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Review

Attitudes to vaccination: A critical review

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ABSTRACT

This paper provides a consolidated overview of public and healthcare professionals' attitudes towards vaccination in Europe by bringing together for the first time evidence across various vaccines, countries and populations. The paper relies on an extensive review of empirical literature published in English after 2009, as well as an analysis of unpublished market research data from member companies of Vaccines Europe. Our synthesis suggests that hesitant attitudes to vaccination are prevalent and may be increasing since the influenza pandemic of 2009. We define hesitancy as an expression of concern or doubt about the value or safety of vaccination. This means that hesitant attitudes are not confined only to those who refuse vaccination or those who encourage others to refuse vaccination. For many people, vaccination attitudes are shaped not just by healthcare professionals but also by an array of other information sources, including online and social media sources. We find that healthcare professionals report increasing challenges to building a trustful relationship with patients, through which they might otherwise allay concerns and reassure hesitant patients. We also find a range of reasons for vaccination attitudes, only some of which can be characterised as being related to lack of awareness or misinformation. Reasons that relate to issues of mistrust are cited more commonly in the literature than reasons that relate to information deficit. The importance of trust in the institutions involved with vaccination is discussed in terms of implications for researchers and policy-makers; we suggest that rebuilding this trust is a multi-stakeholder problem requiring a co-ordinated strategy.

1. Introduction

Vaccines are widely recognised by health authorities and the medical community as a major tool for achieving public health successes such as the eradication of smallpox (Andre et al., 2008; ECDC, 2012). Yet, for many individuals, this is not a sufficient basis with which to embrace vaccination whole-heartedly. They doubt the benefits of vaccines, worry over their safety and question the need for them, an attitude we refer to as vaccine hesitancy. An attitude of hesitancy differs from an action of vaccine refusal. Even those who are vaccinated can harbour hesitancy towards certain aspects of vaccination.

The policy concern is that hesitancy soon becomes refusal, as suggested by theory and experience (Salathé and Bonhoeffer, 2008), and unvaccinated clusters emerge in which disease outbreaks can occur (Gangarosa et al., 1998; Jansen et al., 2003). For example, a UK study of 14,578 children found that three-quarters of parents whose children were not vaccinated with MMR made a conscious decision to not vaccinate (Pearce et al., 2008). The refusal rate suggests that the traditional assumption that parents suffer information deficit, lack access to the facts or are misinformed is, at best, an incomplete understanding of vaccination attitudes (Hobson-West, 2003). We assume that, at one point, these parents were hesitant before they made their decision, and so there is an important distinction to be drawn between hesitancy and outright rejection.

If we take the distinction between hesitancy and rejection seriously, it becomes clear that whilst coverage rates are helpful for identifying those who reject, the metric does little to help us understand hesitant attitudes, their origins and the scope to change them. The goal of maintaining high coverage rates helps to ensure vaccination benefits are delivered widely, but the very act of delivering wide scale vaccination can make vaccines 'victims of their own success'. As the ravages of disease become less familiar to people, it may become more challenging to articulate the desirability of vaccination. Nichter (1995: p 617, 625) distinguished

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between '*active demand*' (an appreciation of the benefits of and the need for vaccination) and '*passive acceptance*' (vaccination denoting compliance or yielding to power). Nichter (1995: p 625) pointed out that "demand is often low, even among populations having impressive immunisation rates". When hesitancy is prevalent, ensuring compliance and high coverage rates may not be enough to ensure that vaccination is sustainable in the future (Roalkvam et al., 2013: p 192). Closer examination is needed of what is required for the development of active demand.

The central concepts for cultivating active demand are trust and legitimacy (as set out in Roalkvam et al., 2013). By trust, we mean the ability to rely on somebody else's claims about a situation, and by legitimacy we mean the grounds upon which policymakers make decisions (O'Neill, 2002). When trust and legitimacy are lacking, many feel the need to re-interpret information about vaccination. Such re-interpretation can be elaborate: for example, some distinguish between 'natural immunity' and 'artificial immunity' induced through vaccination, and some believe a child's immune system can become 'overloaded' (Leach and Fairhead, 2007: p 52–55). The specifics of such re-interpretations are often localised and historically dependent: for example, the autism claims implicating the MMR vaccine were mostly a UK phenomenon, and the multiple sclerosis claims implicating the HepB vaccine were mostly a French phenomenon.

Trust and legitimacy are crucial concepts for understanding why some sources of information on vaccination are consulted more than others, how information on vaccination is re-interpreted and how beliefs that are often contrary to medical science are formed (as in the examples above). They help to explain some of the puzzles thrown up by coverage rates, such as why the better educated (who mistrust) might reject vaccination more readily than the less educated (who accept passively) (Hak et al., 2005).

Concern about the trust in, and legitimacy of, institutions involved with vaccination has again come to the fore following the H1N1 influenza 'pandemic' that never arrived (Allam, 2009; Scoones, 2010). Claims that the 'pandemic' response may have been improperly influenced by commercial interests (Flynn, 2010; Godlee, 2010; Epstein, 2011) coincided with evidence of increasingly hesitant attitudes to vaccination (Sypsa et al., 2009; Poland, 2010; Chanel et al., 2011). The WHO Director-General said about H1N1: "we did not anticipate that people would decide not to be vaccinated … In today's world, people can draw on a vast range of information sources. People make their own decisions about what information to trust, and base their actions on those decisions" (Chan, 2010). Some policymakers were clearly surprised to discover that their organisations did not command the trust they expected when they recommended vaccination.

The erosion of public trust in institutions involved with vaccination could be related to broader social trends (Blume, 2006; Hobson-West, 2007; Poltorak et al., 2005). For scholars such as Hobson-West (2003), public health authorities issuing vaccination recommendations struggle to resonate with a general public who are now more enamoured with notions of individual empowerment and exercising patient-choice. For scholars such as Blume, public health narratives are undermined by multiple stakeholders in multiple ways; for example, by the creation of markets where individual health consumers are expected to exercise purchasing power (Blume, 2006) and by the pressure to conform to the standardised products of global vaccine producers (Blume and Zanders, 2006). Another example might be the way in which many stakeholders now strive for personalised medicine emphasising personal characteristics (rather than the community characteristics that public health would) (Hedgecoe, 2004). Individuals, governments, researchers, companies and health services are all responsible for such public health narratives.

