



Measuring vaccine hesitancy: The development of a survey tool



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ABSTRACT

In March 2012, the SAGE Working Group on Vaccine Hesitancy was convened to define the term “vaccine hesitancy”, as well as to map the determinants of vaccine hesitancy and develop tools to measure and address the nature and scale of hesitancy in settings where it is becoming more evident.

The definition of vaccine hesitancy and a matrix of determinants guided the development of a survey tool to assess the nature and scale of hesitancy issues. Additionally, vaccine hesitancy questions were piloted in the annual WHO-UNICEF joint reporting form, completed by National Immunization Managers globally. The objective of characterizing the nature and scale of vaccine hesitancy issues is to better inform the development of appropriate strategies and policies to address the concerns expressed, and to sustain confidence in vaccination.

The Working Group developed a matrix of the determinants of vaccine hesitancy informed by a systematic review of peer reviewed and grey literature, and by the expertise of the working group. The matrix mapped the key factors influencing the decision to accept, delay or reject some or all vaccines under three categories: contextual, individual and group, and vaccine-specific. These categories framed the menu of survey questions presented in this paper to help diagnose and address vaccine hesitancy.

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1. Introduction

Despite compelling evidence of the value of vaccines in preventing disease and disability and in saving the lives of millions of children every year, vaccine hesitancy has become a growing focus of attention and concern [1–3], given its potential to lead to vaccine delays and refusals, and to risk the public health consequences of vaccine preventable disease outbreaks.

Research to date has shown that the reasons for and expressions of vaccine hesitancy are highly varied [4–7] and need to be better understood in order to appropriately address emerging concerns.

Reasons for hesitancy can vary depending on the particular vaccine or vaccines in question, the individuals or groups expressing reluctance, and the context. Tools are needed to assess the scope and scale of hesitancy issues by vaccine and setting. Ideally, a common survey tool that can be used globally would allow comparability across countries.

The varied reasons for vaccine hesitancy have been mapped by the WHO Strategic Advisory Group on Experts (SAGE) on Immunization and the following definition of vaccine hesitancy was developed:

“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” [8].

Given that vaccine hesitancy is specific to sub-groups within populations and is rarely population-wide, it is important to first understand *who* is hesitant about vaccination, *what* their concerns

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are – i.e. which of the various possible reasons outlined above are driving their hesitancy, and *where* the hesitant individuals are located, i.e. in which geographic, socio-cultural or political context that may be contributing to the hesitancy. Not all vaccine hesitancy is specific to a vaccine or vaccination, and some influences are well beyond the scope of an immunization programme, however they must be understood in order to know how to best minimize the hesitancy.

This paper presents a set of survey questions which were developed following an initial review of existing vaccine hesitancy surveys, and consultations within the SAGE Vaccine Hesitancy Working Group as well as with SAGE members [9]. Additionally, proposed vaccine hesitancy questions for inclusion in the WHO-UNICEF Joint Reporting Form (JRF) [10] on immunization, which are completed by national immunization programme managers annually, were explored as another opportunity to capture an indication of the nature and scope of vaccine hesitancy at the national level.

In 2003, in order to begin to understand the scale of emerging vaccine concerns, one pilot question was included in the JRF, asking national immunization managers whether they had to manage negative media coverage about vaccines in the previous year. The 2004 JRF report [10] showed that negative media coverage was reported by countries in all WHO regions except in South-East Asia. The Americas and the European regions reported the highest levels of negative publicity about vaccines (30% of the countries in those regions). This initial survey question pointed to the scale of vaccine hesitancy already emerging over a decade ago. In the context of the Global Vaccine Action Plan (2011–2020) [11] and the SAGE work on vaccine hesitancy, new questions were considered and piloted for inclusion in the JRF in 2012, 2013 and 2014. While these JRF questions are limited in scope, they can serve as a valuable routine indicator of vaccine hesitancy in the population and point to areas where more in-depth research is needed.

In the feedback from the regions and countries concerning the 2012 JRF Indicators and the Immunization Managers' Survey [12] many countries called for a list of survey questions to help them assess vaccine hesitancy. More detailed survey questions identified through the SAGE process, discussed below, are an additional resource to more specifically understand who is hesitating and what the nature of the concerns are, in order to inform an appropriate response.

2. Methods

As part of the national JRFs completed annually, two indicators for vaccine hesitancy were pilot-tested in the Americas and the European WHO regions. The two indicators were also tested in a self-administered questionnaire distributed at the East, South and Central African Regional Immunization Managers' meetings in 2013. Pilot-testing the feasibility of these indicators within these various regions allowed for input from a broad range of high, middle and low-income countries. The questions were accompanied by the definition of vaccine confidence and prepared in English, French, Russian, and Spanish versions.

In the 2012 JRF pilot test, the focus was on vaccine confidence, rather than on the broader issues driving vaccine hesitancy, in order to be in harmony with the Global Vaccine Action Plan indicators. Specifically, the indicators for Strategic Objective 2: "Individuals and communities understand the value of vaccines and demand immunization both as a right and a responsibility" are: (1) "Percentage of countries that have assessed (or measured) confidence in vaccination at subnational level", and (2) "Percentage of un- and under-vaccinated in whom lack of confidence was a factor that influenced their decision." Modifications to the 2013 JRF included refining the indicators to encompass the wider scope of vaccine

Table 1
Questions of the PACV survey, by category (adapted from Opel 2011(13)).

Immunization behaviour
Have you ever delayed having your child get a shot for reasons other than illness or allergy?
Have you ever decided not to have your child get a shot for reasons other than illness or allergy?
How sure are you that following the recommended shot schedule is a good idea for your child?
Do you agree with the following statement? It is my role as a parent to question shots.
If you had another infant today, would you want him/her to get all the recommended shots?
Overall, how hesitant about childhood shots would you consider yourself to be?
Beliefs about vaccine safety and efficacy
Do you agree with the following beliefs about vaccine safety and efficacy?
Children get more shots than are good for them.
Many of the illnesses that shots prevent are severe.
It is better for my child to develop immunity by getting sick than by getting a shot.
It is better for children to get fewer vaccines at the same time.
How concerned are you that your child might have a serious side effect from a shot?
How concerned are you that any one of the childhood shots might not be safe?
How concerned are you that a shot might not prevent the disease?
Do you know of anyone who has had a bad reaction to a shot?
General attitudes and trust
Which of the following statements reflect your general attitude and trust towards vaccines?
The only reason I have my child get shots is so that they can enter day-care or school.
I trust the information I receive about shots.
I am able to openly discuss my concerns about shots with my child's doctor.
All things considered, how much do you trust your child's doctor?

hesitancy reasons going beyond confidence to also include convenience and complacency, and to link with the revised Working Group definition of vaccine hesitancy.

2.1. 2013 JRF indicator revisions

2.1.1. Reasons for vaccine hesitancy

Question 1: What are the top three reasons for not accepting vaccines according to the national schedule?

Question 2: Is this response based on or supported by some type of assessment, or is it an opinion based on your knowledge and expertise?

2.1.2. Process indicator

Question 1: Has there been some assessment of vaccine hesitancy or refusal among the public at the national or sub-national level?

Question 2: If yes, please provide assessment title(s) and reference(s) to any publication/report.

