Resources for assessing parents' vaccine hesitancy: a systematic review of the literature

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Keywords

Vaccine • Hesitancy • Parents • Questionnaire • Review

Summary

The concept of Vaccine Hesitancy has begun to appear in the scientific landscape, referring to the reluctance of a growing proportion of people to accept the vaccination offer. A variety of factors were identified as being associated with vaccine hesitancy but there was no universal algorithm and currently there aren’t any established metrics to assess either the presence or impact of vaccine hesitancy. The aim of this study was to systematically review the published questionnaires evaluating parental vaccine hesitancy, to highlight the differences among these surveys and offer a general overview on this matter. This study offers a deeper perspective on the available questionnaires, helping future researches to identify the most suitable one according to their own aim and study setting.

Introduction

Vaccines have long been considered as one of the most important public health achievements of the past century and they have largely contributed to the decline in morbidity and mortality related to various infectious diseases [1]. Due to the effectiveness of vaccination programs, many people nowadays have limited or no experience with vaccine-preventable diseases (VPDs), thus parents increasingly assume that the risks associated with VPDs are minimal compared to potential health and safety risks of vaccinations themselves [2, 3]. The concept of Vaccine Hesitancy has subsequently begun to appear in the scientific landscape, referring to the reluctance of a growing proportion of people to accept the vaccination offer [4]. In fact, urban centres with large clusters of vaccine-hesitant individuals are particularly vulnerable to VPD outbreaks among exposed, unimmunized children, as observed with the measles outbreaks in the USA, Canada, and Europe [5-7]. 2014-2015 the Disneyland measles outbreak was a stark reminder of the direct influence of vaccine hesitancy and refusal [8]. The World Health Organization (WHO) defines vaccine hesitancy as the “delay in acceptance or refusal of vaccines despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and for different vaccines. This phenomenon is influenced by factors such as complacency, convenience and confidence” [9]. The “3Cs” Model, that highlights these three categories, was first proposed in 2011 by the WHO EURO Vaccine Communications Working Group. In the “3 Cs” model, confidence is defined as trust in the effectiveness and safety of vaccines, and in the system that delivers them. This includes the reliability and competence of health services and health professionals and the motivations of policy-makers who decide on the needed vaccines. Vaccination complacency exists where the perceived risks of vaccine-preventable diseases are low and vaccination is not deemed a necessary preventive action. Vaccination convenience is a significant factor when physical availability, affordability, willingness-to-pay, geographical accessibility, ability to understand (language and health literacy) and appeal of immunization services affect the vaccination uptake [10]. There is a wide variety of determinants of vaccine hesitancy. In 2015, the WHO EURO Vaccine Communications Working Group developed the Vaccine Hesitancy...
Determinants Matrix which categorized determinants into the following groups: contextual, individual and group influences, and vaccine and vaccination-specific issues [11]. Contextual influences include historic, social, cultural, environmental, economic, political and institutional factors which might influence vaccine hesitant populations. The most common is conspiracy theories, which include a fear that vaccines are introduced to serve the economic and/or political interests of pharmaceutical companies [12, 13].

Individual and group influences include personal perceptions or beliefs about vaccines and influences from the social environment such as the belief that vaccines are unsafe. Parents are more afraid of the adverse events related to vaccines, which are thought to be more frequent and more serious than they really are, than of the complications that could arise from infectious diseases [14]. Moreover, some individuals do not perceive a medical need for certain vaccines. Vaccine Hesitancy is a global, complex and constantly changing phenomenon, currently representing one of the most significant problems of public health: in 2019 the World Health Organization (WHO) listed vaccine hesitancy in its top ten threats to global health [15]. To understand the impact that the various determinants have on vaccine hesitancy and what factors can influence vaccination decisions, numerous studies have been conducted over the years [16, 17].

Despite the growing number of articles on vaccine hesitancy published in recent years, there are some discrepancies among publications in terms of what exactly falls under the umbrella of “vaccine hesitancy”, a term that was only introduced by the SAGE Working Group in 2015. Therefore, in order to obtain as much information as possible on this issue, all studies investigating the determinants of vaccine hesitancy, without specifically using the term “vaccine hesitancy”, were also included in this review. A variety of factors were identified as being associated with vaccine hesitancy but there was no universal algorithm and currently there aren’t any established metrics to assess either the presence or impact of vaccine hesitancy. Study methods used to measure “vaccine hesitancy” are too heterogeneous and this makes it difficult to make inferences about the influence of specific factors on vaccine-hesitant behaviour. The aim of this study was to systematically review the published questionnaires evaluating parental vaccine hesitancy, to highlight the differences among these surveys and offer a general overview on this matter. Administration channel, sample size, type of vaccine being investigated, and the type of questions used in the questionnaire are some of the variables that can be considered, when designing a study to investigate vaccine hesitancy. The characteristics of each study, as well as the variables investigated, have been analyzed in order to enable future researchers to choose the most suitable tool for evaluating and measuring vaccine hesitancy over time and in different settings, according to their own needs and goals.

**Methods**

**SEARCH STRATEGY**

This is a systematic review conducted in accordance with the PRISMA Guidelines [18]. Several databases were consulted, including PubMed/Medline, Web of Science and The Cochrane Library. The latter was used to identify existing systematic reviews with a similar objective, in order to further screen the lists of references of potentially related articles that might have not been retrieved in the other databases. The systematic search was performed with no time filter, from inception to December 14th, 2017; however, a language limit was adopted, indeed only English and Italian articles were included in our review. The predefined search strategy that was used to identify potential relevant articles included four main aspects: parents or caregivers, vaccine hesitancy/acceptance, immunization and survey. Mesh and text words were combined with Boolean operators AND and OR. The full search strategy is: ((((((questionnaire*[Title/Abstract] OR survey*[Title/Abstract] OR “Surveys and Questionnaires”[Mesh]) AND (vaccine*[Title/Abstract] OR immunize*[Title/Abstract] OR immunis*[Title/Abstract] OR shot*[Title/Abstract] OR jab*[Title/Abstract] OR “Vaccines”[Mesh] OR “Immunization”[Mesh] OR “Vaccination”[Mesh])) AND (hesitanc*[Title/Abstract] OR doubt*[Title/Abstract] OR concern*[Title/Abstract] OR criticis*[Title/Abstract] OR rumo*[Title/Abstract] OR sceptic*[Title/Abstract] OR fear*[Title/Abstract] OR refus*[Title/Abstract] OR reject*[Title/Abstract] OR delay*[Title/Abstract] OR accept*[Title/Abstract] OR consen*[Title/Abstract] OR intent*[Title/Abstract] OR confidence*[Title/Abstract] OR adherence*[Title/Abstract] OR compliant*[Title/Abstract] OR uptake*[Title/Abstract] OR engagement*[Title/Abstract] OR *trust*[Title/Abstract] OR a*titude*[Title/Abstract] OR perception*[Title/Abstract] OR opinion*[Title/Abstract] OR belief*[Title/Abstract] OR behavi*[Title/Abstract] OR choice*[Title/Abstract] OR practic*[Title/Abstract] OR barrier*[Title/Abstract] OR facilitator*[Title/Abstract] OR “Health Knowledge, Attitudes, Practice”[Mesh] OR “Vaccination Refusal”[Mesh] OR “Trust”[Mesh] OR “Behavior”[Mesh] OR “Patient Acceptance of Health Care”[Mesh])) AND (parent*[Title/Abstract] OR caregiver*[Title/Abstract] OR guardian*[Title/Abstract] OR tutor*[Title/Abstract] OR mother*[Title/Abstract] OR father*[Title/Abstract] OR “legally acceptable representative”[Title/Abstract] OR “Parents”[Mesh]).

In order to include all publications related to the topic, the list of references was manually screened for all relevant papers. Endnote was used as a software to manage all the retrieved references.

**INCLUSION CRITERIA**

Studies that fulfilled the inclusion criteria were considered in this review. Papers aimed at investigating parents/caregivers vaccine hesitancy through a survey/
questionnaire were considered eligible, regardless of the attitudes and behaviours of the interviewed subjects. As a matter of fact, vaccine hesitancy is complex and driven by a wide variety of factors, as explained by the 3C model developed by the SAGE Working Group. Therefore, knowing the determinants of Vaccine Hesitancy in specific subgroups of parents (such as those who do not trust or have lost confidence in vaccinations) is extremely important in order to develop the right strategies to address it. In addition, including studies selecting the study population according to a negative/positive attitude/behaviour towards vaccination might be helpful for future researchers interested in studying Vaccine Hesitancy in a specific subgroup of parents. Because vaccine hesitancy is a complex phenomenon, strictly depending on several aspects that are country-specific, and because the introduction of vaccine hesitancy as a term in the scientific community is relatively new, we also included studies evaluating public trust/distrust, perceptions, concerns, confidence, attitudes, beliefs about vaccines and vaccination programs. Moreover, we included all types of available vaccines. Furthermore, we only assessed original articles, while other types of publications were not included in the analysis. Lastly, due to the aim of the research, only observational studies were considered: along with cross-sectional studies, we included cohort studies and case-control studies. The last two types of studies are particularly helpful in order to obtain as much information as possible and to have a broader overview of this phenomenon: as a matter of fact, they allowed us to include studies where questionnaires or surveys were used to investigate vaccine hesitancy among parents.

**Exclusion criteria**

Studies were excluded from this review when they investigated vaccine hesitancy in target populations different from parents/caregivers/guardians, for instance physicians, educators, or directly the adolescents. Papers written in languages other than English and Italian were excluded, as well as not original articles (reviews, letters to editor, conference papers, editorials). Additionally, surveys aimed at assessing aspects different than vaccine hesitancy were not included. Lastly, articles were excluded if the vaccines examined were not for humans or were not commercially available yet (such as the HIV vaccine), or if the publications were on vaccine development.

**Data extraction**

Eight couples of reviewers (VG and CA, MN and GV, SP and FD, OG and IB, EA and SDN, OES and LK, OG and AC, FDG and LG), independently performed the screening of titles and abstracts, followed by data extraction of the included articles. Disagreement was solved through a discussion between the authors, if disagreement persisted a third author was consulted (PC). Full-texts were downloaded and consulted only for the included articles. The extracted data were reported in a predefined, ad hoc spreadsheet elaborated in Excel. For each included article, the following items were evaluated: first author's name and year of publication, when and where the study was conducted, study design and study aim, population characteristics and sample size, types of survey and administration, if the questionnaire was previously validated and if it was attached to the manuscript, number and type of questions, type of vaccine analysed, immunization behaviour and beliefs about vaccines.

**Data coding**

The included articles were coded by study period, country, language, study type and study aim, population characteristics, way of administration, number of items and items categories in the questionnaire, types of vaccine, immunization behaviour, beliefs about vaccine safety/efficacy. Regarding the latter, beliefs were coded as follows: i) no assessment of perceived safety/efficacy vaccines; ii) the assessment was performed and most of the respondents believe vaccinations to be safe/effective; iii) the assessment was performed and most of the respondents do not believe vaccinations to be safe/effective; iv) the assessment was performed but data were not available; v) the assessment was performed, but only qualitative and descriptive data were available (numerical data not available). As for the immunization behaviour, it was classified as follows: i) “acceptance”, if the whole population consisted of people receiving the vaccination; ii) “refusal”, if the whole population consisted of parents refusing the vaccination; iii) “hesitancy/scepticism/doubt”, if the population consisted of both parents accepting the vaccine and parents refusing it; iv) if no information was available, it was considered as missing data.