What follows then is a review with an agenda that centres on attitudes to vaccination, and one that seeks to determine whether vaccine hesitancy is a prevalent phenomenon, what the reasons are for hesitancy, and what might constitute a basis for cultivating active demand. A number of recent reviews cover attitudes to vaccination. A US Centers for Disease Control review focused on parental perceptions but not those of healthcare professionals (Kennedy et al., 2011). A Canadian Institute of Health Research systematic review also focused only on parental beliefs (Mills et al., 2005); moreover, they excluded vaccine-specific papers, which we believe can be quite important. A European Centre for Disease Prevention and Control (ECDC) systematic review focused on what constitutes effective communication regarding vaccination, as opposed to explaining reported attitudes (Cairns et al., 2012). There are also at least 3 recent reviews (Allen et al., 2010; Brown et al., 2010; Hofmann et al., 2006) focussing on specific vaccines and/or populations (HPV, Influenza-health professionals and MMR-parents, respectively) which we hope to complement.

We aim to make three distinct contributions to this literature. As far as we are aware, we provide the first consolidated overview of vaccination attitudes (defined here as expressions of support or hesitancy) among public and healthcare professionals across different vaccines and countries in Europe. Secondly, we provide an extensive mapping of the empirical literature (mostly surveys) on attitudes to vaccination in Europe in the 'post-pandemic' period (2009–2012). Thirdly, the paper offers an analysis of unpublished market research data from member-companies of Vaccines Europe, and compares this with published literature.

2. A review of 2009–2012 literature

2.1. Review methodology

The literature containing European data was reviewed systematically in a multi-step process (Fig. 1) conducted in the UK. English language articles from 2009 until August 2012 were searched in PubMed, Embase, Cochrane and Web of Science databases. Search terms included immunisation, perceptions, and attitudes (full search string available on request). Expert knowledge of the literature, snowballing and Google searches were also used and exclusion criteria applied (Appendix 1) to derive the final set of articles for full review (Appendix 2).

The papers we reviewed contained a range of self-reported determinants of vaccination attitudes. During our review, we searched for reasons that were cited for attitudes of hesitancy and support. We then categorised reasons that were very similar so that

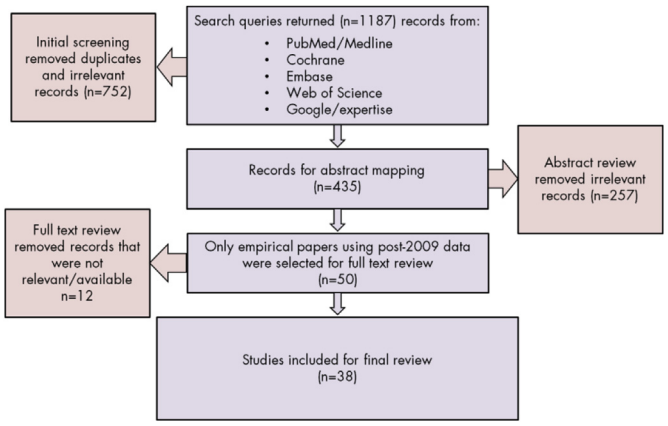

Fig. 1. Method flow-chart.

one can see which kinds of reasons were cited the most for attitudes of hesitancy/support. The frequency with which these kinds of reasons were cited in the literature we reviewed is reported in the figures below and referred to in the text below.

We also organised the papers according to: country of data collection, methodology, type of vaccine (HPV, influenza etc.) and population studied (adults, healthcare professionals, students, children etc). This helped to map the overall landscape of the literature.

The study did not collect any primary data, and no data was collected from human subjects directly by the authors. Even so, the authors sought (and acquired) approval from RAND Europe's Quality Assurance team and ethical review.

2.2. Review results

1187 articles were initially retrieved for review. Title and abstract review, and selection of post-2009 data only, resulted in 50 papers. Of these, 10 were irrelevant and 2 were unavailable – leaving 38 papers for full-text review. Quality criteria were not used since all the papers met prior standards set by the peer-reviewed publication process.

15 countries are represented in the full text review (Fig. 2). There is a paucity of papers from Eastern Europe, though this may simply be an artefact of excluding non-English language papers. The literature is primarily a qualitative gathering of self-reported determinants, with questionnaires the dominant methodology (26 papers), and some using focus groups (5 papers) and interviews (5 papers). Almost a quarter of papers discuss attitudes to vaccination in general but the majority examines attitudes with respect to specific vaccines. Over a third of papers examined attitudes to HPV vaccination, and nearly a quarter examined attitudes to seasonal-influenza vaccination. There were almost twice as many papers about the general population than about healthcare professionals (general population included adults and students of varying ages).

In the sub-sections that follow, we present reasons underlying vaccination attitudes by population group, where the general population includes non-medical students and children and the healthcare population includes a range of professionals (medical students, general practitioners, dentists, midwives, nurses and physicians of varying specialties such as rheumatology). Figs. 3–5 show a count of how often each reason appeared in our reviewed papers. There is no weighting to adjust for importance (significance of the reasons is discussed in relation to wider literature in Section 4). The figures show the range of reasons underlying vaccination attitudes across vaccines and countries.

Country	Number of papers collecting data from named country
Germany	9
Netherlands	6
Sweeden	4
Denmark	3
United Kingdom	3
Czech Republic	2
Greece	2
Hungary	2
Italy	2
Spain	2
Belgium	1
France	1
Ireland	1
Romaina	1
Slovenia	1

Fig. 2. Countries represented in the review (multi-country papers are 'multi-counted').

2.2.1. General population (24 papers)

The most commonly cited reason for general population support for vaccination is healthcare professionals' advice, although this category also includes the often false belief that vaccination is mandatory (mandatory vaccination is quite rare, see Haverkate et al. (2012)). Self-protection may be overestimated here because all nine of the citations in this category come from only three papers, with a single paper (Forster et al., 2012) being responsible for six of the citations (i.e. Forster et al.'s data offered six reasons that were all slight variations on the theme of self-protection – thus, we say that self-protection was cited six times, and nine times if we include the two other papers). Advice from friends, family or colleagues is cited more than awareness of illness and vaccination as a reason for support.