Parallel to the piloting of questions in the JRF, additional survey questions were collected to inform a more detailed survey tool.

A review was undertaken to identify all survey questions and tools mentioned in the articles collected in a systematic review of literature conducted on vaccine hesitancy [3]. A selection of articles ($n=2933$) were re-screened for this purpose.

Keyword searches included: **Search 1:** 'Survey' and any one of 'accept/barrier/refus/trust/missed/delay/confidence/partial/unsure/timeliness/hesitant'

Search 2: 'Scale/Index/measurement/instrument/Questionnaire' and any one of 'Trust/Confidence/Hesitant'

These keywords were chosen to identify either complete surveys or survey items that reflect the concern of vaccine hesitancy.

3. Results

3.1. The JRF

The response rate to the first JRF pilot in 2012 was sub-optimal with only 14% (13/94) of countries completing the questions. The analysis revealed that 19% of all participating countries had done an assessment of the level of confidence in their country, indicating that vaccine confidence was an issue of concern in their country. In the assessments reported, lack of vaccine confidence ranged from 0% in Cuba, Dominica, Botswana and Sao Tomé & Príncipe, 1% in Germany and Brazil, 4% in Guatemala and Jamaica, 5% in Burundi, 8% in the Democratic Republic of Congo, and 10% in Romania, to 18% in Czech Republic and 19% in Uganda. These results demonstrate that the lack of confidence can be a significant problem, even in low-income settings, such as Uganda, where suboptimal availability of services might be presumed to be the reason for under-vaccination rather than lack of confidence.

For the 2013 revision, 69% of countries (31/45) reported on indicator 1, which is a higher response rate to the indicator as compared to 52% (25/48) in the JRF 2012. In the 2013 JRF, 10 countries indicated having undertaken an assessment. This may be due to an increased number of assessments among the countries in the WHO European region, better understanding of the question due to the inclusion of a revised narrative, and/or the inclusion of both

a national and a sub-national assessment in the indicator question in comparison to only a sub-national assessment in 2012. For those countries not responding to indicator 1, it remains unclear if non-response was a proxy for no assessment, lack of understanding, or lack of willingness to answer the question.

With regard to Indicator 2, in the 2013 pilot test, 36% (16/45) of the countries responded to the question and provided reasons for vaccine hesitancy. The response rate to this newly revised indicator was higher compared to the 2012 indicator where only 6% (3 out of 48) of the European region countries in 2012 had provided a measured or estimated percentage of un- or under-vaccinated in whom a lack of confidence in vaccination was a factor.

The top three reasons for vaccine hesitancy reported in the 2013 JRF were (1) beliefs, attitudes, motivation about health and prevention, (2) risk/benefit of vaccines (perceived risks, experiences (heuristics)), and (3) communication and media environment. Major issues were fear of side effects of vaccination and distrust in the vaccine, lack of perceived risk of vaccine-preventable diseases and the influence anti-vaccination reports in the media.

3.1.1. Survey tool

One hundred and eight articles were reviewed for survey questions and 10 articles included complete survey tools on vaccine hesitancy, confidence or trust:

Table 2
Contextual influences.

Contextual influences	(a) Communication and media environment	(b) Influential leaders, gatekeepers and anti- or pro-vaccination lobbies	(c) Historical influences	(d) Religion/culture/gender/socio-economic influences	(e) Politics or policies	(f) Geographic barriers	(g) Pharmaceutical industry influences
Influences arising due to historical, socio-cultural, environmental, health systemic or institutional, economic or political factors	What is the most common information source you turn to for information on vaccines?	Some groups or leaders do not agree to vaccination for different reasons	Do you remember any events in the past that would have discouraged you from getting a vaccine(s) for yourself or your children? If yes, please describe the event(s)	Do you know anyone who does not take a vaccine because of religious or cultural reasons?	Do you trust that your government is making decision in your best interest with respect to what vaccines are provided?	If you have to spend more than one hour in travel time to get a vaccine, do you consider it important enough to travel for it?	Do you believe that vaccine producers are interested in your health?
	When you hear a negative comment about vaccine(s), do you: Ask a friend what they think? Ask a health worker? Ask a family or other relative? Go to the internet? Other?	Do you know of any of these groups or individuals?		Do you think they are risking their health or the health of their child if they do not take a vaccine?	Do you think vaccinations should be compulsory or not?	What is the maximum amount of time you would be able or willing to spend to get a vaccine for yourself or your children?	Do you trust them to provide safe and effective vaccines?
	Whom do you trust the most for information?	In general, do you agree or disagree with these groups?		Do you think any vaccines are more important for boys/men?		Are there other geographical factors that might prevent you from getting a vaccine?	
	Whom do you trust the least?			Do you think any vaccines are more important for girls/women?			

Table 3
Individual and Group Influences.

Individual and group influences	(a) Experience with past vaccination	(b) Beliefs, attitudes about health and prevention	(c) Knowledge awareness	(d) Health system and providers' trust and personal experience	(e) Risk/benefit (perceived, heuristic)	(f) Immunization as a social norm vs. not needed/harmful
Influences arising from personal perception of the vaccine or influences of the social/peer environment	Have you ever not accepted a vaccination for your child?	Can you tell me what a vaccine is?	Do you feel that you know which vaccines you should get for yourself? Your children?	Are you satisfied with your health professional/health worker's answers to your questions related to immunization?	Do you remember which vaccines you have received? Or which diseases you have received vaccinations for?	Do you think it is important for everyone to get the recommended vaccines for themselves and their children?
	Have you ever decided to not get a vaccination for yourself?	What does it do to the body?	Have you heard about the HPV vaccines?	Do you trust the vaccine advice your health care provider gives you?	Do you remember which vaccines your children have gotten? Please name them.	If not, please explain.
	What was the reason?	Do you believe that there are other (better) ways to prevent diseases which can currently be prevented by a vaccine?	Do you think the polio vaccine is still needed?	Do you feel that your health care provider cares about what is best for your child?	Which vaccines do you think are the most important?	
	Do you know anyone who has had a bad reaction to a vaccine?	Do you think vaccines strengthen the immune system?		Did you ever experience an AEFI (adverse event following immunization) and if so, how did the health worker deal with this?	Do you believe vaccine preventable diseases can be serious? Which one(s)?	
	Do you know anyone who has a child who had a serious disease because they were not vaccinated?	Do you think it is possible to have too many vaccines?			Do you have any concerns about vaccines? If so, what are your concerns?	

Parent Vaccine Hesitancy – Vaccines

- Attitudes about Childhood Vaccines Survey [13,14].
- Immunization Hesitancy Survey [15].

Trust – Healthcare and Vaccines

- Measuring Trust in Physicians [16].
- Series of surveys with strong focus on trust in the influenza vaccine using the Trust and Confidence Model and Protection Motivation Theory [17].
- Nine questions developed to assess patient-health provider trust in post-partum mothers' relationship [18].
- The National (US) Network for Immunization Information (NNii) Survey Instrument [19].

Confidence – Healthcare and other sectors
Healthcare Confidence Index [20]
All vaccines

- The Vaccine Safety, Attitudes, Training and communication Project (VACSATC) present a list of core questions included in

multiple surveys implemented across several European countries [21].