**Results**

We identified 5,139 records by running the predefined search strategies on the three selected databases (Medline, Web of Science, The Cochrane Library), and 8 additional records were retrieved from the manual searching of reference lists and citation chains of included papers. After removing duplicates, 3,500 papers were assessed for eligibility by title and abstract, and 2,481 papers were removed. After full text screening selection, 334 studies were included in the descriptive analysis and synthesis [3, 16, 19-350]. Figure 1 shows the selection flow. The main results of our systematic review are shown in Table I.

**Study designs and study aims**

Most of the included studies (60.4%, n = 202/334) were conducted between 2010 and 2019, while 30.5% (n = 102/334) articles reported a study period prior to 2008. In a total of 8.9% (n = 30/334) works the study period was not specified. Among the most recent studies, 48.8% (n = 100/334) were conducted in North or South America (Argentina, Brazil, Canada, Caribbean, El
**Fig. 1. Flow chart of selection process.**

![Flow chart of selection process]

**Tab. I. Main characteristics of the included studies.**

| Author, year  | Study period | Country       | Study design    | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour         |
|---------------|--------------|---------------|-----------------|------------------------|-------------|-----------------|-------------------|------------|-------------------------------|
| Adler A, 2007 | 2007         | Israel        | Cross-sectional | Paper-based            | 1,474       | Varicella       | Closed            | Statistical methods not reported | Hesitancy/scepticism/doubt   |
| Adorador A, 2011 | 2011         | USA           | Cross-sectional | Paper-based            | 108         | Dtp             | Closed            | Not         | Hesitancy/scepticism/doubt     |
| Aharony N, 2017 | 2017         | Israel        | Cross-sectional | On-line                | 200         | Child vaccines  | Likert scale      | With statistical methods     | Refusal                       |
| Akis S, 2011  | 2011         | Turkey        | Cross-sectional | Paper-based            | 611         | Flu             | Closed            | Not         | Acceptance                     |
| Akmatov MK, 2009 | 2009         | Kyrgyzstan    | Cross-sectional | Paper-based            | 934         | Child vaccines  | Closed            | Not         | Acceptance                     |
| Alberts CJ, 2017 | 2017         | Netherlands   | Cross-sectional | Mail                   | 1,309       | Hpv             | Closed            | Statistical methods not reported | Acceptance                   |
| Alfredsson R, 2004 | 2004         | Sweden        | Cross-sectional | Paper-based            | 300         | Mmr             | Closed            | With statistical methods     | Acceptance                     |
| Allen JD, 2010 | 2010         | USA           | Cross-sectional | On-line                | 476         | Hpv             | Closed            | Not         | Acceptance                     |
| Allison MA, 2010 | 2010         | USA           | Cross-sectional | Paper-based            | 259         | Flu             | Likert scale      | With statistical methods     | Hesitancy/scepticism/doubt   |
| Allred NJ, 2005 | 2005         | USA           | Cross-sectional | Mail                   | 7,810       | Dt              | Closed            | With statistical methods     | Acceptance                     |
| Alshammari TM, 2018 | 2018         | Saudi Arabia  | Cross-sectional | Paper-based            | 467         | Child vaccines  | Closed            | Statistical methods not reported | Acceptance                   |

continues
| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|-------------|--------------|---------|--------------|-------------------------|-------------|----------------|------------------|------------|------------------------|
| Ambe JP, 2001 | 2001 | Nigeria | Cross-sectional | Paper-based | 500 | Measles | Closed | Statistical methods not reported | Refusal |
| Aharon AA, 2017 | 2017 | Israel | Cross-sectional | Paper-based | 751 | HbV/dTP/mMR | Likert scale | Not | Refusal |
| Arrossi S, 2012 | 2012 | Argentina | Cross-sectional | Paper-based | 1,200 | Hpv | Closed | With statistical methods | Acceptance |
| Azizi FSM, 2017 | 2017 | Malesa | Cross-sectional | Paper-based | 545 | Child vaccines | Closed | With statistical methods | Hesitancy/scepticism/doubt |
| Baglioni A, 2014 | 2014 | Italy | Cross-sectional | Paper-based | 648 | Hpv | Closed | With statistical methods | Acceptance |
| Baldwin AS, 2013 | 2008-2010 | USA | Cross-sectional | Paper-based | 256 | Hpv | Likert scale | With statistical methods | Acceptance |
| Bardenheier B, 2003 | 2000 | USA | Cross-sectional | Paper-based | 648 | Hav | Closed | Not | Acceptance |
| Bardenheier B, 2004 | 2001 | USA | Case-control | Paper-based | 3,586 | MMR/dTP/hbV | Likert scale | Not | Acceptance |
| Bardenheier BH, 1997-1998 | USA | Cross-sectional | Paper-based | 3,552 | DTP/hib/hbV/polio | Closed | Not | Hesitancy/scepticism/doubt |
| Barnack JL, 2010 | 2006 | USA | Cross-sectional | Mail | 200 | Hpv | Likert scale | Not | Acceptance |
| Barnack-Tavlaris JL, 2016 | 2009 | USA | Cross-sectional | Telephone | 4,666 | Hpv | Closed | Not | Acceptance |
| Bazzano A, 2012 | 2007 | USA | Cross-sectional | Telephone | 197 | Child vaccines | Closed | With statistical methods | Hesitancy/scepticism/doubt |
| Bedford H, 2007 | 2004 | UK | Cross-sectional | Paper-based | 859 | New vaccines | Likert scale | Not | Acceptance |
| Beel ER, 2010-2012 | USA | Cross-sectional | Paper-based | 511 | Child vaccines | Closed | With statistical methods | Acceptance |
| Ben Natan M, 2011 | 2008 | Israel | Cross-sectional | Paper-based | 103 | Hpv | Likert scale | With statistical methods | Hesitancy/scepticism/doubt |
| Ben Natan M, 2016 | 2015 | Israel | Cross-sectional | Paper-based | 200 | Flu | Likert scale | With statistical methods | Acceptance |
| Ben Natan M, 2017 | 2016 | Israel | Cross-sectional | Paper-based | 200 | Hpv | Likert scale | With statistical methods | Acceptance |
| Berenson AB, 2014 | 2011-2013 | USA | Cross-sectional | Paper-based | 1,256 | Hpv | Closed | With statistical methods | Acceptance |
| Bettinger JA, 2016 | 2011 | Canada | Cross-sectional | Mail | 34 | Flu | Closed | Not | Acceptance |
| Bham SQ, 2016 | 2015 | Pakistan | Cross-sectional | Paper-based | 210 | Polio | Closed | Not | Acceptance |
| Bianco A, 2014 | 2014 | Italy | Cross-sectional | Paper-based | 566 | Hpv | Likert scale | Not | Acceptance |
| Bigham M, 2006 | 2002-2003 | Canada | Cross-sectional | Telephone | 487 | Hbv | Likert scale | With statistical methods | Hesitancy/scepticism/doubt |

*continued*
Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|------------------------|-------------|-----------------|------------------|------------|-----------------------|
| Alder S, 2015 | 2012         | Argentina | Cross-sectional | Paper-based            | 180         | Hpv             | Closed           | With statistical methods | Acceptance |
| Basu P, 2011  | 2008         | India    | Cross-sectional | Paper-based            | 522         | Hpv             | Closed           | Statistical methods not reported | Acceptance |
| Blair A, 1997 | 1997         | Australia | Cross-sectional | Paper-based            | 245         | Child vaccines  | Open field       | Not        | Acceptance             |
| Blyth CC, 2014 | 2008-2012   | Australia | Cross-sectional | Paper-based            | 2,576       | Dtp/hib/hbv     | Closed           | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Bodson J, 2013 | 2013         | USA      | Cross-sectional | Paper-based            | 119         | Hpv             | Closed           | With statistical methods | Hesitancy/ scepticism/ doubt |
| Bonanni P, 2001 | 2001         | Italy    | Cross-sectional | Paper-based            | 300         | Child vaccines  | Closed           | Not        | Acceptance             |
| Borena W, 2016 | 2015         | Austria  | Cross-sectional | Mail                   | 459         | Hpv             | Closed           | Not        | Hesitancy/ scepticism/ doubt |
| Borras E, 2009 | 2003-2004   | Spain    | Cross-sectional | Telephone              | 630         | Child vaccines  | Closed           | Not        | Hesitancy/ scepticism/ doubt |
| Brabin L, 2006 | 2005         | UK       | Cross-sectional | Mail                   | 317         | Hpv             | Mixed            | With statistical methods | Hesitancy/ scepticism/ doubt |
| Brambleby P, 1998 | 1988       | UK       | Cross-sectional | Mail                   | 977         | Mmr             | Mixed            | Statistical methods not reported | Refusal |
| Breitkopf CR, 2009 | 2007    | Vietnam  | Cross-sectional | Paper-based            | 139         | Hpv             | Closed           | Not        | Hesitancy/ scepticism/ doubt |
| Brieger D, 2017 | N.A.         | Australia | Cross-sectional | Paper-based            | 201         | Mmr             | Mixed            | Not        | Hesitancy/ scepticism/ doubt |
| Brown B, 2017  | 2015-2016    | USA      | Cross-sectional | Paper-based            | 200         | Hpv             | Closed           | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Brown KG, 2011 | 2009         | UK       | Cross-sectional | Mail                   | 535         | Mmr             | Mixed            | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Brunson EK, 2013 | 2010        | USA      | Cross-sectional | On-line                | 196         | Child vaccines  | Mixed            | With statistical methods | Hesitancy/ scepticism/ doubt |
| Buls M, 2011  | 2009-2010    | Netherlands | Cross-sectional | Face to face/mail     | 1900        | Flu             | Open field       | With statistical methods | Refusal |
| Burdette AM, 2014 | 2014        | USA      | Cross-sectional | Telephone              | 20,000      | Hpv             | Closed           | With statistical methods | Refusal |
| Busse JW, 2011 | 2010         | Canada   | Cross-sectional | Paper-based            | 95          | Child vaccines  | Closed           | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Buyuktiryaki B, 2014 | 2010      | Turkey   | Cross-sectional | Paper-based            | 625         | Flu             | Likert scale     | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Cacciato MA, 2016 | 2014-2015   | USA      | Cross-sectional | On-line                | 2,000       | Measles         | Mixed            | Not        | Hesitancy/ scepticism/ doubt |
| Campbell H, 2017 | 2015         | UK       | Cross-sectional | Face to face/mail      | 1,792       | Child vaccines  | Mixed            | Not        | Hesitancy/ scepticism/ doubt |
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Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|------------------------|-------------|-----------------|-------------------|------------|------------------------|
| Carlos RC, 2011 | N.A. | USA | Cross-sectional | Mail | 937 | Hpv | Mixed | Not | Hesitancy/scepticism/doubt |
| Casiday R, 2006 | 2004 | UK | Cross-sectional | Mail | 996 | Mmr | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Cassell JA, 2006 | 2004 | UK | Cross-sectional | Mail | 452 | Mmr | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Cataldi JR, 2016 | 2015 | USA | Cross-sectional | On-line | 343 | Mmr | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Chan JY, 2014 | 2012 | Hong Kong | Cross-sectional | Paper-based | 1,285 | Varicella | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Chaparro RM, 2016 | 2012 | Argentina | Cross-sectional | Paper-based | 77 | Hpv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Chau JPC, 2017 | 2015 | Hong Kong | Cross-sectional | Paper-based | 623 | Flu | Likert scale | With statistical methods | Hesitancy/scepticism/doubt |
| Chen CH, 2013 | 2011 | Taiwan | Cross-sectional | Mail | 1,300 | Flu | Likert scale | With statistical methods | Hesitancy/scepticism/doubt |
| Chen MF, 2011 | 2009 | Taiwan | Cross-sectional | Paper-based | 2,778 | Flu | Mixed | With statistical methods | Hesitancy/scepticism/doubt |
| Cheruvu VK, 2017 | 2017 | USA | Cross-sectional | Telephone | 21,467 | Hpv | Closed | Not | Refusal |
| Chung YM, 2012-2017 | 2012-2014 | USA | Cross-sectional | On-line | 5,121 | Child vaccines | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Cipriano JJ, 2018 | 2016 | USA | Cross-sectional | On-line | 75 | Hpv | Mixed | Not | Acceptance |
| Clark SJ, 2016 | 2012 | USA | Cross-sectional | On-line | 1,799 | Hpv | Mixed | With statistical methods | Acceptance |
| Clark SJ, 2016 | 2012 | USA | Cross-sectional | On-line | 1,799 | Hpv | Mixed | Not | Hesitancy/scepticism/doubt |
| Clark SJ, 2016 | 2013 | USA | Cross-sectional | On-line | 1,799 | Hpv | Mixed | Not | Hesitancy/scepticism/doubt |
| Cockcroft A, 2011 | 2011 | Nigeria | Cross-sectional | Paper-based | 5,257 | Measles | Closed | Not | Acceptance |
| Colon-Lopez V, 2016 | 2013 | Puerto Rico | Cross-sectional | Paper-based | 200 | Hpv | Mixed | Not | Acceptance |
| Colon-Lopez V, 2015 | 2013 | Puerto Rico | Cross-sectional | Paper-based | 200 | Hpv | Mixed | Not | Acceptance |
| Coniglio MA, 2011 | 2008 | Italy | Cross-sectional | Paper-based | 1,500 | Child vaccines | Closed | Not | Hesitancy/scepticism/doubt |
| Constantine NA, 2007 | 2006 | USA | Cross-sectional | Telephone | 802 | Hpv | Mixed | Not | Acceptance |
| Cooper Robbins SC, 2011 | 2007 | Australia | Cross-sectional | Paper-based | 169 | Flu | Mixed | Not | Acceptance |
| Costa-Pinto JC, 2017 | 2014-2015 | Australia | Cross-sectional | On-line | 612 | Child vaccines | Mixed | Not | Acceptance |
| Coyne-Beasley T, 2015 | 2008 | USA | Cross-sectional | Telephone | 1281 | Mcv | Mixed | Not | Acceptance |

