quarter of the GPs who declared that they had immunised or would immunise their daughters for HPV did it using an alternative schedule.

Since differences in immunisation practices were observed between GPs' patients and children, we explored these divergences. When considering all investigated vaccines, a 45.7 % divergence was found between GPs' declared immunisation practice for their patients and their children in the whole panel. After univariate and multivariate analysis shown in Table 3, GPs' age was the only factor associated with a higher risk of divergence between immunisation practice for their patients and their children. When compared to <40-year-old GPs, the risk of divergence kept growing between 40–49, 50–59 and  $\geq 60$ -year-old GPs, with odds ratios of 1.70, 3.07 and 3.51, respectively ( $p < 0.001$ ). This divergence was predominantly found for the newest and more controversial vaccines. The divergence rate was particularly measured among GPs practising homeopathy ( $n = 62$ ) or acupuncture ( $n = 11$ ), and was found to be higher than in the rest of the panel, with, respectively, 71.0 % ( $p = 0.001$ ) and 81.8 % ( $p = 0.03$ ) of divergence. When considered individually in the whole panel, we found a 0.9 % divergence for DTP, 2.7 % for pertussis, 2.6 % for MMR, 11.8 % for HPV, 13.1 % for hepB, 19.8 % for pneumococcal and 23.7 % for menC vaccines. Regarding the highest vaccine-specific divergence rates, the 'direction' of this divergence depended on the considered vaccine. 'Divergent' GPs tended to recommend more pneumococcal and HPV vaccines to their patients, whereas it was the other way round for hepB. There was no clear trend in one direction or the other for menC vaccine. Finally, when considering two or more different immunisation practices between what GPs declared for their patients and what they declared for their children, the divergences rate was 19.9 %.

## Discussion

Attitudes of GPs about vaccination as HCP have been largely studied [12, 15, 19]. By contrast, data about GPs' vaccination practice for themselves and their own children are scarce. To our best knowledge, only one Swiss declarative survey [20] investigated physicians' immunisation attitudes for their children. The present study was the first to make a comparison of GPs' immunisation attitudes for themselves, their own children and their patients.

**Table 2** Comparison of GPs' immunisation practices for their patients and their own children ( $n = 693$ )

Vaccines recommended by GPs to:	Their patients	Their children	<i>p</i> -Value
DTP	99.1 %	99.7 % <sup>a</sup>	0.33
Pertussis for child patients	98.6 %	97.0 % <sup>b</sup>	0.07
MMR	97.7 %	99.1 % <sup>c</sup>	0.2
Pneumococcal (13-valent vaccine)	90.2 %	84.3 % <sup>d</sup>	0.001
Hepatitis B	86.9 %	100.0 % <sup>e</sup>	<0.001
Papillomavirus	83.4 %	73.9 % <sup>f</sup>	<0.001
Meningococcal C meningitis	79.65 %	81.7 % <sup>g</sup>	0.11

<sup>a</sup> 1.6 % were immunised with alternative schedules

<sup>b</sup> 3.1 % were immunised with alternative schedules

<sup>c</sup> 3.6 % were immunised with alternative schedules

<sup>d</sup> 11.9 % were immunised with alternative schedules

<sup>e</sup> 14.9 % were immunised with alternative schedules

<sup>f</sup> 22.9 % were immunised with alternative schedules

<sup>g</sup> 20.7 % were immunised with alternative schedules

Vaccination coverage claimed by GPs for their children was superior to the reported coverage in the general population for DTP, pertussis, MMR and hepB vaccines [21, 22]. An explanation for this might be a higher degree of dedication among GPs to prevent these diseases from reaching their loved ones. A more likely reason would be the difficulties in convincing some of their patients to get immunised [23]. In the Swiss study, similar findings were reported for DTP, pertussis and MMR [20], whose use seems well established and accepted. Interestingly, for hepB vaccine, the entire panel claimed that their children were immunised, among whom more than 85 % used the schedule recommended by the French authorities [18] (three administrations during the first year of life). The reported rates were higher than Swiss paediatricians' (68.1 %) and non-paediatricians' (64.6 %) children coverage, possibly due to different recommendations at that time in Switzerland (limited to children from 11 to 15 years of age) [20]. The declared hepB vaccination coverage in GPs' children found in our study was also much better than what was previously described in the general population [24]. A French survey conducted in 2008 among 2175 GPs reported that 10 % of the panel had not immunised their children against hepB at that time [25]. As previous surveys [24, 25] were declarative like ours, we hypothesise that our findings might reflect an improvement of hepB vaccine's perception

among French physicians within the time frame since the suspension of the school-based hepatitis B vaccination programme in 1998 [26]. This improvement would be in accordance with recent reports [24], but may also reflect the presence of a selection bias induced by the fact that GPs were aware of the survey's subject before participating. By contrast, GPs' own declared vaccination coverage was insufficient and even lower than those of the general population for DTP and pertussis, as previously reported [27, 28]. The fact that they are usually taking care of their vaccinations on their own, and that nearly 10 % of the panel did not use any record to monitor these vaccinations, can at least partially explain this. For seasonal influenza and pandemic influenza in 2009, vaccination coverages seemed higher than in precedent reports [28–30]. GPs' hepB vaccine coverage has not been evaluated since, in France, it is strongly recommended for GPs and mandatory for medical students and physicians that work in healthcare facilities, and we assumed that nearly 100 % were vaccinated. However, as nearly one-quarter of the panel declared that they would not accept a booster dose if their anti-HBs antibody titre was found to be undetectable, it suggests that they could be hesitant about HepB vaccine for themselves.