Unsurprisingly, the most commonly cited reason for general population hesitancy towards vaccination is safety concerns. Lack of awareness, low perceived severity of illness and a belief in alternative medicine were often cited as reasons for hesitancy. However, lack of knowledge was mentioned less than distrust of government sources. One paper also noted a lack of importance placed on GP's recommendations, and another noted distrust of pharmaceutical companies. Two hesitancy reasons are specific to HPV vaccination. The 'other' category encompasses reasons which were only cited once across all of the papers – including 'choice restriction' and 'too much choice in vaccines' revealing the existence of directly opposing views. Reasons cited under 'Fear of needles' varied in significance across the papers, from being the primary reason for the avoidance of vaccination (Forster et al., 2012) to being cited by only a few study participants (Prymula et al., 2012).

2.2.2. Healthcare professionals (patient-vaccinating) (4 papers)

A belief in the benefits of vaccines and a sense of duty to promote health and vaccination are the primary reasons for healthcare workers recommending vaccines to their patients. One study showed that a trustful doctor–patient relationship is necessary to recommend vaccines to patients, which is listed here under the term practicalities (see next paragraph for other reasons entered under the term). Two of the four papers reviewed here (Gottvall et al., 2011; Oscarsson et al., 2011) specifically relate to HPV. More generally, three of the four papers noted lack of time when discussing vaccines with patients.

2.2.3. Healthcare professionals (self-vaccinating) (10 papers)

The most commonly cited reasons underlying healthcare professionals' self-vaccination were to protect patients, themselves and non-patients (e.g. family). Three sentiments were classified under the reason 'practicalities': workplace vaccination, free vaccination and vaccination to avoid absenteeism. The third sentiment reveals an assumption: in order to believe a vaccine will help avoid absenteeism, there needs to be an appreciation for the possibility of contracting illness and an acknowledgement of its potential severity. So, the sentiment indicates that healthcare professionals have this kind of appreciation for vaccination.

The most commonly cited reason for healthcare professional hesitancy towards self-vaccination is safety concerns. A lack of vaccine knowledge is also revealed through a number of sentiments, widely regarded as false and unsubstantiated, which included: the belief that pregnancy is a contraindication for the pandemic-influenza vaccine, the belief that vaccines contain dangerous additives and promote allergies, and the belief that the seasonal-influenza vaccine also protects against pandemic-influenza. In addition, a lack of awareness about national guidelines or recommendations was categorised under this reason. As such, lack of knowledge remains an important reason for hesitancy.

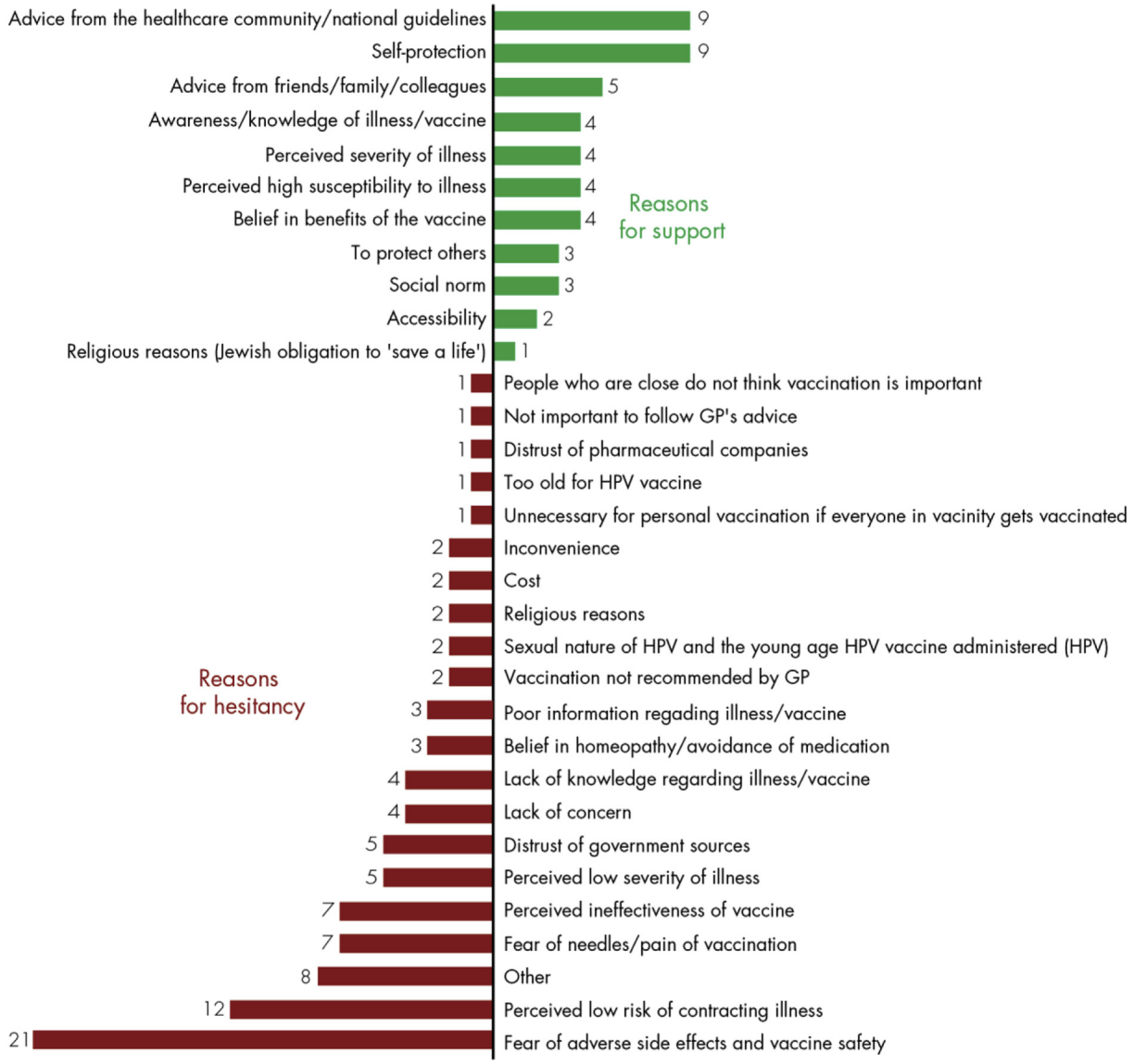

Fig. 3. General population's reasons for vaccination attitudes and the number of times such kinds of reasons are cited in the literature we reviewed.