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### Tab. I. Main characteristics of the included studies.

| Author, year          | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|-----------------------|--------------|---------|--------------|------------------------|-------------|-----------------|-------------------|------------|------------------------|
| Cuninghame CJ, 1994   | 1991-1992    | UK      | Cross-sectional | Face to face/telephone/mail | 93          | Child vaccines  | Mixed             | Not        | Acceptance              |
| Cunningham-Erves J, 2016 | 2012-2013   | USA     | Cross-sectional | Paper-based            | 242         | Hpv             | Likert scale      | Not        | Acceptance              |
| Dahlstrom LA, 2010    | 2007         | Sweden  | Cross-sectional | Web/paper based        | 13,946      | Hpv             | N.A.              | With statistical methods | Acceptance |
| Daley MF, 2007        | 2005         | USA     | Cross-sectional | Telephone              | 472         | Flu             | Mixed             | Not        | Acceptance              |
| Danchin MH, 2017      | 2015-2016    | Australia | Cross-sectional | Questionnaire (iPad), follow-up phone surveys | 975         | Child vaccines  | Mixed             | Not        | Acceptance              |
| Danis K, 2010         | 2004-2005    | Greece  | Cross-sectional | Paper-based            | 3,434       | Child vaccines  | Mixed             | Not        | Acceptance              |
| Dannetun E, 2007      | 2005         | Sweden  | Cross-sectional | Paper-based and online | 1,229       | Hbv             | Mixed             | Statistical methods not reported | Acceptance |
| Dannetun E, 2005      | 2003         | Sweden  | Cross-sectional | Paper-based            | 173         | Mmr             | Mixed             | Not        | Refusal                 |
| Danoa J, 2015         | 2013-2014    | Repubblica Ceca | Cross-sectional | Paper-based            | 480         | Child vaccines  | Closed            | Not        | Refusal                 |
| Darden PM, 2013       | 2008-2010    | USA     | Cross-sectional | Telephone              | Dtp/mcv/hpv | N.A.            | Not               | Refusal                 |
| Davis K, 2004         | 2005         | USA     | Cross-sectional | Paper-based            | 575         | Hpv             | Mixed             | Not        | Acceptance              |
| Dawar M, 2002         | 1999         | Canada  | Cross-sectional | Telephone              | 191         | Hbv/dtp Hib     | Mixed             | Not        | Acceptance              |
| de Courval FP, 2003   | 2000         | Canada  | Cross-sectional | Telephone              | 663         | Varicella       | Mixed             | Not        | Refusal                 |
| de Visser R, 2008     | 2008         | UK      | Cross-sectional | Paper-based            | 353         | Hpv             | Likert scale      | Not        | Acceptance              |
| Dempsey AF, 2011      | N.A.         | USA     | Cross-sectional | Mail                   | 830         | Hpv             | Mixed             | Not        | Acceptance              |
| Dempsey AF, 2012-2015 | 2012-2015    | USA     | Cross-sectional | On-line                | 54          | Hpv             | Mixed             | Not        | Acceptance              |
| Dempsey AF, 2006      | 2009         | USA     | Cross-sectional | On-line                | 1,178       | Hpv             | Likert scale      | Not        | Acceptance              |
| Diana Kinder F, 2017  | N.A.         | USA     | Cross-sectional | Paper-based            | 72          | Hpv             | Mixed             | Not        | Refusal                 |
| Dinh TA, 2007         | 2005         | Vietnam | Cross-sectional | Paper-based            | 181         | Hpv             | Likert scale      | Statistical methods not reported | Acceptance |
| Dorell C, 2014        | 2010         | USA     | Cross-sectional | Telephone              | 4103        | Hpv             | Closed            | Not        | Hesitancy/ scepticism/ doubt |
| Dorell C, 2015        | 2010-2011    | USA     | Cross-sectional | Telephone              | 8,652       | Hpv/dtp/mcv     | Closed            | Not        | Hesitancy/ scepticism/ doubt |
| Dorell C, 2011        | 2009-2010    | USA     | Cross-sectional | Telephone              | 20,066      | Hpv/mcv/dtp     | Closed            | Not        | Hesitancy/ scepticism/ doubt |
| Dube E, 2012          | 2008-2009    | Canada  | Cohort        | Paper-based            | 413         | Rotavirus       | Mixed             | Not        | Acceptance              |
| Dube E, 2014          | 2014         | Canada  | Cross-sectional | Telephone              | 703         | Menb            | Likert scale      | Statistical methods not reported | Acceptance |
| Dube E, 2015          | 2015         | Canada  | Cross-sectional | On-line                | 20,13       | Child vaccines  | Mixed             | Not        | Acceptance              |
| Dube E, 2017          | 2015         | Canada  | Cross-sectional | Telephone              | 589         | Child vaccines  | Likert scale      | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Dube E, 2016          | 2014         | Canada  | Cross-sectional | Telephone              | 589         | Child vaccines  | Likert scale      | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
Table I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|------------------------|-------------|-----------------|------------------|------------|-----------------------|
| Ezat SW, 2013 | 2012 | Malaysia | Cross-sectional | Not reported | 155 | Hpv | N.A. | Not | Acceptance |
| Ezeanochie MC, 2014 | 2009 | Nigeria | Cross-sectional | Paper-based | 201 | Hpv | Closed | Statistical methods not reported | Acceptance |
| Ezenwa BN, 2013 | 2012 | Nigeria | Cross-sectional | Paper-based | 290 | Hpv | N.A. | Not | Acceptance |
| Farias CC, 2016 | 2015 | Brazil | Cross-sectional | Paper-based | 797 | Hpv | Mixed | Not | Acceptance |
| Flood EM, 2010 | 2009 | USA | Cross-sectional | On-line | 500 | Flu | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Flynn M, 1999-2000 | 1999-2000 | UK | Cohort | Paper-based | 511 | Mmr | Likert scale | Not | Hesitancy/scepticism/doubt |
| Freed GL, 2016 | 2016 | USA | Cross-sectional | On-line | 1,552 | Mmr/varicella/mcv/hpv | N.A. | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Freeman VA, 1999 | 1995 | USA | Cross-sectional | Mail | 247 | Varicella | Closed | Not | Hesitancy/scepticism/doubt |
| Frew PM, 2012-2014 | 2012-2014 | USA | Cross-sectional | On-line | 5,121 | Child vaccines | Closed | Not | Acceptance |
| Frew PM, 2011 | 2009 | USA | Cross-sectional | Not reported | 223 | Flu | Likert scale | Not | Refusal |
| Fry AM, 1999-2000 | 1999-2000 | USA | Case-control | Paper-based | 66 | Hib | Open field | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Fuchs EL, 2011-2013 | 2011-2013 | USA | Cross-sectional | Not reported | 350 | Hpv | Likert scale | Not | Hesitancy/scepticism/doubt |
| Garcia DA, 2014 | 2000 | Colombia | Cross-sectional | Paper-based | 4,802 | Child vaccines | Mixed | Not | Hesitancy/scepticism/doubt |
| Gargano LM, 2011 | 2011 | USA | Cross-sectional | Telephone | 114 | Flu/dtp/mcv/hpv | Closed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gaudino JA, 2012 | 2004-2005 | USA | Cross-sectional | On-line | 1,588 | Child vaccines | Likert scale | Not | Hesitancy/scepticism/doubt |
| Gefenaiete G, 2012 | 2009 | Netherlands | Case-control | Mail | 469 | Hpv | Closed | Not | Hesitancy/scepticism/doubt |
| Gellaty J, 2005-2004 | 2005-2004 | UK | Cross-sectional | Paper-based | 110 | Mmr | Likert scale | Not | Hesitancy/scepticism/doubt |
| Gellin BC, 2000 | 1999 | USA | Cross-sectional | Telephone | 1,600 | Child vaccines | Likert scale | Not | Acceptance |
| Gentile A, 2015 | 2013 | Argentina | Cross-sectional | Not reported | 1,350 | Flu | Likert scale | Not | Hesitancy/scepticism/doubt |
| Gerend MA, 2009 | 2008 | USA | Cross-sectional | Paper-based | 82 | Hpv | Closed | Not | Acceptance |
| Gesser-Edelsburg A, 2016 | 2013 | Israel | Cross-sectional | On-line | 197 | Polio | Open field | Not | Refusal |
| Giambli C, 2014 | 2012 | Italy | Cross-sectional | Mail | 1,758 | Hpv | Mixed | Not | Refusal |
| Gilbert NL, 2016 | 2013 | Canada | Cross-sectional | Telephone | 5,720 | Hpv | Likert scale | Not | Hesitancy/scepticism/doubt |