The work of Opel et al. was among the first to develop and validate a survey tool specific to vaccine hesitancy, the Parent Attitudes About Childhood Vaccines (PACV) survey. The PACV was originally developed by adapting items from previous surveys on health beliefs, conducting focus groups to produce additional items, submitting these items to a panel of immunization experts to remove items unlikely to be useful, and pre-testing the product on a group of parents. The result of this process was an 18-item survey encompassing the domains: immunization behaviour, beliefs about vaccine safety and efficacy, attitudes and trust [22]. This was then refined using a cross-sectional survey of parents of 19–35 month old children in a Washington State HMO¹ to assess the metric's construct validity and reliability [23]. Below is the set of questions adapted by the Working Group to have more global relevance, given that the tool was developed and validated for a high-income setting (Table 1).

¹ Health Maintenance Organization (USA).

Table 4
Vaccine/vaccination-specific issues.

Vaccine/vaccination-specific issues	(a) Risk/benefit (scientific evidence)	(b) Introduction of a new vaccines or a new formulation	(c) Mode of administration	(d) Design of vaccination program/mode of delivery	(e) Reliability and/or source of vaccine supply	(f) Vaccination schedule	(g) Costs	(h) Role of healthcare professionals
Directly related to vaccine or vaccination	Do you believe vaccines are safe for yourself? For your child/children? For those in your community?	What is the first thing you want to know when a new vaccine is introduced or announced? When a new vaccine is introduced, do you want to be the first to get it? Would you rather wait and see what other people do?	Do you prefer a vaccine that is injected, taken orally, or with a nasal spray?	Is access to immunization easy? Is it conveniently located? Is the process of being immunized welcoming? Are there any things that could be done to make it easier for you to get vaccines (on time) for yourself and your children?	Do you feel confident that the health centre or doctor's office will have the vaccine you need, when you need them?	Do you know the recommended vaccine schedule? Are there any vaccines that are difficult for you to get because of the schedule? Is it better for a child to have multiple vaccines in one shot with fewer injections or to have individual vaccines?	Would the cost of a vaccine prevent you from getting it, even if you felt you or your child needed it? Would you be willing to pay for it privately?	Has a healthcare professional ever treated you without respect (e.g. in regards to your appearance, your education, cultural background, etc.) so that you will hesitate to return to the healthcare facility? Has your healthcare provider ever advised you that a certain vaccine was not necessary? Which vaccine?

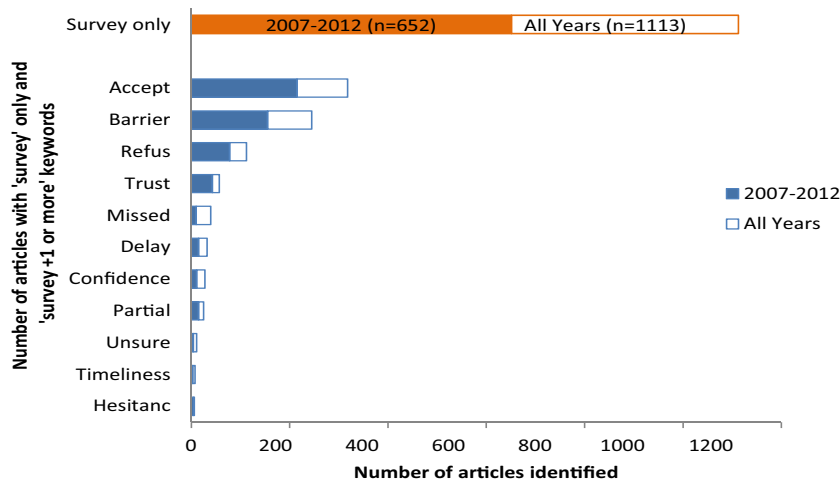


Fig. 1. Articles identified with 'survey' only and 'survey' +1 or more Keywords.

Across all years, Search 1 identified 77 articles containing the keywords 'trust', 'confidence', or 'hesitant' (Fig. 1). Search 2 identified an additional 31 relevant articles. All 108 articles [13,15,17–19,21,24–124] were reviewed for survey items pertaining to the components of the SAGE Vaccine Hesitancy Model of determinants.

The review of vaccine hesitancy research to identify specific survey questions revealed that much of the research on this topic is largely on cognition-based features such as knowledge, attitudes and beliefs and draws on two commonly used health behaviour models: the Health belief Model and the Theory of Planned Behaviour. Neither of these models adequately investigate the significance of social, economic and/or environmental factors as determinants of health behaviour, in this case vaccine hesitancy.

Questions that were identified through the literature search were then mapped against the key determinants identified (Tables 2–4) based on feedback from the Working Group, and were presented at a meeting on December 2013 for further discussion and feedback. It was clear that a number of determinants of vaccine hesitancy were not adequately addressed in the identified survey questions documented in the literature review. It was also agreed that while the matrix was a useful approach to identifying gaps in the questions, a more survey-ready format was needed for implementation.

The Working Group developed a compendium of three different types of survey questions (See Appendices): Core Closed Questions (Appendix A); Likert Scale Questions (Appendix B); and a set of Open Ended Questions (Appendix C). Some were derived from previously validated questionnaires, albeit in high-income countries only, some came from experts in the field, and others are newly proposed.

4. Discussion

Routine monitoring of vaccine hesitancy, such as through the JRF, could play a valuable role in identifying vaccine concerns early, in order to address them. Strategies to address any identified concerns, though, need more in-depth understanding of the nature of hesitancy, as well as who is hesitating. This more detailed understanding will need further research which could be initially guided by the menu of survey questions presented here, followed by additional qualitative research in areas where surveys do not provide adequate information to inform appropriate interventions. A standardized compendium of both survey and determinants questions could also enable intra- and inter-country comparison of the prevalence of, and the major determinants leading to, vaccine hesitancy, and support global assessment.

When countries use questions presented in this paper to monitor hesitancy, several points must be considered in question selection: (1) Refusal is not the same as hesitancy, i.e. counting only vaccine refusers will not capture hesitancy; (2) Vaccine hesitancy is defined as *delay in acceptance or refusal of vaccines despite availability of vaccine services* [125] and it is therefore essential to assess the different reasons why people are under- or unvaccinated in a particular setting to be able to tackle vaccine hesitancy as distinct from access issues; and (3) Vaccine hesitancy may be specific to one or some, but not all, vaccines, so interpretation of surveys should not generalize findings to all vaccines unless that is stated in the survey response. All of the survey questions, whether from the general survey or from the determinant examples, need to be pilot tested and validated in all settings and then refined.

Given the dynamic and changing nature of vaccine hesitancy, the importance of ongoing monitoring cannot be overstated. A survey which reveals little hesitancy this year may have a different result next year. These trends need monitoring. Additionally, qualitative research to better understand the contextual and socio-cultural influences that may be contributing to vaccine hesitancy will be important in informing the most relevant strategies to engage hesitant publics, health providers and policy makers.

5. Limitations

As the term “vaccine hesitancy” is relatively new, the availability of existing survey questions is limited. Most are predominately designed for high-income settings, and few have been validated. Furthermore, the questions identified do not address all the determinants in the Vaccine Hesitancy Matrix and additional questions will need to be developed and validated.