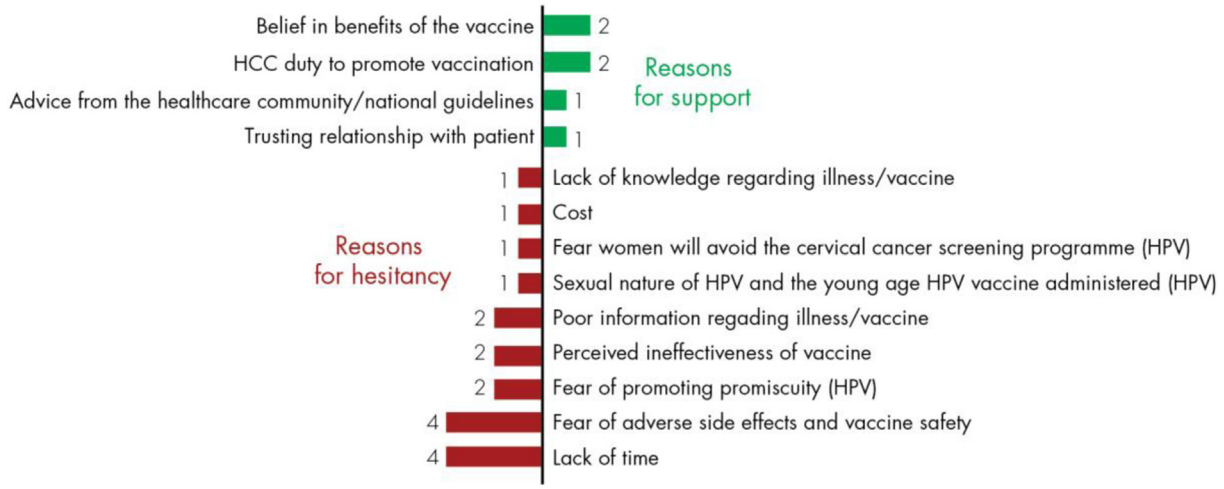

Fig. 4. Patient-vaccinating healthcare professionals' attitudes and their citation frequency.

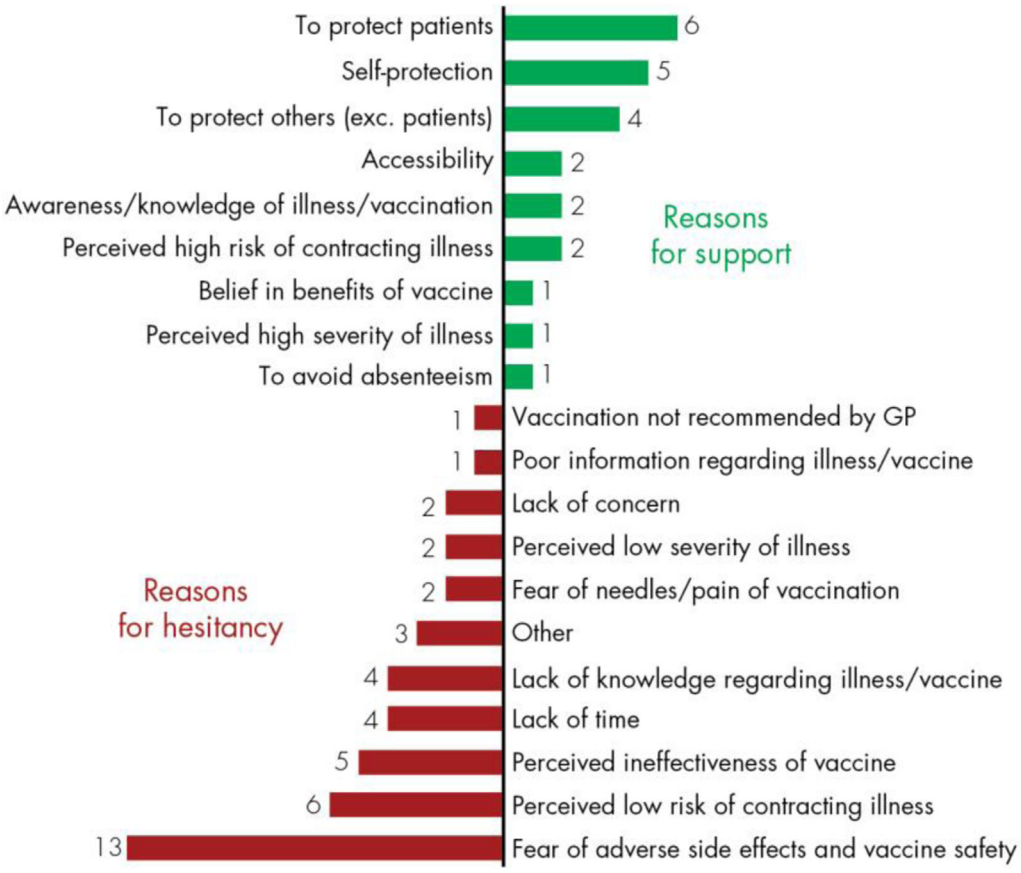

Fig. 5. Self-vaccinating healthcare professionals' attitudes and their citation frequency.

The 'other' category includes objection to some types of adjuvants, and the belief that one's own vaccination does not benefit patients – a reason which could have been classified under lack of concern or lack of knowledge.