Continues
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Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|-------------------------|-------------|-----------------|------------------|------------|------------------------|
| Gilkey MB, 2017 | 2014-2015 | USA | Cross-sectional | On-line | 1,484 | Hpv | Closed | Not | Hesitancy/scepticism/doubt |
| Glanz JM, 2013 | 2009-2011 | USA | Cross-sectional | Mail | 854 | Child vaccines | Closed | Not | Hesitancy/scepticism/doubt |
| Glenn BA, 2015 | 2009 | USA | Cross-sectional | Telephone | 444 | Hpv | Closed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gomez Y, 2012 | 2009-2011 | USA | Cross-sectional | Paper-based | 773 | Flu | N.A. | Not | Hesitancy/scepticism/doubt |
| Gottlieb SL, 2009 | 2007 | USA | Cross-sectional | Telephone | 889 | Hpv | Mixed | Not | Hesitancy/scepticism/doubt |
| Gowda C, 2013 | 2009-2010 | USA | Cross-sectional | On-line | 79 | Mmr | Likert scale | Statistical methods not reported | Refusal |
| Grabiel M, 2012 | 2012 | Sweden | Cross-sectional | Face to face | 25 | Hpv | Open field | Statistical methods not reported | Acceptance |
| Grandahl M, 2014 | 2012 | Canada | Cross-sectional | On-line | 1,121 | Mmr | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Grandahl M, 2017 | 2012 | Turkey | Cross-sectional | Paper-based | 285 | Flu | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Greenberg J, 2015 | 2012 | USA | Cross-sectional | Face to face | 157 | Dtp/mcv/hpv | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Greenfield LS, 2015 | 2010 | USA | Cross-sectional | Paper-based | 102 | Hpv | Likert scale | Statistical methods not reported | Acceptance |
| Griebeler M, 2012 | 2007-2008 | USA | Cross-sectional | Telephone | 509 | Hpv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Guerry SL, 2011 | 2009-2010 | USA | Cross-sectional | Paper-based and online | 300 | Varicella | Likert scale | Statistical methods | Acceptance |
| Gundogdu Z, 2014 | 2011-2012 | USA | Cross-sectional | Paper-based | 285 | Flu | Mixed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gunduz S, 2013 | 2009-2010 | USA | Cross-sectional | Paper-based | 381 | Flu | Closed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gupta R, 2005 | 2002 | USA | Cross-sectional | Mail | 697 | Child vaccines | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gust DA, 2006 | 2003-2005 | USA | Cross-sectional | Mail | 1,477 | Mmr/dtp/hbv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gust DA, 2008 | 2003-2004 | USA | Cross-sectional | Mail | 642 | Child vaccines | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gust DA, 2005 | 2001 | USA | Case-control | Mail | 1,477 | Mmr/dtp/hbv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Gust DA, 2004 | 2001 | USA | Case-control | Mail | 1,477 | Mmr/dtp/hbv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|-------------|--------------|---------|--------------|------------------------|-------------|-----------------|------------------|------------|-----------------------|
| Gust DA, 2003 | 2002 | USA | Cross-sectional | Mail | 1,768 | Child vaccines | Likert scale | Statistical methods not reported | Acceptance |
| Gustafson R, 2005 | 2003 | Canada | Cross-sectional | Telephone | 1,246 | Varicella | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Haezebaert J, 2012 | 2008 | France | Cross-sectional | Face to face | 32 | Hpv | Open field | Statistical methods not reported | Acceptance |
| Hagan D, 2013 | 2013 | Ghana | Cross-sectional | Paper-based | 303 | Child vaccines | Closed | Statistical methods not reported | Acceptance |
| Hagemann C, 2017 | 2009-2011 | Germany | Cross-sectional | Paper-based | 1,998 | Varicella/measles | N.A. | With statistical methods | Hesitancy/scepticism/doubt |
| Hak E, 2005 | N.A. | Netherland | Cross-sectional | Not reported | 283 | Influenza/hbv/bcg | Likert scale | Not | Refusal |
| Hamama-Raz Y, 2014 | 2014 | Israel | Cross-sectional | On-line | 314 | Child vaccines | Likert scale | Not | Acceptance |
| Han K, Zheng H, 2014 | 2010 | China | Cross-sectional | Face to face | 1,550 | Bcg/dtp/polio/mcv/hbv | Closed | With statistical methods | Hesitancy/scepticism/doubt |
| Hanley SJ, 2012 | 2010 | Japan | Cross-sectional | Paper-based | 862 | Hpv | Likert scale | Not | Acceptance |
| Hanley SJ, 2014 | 2010 | Japan | Cross-sectional | Paper-based | 54 | Hpv | Likert scale | Not | Acceptance |
| Harmsen IA, 2012 | 2011 | Netherlands | Cross-sectional | Paper-based | 906 | Hbv | Likert scale | Not | Acceptance |
| He L, 2015 | 2013 | China | Cross-sectional | Face to face | 298 | Flu | Open field | Not | Hesitancy/scepticism/doubt |
| Healy CM, 2014 | N.A. | USA | Cross-sectional | Not reported | 401 | Hib/pcv/mcv/flu/hbv/hav/hpv/rotavirus | Closed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Henrikson NB, 2017 | 2013-2015 | USA | Cohort | Telephone | 257 | Child vaccines | Closed | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Hertweck SP, 2013 | N.A. | USA | Cross-sectional | On-line | 68 | Hpv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Hillyard KM, 2014 | 2010 | USA | Cross-sectional | Not reported | 684 | Flu | Closed | Not | Hesitancy/scepticism/doubt |
| Hofman R, 2014 | 2009-2011 | Netherlands | Cohort | Mail | 793 | Hpv | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Hofstetter AM, 2015 | 2011 | USA | Cross-sectional | Face to face | 128 | Flu | Closed | With statistical methods | Hesitancy/scepticism/doubt |
| Hon KL, 2016 | N.A. | Hong Kong | Cross-sectional | Paper-based | 3,479 | Flu | N.A. | Not | Hesitancy/scepticism/doubt |
| Hontelez JA, 2010 | N.A. | Netherland | Cross-sectional | Paper-based | 198 | Hbv | Likert scale | Not | Hesitancy/scepticism/doubt |
| Horn L, 2010 | 2008 | USA | Cross-sectional | Paper-based | 325 | Hpv | Likert scale | With statistical methods | Acceptance |
Follows

Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country     | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|-------------|--------------|------------------------|-------------|-----------------|-------------------|------------|-----------------------|
| How CH, 2016 | 2014         | Singapore   | Cross-sectional | Face to face         | 200         | Pcv             | Likert scale      | Not        | Hesitancy/ scepticism/ doubt |
| Hu Y, 2017   | 2014         | China       | Cross-sectional | Face to face         | 2,772       | Child vaccines  | N.A.               | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Hwang JH, 2017 | 2014        | South Korea | Cross-sectional | Face to face         | 638         | Flu             | Closed             | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Ilter E, 2010 | 2009         | Turkey      | Cross-sectional | Face to face         | 525         | Hpv             | Likert scale      | Not        | Hesitancy/ scepticism/ doubt |
| Imburgia TM, 2017 | 2014   | USA         | Cross-sectional | On-line              | 2,363       | Flu             | Likert scale      | Not        | Hesitancy/ scepticism/ doubt |
| Impicciatore P, 2000 | 1997  | Italy       | Cross-sectional | Face to face         | 1,035       | Mmr             | Closed             | With statistical methods | Acceptance |
| Jani JV, 2008 | 2001         | Mozambique  | Cross-sectional | Face to face         | 668         | Child vaccines  | N.A.               | Statistical methods not reported | Acceptance |
| Jaspers L, 2009 | 2009        | Indonesia   | Cross-sectional | Face to face         | 746         | Hpv             | Closed             | Not        | Acceptance |
| Jessop LJ, 2010 | 2001-2004   | UK          | Cohort         | Paper-based          | 749         | Mmr             | Closed             | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Jolley D, 2014 | 2012         | UK          | Cross-sectional | On-line              | 89          | Child vaccines  | Likert scale      | Statistical methods not reported | N.A. |
| Joseph NP, 2012 | 2008-2009   | USA         | Cross-sectional | Face to face         | 70          | Hpv             | Open field         | With statistical methods | Hesitancy/ scepticism/ doubt |
| Joseph NP, 2015 | N.A.        | USA         | Cross-sectional | Paper-based          | 55          | Hpv             | Closed             | With statistical methods | N.A. |
| Jung M, 2013  | N.A.         |             | Cross-sectional | On-line              | 639         | Flu             | N.A.               | Not        | Hesitancy/ scepticism/ doubt |
| Kadis JA, 2011 | 2009        | USA         | Cross-sectional | On-line              | 496         | Hpv             | Closed             | Statistical methods not reported | Acceptance |
| Kahn JA, 2009 | 2006-2007   | USA         | Cross-sectional | Paper-based          | 7,207       | Hpv             | Likert scale      | With statistical methods | Hesitancy/ scepticism/ doubt |
| Kalucka SK, 2016 | N.A.       | Poland      | Cross-sectional | Paper-based          | 140         | Child vaccines  | Closed             | Statistical methods not reported | Hesitancy/ scepticism/ doubt |
| Katz ML, 2012  | 2009        | USA         | Cross-sectional | Paper-based          | 111         | Hpv             | Likert scale      | Not        | Hesitancy/ scepticism/ doubt |
| Haesebaert J, 2014 | 2008   | France      | Cross-sectional | Paper-based          | 99          | Hpv             | Open field         | With statistical methods | Hesitancy/ scepticism/ doubt |
| Kaya A, 2017  | 2016        | Turkey      | Cross-sectional | Paper-based          | 102         | Flu             | Mixed              | Not        | Acceptance |
| Kelley CA, 2015 | N.A.        |             | Case-control    | Paper-based          | 229         | Child vaccines  | Mixed              | Statistical methods not reported | Refusal |
| Kempe A, 2007  | 2003        | USA         | Cross-sectional | Telephone            | 472         | Flu             | Mixed              | Statistical methods not reported | Hesitancy/ scepticism/ doubt |