6. Conclusion

In the final report on the work on vaccine hesitancy, SAGE “encouraged validation of the developed compendium of survey questions on vaccine hesitancy, which have been assessed and validated only in some high-income countries or not at all.” SAGE also urged:

WHO to develop capacity “for gaining behavioural insights that can be applied in an integrated fashion for prevention of many communicable and non-communicable diseases, as well as vaccine hesitancy” and stressed that “this will require a multi-disciplinary approach, involving sociologists, psychologists, anthropologists, experts in social marketing, communication experts, and specific disease and vaccine experts.”

The recommendation for bringing multiple disciplines together to understand and address the complex, context specific and dynamic nature of vaccine hesitancy – and its varied drivers of complacency, convenience and confidence – needs to extend to all immunization stakeholders from national immunization programmes and community based organizations to private sector partners and research entities.

Publics are changing, embracing their rights to information, and their rights to choice. A certain amount of questioning by new parents, or parents faced with new vaccines or combinations of vaccines, would be considered responsible. Keeping an open dialogue is fundamental to building trust. These survey tools are primarily aimed to better understand the public concerns and thereby better respond to the issues that are relevant to them.

Conflict of interest statements

The LSHTM research group “Project to monitor public confidence in Immunization Programs” has received research funding from Novartis as well as funding from GSK to host a meeting on vaccine confidence. Heidi Larson has done consulting on vaccine confidence with GSK.

None of the other authors had any potential conflict of interest. Some of the authors are World Health Organization staff members. The opinions expressed in this article are those of the authors and do not necessarily represent the decisions, official policy or opinions of the World Health Organization.

Appendix A. Vaccine hesitancy survey questions: version 1.0

Questions to consider in assessing vaccine hesitancy at a community level

To be asked to parents/caregivers about childhood vaccinations

1. Do you believe that vaccines can protect children from serious diseases? Y/N
2. Do you think that most parents like you have their children vaccinated with all the recommended vaccines? Y/N
3. Have you ever been reluctant or hesitated to get a vaccination for your child? Y/N
4. Have you ever refused a vaccination for your child? Y/N
5. If response is "yes" to questions 3 or 4:
Please check (✓) which one(s):

Hesitated

Refused

Vaccine names

Chickenpox vaccine
Haemophilus influenzae b (Hib) Vaccine
 Hepatitis B vaccine
 Human papilloma virus (HPV) vaccine
 Influenza vaccine
 Polio vaccine
 Measles vaccine
 Meningococcal vaccine
 Mumps vaccine
 Rubella vaccine
 "Pentavalent" or other combination infant vaccine
 Pneumococcal vaccine
 Rotavirus vaccine
 Tetanus, diphtheria, pertussis vaccine
 What was/were the reason(s)? (Use list below to code response)

Reason

Did not think it was needed
 Did not know where to get vaccination
 Did not know where to get good/reliable information
 Heard or read negative media
 Did not think the vaccine was effective
 Did not think the vaccine was safe/concerned about side effects
 Someone else told me that the vaccine was not safe
 Had a bad experience with previous vaccinator/health clinic
 Had a bad experience or reaction with previous vaccination
 Someone else told me they/their child had a bad reaction
 Fear of needles
 Not possible to leave other work (at home or other)
 Religious reasons
 Other beliefs/traditional medicine
 Other (please specify):

Check (✓) if applicable

6. Has distance, timing of clinic, time needed to get to clinic or wait at clinic, and/or costs in getting to clinic prevented you from getting your child immunized? Y/N
If yes, please explain:
7. Are there other pressures in your life that prevent you from getting your child immunized on time? Y/N
If yes, please specify:
8. Are there any reasons you can think of why children should not be vaccinated? Y/N
If yes, please specify:
9. Do you think that it is difficult for some ethnic or religious groups in your community/region to get vaccinations for their children? Y/N
If yes, what do you think are the reason(s)?

Check (✓) if applicable

Reason

They choose not to vaccinate
 They do not feel welcome at the health service
 Health services do not reach them

9. Have you ever received or heard negative information about vaccinations? Y/N
If yes,
a. Please give an example:
ab. Did you still take your child to get vaccinated after you heard the negative information? Y/N
11. Do leaders (religious or political leaders, teachers, health care workers) in your community support vaccines for infants and children? Please indicate below:

Check (✓) if applicable

Leaders

Religious
 Political
 Teachers
 Health care workers
 Other, please specify:

Appendix B. Vaccine hesitancy 5 point likert scale questions

Vaccine Hesitancy 5 point Likert scale questions:

How much do you agree with the each of the following statement on vaccinations?

Please indicate your response with a check mark (✓) in the appropriate box, using the scale below:

SCALE:

- 1 = strongly disagree
- 2 = disagree
- 3 = neither agree nor disagree
- 4 = agree
- 5 = strongly agree

	1	2	3	4	5
L1. Childhood vaccines are important for my child's health					
L2. Childhood vaccines are effective					
L3. Having my child vaccinated is important for the health of others in my community					
L4. All childhood vaccines offered by the government programme in my community are beneficial.					
L5. New vaccines carry more risks than older vaccines					
L6. The information I receive about vaccines from the vaccine program is reliable and trustworthy.					
L7. Getting vaccines is a good way to protect my child/children from disease.					
L8. Generally I do what my doctor or health care provider recommends about vaccines for my child/children.					
L9. I am concerned about serious adverse effects of vaccines.					
L10. My child/children does or do not need vaccines for diseases that are not common anymore.					

Appendix C. Vaccine hesitancy open ended survey questions

Vaccine Hesitancy Open Ended Survey Questions

Name of Respondent (Parent/Guardian):Name of Reviewer:

Respondent's Age:..... Respondent's Gender:.....

Number of children under the care of the Respondent:.....

Age of the youngest child under the care of the Respondent:

Immunization status of the youngest child under the care of the Respondent: Fully vaccinated for age/Partially vaccinated for age/Unvaccinated

Question 1: Dear Parent/Guardian, what are the 3 major reasons why you should immunize your child? (Reviewer, please list them below in the order of priority).

Question 2: Dear Parent/Guardian, Do you have any worries or concerns when you take your child for immunization? Y/N If yes, what are they? (Please list them below in the order of priority).

Question 3: (ask this question only for Parent/Guardians who are known to have accepted immunization in the last 1 year) Dear Parent/Guardian, in your family, what was the reason behind your decision to vaccinate your child (Name XYZ) last week/month/year? (Please list them below in the order of priority).

Question 4: (ask this question only for Parent/Guardians who are known to have refused immunization in the last 1 year) Dear Parent/Guardian, in your family, what was the reason behind your decision NOT to vaccinate your child (Name XYZ) last week/month/year? (Please list them below in the order of priority).

Question 5: Dear Parent/Guardian, in your personal opinion, why do some persons refuse to vaccinate their children?