3. Market research data

3.1. Data acquisition and methodology

Unpublished market research data was provided to authors by Vaccines Europe member-companies under confidentiality agreements. Data was included only if study methods were available for review by the research team. Editorial and analytical control remained with authors (OY and SCC) throughout the analysis.

3.2. Market research results

Six datasets were included, all of which collected data after 2009, using a mix of survey, focus groups and interview across multiple European countries. Datasets focused on perceptions of vaccination, sources of vaccination information, and changes in attitudes over time. One dataset was excluded for not reporting methods explicitly; five were reviewed in full:

- Dataset 1: 4015 adults surveyed across Germany, UK, France and Spain.
- Dataset 2: 1000 adults surveyed across UK.
- Dataset 3: 800 GPs surveyed across Germany, UK, France and Spain.
- Dataset 4: 80 healthcare professionals interviewed across Germany, Italy, France and Spain.
- Dataset 5: 130 physicians and patients interviewed across France, Spain, Italy, Germany and UK.

Major findings from the datasets are reported below, with some details presented in Figs. 6, 7.

3.2.1. General population and healthcare professionals (Datasets 1–4)

Vaccination was one of the three most desired public health outcomes for 41% (only healthcare provision and sanitation featured more strongly) (Dataset 2). A majority (>95%) of GPs agreed that vaccination is 'the best way to protect populations' and 'truly a major asset'. However, GPs also agreed with a number of propositions that should concern policymakers. 63% feel they have to contend with more sceptical patients than they did a few years ago, 90% want better patient campaigns, 57% feel there is not enough support from government (Dataset 3).

Healthcare professionals were found to have altruistic views of vaccination (Dataset 4). Their focus is on protecting their patients and sometimes the public community. They tend not to consider themselves as needing vaccination, seeing themselves as strong and healthy in comparison to their patients. For healthcare professionals, practical issues (such as convenience) do not seem to be as significant a barrier as their perceived lack of need for vaccination, especially in Spain and Italy (Dataset 4).

3.2.2. Patient–physician interaction (Dataset 5)

65 mock (i.e. simulated) consultations between a physician and a patient were conducted (Dataset 5). Physicians' behaviour was examined in response to different types of patients, and then classified as assertive or unassertive (Fig. 7).

	General perceptions of vaccination	Vaccination information sources
General Population	Half thought vaccination is important for all ages; this figure rose to two-thirds for over-65s and under 12s (Dataset 2).	'Main' sources: about 65% cited physicians, 50% media, 30% internet, 30% government, and others below 25% which include friends and family, pharmacists, vaccine companies and patient associations (Dataset 1). About half reported physician advice has 'strongest influence'; only a few people (less than 10%) reported other sources as strongest influence (Dataset 1). Doctors were the most important information source (65%), followed by leaflets (39%) and nurses (36%). Government websites have been used by a third; for under-35s this proportion rose to 43%. Other media, and friends and family, are reported as being used by a third of respondents. Internet sources such as blogs, Wikipedia, and social media sites are used more by younger respondents, but are still used by few overall (<10% overall; <20% of under-24s) (Dataset 2)
Healthcare Professionals	>95% view have positive views. >95% agree vaccination is 'safe' and 'effective'. However, 62% feel vaccines are too expensive and 88% agree with larger reimbursement (Dataset 3)	Around two-thirds of GPs report as their main source: scientific journals, vaccination experts, and vaccine companies. About half report conferences, and government; slightly fewer report internet and colleagues, whilst few rely on media (<10%). Of these, vaccination experts, scientific journals, and government carry strongest influence on more GPs than other sources. (Dataset 1).

Fig. 6. Summarised details from datasets 1–4 on attitudes to vaccination.

The dataset shows that the ability of physicians to persuade hesitant patients depended on whether patients were 'non-informed', 'passively informed' or 'pro-actively misinformed'. However, the dataset also revealed that the ability to persuade hesitant patients depended on whether physicians were 'assertive' or 'unassertive'. Unassertive physicians were easily perturbed by their environment (such as a media scare), whilst assertive physicians carried a stable belief in the value of vaccination. Unassertive-physicians and hesitant-patient interactions were shaped strongly by forces beyond the individuals present in the consultation room (Dataset 5).

4. Discussion

4.1. The general population exhibits high levels of hesitancy and multiple forms of distrust

A number of findings about the general population emerge from our review of the literature and market research data. First, hesitant attitudes are prevalent in empirical studies and datasets. Hesitancy is not a rare phenomenon or confined solely to 'anti-vaccinationists'; it includes people who have not yet rejected vaccination. Focussing on only vaccine uptake rates and neglecting underlying attitudes is likely to underestimate the challenge of maintaining vaccination coverage in the future.

Second, a wide variety of reasons were reported for vaccination attitudes, few of which relate to a lack of awareness about vaccination. Many of the reasons that were reported are not about people being un-informed, or even misinformed. Our literature review reports 'distrust of doctors', 'distrust of government sources', and 'distrust of pharmaceutical companies' as reason for hesitancy. In the Netherlands, people who report such reasons are not only vaccine-hesitant, but are also strongly associated with rejecting vaccination outright (Zijtregtop et al., 2009). This helps to explain why many hesitant attitudes are harboured by the well-educated (Hak et al., 2005), and why few people express hesitancy because they lack information about vaccination (Only 13% of over 400 survey respondents felt they did not have access to

	Non-informed patients	**Passively misinformed patients**	**Pro-actively misinformed patients**
	They have low awareness of vaccines. Poorly informed.	*They are aware but somewhat misinformed about vaccines. They seek reassurance about their concerns.*	*They are aware and very misinformed about vaccines. They have complex views, harbour doubts vaccine companies' motivations, and distrust the wider health environment too.*
Assertive physician *They see vaccines as having large social value and feel a sense of duty to promote vaccines, regardless of patient-type.*	Physicians are confident about their knowledge of vaccination, whilst patients often recognise their own lack of knowledge for themselves.	Physicians are confident about knowing their patients well.	Physicians are able to take time to persuade patients and are willing to draw on their personal experiences (for example, by divulging to the patient their own child's vaccination status).
Unassertive physician *They are dismayed by media scares and may be personally cautious about new vaccines. They feel a lack of support from government and feel frustrated by hesitant patients*	Physicians are passive about seeking vaccine information.	Physicians lack confidence as a result of not having enough vaccination knowledge.	Physicians find it difficult to involve their personal experience and give up if persuasion takes too long.