continues
Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country     | Study design   | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour   |
|--------------|--------------|-------------|----------------|------------------------|-------------|-----------------|------------------|------------|-------------------------|
| Kennedy A, 2011 | 2009 USA | Cross-sectional | Mail          | 475 Child vaccines     | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Kennedy A, 2011 | 2010 USA | Cross-sectional | Mail          | 376 Child vaccines     | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Kennedy AM, 2005 | 2002 USA | Cross-sectional | Mail          | 1527 Child vaccines    | Likert scale | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Kepka D, 2015   | 2013 USA   | Cross-sectional | Paper-based   | 118 Hpv Closed         | Not          | Acceptance        |                   |
| Kepka D, 2015   | 2013 USA   | Cross-sectional | Paper-based   | 67 Hpv Mixed           | Not          | Acceptance        |                   |
| Kepka DL, 2012  | 2009 USA   | Cross-sectional | Paper-based   | 578 Hpv Closed         | Not          | Acceptance        |                   |
| Kester LM, 2013 | 2010 USA   | Cross-sectional | On-line       | 501 Hpv Mixed          | Not          | Acceptance        |                   |
| Kettunen C, 2017 | N.A. USA | Cross-sectional | Mail          | 84 Child vaccines Mixed | Statistical methods not reported | Acceptance |
| Kim KM, 2017    | 2014-2015 South Korea | Cross-sectional | Paper-based | 200 Hpv Mixed         | Not          | Acceptance        |                   |
| Kinder FD, 2016 | N.A. USA   | Cross-sectional | Paper-based   | 72 Hpv Mixed           | Not          | Acceptance        |                   |
| Ko HS, 2015     | N.A. South Korea | Cross-sectional | Paper-based   | 308 Dtp Closed         | Not          | Acceptance        |                   |
| Kong KA, 2014   | 2013 South Korea | Cross-sectional | Telephone   | 800 Hav Mixed          | Statistical methods not reported | Acceptance |
| Krawczyk A, 2015 | 2010 Canada | Cross-sectional | Mail          | 774 Hpv Likert scale   | Not          | Hesitancy/scepticism/doubt |
| Krawczyk A, 2015 | 2010 Canada | Cross-sectional | Mail          | 708 Hpv Open field     | Not          | Refusal           |                   |
| Krieger JL, 2011 | N.A. USA   | Cross-sectional | Paper-based   | 182 Hpv Closed         | Not          | Acceptance        |                   |
| Lavall KH, 2013 | 2010 USA   | Case-control   | Mail          | 376 Child vaccines     | Likert scale | Not          | Acceptance        |
| Le Ngoc Tho S, 2015 | 2013 France | Cross-sectional | Paper-based   | 1,270 Menb Mixed       | With statistical methods | Acceptance |
| Lechuga J, 2012 | N.A. USA   | Cross-sectional | Paper-based   | 150 Hpv Open field     | Not          | Acceptance        |                   |
| Lee KN, 2017    | 2015-2016 South Korea | Cross-sectional | Paper-based | 140 Hpv Mixed         | Not          | Acceptance        |                   |
| Lee Mortensen G, 2015 | Multinational | Cross-sectional | Paper-based | 1,837 Hpv Closed       | Not          | Acceptance        |                   |
| Lehmann BA, 2017 | 2015 Netherlands | Cross-sectional | Paper-based | 1,615 Child vaccines   | Mixed        | Not          | Acceptance        |
| Lewis T, 1988   | 1988 USA   | Cohort        | Mail          | 2,029 Dtp N.A.         | Not          | N.A              |                   |
| Liao Q, 2016    | 2012-2013 Hong Kong | Cross-sectional | Telephone   | 1,226 Flu Mixed        | Not          | Acceptance        |                   |
| Lin CJ, 2006    | 2005-2004 USA | Cross-sectional | Paper-based | 951 Flu Mixed          | Not          | Acceptance        |                   |
| Linam WM, 2014  | 2010-2011 USA | Cross-sectional | Paper-based | 372 Flu Mixed          | Not          | Acceptance        |                   |
| Lindley MC, 2016 | 2013 USA   | Cross-sectional | Mail          | 6,676 Hpv Mixed        | Not          | Acceptance        |                   |

continues
## Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country     | Study design       | Administration channel | Sample size | Type of vaccine | Type of questions | Validation               | Immunization behaviour |
|-------------|--------------|-------------|--------------------|------------------------|-------------|-----------------|---------------------|-------------------------|------------------------|
| Livni G, 2017 | 2012         | Israel      | Cross-sectional    | Paper-based            | 186         | Flu             | Mixed               | Statistical methods not reported | Acceptance             |
| Loke AY, 2017 | 2010         | Hong Kong   | Cross-sectional    | Paper-based            | 170         | Hpv             | Mixed               | Not                      | Hesitancy/scepticism/doubt |
| Low MSF, 2017 | 2015-2016    | Singapore   | Cross-sectional    | On-line                | 332         | Flu             | Mixed               | Statistical methods not reported | Acceptance             |
| Luthy KE, 2017 | 2017         | USA         | Cross-sectional    | Paper-based            | 86          | Child vaccines  | Mixed               | Not                      | Hesitancy/scepticism/doubt |
| Luthy KE, 2013 | N.A.         | USA         | Cross-sectional    | Paper-based            | 801         | Child vaccines  | Mixed               | Not                      | Hesitancy/scepticism/doubt |
| Luthy KE, 2009 | N.A.         | USA         | Cross-sectional    | Paper-based            | 86          | Child vaccines  | Closed              | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Maayan-Metzger A, 2005 | 2003       | Israel      | Case-control       | Paper-based            | 204         | Hbv             | Closed              | Not                      | Hesitancy/scepticism/doubt |
| MacDonald SE, 2014 | 2013       | Canada      | Case-control       | Mail                   | 444         | Child vaccines  | Closed              | Not                      | Hesitancy/scepticism/doubt |
| MacDougall DM, 2016 | 2010-2012  | Canada      | Case-control       | Paper-based            | 722         | Rotavirus       | Mixed               | Statistical methods not reported | Acceptance             |
| Madhivanan P, 2014 | 2010       | India       | Cross-sectional    | Mail                   | 797         | Hpv             | Likert scale        | Not                      | Acceptance             |
| Marneli C, 2014 | 2013        | Italy       | Cross-sectional    | Paper-based            | 1,842       | Menb            | Closed              | Not                      | Hesitancy/scepticism/doubt |
| Marlow LA, 2007 | 2006        | UK          | Cross-sectional    | Paper-based            | 684         | Hpv             | Mixed               | Not                      | Acceptance             |
| Marlow LA, 2007 | 2006        | UK          | Cross-sectional    | Paper-based            | 684         | Hpv             | Likert scale        | With statistical methods   | Acceptance             |
| Marshall H, 2014 | 2012        | Australia   | Cross-sectional    | Paper-based            | 966         | Menb            | N.A.                | With statistical methods   | Acceptance             |
| Marshall H, 2007 | 2006        | Australia   | Cross-sectional    | Telephone              | 2,002       | Hpv             | Closed              | With statistical methods   | Acceptance             |
| Mayet AY, 2017 | 2013        | Saudi Arabia| Cross-sectional    | Paper-based            | 998         | Flu             | Mixed               | Not                      | Hesitancy/scepticism/doubt |
| McCauley MM, 2012 | 2010        | USA         | Cross-sectional    | Telephone              | 690         | Child vaccines  | Likert scale        | Statistical methods not reported | N.A.                  |
| Mchale P, 2016 | 2012-2013   | UK          | Cross-sectional    | Telephone              | 47          | Mmr             | Open field          | Statistical methods not reported | N.A.                  |
| Melman ST, 1999 | 1995-1997   | USA         | Cross-sectional    | Paper-based            | 1,059       | Child vaccines  | Open field          | Not                      | N.A.                  |
| Meszaros JR, 1966 | N.A.      | USA         | Cross-sectional    | Paper-based            | 294         | Pertussis       | Mixed               | Not                      | N.A.                  |
| Michael CA, 2014 | 2012        | Nigeria     | Cross-sectional    | Paper-based            | 48          | Polio           | Open field          | Not                      | N.A.                  |
| Michael CE, 2009 | 2009        | Nigeria     | Cross-sectional    | Paper-based            | 201         | Hpv             | Closed              | Not                      | Acceptance             |

continues
Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|-------------------------|-------------|-----------------|-------------------|------------|------------------------|
| Middleman AB, 2002 | 2000 | USA | Cross-sectional | Paper-based | 563 | Hbv | Closed | Not | Hesitancy/ scepticism/ doubt |
| Mitteer RM, 1996 | 1991-1994 | USA | Cross-sectional | Paper-based | 175 | Child vaccines | Open field | Not | N.A. |
| Morales-Campos DY, 2017 | 2011-2013 | Cameroon | Cross-sectional | Paper-based | 517 | Hpv | Mixed | Not | Hesitancy/ scepticism/ doubt |
| Morhason-Bello IO, 2015 | 2012 | Nigeria | Cross-sectional | Paper-based | 1,002 | Hpv | Likert scale | With statistical methods | Acceptance |
| Morrone T, 2017 | 2015 | Italy | Cross-sectional | Paper-based | 543 | Menb | N.A. | With statistical methods | N.A. |
| Mouldsdaile P, 2017 | 2014 | UK | Cross-sectional | Paper-based | 86 | Flu | Likert scale | Not | Acceptance |
| Muthezi WW, 2014 | 2012 | Uganda | Cross-sectional | Paper-based | 870 | Hpv | Closed | With statistical methods | Acceptance |
| Murakami H, 2014 | 2007 | Pakistan | Cross-sectional | Paper-based | 630 | Polio | Open field | Not | Refusal |
| My C, 2017 | 2012 | Australia | Cross-sectional | On-line | 452 | Flu | Closed | Not | Hesitancy/ scepticism/ doubt |
| Naeem M, 2011 | 2010 | Pakistan | Cross-sectional | Paper-based | 548 | Polio | Closed | Not | Hesitancy/ scepticism/ doubt |
| Naeem M, 2011 | 2010 | Pakistan | Cross-sectional | Paper-based | 506 | Hbv | Closed | Not | Hesitancy/ scepticism/ doubt |
| Namuigi P, 2005 | 2003 | Papua New Guinea | Cross-sectional | Paper-based | 120 | Measles | Closed | Not | Hesitancy/ scepticism/ doubt |
| Niederhauser VP, 2007 | 2003-2004 | USA | Cross-sectional | Paper-based | 64 | Child vaccines | Open field | Not | Hesitancy/ scepticism/ doubt |
| Oladokun RE, 2010 | 2009 | Nigeria | Cross-sectional | Paper-based | 248 | Bcg/ polio/ dtp/ measles/ hbv | Closed | Statistical methods not reported | Acceptance |
| Onnela JP, 2016 | 2012 | India | Cohort | Paper-based | 2,462 | Polio | Closed | Statistical methods not reported | Acceptance |
| Oria PA, 2013 | 2010 | Kenya | Cross-sectional | Paper-based | 7,177 | Flu | Mixed | Not | N.A. |
| Ozaawa S, 2013 | 2013 | Nigeria | Cross-sectional | Paper-based | 198 | Dtp/ measles/ polio | Closed | Statistical methods not reported | N.A. |
| Paek HJ, 2015 | 2014 | South Korea | Cross-sectional | Paper-based | 1,017 | Child vaccines | Mixed | Not | N.A. |
| Painter JE, 2011 | 2009 | USA | Cross-sectional | Paper-based | 102 | Flu | Mixed | Not | N.A. |
| Parrella A, 2015 | 2011 | Australia | Cross-sectional | Telephone | 469 | Child vaccines | Likert scale | Not | N.A. |
| Parrella A, 2012 | 2010 | New Zeland | Cross-sectional | Telephone | 179 | Dtp/ polio/ hib/ rotavirus/ mmr/ polio/ pcv/ flu | Closed | Statistical methods not reported | N.A. |
| Paulussen TC, 2006 | 1999 | Netherlands | Cross-sectional | On-line | 491 | Dtp/ polio/ hib/ mmr | Closed | Not | N.A. |