Appendix D. SAGE Working Group on Vaccine Hesitancy

Juhani Eskola, National Institute for Health and Welfare, Finland (Chair of Working Group since April 2014); Xiaofeng Liang, Chinese Center for Disease Control, China (Member of SAGE until 2014, Chair of Working Group from March 2012 to April 2014); Mohaya Chaudhuri, Independent Journalist and Documentary Filmmaker, India; Eve Dubé, Institut National de Santé Publique du Québec, Canada; Bruce Gellin, Department of Health and Human Services, U.S.A.; Susan Goldstein, Soul City: Institute for Health and Development Communication, South Africa; Heidi Larson, London School of Hygiene and Tropical Medicine, U.K.; Noni MacDonald, Dalhousie University, Canada; Mahamane Laouali Manzo, Ministry of Health, Niger; Arthur Reingold, University of California at Berkeley, U.S.A.; Kinzang Tshering, Jigme Dorji Wangchuck National Referral Hospital, Bhutan; Yuqing Zhou, Chinese Center for Disease Control, China with the WHO/UNICEF Secretariat; Robb Butler, World Health Organization, Denmark; Philippe Duclos, World Health Organization, Switzerland; Sherine Guirguis, UNICEF, U.S.A.; Ben Hickler, UNICEF, U.S.A.; Melanie Schuster, World Health Organization, Switzerland.

References

- [1] Black S, Rappuoli R. A crisis of public confidence in vaccines. *Sci Transl Med* 2010;2(61):61mr1.
- [2] Leask J. Target the fence-sitters. *Nature* 2011;473(7348):443–5.
- [3] Larson H, Jarrett C, Eckersberger E, Smith D, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007–2012. *Vaccine* 2014;32(19):2150–9.
- [4] Cooper LZ, Larson HJ, Katz SL. Protecting public trust in immunization. *Pediatrics* 2008;122(1):149–53.
- [5] Bloom BEMSM. Addressing vaccine hesitancy. *Science* 2014;344(6182):339.
- [6] Larson HJ, Cooper LZ, Eskola J, Katz SL, Ratzan S. Addressing the vaccine confidence gap. *Lancet* 2011;378(9790):526–35.
- [7] Dube E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger J. Vaccine hesitancy: an overview. *Hum Vaccin Immunother* 2013;9(8):1763–73.
- [8] Meeting of the Strategic Advisory Group of Experts on immunization, October 2014 – conclusions and recommendations. 2014 Contract No.: 50.
- [9] Strategic Advisory Group of Experts (SAGE) on Immunization: WHO; 2014 [cited 2014 9 December]. Available from: <http://www.who.int/immunization/policy/sage/en/>
- [10] Global status of immunization safety: report based on the WHO/UNICEF Joint Reporting Form; 2004 update. WHO, 2005 Contract No.: 42.
- [11] Global Vaccine Action Plan 2011–2020: WHO; 2014 [cited 3 December 2014]. Available from: <http://www.who.int/immunization/global.vaccine.action.plan/en/>
- [12] Dube E, Gagnon D, Nickels E, Jeram S, Schuster M. Mapping vaccine hesitancy – country-specific characteristics of a global phenomenon. *Vaccine* 2014;32(49):6649–54.
- [13] Opel DJ, Mangione-Smith R, Taylor JA, Korfiatis C, Wiese C, Catz S, et al. Development of a survey to identify vaccine-hesitant parents: the parent attitudes about childhood vaccines survey. *Hum Vaccin* 2011;7(4):419–25.
- [14] Brown K, Fraser G, Ramsay M, Shanley R, Cowley N, van Wijgerden J, et al. Attitudinal and demographic predictors of measles-mumps-rubella vaccine (MMR) uptake during the UK catch-up campaign 2008–09: cross-sectional survey. *PLoS ONE* 2011;6(5):e19381.
- [15] Luthy KE, Beckstrand RL, Callister LC. Parental hesitation in immunizing children in Utah. *Public Health Nurs* 2010;27(1):25–31.
- [16] Hall J, Kenny P, King M, Louviere J, Viney R, Yeoh A. Using stated preference discrete choice modelling to evaluate the introduction of varicella vaccination. *Health Econ* 2002;11(5):547–65.
- [17] van der Weerd W, Timmermans DR, Beaujean DJ, Oudhoff J, van Steenberghe JE. Monitoring the level of government trust, risk perception and intention of the general public to adopt protective measures during the influenza A (H1N1) pandemic in The Netherlands. *BMC Public Health* 2011;11:575.
- [18] Wu AC, Wisler-Sher DJ, Griswold K, Colson E, Shapiro ED, Holmboe ES, et al. Postpartum mothers' attitudes, knowledge, and trust regarding vaccination. *Matern Child Health J* 2008;12(6):766–73.
- [19] Gellin BG, Maibach EW, Marcuse EK. Do parents understand immunizations? A national telephone survey. *Pediatrics* 2000;106(5):1097–102.
- [20] Healthcare Confidence Index: Lloyds Bank; 2014 [cited 14 December 2014]. Available from: <http://www.lloydsbank.com/business/industry-focus/healthcare/healthcare-confidence-index.asp>
- [21] Stefanoff P, Mamelund SE, Robinson M, Netterlid E, Tuells J, Bergsaker MAR, et al. Tracking parental attitudes on vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VAC-SATC). *Vaccine* 2010;28(35):5731–7.
- [22] Opel DJ, Taylor JA, Mangione-Smith R, Solomon C, Zhao C, Catz S, et al. Validity and reliability of a survey to identify vaccine-hesitant parents. *Vaccine* 2011;29(38):6598–605.
- [23] SAGE meeting of April 2013: WHO; 2013 [cited 9 July 2014]. Available from: http://www.who.int/immunization/sage/meetings/2013/april/presentations.background_docs/en/
- [24] Chin-Yee BH, Monkman K, Hussain Z, Minuk LA. Attitudes toward vaccination for pandemic H1N1 and seasonal influenza in patients with hematologic malignancies. *J Support Oncol* 2011;9(4):156–60.
- [25] Williams K, Forster A, Marlow L, Waller J. Attitudes towards human papillomavirus vaccination: a qualitative study of vaccinated and unvaccinated girls aged 17–18 years. *J Fam Plann Reprod Health Care* 2011;37(1):22–5.
- [26] Tan TQ, Bhattacharya L, Gerbie MV. Awareness, perceptions and knowledge of recommended adult vaccines among a nationwide sample of adult primary care providers. *J Reprod Med* 2011;56(7–8):301–7.
- [27] Kennedy A, LaVail K, Nowak G, Basket M, Landry S. Confidence about vaccines in the united states: understanding parents' perceptions. *Health Aff* 2011;30(6):1151–9.
- [28] Painter JE, Gargano LM, Sales JM, Morfaw C, Jones LM, Murray D, et al. Correlates of 2009 H1N1 influenza vaccine acceptability among parents and their adolescent children. *Health Educ Res* 2011;26(5):751–60.
- [29] Parry HM, Damery S, Fergusson A, Draper H, Bion J, Low AE. Pandemic influenza A (H1N1) 2009 in a critical care and theatre setting: beliefs and attitudes towards staff vaccination. *J Hosp Infect* 2011;78(4):302–7.
- [30] Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics* 2011;S107–12.
- [31] Hilton S, Bedford H, Calnan M, Hunt K. Competency, confidence and conflicting evidence: key issues affecting health visitors' use of research evidence in practice. *BMC Nurs* 2009;8:4. <http://dx.doi.org/10.1186/1472-6955-8-4>.
- [32] Torun SD, Torun F, Catak B. Healthcare workers as parents: attitudes toward vaccinating their children against pandemic influenza A/H1N1. *BMC Public Health* 2010;10:596.
- [33] Kumar D, Aggarwal A, Gomer S. Immunization status of children admitted to a tertiary-care hospital of north India: reasons for partial immunization or non-immunization. *J Health Popul Nutr* 2010;28(3):300–4.
- [34] Savas E, Tanriverdi D. Knowledge, attitudes and anxiety towards influenza A/H1N1 vaccination of healthcare workers in Turkey. *BMC Infect Dis* 2010;10:281.
- [35] Luthy KE, Beckstrand RL, Peterson NE. Parental hesitation as a factor in delayed childhood immunization. *J Pediatr Healthc* 2009;23(6):388–93.
- [36] Gust DA, Darling N, Kennedy A, Schwartz B. Parents with doubts about vaccines: which vaccines and reasons why. *Pediatrics* 2008;122(4):718–25.
- [37] Pitts M, Smith A, Croy S, Lyons A, Ryall R, Garland S, et al. Singaporean women's knowledge of human papillomavirus (HPV) and attitudes toward HPV vaccination. *Women Health* 2009;49(4):334–51.
- [38] Cameron KA, Rintamaki LS, Kamanda-Kosseh M, Noskin GA, Baker DW, Makoul G. Using theoretical constructs to identify key issues for targeted message design: African American seniors' perceptions about influenza and influenza vaccination. *Health Commun* 2009;24(4):316–26.
- [39] Woodhall SC, Lehtinen M, Verho T, Huhtala H, Hokkanen M, Kosunen E. Anticipated acceptance of HPV vaccination at the baseline of implementation: a survey of parental and adolescent knowledge and attitudes in Finland. *J Adolesc Health* 2007;40(5):466–9.
- [40] Riddle MS, Patel SS, Sanders JW, Armstrong AW, Putnam SD, Schlett CD, et al. Attitudes toward predeployment and experimental vaccinations among troops deployed to Operation Iraqi Freedom and Operation Enduring Freedom. *J Travel Med* 2008;15(2):68–76.
- [41] Chen JY, Fox SA, Cantrell CH, Stockdale SE, Kagawa-Singer M. Health disparities and prevention: racial/ethnic barriers to flu vaccinations. *J Community Health* 2007;32(1):5–20.
- [42] Leask J, Quinn HE, Macartney K, Trent M, Massey P, Carr C, et al. Immunisation attitudes, knowledge and practices of health professionals in regional NSW. *Aust N Z J Public Health* 2008;32(3):224–9.
- [43] Smedley J, Poole J, Waclawski E, Stevens A, Harrison J, Watson J, et al. Influenza immunisation: attitudes and beliefs of UK healthcare workers. *Occup Environ Med* 2007;64(4):223–7.
- [44] Colley E. Influenza vaccination in adults with a long-term condition. *Community Pract* 2008;81(4):25–8.
- [45] Daniels NA, Gouveia S, Null D, Gildengorin GL, Winston CA. Acceptance of pneumococcal vaccine under standing orders by race and ethnicity. *J Natl Med Assoc* 2006;98(7):1089–94.
- [46] Bardenheier B, Yusuf H, Schwartz B, Gust D, Barker L, Rodewald L. Are parental vaccine safety concerns associated with receipt of measles-mumps-rubella, diphtheria and tetanus toxoids with acellular pertussis, or hepatitis B vaccines by children? *Arch Pediatr Adolesc Med* 2004;158(6):569–75.
- [47] Maconachie M, Lewendon G. Immunising children in primary care in the UK – what are the concerns of principal immunisers? *Health Educ J* 2004;63(1):40–9.
- [48] Daley MF, Crane LA, Chandramouli V, Beaty BL, Barrow J, Allred N, et al. Influenza among healthy young children: changes in parental attitudes and predictors of immunization during the 2003 and 2004 influenza season. *Pediatrics* 2006;117(2):e268–77.