Fig. 7. Patient-physician interactions.

enough information, with 67% agreeing they had enough information (Gust et al., 2008)).

Third, our consolidated evidence base suggests that understanding vaccination attitudes requires incorporating institutional trust into models of information, communication and cognition more explicitly. There may exist a wide variety of information sources that shape vaccination attitudes but they are not all treated equally by the general population. People visit sources they trust, and attitudes are shaped accordingly. Both the literature and market research data confirmed that advice from healthcare professionals was the main and most influential source of vaccination information for most people. The pivotal role of the physician – as a trusted arbitrator of knowledge – is well recognised, but it remains important for understanding hesitant attitudes. It is not *vaccines per se* that are mistrusted, rather it is the *institutions* (through which information about vaccines is delivered) that are mistrusted. Information does not always speak for itself and social context shapes how information is interpreted and used (Brown and Duguid, 2002). As such, information in itself is not as important as the institutions involved in its curation and delivery (Johns, 1998).

In our findings, the credibility of institutions seems to matter more than the information content itself. A Dutch study we reviewed found 83% of parents of non-vaccinated children believed that '[t]he government is strongly influenced by the vaccine producers' (Gefenaite et al., 2012). Moreover, 56% of parents of non-vaccinated children believed that the government would not cease vaccinations if there was evidence of serious side effects. Many parents of vaccinated children also shared these beliefs. Whilst better information provision may improve vaccination attitudes in some cases, this is unlikely to be sufficient in cases where the institutions are mistrusted. Indeed counter-claims and refutations may make matters worse on internet forums where institutional mistrust remains by serving to galvanise movements and exacerbate polarisation of attitudes (Betsch and Sachse, 2012; Sunstein, 2001).

Our results show the internet is used frequently as a source of vaccination information. However, some websites were more trusted than others, with government websites preferred over blogs and Wikipedia. The appearance of friends, family and colleagues' endorsement as a frequent reason for supporting vaccination may seem less surprising if one assumes these sources are increasingly trusted relative to other institutions – be it in person or through social media. Even though they may not be 'experts' in vaccination, they may provide welcome contrast to general information intended for the population at large and may serve as local, 'just-like-me', reference points. Some parents put little emphasis on science (McMurray et al., 2004), preferring instead to attach high significance to circumstantial and specific life events, incorporating their family history and religion, and their child's birth timing, maturity, allergies, sleep patterns and behaviour into their attitudes about medicine and healthcare as a whole, not just vaccination (Evans et al., 2001; Hobson-West, 2007; Poltorak et al., 2005). The result is a particular view where each individual has his or her own mix of risk factors and vulnerabilities. Mainstream vaccination literature and the attitudes of physicians who don't take the time to familiarise themselves with personal narratives can make patients feel the information they are receiving is irrelevant to their situations and concerns. For them, vaccine-critical websites resonate strongly (Betsch et al., 2010) and sentiments can travel quickly across 'fertile' social networks (UNICEF, 2013).

Fourthly, distrust in Eastern Europe takes a slightly different form. In a Romanian study, many mothers declined HPV vaccination on the belief that the vaccination campaign was too experimental and their daughters were being used as little more than testing material (Craciun and Baban, 2012). Participants wondered why else the vaccine would be available in Eastern Europe. Delivering the vaccine free of charge only exacerbated suspicions. Doctors' efforts at reassurance were seen to lack conviction in their efforts to promote vaccination, their expertise regarding vaccines was questioned, along with their impartiality from commercial interests (pharmaceutical companies were also mistrusted). Where participants had access to a trustworthy doctor (proxied by length of time patient knew doctor and doctor's expertise), the doctor's advice was reported as important in relation to accepting the vaccine.

The findings discussed above are a static snapshot of vaccination attitudes. There is preliminary evidence that the prevalence of hesitancy and the challenges of addressing it are increasing over time. Specific events, such as the 'H1N1 pandemic' and the response to it, might exacerbate attitudes to vaccination by altering trust in institutions. For example, in France, intention to refuse pandemic influenza vaccination increased from 45% to 78% over the last four months of 2009 (Chanel et al., 2011) and, in Greece, it increased from 47% to 63% in August 2009 alone (Sypsa et al., 2009). This is consistent with market research data (Fig. 8), showing that fewer people report confidence in vaccination since the 'pandemic'. Comparing market research data from 2004 to 2009, positive perceptions of vaccination were reported less often in 2009. Market research data also suggested that the challenges of establishing a trustful relationship with patients may be worsening. Since 2004, fewer GPs now report very positive perceptions and, compared to a few years ago, about two-thirds of GPs report having to contend with more sceptical patients. However, it is important to emphasise that this is a tentative finding which requires further evidence in the form of direct pre- and post-2009 comparisons of vaccination attitudes.

Some of these changes in attitude are likely to be part of broader social and political transformations that are underway which, in the literature we reviewed, tended to be overlooked. With increasing rhetoric around 'patient-choice', public health agendas have gradually shifted to accommodate the right to make an informed choice and towards the primacy of an individual's rights. One indication of such a shift was apparent when, in the UK for example, the response to lowered MMR vaccination uptake neglected to prioritise any social benefits of vaccination and missed the opportunity to present vaccination as a social duty (Hobson-West, 2003).

The sense of empowerment that comes with taking responsibility over personal health means that those who trust (with blind faith) generalised advice from authority can be viewed disparagingly. The good parent becomes one who is a critical consumer of health services and products, accounting for their own individual situation as they see it with little regard for the implications of their decisions on other children (Hobson-West, 2007; Poltorak et al., 2005). Indeed, one paper we reviewed reported that parents felt vaccination was unnecessary if others in the vicinity were vaccinated.