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Table I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|------------------------|-------------|-----------------|------------------|------------|------------------------|
| Peleg N, 2015 | 2011         | Israel  | Cross-sectional | Paper-based        | 273         | Flu             | Closed           | Statistical methods not reported | N.A. |
| Pelucchi C, 2010 | 2008         | Italy   | Cross-sectional | Paper-based        | 3,026       | Hpv             | N.A.             | Not        | N.A. |
| Perez S, 2016 | N.A.         | Canada  | Cross-sectional | On-line            | 2,272       | Hpv             | Closed           | Statistical methods not reported | N.A. |
| Perez S, 2017 | 2014         | Canada  | Cross-sectional | On-line            | 2,272       | Hpv             | Closed           | With statistical methods          | N.A. |
| Perez S, 2016 | 2014         | Canada  | Cross-sectional | On-line            | 2,272       | Hpv             | Closed           | Statistical methods not reported | N.A. |
| Perez S, 2016 | 2014         | Canada  | Cross-sectional | On-line            | 2,272       | Hpv             | Closed           | Statistical methods not reported | N.A. |
| Podolsky R, 2009 | N.A.      | USA     | Cross-sectional | Paper-based        | 308         | Hpv             | Mixed            | Statistical methods not reported | N.A. |
| Pot M, 2017    | 2015-2016    | Netherlands | Cross-sectional | On-line            | 8,062       | Hpv             | Closed           | Not        | N.A. |
| Reiter PL, 2013 | 2008-2010   | USA     | Cross-sectional | Mail               | 1,951       | Hpv             | Mixed            | Statistical methods not reported | N.A. |
| Restivo V, 2015 | 2012-2013   | Italy   | Cross-sectional | Telephone          | 443         | Mmr             | Closed           | Not        | N.A. |
| Roberts JR, 2015 | 2011-2012  | USA     | Cross-sectional | Paper-based        | 363         | Dtp/mcv/hpv     | Closed           | Statistical methods not reported | N.A. |
| Robitz R, 2011 | 2007-2008   | USA     | Cross-sectional | Telephone          | 484         | Hpv             | Closed           | Statistical methods not reported | N.A. |
| Rogers C, 2014 | N.A.        | USA     | Cross-sectional | On-line            | 51          | Child vaccines  | Closed           | Not        | N.A. |
| Ruffin MT, 2012 | 2006-2008   | USA     | Case-control    | Telephone          | 1,131       | Hpv             | Closed           | Not        | N.A. |
| Salmon DA, 2005 | 2002-2003   | USA     | Case-control    | Mail               | 1,367       | Polio/mmr/dtp/hib/hbv | Closed | Not        | N.A. |
| Salmon DA, 2009 | N.A.        | USA     | Case-control    | Mail               | 963         | Child vaccines  | Closed           | Not        | N.A. |
| Sam IC, 2009   | 2007        | Malaysia| Cross-sectional | Paper-based        | 362         | Hpv             | Mixed            | Not        | N.A. |
| Sampson R, 2011 | 2008        | UK      | Cross-sectional | I part mail, ii part interview | 7          | Flu             | Closed           | Not        | N.A. |
| Rickert VI, 2015 | 2012-2013   | USA     | Cross-sectional | On-line            | 501         | Child vaccines/flu/pcv/mmr/varicella/dtp/hav/hpv/mcv | Closed | Not        | N.A. |
| Rose SB, 2012  | 2008-2009   | New Zeland | Cross-sectional | Paper-based        | 769         | Hpv             | Closed           | Not        | N.A. |
| Santibanez TA, 2016 | 2011-2012 | USA     | Cross-sectional | Telephone          | 19,178      | Flu             | Closed           | Not        | Hesitancy/scepticism/doubt |

continues
## Table I. Main characteristics of the included studies.

| Author, year | Study period | Country     | Study design      | Administration channel | Sample size | Type of vaccine | Type of questions | Validation   | Immunization behaviour |
|--------------|--------------|-------------|-------------------|------------------------|-------------|-----------------|-------------------|-------------|------------------------|
| Sager A, 2017 | 2017         | Emirati Arabi | Cross-sectional   | Paper-based            | 400         | Hpv             | Closed            | With statistical methods | Hesitancy/scepticism/doubt |
| Schollin Ask L, 2014 | Sweden         | Cross-sectional   | On-line            | 1,063                  |             | Rotavirus        | Closed            | With statistical methods | Hesitancy/scepticism/doubt |
| Schwarz NG, 2009 | Gabon         | Cross-sectional   | Paper-based        | 40                     | Child vaccines | Closed | Statistical methods not reported | Acceptance |
| Selmouni F, 2015 | Morocco       | Cross-sectional   | Paper-based        | 1,312                  | Hpv         | Open field      | Not               | Acceptance |
| Sengupta B, 1998 | India         | Cross-sectional   | Paper-based        | 656                    | Polio       | Mixed           | Not               | Hesitancy/scepticism/doubt |
| Seven M, 2015 | Turkey        | Cross-sectional   | Paper-based        | 568                    | Hpv         | Closed          | Not               | N.A.         |
| Shao SJ, 2014 | Caraibi       | Cross-sectional   | Paper-based        | 35                     | Hpv         | Closed          | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Shapiro GK, 2016 | Canada        | Cross-sectional   | On-line            | 1,427                  | Hpv         | Mixed           | Not               | Hesitancy/scepticism/doubt |
| Shapiro GK, 2017 | Canada        | Cross-sectional   | On-line            | 4,606                  | Hpv         | Open field      | Statistical methods not reported | Acceptance |
| Shawn DH, 1986 | Canada        | Cross-sectional   | Paper-based        | 133                    | Hib         | Closed          | Statistical methods not reported | Hesitancy/scepticism/doubt |
| Sheikh A, 2013 | Pakistan      | Cross-sectional   | Paper-based        | 1,044                  | Polio/tetanus/measles | Closed | Not               | Hesitancy/scepticism/doubt |
| Shualb FM, 2008 | Jamaica       | Case-control      | Paper-based        | 285                    | Child vaccines | Closed | Not               | Hesitancy/scepticism/doubt |
| Skinner J, 1995 | Australia     | Cohort            | Mail               | 1,004                  | Child vaccines | Mixed | Statistical methods not reported | Acceptance |
| Smallbegovic MS, 2003 | UK           | Case-control      | On-line            | 129                    | Child vaccines | Closed | Not               | Hesitancy/scepticism/doubt |
| Smith MJ, 2009 | USA           | Cross-sectional   | On-line            | 121                    | Child vaccines | Mixed | Not               | Hesitancy/scepticism/doubt |
| Smith PJ, 2011 | USA           | Cross-sectional   | Telephone          | 11,206                 | Child vaccines | Closed | Not               | Hesitancy/scepticism/doubt |
| Smith PJ, 2003 | USA           | Cross-sectional   | Telephone          | 2,921                  | Child vaccines | Closed | Not               | Hesitancy/scepticism/doubt |
| Smith PJ, 2006 | USA           | Cross-sectional   | Telephone          | 7,695                  | Child vaccines | Closed | Not               | Hesitancy/scepticism/doubt |
| Smith PJ, 2015 | USA           | Cross-sectional   | Telephone          | 19,144                 | Measles      | Closed | Not               | Hesitancy/scepticism/doubt |
| Smith PJ, 2010-2014 | USA       | Cross-sectional   | Telephone          | 8,490                  | Hpv         | Closed          | Not               | Hesitancy/scepticism/doubt |
| Sohail MM, 2015 | N.A.          | Pakistan          | Cross-sectional   | 200                    | Child vaccines | Mixed | Not               | Acceptance |

*continues*
Tab. I. Main characteristics of the included studies.

| Author, year                  | Study period | Country          | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|-------------------------------|--------------|------------------|--------------|------------------------|-------------|-----------------|-------------------|------------|------------------------|
| Songthap A, 2012              | 2012         | Thailandia       | Cross-sectional | Paper-based            | 664         | Hpv             | Closed            | Not        | Hesitancy/ scepticism/ doubt |
| Soyer OU, 2011                | 2003         | USA              | Cross-sectional | Telephone              | 500         | Flu             | Mixed             | Not        | Acceptance              |
| Staras SA, 2014               | 2009         | USA              | Cross-sectional | Telephone              | 2,422       | Hpv             | Closed            | Not        | Acceptance              |
| Steelfisher GK, 2015          | 2013-2014    | Multinational    | Cross-sectional | Paper-based            | 6,025       | Polio           | Closed            | Not        | Acceptance              |
| Stefanoff P, 2010             | 2008-2009    | Multinational    | Cross-sectional | Telephone, paper-based, mail | 6,611       | Child vaccines  | Mixed             | Not        | Acceptance              |
| Stein Zamir C, 2017           | 2015         | Israel           | Cross-sectional | Paper-based            | 45          | Child vaccines  | Closed            | Not        | Acceptance              |
| Stephenson JD, 1987           | 1986         | Canada           | Cross-sectional | Paper-based            | 133         | Hib             | Closed            | Not        | Hesitancy/ scepticism/ doubt |
| Stockwell MS, 2014            | 2007-2008    | USA              | Cross-sectional | Paper-based            | 705         | Child vaccines  | Mixed             | Not        | Acceptance              |
| Streititz B, 2015             | 2013-2014    | USA              | Cross-sectional | Paper-based            | 152         | Flu             | Likert scale      | Statistical methods not reported | Acceptance |
| Stretch R, 2007-2008          | 2007-2008    | UK               | Cross-sectional | Paper-based            | 651         | Hpv             | Likert scale      | Statistical methods not reported | Acceptance |
| Suarez-Castaneda E, 2014      | 2011         | El Salvador      | Cross-sectional | Paper-based            | 2,550       | Child vaccines  | Mixed             | Not        | Acceptance              |
| Sundaram SS, 2010             | N.A.         | UK               | Cross-sectional | Paper-based            | 50          | Hpv             | Likert scale      | Statistical methods not reported | Acceptance |
| Tadesse H, 2009               | 2008         | Ethiopia         | Case-control    | Paper-based            | 266         | Child vaccines  | Mixed             | Statistical methods not reported | Acceptance |
| Tagbo BN, 2014                | 2014         | Nigeria          | Cross-sectional | Paper-based            | 426         | Polio           | Likert scale      | With statistical methods | Acceptance |
| Taiwo L, 2017                 | 2015         | Nigeria          | Cross-sectional | Paper-based            | 379         | Child vaccines  | Mixed             | Not        | Hesitancy/ scepticism/ doubt |
| Takahashi K, 2014             | 1999-2003    | Japan            | Cross-sectional | Paper-based            | 120         | Measles         | Mixed             | Not        | Refusal                 |
| Tam WW, 2015                  | 2003         | Hong Kong        | Cross-sectional | Paper-based            | 5,617       | Varicella       | Likert scale      | Not        | Acceptance              |
| Tan TNQ, 2017                 | 2011-2013    | USA              | Cross-sectional | Paper-based            | 516         | Hpv             | Mixed             | Not        | Acceptance              |
| Tang CW, 2011                 | 2006-2008    | Taiwan           | Cross-sectional | Paper-based            | 539         | Child vaccines  | Mixed             | Statistical methods not reported | Acceptance |
| Taylor JA, 1996               | 1993         | USA              | Case-control    | Paper-based            | 194         | Child vaccines  | Likert scale      | Statistical methods not reported | Acceptance |
| Taylor JA, 2002               | 1998-2000    | USA              | Cross-sectional | Paper-based            | 13,520      | Child vaccines  | Mixed             | Not        | Acceptance              |
| Thomas T, 2015                | N.A.         | Georgia          | Cross-sectional | Paper-based            | 37          | Hpv             | Mixed             | Not        | Hesitancy/ scepticism/ doubt |
| Thomas TL, 2012               | 2010-2011    | USA              | Cross-sectional | Paper-based            | 400         | Hpv             | Mixed             | Not        | Hesitancy/ scepticism/ doubt |
| Thomas TL, 2013               | 2009         | USA              | Cross-sectional | Paper-based            | 200         | Hpv             | Likert scale      | Statistical methods not reported | N.A. |
Salvator, Puerto Rico and USA). 14.4% of the studies (n = 48/334) investigated the Asian population (Hong Kong, China, India, Indonesia, Israel, Japan, South Korea, Kyrgyzstan, Malaysia, Pakistan, Saudi Arabia, United Arab Emirates, Singapore, Taiwan, Thailand and Turkey), 12.8% (n = 26/334) the studies were about European people (Italy, Sweden, United Kingdom, Spain, Greece, France, Germany and the Netherlands), and 11.7% (n = 24/334) of the studies the population was from African and Oceanic countries (Cameroon, Ghana, Kenya, Gabon, Nigeria, Uganda, Morocco, Australia and New Zealand). Only 1.9% of the studies (n = 5/334) were carried out in multiple countries and were therefore classified as multinational surveys. Almost all of the examined studies, 92.8% (n = 310/334), are cross-sectional; 4.8% (n = 16/334) are case-control studies and finally 2.4% (n = 8/334) are cohort studies. Even though all the studies included in our review aimed at investigating the phenomenon of vaccine hesitancy, each of them focused on specific aspects of this behaviour. In this respect, the main purpose in 30.8% (n = 103/334) of the studies was to investigate parental knowledge, attitudes, practices, beliefs, awareness, concerns and sources of information about childhood vaccinations. In 21.6% (n = 72/334) of the studies the main objective was focused on investigating parents’ attitudes towards childhood vaccinations and exploring possible influential or determining factors. 18.6% (n = 62/334) and 15.0% (n = 50/334) of the studies were aimed respectively at identifying the factors associated with the parental decision to vaccinate and at examining the potential reasons for refusing immunization of their children. In 4.5% (n = 15/334) of the cases, a broad assessment of the vaccine hesitancy phenomenon was specifically investigated. According to the 3C model, vaccine convenience is determined by physical availability, affordability and willingness-to-pay, geographical accessibility, ability to understand (consisting of both language and health literacy) and appeal of immunization services [9]. Therefore, potential barriers to immunization were also considered in our research and were investigated in 3.6% (n = 12/334) of the studies. Particular attention to the aspect of non-compliance with the vaccination schedule, such as following the correct timing and the complete administration of all the required vaccine doses, was only investigated in 3.3% (n = 11/334) of the analysed studies. Finally, 9 studies (n = 2.7%) explored the various determinants that can condition parental decisions or attitudes towards the immunization of children with pre-existing pathologies or health problems.