- [49] Bedford H, Lansley M. Information on childhood immunisation: parents' views. *Community Pract* 2006;79(8):252–5.
- [50] Salmon DA, Moulton LH, Omer SB, Chace LM, Klassen A, Talebian P, et al. Knowledge, attitudes, beliefs of school nurses and personnel and associations with nonmedical immunization exemptions. *Pediatrics* 2004;113(6):e552–9.
- [51] Macdonald H, Henderson R, Oates K. Low uptake of immunisation: contributing factors. *Community Pract* 2004;77(3):95–100.
- [52] Flynn M, Ogdén J. Predicting uptake of MMR vaccination: a prospective questionnaire study. *Br J Gen Pract* 2004;54(504):526–30.
- [53] Samoff E, Dunn A, Vandevanter N, Blank S, Weisfuse IB. Predictors of acceptance of hepatitis B vaccination in an urban sexually transmitted diseases clinic. *Sex Transm Dis* 2004;31(7):415–20.
- [54] Santibanez TA, Nowalk MP, Zimmerman RK, Bruehlman RD. Effects of the year 2000 influenza vaccine delay on elderly patients' attitudes and behaviors. *Prev Med* 2003;37(5):417–23.
- [55] Kolasa MS, Bisgard KM, Prevots DR, Desal SN, Dibling K. Parental attitudes toward multiple poliovirus injections following a provider recommendation. *Public Health Rep* 2001;116(4):282–8.
- [56] Ramsay ME, Yarwood J, Lewis D, Campbell H, White JM. Parental confidence in measles, mumps and rubella vaccine: evidence from vaccine coverage and attitudinal surveys. *Br J Gen Pract* 2002;52(484):912–6.
- [57] Bardenheier B, Gonzalez JM, Washington ML, Bell BP, Averhoff F, Massoudi MS, et al. Parental knowledge, attitudes, and practices associated with not receiving hepatitis A vaccine in a demonstration project in Butte County, California. *Pediatrics* 2003;112(4):e269–74.
- [58] Gust DA, Woodruff R, Kennedy A, Brown C, Sheedy K, Hibbs B. Parental perceptions surrounding risks and benefits of immunization. *Semin Pediatr Infect Dis* 2003;14(3):207–12.
- [59] Campos W, Jalaludin BB. Predictors of influenza vaccination amongst Australian nurses. *Aust J Adv Nurs* 2002;20(2):19–21.
- [60] Pareek M, Pattison HM. The two-dose measles, mumps, and rubella (MMR) immunisation schedule: factors affecting maternal intention to vaccinate. *Br J Gen Pract* 2000;50(461):969–71.
- [61] Smailbegovic MS, Laing GJ, Bedford H. Why do parents decide against immunization? The effect of health beliefs and health professionals. *Child Care Health Dev* 2003;29(4):303–11.
- [62] Prislín R, Dyer JA, Blakely CH, Johnson CD. Immunization status and sociodemographic characteristics: the mediating role of beliefs, attitudes, and perceived control. *Am J Public Health* 1998;88(12):1821–6.
- [63] Brambleby P, Hanrahan J. Measles immunisation non-acceptance: validation of computer-held records and raising the vaccine uptake at early school age; the Maidstone experience. *Public Health* 1989;103(4):289–94.
- [64] Pace AC, Flowers SK, Hastings JK. Arkansas community pharmacists' opinions on providing immunizations. *J Pharm Pract* 2010;23(5):496–501.
- [65] Tsutsui Y, Benzion U, Shahrabani S, Din GY. A policy to promote influenza vaccination: a behavioral economic approach. *Health Policy* 2010;97(2–3):238–49.
- [66] Gaglia Jr MA, Cook RL, Kraemer KL, Rothberg MB. Patient knowledge and attitudes about avian influenza in an internal medicine clinic. *Public Health* 2008;122(5):462–70.
- [67] Ramsey MA, Marczynski CA. College students' perceptions of H1N1 flu risk and attitudes toward vaccination. *Vaccine* 2011;29(44):7599–601.
- [68] Henrich N, Holmes B. What the public was saying about the H1N1 vaccine: perceptions and issues discussed in on-line comments during the 2009 H1N1 pandemic. *PLoS ONE* 2011;6(4):e18479.
- [69] Marek E, Dergez T, Kricskovic A, Kovacs K, Rebek-Nagy G, Gocze K, et al. Difficulties in the prevention of cervical cancer: adults' attitudes towards HPV vaccination 3 years after introducing the vaccine in Hungary. *Vaccine* 2011;29(32):5122–9.
- [70] Kardas P, Zasowska A, Dec J, Stachurska M. Reasons for low influenza vaccination coverage: cross-sectional survey in Poland. *Croat Med J* 2011;52(2):126–33.
- [71] Gilles I, Bangerter A, Clemence A, Green EGT, Krings F, Staerke C, et al. Trust in medical organizations predicts pandemic (H1N1) 2009 vaccination behavior and perceived efficacy of protection measures in the Swiss public. *Eur J Epidemiol* 2011;26(3):203–10.
- [72] Reiter PL, McRee AL, Gottlieb SL, Markowitz LE, Brewer NT. Uptake of 2009 H1N1 vaccine among adolescent females. *Hum Vaccin* 2011;7(2):191–6.
- [73] Takahashi LM, Kim AJ, Sablan-Santos L, Quitugua LF, Aromin J, Lepule J, et al. Hepatitis B among Pacific Islanders in Southern California: how is health information associated with screening and vaccination? *J Community Health* 2011;36(1):47–55.
- [74] Brown K, Fraser G, Ramsay M, Shanley R, Cowley N, Wijgerden J, et al. Attitudinal and demographic predictors of measles-mumps-rubella vaccine (MMR) uptake during the UK catch-up campaign 2008–09: cross-sectional survey. *PLoS ONE* 2011;6(May):e19381.
- [75] Brabin L, Stretch R, Roberts SA, Elton P, Baxter D, McCann R. The school nurse, the school and HPV vaccination: a qualitative study of factors affecting HPV vaccine uptake. *Vaccine* 2011;29(17):3192–6.
- [76] Nougairede A, Lagier JC, Ninove L, Sartor C, Badiaga S, Botelho E, et al. Likely correlation between sources of information and acceptability of A/H1N1 swine-origin influenza virus vaccine in Marseille, France. *PLoS ONE* 2010;5(6):e11292.
- [77] Allen JD, Othus MKD, Shelton RC, Li Y, Norman N, Tom L, et al. Parental decision making about the HPV vaccine. *Cancer Epidemiol Biomarkers Prev* 2010;19(9):2187–98.