To a certain extent, the task is one of pointing out obligations to others in society. This seems to be occurring in a rather haphazard and uncoordinated way on peer-to-peer websites such as 'mumsnet' where some non-vaccinators are criticised for their lack of social duty, for free-riding and for exposing unborn children to diseases like rubella (Skea et al., 2008). Our review showed relatively few citations to 'protection of others', suggesting an underappreciation of vaccination to wider society.

Blume (2006: 639) asks, "Isn't a critical stance towards vaccination a logical consequence of this ideological shift [towards encouraging individual rights]?" The implication for those seeking to create active demand for vaccination by articulating the common

	Confidence change in vaccination: - 2004 vs 2010 - since pandemic	Confidence change in information sources: - since pandemic
General Population	The 'very positive' perception of vaccines significantly decreased in France from 47% to 13%. There were also decreases in similar samples for Spain, UK and Germany (although the German decrease was not significant) (Dataset 1). Since pandemic, German and French samples reported lower overall confidence in vaccinations, whilst Spanish sample reported overall increase. Seasonal flu vaccination saw greatest overall decreases in confidence, whilst paediatric vaccination saw greatest overall increases (Dataset 1).	In France and Germany, about 40% reported lower confidence in media; more than half reported lower confidence in vaccine companies and government campaigns (Dataset 1). In Spain, 40% were more confident in their physicians, smaller increases were also observed in France and the UK (Dataset 1).
Healthcare Professionals	The 'very positive' perception of vaccines significantly decreased in France from 86% to 43%. There were also decreases in similar samples for Spain, UK and Germany (although the German decrease was not significant) (Dataset 3).	About half of GPs reported a decrease in confidence in all types of information sources (media, government, vaccination campaigns, manufacturers, internet, and vaccination experts). More GPs from Germany and France, reported a decrease than from Spain and the UK (Dataset 3).

Fig. 8. Changes in attitudes to vaccination (datasets 1 and 3).

good is that they are likely to continue encountering tension from efforts to encourage individual rights. Building active demand at the community level may be even more challenging than building active demand at the individual level.

4.2. Healthcare professionals face difficulties in building trust with patients

Healthcare professionals report at least three challenges in building a trustful relationship with patients. Firstly, a lack of time with patients hindered recommendation of vaccination; as one participant stated, "you just cannot do it all; it is a matter of making choices" (Mollema et al., 2012). Even in a study of physicians' attitudes where 90% agreed that the responsibility for ensuring vaccination lay with healthcare professionals, "insufficient time with patients" was often cited as a reason why vaccination was not recommended (McCarthy et al., 2012). As health professionals operate under increasing time constraints, there is a growing opportunity for 'alternative' medical information and practices to play a more trusted role. Complementary and alternative medicine (CAM) users refused vaccination more frequently than non-CAM users ($p < 0.001$) (Zuzak et al., 2008). Many physicians can become frustrated and respond simply by discontinuing care for families that are non-compliant with vaccination (Flanagan-Klygis et al., 2005). Outright dismissal of patients is unlikely to persuade and instil confidence (Freed et al., 2004). The physician not only needs to keep abreast of the latest vaccine information but also needs to remain engaged with seemingly random and unusual patient concerns such as, for example, whether a parent considers their child more likely to take up smoking following HPV vaccination (Casper and Carpenter, 2008; Waller et al., 2006).

Secondly, our results showed that healthcare professionals can suffer from a lack of awareness about national guidelines and a lack of knowledge about vaccines (both on specific attributes such as beliefs about contraindications, as well as more general attributes such as beliefs about vaccine-related allergies) (see also Betsch and Wicker, 2012). Even where health professionals are informed, they may not necessarily feel confident. In a study of Swedish midwives' attitudes to HPV vaccination, many felt uncertain about their knowledge of HPV, despite receiving HPV information (Oscarsson et al., 2011). They questioned their own competence to deliver advice and answer questions effectively. A focus group with Dutch healthcare professionals revealed that poorly communicated changes in the national vaccination schedule and changes in scientific understanding can exacerbate feelings of uncertainty (Mollema et al., 2012). This lack of confidence in dispensing advice is likely to hinder the development of a trusting relationship.

Thirdly, healthcare professionals may have their own reservations about recommending specific vaccinations. Epistemic communities can be large and the institutional arrangements for discussing uncertainties can be intimidating (Knorr-Cetina, 1999), some healthcare professionals may need support on how to navigate these so that their vaccination recommendations are less affected by their own personal positions and misperceptions. Examples of uncertainties that need to be discussed include safety, potential benefits, and alternatives. Regarding safety, participants in two different studies were concerned about the long-term effects of the HPV vaccine, given that it has only been tested in what they felt were 'short' studies (Gottvall et al., 2011; Oscarsson et al., 2011). Regarding potential benefits, many healthcare professionals were critical of vaccination programmes when they perceived little significant disease burden reduction (Mollema et al., 2012). Regarding alternatives and potential drawbacks, a majority of Swedish midwives and nurses felt that the HPV vaccination may undermine pre-existing cervical cancer-screening programs and they even felt vaccination could encourage promiscuity or risky sexual behaviour (Oscarsson et al., 2011). Such concerns, however unsubstantiated or incorrect they may be, seem unlikely to be alleviated unless there is a participatory approach to knowledge and vaccination policy. Training should afford the opportunity to engage with the professionalised institutions in which such debates occur and policy decisions are made.

Our results showed that healthcare professionals were not very concerned with their own vaccination and were complacent about contracting illness. These reasons seem more important in explaining their non-vaccination than practical barriers which

included a lack of time (cited twice), forgetting to vaccinate, and missing the vaccination day at the hospital. Concerns about safety also entered their attitudes towards self-vaccination, though there is evidence to suggest that they probably perceive adverse events less severely than the general population does (less than 4% of healthcare professionals believed influenza vaccines had a 'devastating effect on the immune system') (Sočan et al., 2013; Wicker et al., 2012).