**Population characteristics**

The population interviewed mainly consisted of parents – without any further details (73.1%, n = 244/334) – in approximately 20% of the studies (n = 66/334) the mother was the only parent surveyed, and only 1 study recruited selectively fathers. The sample size ranged from 7 to 59,897, the mean population included was about 1,647 people. In primary studies, parents were recruited regardless of their attitudes and beliefs in 68.9% of the studies (n = 230/334), while in the remaining 103 articles, the primary

**Follows**

Tab. I. Main characteristics of the included studies.

| Author, year | Study period | Country | Study design | Administration channel | Sample size | Type of vaccine | Type of questions | Validation | Immunization behaviour |
|--------------|--------------|---------|--------------|------------------------|-------------|----------------|-----------------|------------|------------------------|
| Thomas TL, 2017 | 2010-2011 | USA     | Cross-sectional | Paper-based | 541 | Hpv | Likert scale | Not | Acceptance |
| Thompson EL, 2017 | 2012-2015 | USA     | Cross-sectional | Telephone | 59,897 | Hpv | Closed | With statistical methods | Hesitancy/ scepticism/ doubt |
| Tisi G, 2013 | 2011 | Italy | Cross-sectional | Paper-based | 161 | Hpv | Mixed | Not | Acceptance |
| Taylor, JA, 2000 | 1997-1998 | USA     | Cross-sectional | Paper-based | 598 | Varicella | Likert scale | Not | Hesitancy/ scepticism/ doubt |
| Schwartz B, 2000 | 2000-2001 | USA     | Cross-sectional | Telephone | 12,060 | Hbv/dtp/measles/varicella | Mixed | Not | N.A. |
| Streng A, 2010 | 2006-2008 | Germany | Cross-sectional | Paper-based | 1,088 | Varicella | Mixed | Statistical methods not reported | Acceptance |
| Opel DJ, 2011 | 2010 | USA     | Cross-sectional | Mail | 228 | Dtp/polio/mmr | Likert scale | Not | Hesitancy/ scepticism/ doubt |
| World Health Organization, 1997 | 1994 | Italy | Cross-sectional | Face to face | 1,800 | Dtp/polio | Closed | With statistical methods | Hesitancy/ scepticism/ doubt |

N.A.: not available.
studies selected the population based on their attitude: about 13.5% of the studies (45/334) were conducted in people with a positive attitude of acceptance, 38 studies (11.4%) were conducted among a hesitant population and 20 (6%) selected a population with an attitude of refusal towards vaccines. The definition of “acceptant/hesitant/refusing” behaviour was described in every article considered, and even though the specific characteristics might be slightly different among different studies, we relied on the classification provided by each article to analyse our results. Recruiting parents on the basis of their attitude towards vaccinations was very important in order to analyse the determinants of Vaccine Hesitancy in each different subgroup.

**Questionnaires characteristics**

The Authors reported both the number and the type of items only in 38.0% (n = 127/334) of the included studies. Regarding the type, more than half (37.7%, n = 126/334) consisted of closed questions. Likert scales were the second most common type used in the questionnaires (23.6%, n = 79/334), while open-ended questions were used in 14.9% of the studies (n = 50/334).

Frequently the studies were conducted using a self-reported questionnaire (69.2%, n = 231/334), or interview (28.1%, n = 94/334), while in 2.7% (n = 9/334) of the studies data were collected in a multi-phase study. Considering the questionnaires, they were mainly administered either on paper (41.6%, n = 139/334) or as an online version (13.5%, n = 45/334). Other administration channels were mail, face to face interviews (9.9%, n = 33/334) or telephone interviews (13.5% 45/334).

However, in 80.2% of the studies, the questionnaire was not attached to the paper and for this reason it was not possible to obtain any further information. Lastly, in 42.8% of the studies (n = 143/334) the questionnaire had been previously validated; however, statistical methods were reported only in 14.8% of the sample (n = 51/334); while in 57.2% (n = 191/334) of the papers the questionnaire had not been validated.

**Vaccines and immunization behaviours**

22.4% (n = 75/334) of the included articles regarded childhood vaccinations in general, without addressing a specific vaccine. The HPV vaccine was the most frequently investigated (39.2%, n = 133/334), followed by influenza (13.5%, n = 47/334), measles (10.8%, n = 36/334) and varicella or varicella containing vaccine (MMRV) (4.5%, n = 15/334). 67.4% (n = 225/334) of the papers assessed the attitude towards one specific vaccine (monovalent or combined): 5.7% (n = 19/334) of the articles assessed attitudes towards polio vaccine, while 6.3% (n = 22/334) assessed HBV vaccine; a lower percentage reported the behaviour towards meningococcal vaccinations (1.7% - n = 6/334 MenB and 3.6% - n = 12/334 quadrivalent vaccine), Hib vaccine, HAV vaccine, rotavirus and BCG vaccination. 7.5% (n = 25/334) of the studies focused on more than one vaccine, such as diphtheria, tetanus and pertussis vaccination.

Data about the immunization behaviours were reported in 88% of the studies (n = 294/334). In particular, the subjects involved in the studies showed a behaviour defined as “acceptance” in 38.6% studies (38.6%, n = 129/334), as “hesitancy/scepticism/doubt” in 43.4% (n = 145/334) of the studies (and as “refusal” in 6.6% (n = 22/334) of the studies. In 10.5% (n = 35/334) of the studies assessed this information was not detected.

**Parents’ beliefs about vaccine safety/efficacy**

Parents’ beliefs about vaccine safety/efficacy were evaluated in most (58.7%; n = 196/334) of the papers included in the review. In particular, 52.4% (n = 175/334) gave a quantitative evaluation, among which 53.7% (n = 94/175) showed that the majority of the sample believed vaccines to be safe and effective, 4.6% of the studies (n = 8/175) showed that the minority of the subjects interviewed believed in vaccine safety/efficacy, while 41.7% (73/175) outlined how the beliefs about vaccines’ safety/efficacy are one of the most important barriers in vaccination. Other studies (10.7%, n = 21/196) gave a qualitative and descriptive approach to the issue of “vaccine safety/efficacy”. No information was given in 41.3% of the studies (n = 138/334).

**Discussion**

This manuscript shows the results of an extensive systematic review conducted using three scientific databases (PubMed/Medline, Web of Science and The Cochrane Library). Out of 3,508 retrieved studies, 334 papers were included in the qualitative evaluation. The inclusion of a great number of relevant studies, of which two thirds have been conducted in the last 10 years, reflects the relevance of this issue nowadays: investigating and therefore understanding the phenomenon of vaccine hesitancy is a necessary step in the process of overcoming it. As a matter of fact, it is extremely important to counteract this attitude, as it might lead to a decrease in vaccination coverage and therefore increase the risk of future epidemics of VPDs.

The original papers included in the analysis were mainly studies conducted in western countries, while 1/4 were performed in Asia and 1/7 in Africa and Oceania. Even if all the studies included in the review aimed at exploring VH among parents or guardians, they differ in their study design, overall number of items, context and response formats. Most of the times, three different types of questions were used in the articles examined: closed questions, likert scales questions and open-ended questions (however, a combination of these types of questions was often used as well). Most of studies had a cross-sectional design and were conducted in the last ten years, aimed to investigate parental knowledge, attitudes, practices and beliefs about childhood vaccinations, while only a small percentage (4.5%) investigated the specific
reasons for vaccine hesitancy. Closed questions were the most frequent, mainly through the administration of a self-reported questionnaire, but in most cases it was impossible to get more information about the tool used, because only in 20% of studies the questionnaire was attached to the article. Closed questions, allowing a quantitative analysis, are a very useful tool although they don’t permit to explain with more details the reasons behind VH for vaccine preventable diseases. In fact, it can be defined as “the means for testing objective theories by examining the relationship among variables which in turn can be measured so that numbered data can be analyzed using statistical procedures”. On the other hand, a qualitative approach is more likely to use open questions as research tool. Open ended questions don’t enable comparisons between different studies but they do provide more detailed information of the issues examined. In fact, a qualitative approach is useful when statistical procedures and numeric data may be insufficient to capture how patients and health care professionals feel about patients’ care, enabling researchers to understand the world as another experiences it [351]. Qualitative tools are connected to the way human behavior can be explained, within the framework of the social structures in which that behavior takes place. However, closed questions represent the easiest way to explore a topic and simplify the analysis for the Authors. It should be considered that the way of administration varied among the studies and might have had an impact on the quality of the data generated [352]. Moreover, since questionnaires are a sort of “diagnostic” epidemiological tool, they should be previously validated in order to effectively measure their outcomes [353]. However, only a small percentage of questionnaire had been previously validated in the studies analysed. This aspect should be taken into account, since effectively monitoring VH and identifying beliefs about vaccines is extremely important in order to fully understand the nature of such hesitancy, to compare the phenomenon among countries and over the time, and lastly, to implement the appropriate types of intervention. In addition, only 14.8% of the included studies reported the statistical methods used to validate the questionnaire in detail.

This review shows that the most frequently analysed vaccines are HPV and flu, followed by measles and varicella containing vaccines. They were mainly investigated for the perception about risks and safety, as well for the low vaccine coverages (compared to the WHO target), which is partly due to the reduction in the perceived risk of these diseases [354]. In this perspective, the reinforcement of mandatory vaccination laws in some European countries (e.g. Italy and France) led to an increase in vaccination coverage, mainly because this intervention tackled the complacency component of VH [355, 356]. In Italy, the reinforcement of the mandatory vaccination law dramatically reduced the number of parents who missed the measles vaccination due to definitive informed dissent or unwillingness to attend the appointment [357].