- [78] Brotherton JML, Leask J, Jackson C, McCaffery K, Trevena LJ. National survey of general practitioners experience of delivering the national human papillomavirus vaccination program. *Sex Health* 2010;7(3):291–8.
- [79] Cheng PJ, Huang SY, Shaw SW, Kao CC, Chueh HY, Chang SD, et al. Factors influencing women's decisions regarding pertussis vaccine: a decision-making study in the Postpartum Pertussis Immunization Program of a teaching hospital in Taiwan. *Vaccine* 2010;28(34):5641–7.
- [80] Balinska MA. Hepatitis B vaccination and French Society ten years after the suspension of the vaccination campaign: how should we raise infant immunization coverage rates? *J Clin Virol* 2009;46(3):202–5.
- [81] Quinn SC, Kumar S, Freimuth VS, Kidwell K, Musa D. Public willingness to take a vaccine or drug under emergency use authorization during the 2009 H1N1 pandemic. *Biosecur Bioterr* 2009;7(3):275–90.
- [82] Brabin L, Roberts SA, Stretch R, Baxter D, Elton P, Kitchener H, et al. A survey of adolescent experiences of human papillomavirus vaccination in the Manchester study. *Br J Cancer* 2009;101(9):1502–4.
- [83] Moseley KL, Hudson EJ. Steroid inhaler adherence, flu vaccine receipt, and race: associations with the quality of the parent-physician relationship for asthmatic children. *J Natl Med Assoc* 2009;101(5):407–13.
- [84] Lu PJ, Euler GL, Jumaan AO, Harpaz R. Herpes zoster vaccination among adults aged 60 years or older in the United States, 2007: uptake of the first new vaccine to target seniors. *Vaccine* 2009;27(6):882–7.
- [85] Toffolon-Weiss M, Hagan K, Leston J, Peterson L, Provost E, Hennessy T. Alaska native parental attitudes on cervical cancer, HPV and the HPV vaccine. *Int J Circumpolar Health* 2008;67(4):363–73.
- [86] Marlow LAV, Waller J, Wardle J. Trust and experience as predictors of HPV vaccine acceptance. *Hum Vaccin* 2007;3(5):171–5.
- [87] Pitts MK, Dyson SJ, Rosenthal DA, Garland SM. Knowledge and awareness of human papillomavirus (HPV): attitudes towards HPV vaccination among a representative sample of women in Victoria, Australia. *Sex Health* 2007;4(3):177–80.
- [88] Kempe A, Daley MF, Parashar UD, Crane LA, Beaty BL, Stokley S, et al. Will pediatricians adopt the new rotavirus vaccine? *Pediatrics* 2007;119(1):1–10.
- [89] Fowler GL, Baggs JM, Weintraub ES, Martin SW, McNeil MM, Gust DA. Factors influencing laboratory workers' decisions to accept or decline anthrax vaccine adsorbed (AVA): results of a decision-making study in CDC's Anthrax Vaccination Program. *Pharmacoepidemiol Drug Saf* 2006;15(12):880–8.
- [90] Song JY, Park CW, Jeong HW, Cheong HJ, Kim WJ, Kim SR. Effect of a hospital campaign for influenza vaccination of healthcare workers. *Infect Control Hosp Epidemiol* 2006;27(6):612–7.
- [91] Casiday R, Cresswell T, Wilson D, Panter-Brick C. A survey of UK parental attitudes to the MMR vaccine and trust in medical authority. *Vaccine* 2006;24(2):177–84.
- [92] Taylor-Clark K, Blendon RJ, Zaslavsky A, Benson J. Confidence in crisis? Understanding trust in government and public attitudes toward mandatory state health powers. *Biosecur Bioterror* 2005;3(2):138–47.
- [93] Mills EJ, Montori VM, Ross CP, Shea B, Wilson K, Guyatt GH. Systematically reviewing qualitative studies complements survey design: an exploratory study of barriers to paediatric immunisations. *J Clin Epidemiol* 2005;58(11):1101–8.
- [94] Salmon DA, Moulton LH, Omer SB, DeHart MP, Stokley S, Halsey NA. Factors associated with refusal of childhood vaccines among parents of school-aged children: a case-control study. *Arch Pediatr Adolesc Med* 2005;159(5):470–6.
- [95] Petousis-Harris H, Goodyear-Smith F, Turner N, Soe B. Family practice nurse views on barriers to immunising children. *Vaccine* 2005;23(21):2725–30.
- [96] Keane MT, Walter MV, Patel BI, Moorthy S, Stevens RB, Bradley KM, et al. Confidence in vaccination: a parent model. *Vaccine* 2005;23(19):2486–93.
- [97] Maayan-Metzger A, Kedem-Friedrich P, Kuint J. To vaccinate or not to vaccinate - that is the question: why are some mothers opposed to giving their infants hepatitis B vaccine? *Vaccine* 2005;23(16):1941–8.
- [98] Henderson R, Oates K, Macdonald H, Smith WC. General practitioners' concerns about childhood immunisation and suggestions for improving professional support and vaccine uptake. *Commun Dis Public Health* 2004;7(4):260–6.
- [99] Hamilton M, Corwin P, Gower S, Rogers S. Why do parents choose not to immunise their children? *N Z Med J* 2004;117(1189):U768.
- [100] Wilson K, Mills E, Boon H, Tomlinson G, Ritvo P. A survey of attitudes towards paediatric vaccinations amongst Canadian naturopathic students. *Vaccine* 2004;22(3–4):329–34.
- [101] Smith A, McCann R, McKinlay I. Second dose of MMR vaccine: health professionals' level of confidence in the vaccine and attitudes towards the second dose. *Commun Dis Public Health* 2001;4(4):273–7.
- [102] McPhillips HA, Davis RL, Marcuse EK, Taylor JA. The rotavirus vaccine's withdrawal and physicians' trust in vaccine safety mechanisms. *Arch Pediatr Adolesc Med* 2001;155(9):1051–6.
- [103] Goudey RE, Thompson SC. Knowledge of and attitudes to infection control of tattooists at registered premises in Victoria, 1994. *Aust N Z J Public Health* 1997;21(1):17–22.
- [104] Rushton TC, Ganguly R, Sinnott IV JT, Banerji M. Barriers to immunization - an examination of factors that influence the application of pneumococcal vaccine by house staff. *Vaccine* 1994;12(13):1173–9.
- [105] Velan B, Kaplan G, Ziv A, Boyko V, Lerner-Geva L. Major motives in non-acceptance of A/H1N1 flu vaccination: the weight of rational assessment. *Vaccine* 2011;29(6):1173–9.