Newer vaccines such as pneumococcal, HPV and menC, respectively added to the French official recommendations in 2006, 2007 and 2010, were less likely to be recommended by

**Table 3** Univariate and multivariate analysis of risk factors for divergence

Risk factors for divergence	Univariate analysis	Multivariate analysis	OR [SE]
Age (<40; 40–50; 50–60; >60)	$p < 0.001$	$p < 0.001$	1.578 [0.075]
Male sex	$p = 0.19$	NS	
Practice (rural, urban, mixed)	$p = 0.249$	NS	
Workload (<3000 procedures; 3000–4000; 4000–5000; >5000)	$p = 0.141$	NS	

NS not statistically significant; SE standard error



GPs to their paediatric patients and even less likely to be administered to their own children. Despite being slightly better than GPs' level of recommendation for HPV vaccine in the last national survey in 2009 [31], our results revealed that the recommendation level for HPV vaccine was low for GPs' daughters (<75 %) and their patients (<85 %). This attitude is probably linked to the barriers and controversies that have emerged about HPV vaccine during the past several years and revealed that GPs have a barely higher acceptance level toward this vaccine than the general population [9]. Barriers to HPV vaccine in the general population were religious beliefs [32], parents' concerns about the fantasised effect on their children's sexual behaviour [33] or a low perceived risk of HPV infection. In France, claims of unproven links between HPV vaccination and autoimmune disorders have resulted in demands, made by a few patients and GPs, to establish a parliamentary mission and a moratorium on HPV vaccines. They have not succeeded, unlike in Japan, where health authorities have suspended their HPV vaccination recommendation in 2013 [34]. Despite their unproved nature, these elements probably induce vaccine hesitancy among GPs and could partially explain our results. MenC and pneumococcal vaccines were also less frequently recommended to their patients and their children, even when only <40-year-old GPs' (whose children were potentially at the age of receiving these vaccines according to current immunisation guidelines) responses were analysed (data not shown). In fact, in France, vaccine coverage concerning these vaccines has been reported to be lower than what is recommended by the health authorities, to expect effectiveness of the vaccination policy [35, 36]. GPs' recommendations is one of the most important factors in parents' decision to vaccinate their children [33], whereas vaccine hesitancy lessens their ability to be good pro-vaccination preachers [16]. One of the possible consequences of this hesitancy is the existence of alternative immunisation strategy users for all investigated vaccines in the survey (see Table 2), particularly for the newest and most controversial ones. This attitude might result from wrong beliefs about immune overload among GPs [20, 37] or could be linked to the use of other countries' recommendations known by GPs (e.g. two and not three injections for HPV vaccine). A divergent immunisation practice for their patients and their children was reported by a high percentage of the GPs, representing almost half of the panel. We think that this "do as I say, not as I do" attitude can be considered as vaccine hesitancy, at least at a personal level, with the highest degree of divergence for the newest and the most controversial vaccines. Hopefully, the fact that 'divergent' GPs declared a higher rate of recommendation for the majority of the considered vaccines among their patients when compared to their children might indicate a lower impact of this hesitancy at the professional level. Alternative medicine practitioners, known to be less favourable to vaccination [38], reported

more divergent immunisation practice, but their low percentage (particularly for acupuncture practitioners) in the panel doesn't allow any conclusions to be drawn.

Because of its complexity and context-specific nature, no univocal solution could overcome the worldwide issue that is vaccine hesitancy, but HCP are key players in the process. To address GPs' vaccine hesitancy, the importance of including appropriate training about immunisation matters in general, and vaccine hesitancy in particular, in the curricula of healthcare students has already been pointed out by the SAGE [5]. The results of this study suggest, as reported elsewhere [16], that training should also be organised by independent medical associations for current practitioners to update their knowledge, especially for the newest vaccines.

Limits must be noted about the present work. First of all, its declarative character must have led to inaccuracies in the responses. However, the questionnaire data appear to overestimate vaccination rates by less than 10 % [39] and are good proxies for recorded vaccine coverage in HCP [40]. Moreover, the panel was representative of the GPs population in the Rhone-Alpes region when compared to official data [41, 42]. As reported previously [38], the responding physicians were probably more concerned about vaccination matters, whether it was positively or negatively, but it could not have been verified in the absence of data about the refusing GPs. Some GPs may have grown-up children or no children at all, and may have incorrectly understood the questions, especially because immunisation schedules have evolved over the years, and some of the new vaccines may not have been officially recommended when older GPs' children were receiving infant vaccines and we cannot exclude that it may have biased their responses. However, we received a very limited number (less than five) of queries about the lack of specific instruction for childless GPs. Moreover, although absolute divergence rates increased with GPs' age, menC and pneumococcal vaccines' relative contribution (nearly a half) to them was approximatively the same among all age groups (data not shown). With hepB vaccine being part of child and adolescent immunisation guidelines since 1994 in France, it was most probably present in vaccination schedules when older GPs' children were of appropriate age to receive it. For HPV vaccine, the question was clearer, and we believe that the answers were correct.

In conclusion, the results from this survey support the fact that French GPs are, in general, favourable to vaccination, but also argue for the existence of vaccine hesitancy among them, as reported recently by Verger et al. [16]. It is notably the case when they act as parents. GPs seem to have divergent attitudes regarding immunisation policies for their relatives and their patients. Today, HPV vaccine appears to be the main focus of controversies in France. Older age seems to play a part in divergence, potentially because these GPs might be less confident about the newest vaccines (the main source of

divergence), but reasons for divergent attitudes are unclear and further studies are needed in order to better understand this phenomenon. With vaccine hesitancy being a context-specific issue, further research will be necessary to confirm these findings at a national level, to determine their prevalence in other countries and to understand the determinants of divergent vaccination behaviours among physicians in order to assess this specific issue, as recommended by the SAGE Working Group on Vaccine Hesitancy [5].

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#### Compliance with ethical standards

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**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** For this type of study, formal consent is not required.

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