4.3. Limitations

In both the literature and market research data, reasons for attitudes are self-reported rather than revealed or observed. Respondents may not be able to articulate their reasons or even know what they are, or they may have been prompted into offering reasons they believed questioners wanted to hear. The results (Figs. 3–5) only report the frequency with which various reasons for vaccination attitudes are cited in the literature; no attempt was made to quantitatively weight the reasons according to significance or importance (though this was done qualitatively in the discussion). As such, the results of the literature review are subject to publication biases that might exist in the literature. Some of the results for a given population are drawn from a small number of papers and where paper numbers are large, the complexity of reasons can limit synthesis. There may be some differences in attitudes for different vaccines and countries which we did not have scope to report here.

5. Conclusions and policy implications

Hesitant attitudes were prevalent in the empirical studies and datasets we reviewed, and included people who had not yet rejected vaccination. Focussing only on vaccine uptake rates and neglecting underlying attitudes is likely to underestimate the challenge of maintaining vaccination coverage in the future and is likely to take future research in a less fruitful direction.

Emphasis on vaccine rejection steers research into understanding the behavioural characteristics of individuals who fail to comply, which in turn drives recommendations towards targeting efforts to fight misinformation on certain deviant types of individuals. In contrast, emphasis on underlying attitudes gives rise to a new research agenda, one that goes beyond notions of vaccine acceptance such that it includes knowledge of communities, knowledge about how they relate and trust the institutions involved with vaccination and knowledge of how much active demand there is for vaccination at the community level. Efforts to measure trust in overall health systems are pertinent, but they remain focused on how individuals rather than communities view health systems (Ozawa and Sripad, 2013). Such community-level data on active demand would also help public health authorities find greater legitimacy when they formulate 'evidence-based' policy (Roalkvam et al., 2013: p203) and when they call for further rounds of vaccine innovation (Yaqub and Nightingale, 2012).

The EU Council's conclusions on childhood vaccination, which calls for the ECDC to monitor attitudes more closely and develop new metrics, are highly germane. A network of sentinels across Europe could be fruitful, particularly if its major task is to capture vaccine specific concerns, geographical trends, and differences in populations.

A wide variety of reasons were reported for vaccination attitudes, few of which related to a lack of awareness or misinformation. Our consolidated evidence base suggested that understanding vaccination attitudes requires incorporating institutional trust into models of information. Whilst it is evident that people draw on an increasingly wide range of information sources to shape their vaccination attitudes, our paper found sharp differentiation in the levels of trust and confidence accorded to these various sources. For many people, 'official' sources were already seen as having been sullied by commercial interests or overzealous vaccinators. This means that, in addition to developing new metrics and monitoring them, restoring trust and credibility of the institutions involved with vaccinations must take centre-stage.

As part of the effort to restore trust and credibility in institutions involved with vaccination, the EU and national authorities need to consider not only their own relationship with the public, but also the support they offer healthcare professionals. Physicians are the main and most influential source of vaccination information, but in our review they reported facing increasing difficulties in building trustful relationships with patients. Physicians now contend with an increasing number of sceptical patients, whilst also being faced with a lack of time for building relationships with patients. If this continues unabated, the scope for opportunistic 'alternative' sources of information to be seen as trustworthy is likely to grow. Our paper found that many physicians felt there was not enough support from governments and health authorities, and wanted better vaccination campaigns.

A more pro-active stance from public institutions involved with vaccination would be welcomed by most stakeholders, but responding with more information campaigns is likely to be insufficient for building trust; for trust-building, more engagement and interaction is needed. Institutions involved with vaccination may take note of the influence of online social networks and try to build further 'online social presence' or try to highlight the costs of mistrust and suspicion (i.e. more illness); but the impact of such efforts are likely to remain dependent on how trusted they are to begin with. Such efforts need to be allied with other online and offline platforms that draw in healthcare professionals and medical societies to support sustained dialogue with hesitant patients. Through engagement and dialogue, perhaps institutions will one day make the notion of herd immunity as ubiquitous in everyday health conversations as the notion of patient-choice has recently become.

The paper showed that concern about safety underpinned most hesitant attitudes. The way in which safety concerns develop into overall hesitancy and rejection is likely to be affected by systems for monitoring what happens after vaccination, for reporting any adverse reactions and for engaging with post-vaccination anxieties (Calain 2006, cited in Roalkvam et al., 2013). Where such systems are not available, frustrations are more likely to be expressed among friends or through the internet and other media, where the scope for shifting attitudes is perhaps narrower. Further investigation into vaccine safety surveillance systems (including active surveillance studies) will help improve our understanding about what institutional features sustain confidence in vaccine safety over the long term. This may also help avoid raising expectations that vaccines should be 100% effective and safe.

Our paper also suggested that the some assumptions regarding the design of teaching curricula and training programmes of healthcare professionals may need examining. Curricula and training programmes may assume that healthcare professionals will (a) readily understand and support vaccination with minimal introduction and will not need to subsequently revisit the topic in their continual professional development, and (b) have the skills to improve attitudes to vaccination among the general population effectively. For example, unassertive physicians might benefit from acquiring skills from assertive physicians before attempting to persuade and garner trust in hesitant patients. Where healthcare professionals feel inhibited due to personal reservations, they may need to be alerted to the mechanisms that exist for debating uncertainties about vaccines and vaccination policy, offering them

support in accessing wider bodies of professional knowledge and expertise.

Restoring trust in institutions is a multi-stakeholder problem. Policy-makers must not shy away from the scale of engagement needed with healthcare professionals and other stakeholders whilst navigating notions such as patient-choice and the common good.

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Appendix A. Exclusion criteria

Exclusion focus	Papers that were removed
Vaccine attitudes	Papers not specifically concerned with vaccine attitudes (such as those covering vaccine efficacy trials, vaccination coverage, and institutional vaccine policy).
Post-pandemic attitudes	Papers concerning only H1N1 pandemic-influenza. Any papers that collected empirical data before 2009.
European attitudes	Papers that collected data from outside EU-27 countries. Also papers focussing on vaccines primarily associated with travelling: Q fever, influenza (avian), STIs (other than HPV), Traveller's Diarrhoea, TB, BCG, Rabies, Hepatitis A and Varicella.
Empirical focus for full text review	Papers that contained only commentary, opinion or theoretical content. Abstract-only papers for poster presentations at conferences, which did not contain sufficient exposition of data.

Appendix B. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2014.04.018.

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