- [106] Fredrickson DD, Davis TC, Arnold CL, Kennen EM, Humiston SG, Cross JT, et al. Childhood immunization refusal: provider and parent perceptions. *Fam Med* 2004;36(6):431–9.
- [107] Naing C, Pereira J, Abe T, Eh Zhen Wei D, Rahman Bajera IB, Kavinda Perera UH. Predictors associated with the willingness to take human papilloma virus vaccination. *J Community Health* 2012;37(2):288–93.
- [108] Gaudino JA, Robison S. Risk factors associated with parents claiming personal-belief exemptions to school immunization requirements: community and other influences on more skeptical parents in Oregon, 2006. *Vaccine* 2012;30(6):1132–42.
- [109] Redelings MD, Piron J, Smith LV, Chan A, Heinzerling J, Sanchez KM, et al. Knowledge, attitudes, and beliefs about seasonal influenza and H1N1 vaccinations in a low-income, public health clinic population. *Vaccine* 2012;30(2):454–8.
- [110] Tucker Edmonds BM, Coleman J, Armstrong K, Shea JA. Risk perceptions, worry, or distrust: what drives pregnant women's decisions to accept the H1N1 vaccine? *Matern Child Health J* 2011;15(8):1203–9.
- [111] Marek E, Dergez T, Rebek-Nagy G, Kricskovic A, Kovacs K, Bozsa S, et al. Adolescents' awareness of HPV infections and attitudes towards HPV vaccination 3 years following the introduction of the HPV vaccine in Hungary. *Vaccine* 2011;29(47):8591–8.
- [112] Choudhury P, Thacker N, Gargano LM, Weiss PS, Vashishtha VM, Amladi T, et al. Attitudes and perceptions of private pediatricians regarding polio immunization in India. *Vaccine* 2011;29(46):8317–22.
- [113] Kraut A, Graff L, McLean D. Behavioral change with influenza vaccination: factors influencing increased uptake of the pandemic H1N1 versus seasonal influenza vaccine in health care personnel. *Vaccine* 2011;29(46):8357–63.
- [114] Walter D, Bohmer MM, Reiter S, Krause G, Wichmann O. Risk perception and information-seeking behaviour during the 2009/10 influenza a(H1N1)pdm09 pandemic in Germany. *Eurosurveillance* 2012;17(13).
- [115] Berry JG, Gold MS, Ryan P, Duszynski KM, Braunack-Mayer AJ. Public perspectives on consent for the linkage of data to evaluate vaccine safety. *Vaccine* 2012;30(28):4167–74.
- [116] Gargano LM, Thacker N, Choudhury P, Weiss PS, Pazol K, Bahl S, et al. Predictors of administration and attitudes about pneumococcal, Haemophilus influenzae type b and rotavirus vaccines among pediatricians in India: a national survey. *Vaccine* 2012;30(24):3541–5.
- [117] Thacker N, Choudhury P, Gargano LM, Weiss PS, Pazol K, Bahl S, et al. Comparison of attitudes about polio, polio immunization, and barriers to polio eradication between primary health center physicians and private pediatricians in India. *Int J Infect Dis* 2012;16(6):e417–23.
- [118] Riccardo F, Dente MG, Kojouharova M, Fabiani M, Alfonsi V, Kurchatova A, et al. Migrant's access to immunization in Mediterranean Countries. *Health Policy* 2012;105(1):17–24.
- [119] Duvall J, Buchwald D. Human papillomavirus vaccine policies among American Indian tribes in Washington State. *J Pediatr Adolesc Gynecol* 2012;25(2):131–5.
- [120] Naing C, Tan RYP. Knowledge about the pandemic influenza A (H1N1) and willingness to accept vaccination: a cross-sectional survey. *J Public Health* 2011;19(6):511–6.
- [121] Edmonds BMT, Coleman J, Armstrong K, Shea JA. Risk perceptions, worry, or distrust: what drives pregnant women's decisions to accept the H1N1 vaccine? *Matern Child Health J* 2011;15(8):1203–9.
- [122] Krawczyk AL, Perez S, Lau E, Holcroft CA, Amsel R, Knauper B, et al. Human papillomavirus vaccination intentions and uptake in college women. *Health Psychol* 2012;31:685–93.
- [123] Rebmann T, Iqbal A, Anthony J, Knaup RC, Wright KS, Peters EB. H1N1 influenza vaccine compliance among hospital- and non-hospital-based healthcare personnel. *Infect Control Hosp Epidemiol* 2012;33(7):737–44.
- [124] Middleman AB, Short MB, Doak JS. School-located influenza immunization programs: factors important to parents and students. *Vaccine* 2012;30(33):4993–9.
- [125] MacDonald NE. The SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy definition, scope and determinants. *Vaccine* 2015;33(34):4161–4.