Fathers were specifically investigated only in 1 study included [175] in this review: further studies should investigate this population, in order to determinate possible gender differences in VH definition. It can be speculated that fathers are little involved, by healthcare professionals, in the vaccination decisions of their children. On the contrary, the involvement of both parents could be important in order to recover the confidence of families, which has diminished over time. In this perspective, healthcare professionals should be adequately trained and properly equipped with communication skills to clearly, transparently and comprehensively deal with this problem [358, 359]. Healthcare professionals are the main source of information on the issue of vaccinations, but they are not the only one: parents frequently rely on the information they obtain on the internet, especially regarding vaccinations and the related diseases [360-362].

Before generalizing the results of this review, some limitation should be acknowledged. First, a small percentage of included studies was validated, and the questions identified didn’t address all the determinants in the Vaccine Hesitancy Matrix.

Secondly, the findings from studies investigating specific vaccines should not be generalized to all vaccines. Moreover, VH evolves rapidly in time and some determinants could change quickly, not only according to the perception of danger of the diseases reported by media in different countries but also due to other socio-cultural influences. Monitoring the trend is important in order to measure parental VH in time and to better understand parents’ concerns and behaviors. Generally speaking, the availability of a good and accurate tool, tested and validated in all settings, and subsequently refined, is necessary to compare the results, to assess the dynamic nature of VH and to develop tailored communication strategies [363-366]. Furthermore, most of the information, especially related to the vaccination status were self-reported and no vaccination cards or Immunization Information System (IIS) were used to verify the information. Healthcare professionals and scientists should be encouraged to use the new technologies, as for instance the IIS, to monitoring both the vaccination coverage and the VH trends [367, 368]. Moreover, according to a recent review, the IIS might greatly improve and counter VH [369].

Nevertheless, a point of strength of this review is the variety of vaccine preventable diseases included. Moreover, to the best of our knowledge, this is the first systematic review that extensively assessed the developed questionnaires aimed to evaluate the parents’ VH.

Conclusions

To conclude, VH is a public health challenge as confirmed by the high number of studies and questionnaires retrieved. No questionnaire can be considered the absolute best a priori, but this study offers a deeper perspective on the available questionnaires, therefore
helping future researches to identify the most suitable one according to their own aim and study setting. Further studies monitoring VH should take into account the questionnaires already available in literature, therefore allowing to improve intra- and inter-country comparability among countries and over time, reducing the time waste in developing a new questionnaire, and improving the financial sustainability of research. Moreover, using a validate questionnaire will improve the methodological quality of future studies.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors’ contributions

VG and PC conceived the study, PC, GV, IB, GD, MN, OG, FD, PS, SDN, SP, AC, LG, FDA, FDG, EA, OES, LK, CA, VG performed a search of the literature, drafted and revised the manuscript. GD revised the language. LK, CA, VG drafted a first version of the manuscript. OG, FD, PS, SDN, SP, AC, LG, FDA, FDG, EA, OES, Orenstein W A, Rodewald LE, Hinman AR. Immunizations in the United States: success, structure, and stress. Health Aff (Millwood) 2005;24(3):599-6. https://doi.org/10.1377/hlthaff.24.3.599.

[3] Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Parental vaccine safety concerns in 2009. Pediatrics 2010;125(4):654-9. https://doi.org/10.1542/peds.2009-1962.

[4] McClure CC, Cataldi JR, O’Leary ST. Vaccine Hesitancy: Where We Are and Where We Are Going. Clin Ther 2017;39(8):1550-62. https://doi.org/10.1016/j.clinthera.2017.07.003.

[5] Patel M, Lee AD, Redd SB, Clemmons NS, McNall RJ, Cohn AC, Gastanaduy PA. Increase in Measles Cases - United States, January 1-April 26, 2019. MMWR Morb Mortal Wkly Rep 2019;68(17): 402-4. https://doi.org/10.15585/mmwr.mm6817e1.

[6] Public Health Agency of Canada. Measles & Rubella Weekly Monitoring Report – Week 20: May 12 to May 18, 2019. 2019 November 2019; Available from: https://www.canada.ca/en/public-health/services/publications/diseases-conditions/measles-rubella-surveillance/2019/week-20.html.

[7] European Center for Diseases Control and prevention. Monthly measles and rubella monitoring report, May 2019. 2019.

[8] Zipprich J, Winter K, Hacker J, Xia D, Watt J, Harriman K. Center for Disease Control and Prevention, Measles outbreak -California, December 2014-February 2015. MMWR Morb Mortal Wkly Rep 2015;64(6):153-4.

[9] MacDonald NE, Sage Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. Vaccine 2015;33(34):4161-4. https://doi.org/10.1016/j.vaccine.2015.04.036.

[10] World Health Organization. Report of the SAGE working group on vaccine hesitancy. 2014.

[11] Larson HJ, Jarrett C, Eckerberger E, Smith DM, Paterson 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. https://doi.org/10.1016/j.vaccine.2014.01.081.

[12] Gesser-Edelsburg A, Shoh-Raz Y, Green M. Why do parents who usually vaccinate their children hesitate or refuse? General good vs. individual risk. Journal of Risk Research 2016;19(4):405-24. https://doi.org/10.1080/13669877.2014.983947.

[13] Harmsen IA, Mollena L, Ruitter RA, Paulussen TG, de Mekker HE, Kok G. Why parents refuse childhood vaccination: a qualitative study using online focus groups. BMC Public Health 2013;13:1183. https://doi.org/10.1186/1471-2458-13-1183.

[14] European Centre for Disease Prevention and Control, Rapid literature review on motivating hesitant population groups in Europe to vaccinate. 2015. Stockholm.

[15] World Health Organization. Ten threats to global health in 2019, WHO/Rada Akbar. 2019 November 2019]; Available from: https://www.who.int/emergencies/ten-threats-to-global-health-in-2019.

[16] Dorell C, Yankey D, Kennedy A, Stokley S. Factors that influence parental vaccination decisions for adolescents, 13 to 17 years old: National Immunization Survey-Teen, 2010. Clin Pediatr (Philta) 2013;52(2):162-70. https://doi.org/10.1117/000922812468208.

[17] Smith LE, Amlot, R, Weinman J, Yend J, Rubin GJ. A systematic review of factors affecting vaccine uptake in young children. Vaccine 2017;35(45):6059-69. https://doi.org/10.1016/j.vaccine.2017.09.046.

[18] Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med 2009;151(4):264-9, W64. https://doi.org/10.7326/0003-4819-151-4-200908180-00135.

[19] Childhood vaccination coverage in Italy: results of a seven-region survey. The Italian Vaccine Coverage Survey Working Group. Bull World Health Organ 1994;72(6):885-95.

[20] Adler A, Herring E, Babiksky H, Gazala E, Cohen A, Levy I. Parent-dependent barriers to varicella immunization in Israel: the importance of adequate information. Acta Paediatr 2007;96 (3):428-31. https://doi.org/10.1111/j.1651-2227.2007.00118.x.

[21] Adorador A, McNulty R, Hart D, Fitzpatrick, J. Perceived barriers to immunizations as identified by Latino mothers. Journal of the American Academy of Nurse Practitioners 2011;23 (9):501-8.

[22] Aharony N, Goldman R. E-health literacy and the vaccination dilemma: an Israeli perspective. Information Research—an International Electronic Journal 2017;22 (2).

[23] Akis S, Velipasagoglu S, Camurda AD, Beyazova U, Sahn F. Factors associated with parental acceptance and refusal of pandemic influenza A/H1N1 vaccine in Turkey. Eur J Pediatr 2011;170 (9):1165-72. https://doi.org/10.1007/s00431-011-1425-8.

[24] Akmatov M, Mikolaizyk R, Kretschmar M, Kramer A. Attitudes and beliefs of parents about childhood vaccinations in post-soviet countries: the example of Kyrgyzstan. The Pediatric infectious disease journal 2009;28(7):637-40.

[25] Alberts CJ, van der Loeff MF, Hazeveld Y , de Melker HE, van der Wal MF, Nielen A, El Fakiri, F, Prins M, Paulusse TG. A longitudinal study on determinants of HPV vaccination uptake
in parents/guardians from different ethnic backgrounds in Amsterdam, the Netherlands. BMC Public Health 2017;17(1): 220. https://doi.org/10.1186/s12889-017-4091-4

[26] Alfredsson R, Svensson E, Trollfors B, Borres M. Why do parents hesitate to vaccinate their children against measles, mumps and rubella? Acta paediatrica 2004;93(9):1233-7.

[27] Allison M, Reyes M, Young P, Calame L, Sheng X, Weng H. Parental attitudes about influenza immunization and school-based immunization for school-aged children. The Pediatric infectious disease journal 2010;29(8):751-5.

[28] Allen J, Othu M, Shelton R, Li Y, Norman N, Tom L. Parental decision making about the HPV vaccine. Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology 2010;19(9):2187-98.

[29] Allred NJ, Shaw KM, Santibanez TA, Rickert DL, Santoli JM. Parental vaccine safety concerns: results from the National Immunization Survey, 2001-2002. Am J Prev Med 2005;28(2): 221-4. https://doi.org/10.1016/j.amepre.2004.10.014

[30] Alshammari TM, Subaiea GM, Hussain T, Moin A, Yusuff KB. Parental perceptions, attitudes and acceptance of childhood immunization in Saudi Arabia: A cross sectional study. Vaccine 2018;36(1):23-28. https://doi.org/10.1016/j.vaccine.2017.11.050

[31] Ambje JP, Omtora BA, Mandu Babu M. Perceptions, beliefs and practices of mothers in sub-urban and rural areas towards measles and measles-vaccination in Northern Nigeria. Trop Doct 2001; 31(2):89-90. https://doi.org/10.1177/004947550103100211

[32] Aharon A, Nehama H, Rishpon S, Baron-Epel O. Parents with high levels of communicative and critical health literacy are less likely to vaccinate their children. Patient Education and Counseling 2017;100(4):768-75.

[33] Arrossi S, Maceira V, Paolino M, Sankaranarayanan R. Acceptability and uptake of HPV vaccine in Argentina before its inclusion in the immunization program: a population-based survey. Vaccine 2012;30(14):2467-74. https://doi.org/10.1016/j.vaccine.2012.01.032

[34] Mohd Azizi FS, Kew Y, Moy FM. Vaccine hesitancy among parents in a multi-ethnic country, Malaysia. Vaccine 2017;35(22): 2955-61. https://doi.org/10.1016/j.vaccine.2017.04.010

[35] Baglioni A, Ceriale E, Bagnoli A, Mercone A, Nante N, Messina G. Parents’ awareness and acceptance of HPV vaccination in Italy. Ig Sanita Pubbl 2014;70(5):489-98.

[36] Bakhache P, Rodrigo C, Davie S, Ahuja A, Sudovar B, Crudup L. Vaccination against human papilloma virus infection in male adolescents: a multinational survey. Eur J Pediatr 2015;172(4):485-92. https://doi.org/10.1007/s00431-012-1904-4

[37] Baldwin AS, Bruce CM, Tiro JA. Understanding how mothers of adolescent girls obtain information about the human papillomavirus vaccine: associations between mothers’ health beliefs, information seeking, and vaccination intentions in an ethnically diverse sample. J Health Psychol 2013;18(7):926-38. https://doi.org/10.1177/135910531450578

[38] Bardenheier B, Gonzalez JM, Washington ML, Bell BP, Averbough F, Massoudi MS, Hyams I, Simard EP, Yusuf H. 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. https://doi.org/10.1542/peds.112.4.e269

[39] Bardenheier B, Yusuf H, Schwartz B, Gust D, Barker L, Kodewald L. Are parental vaccine safety concerns associated with receipt of measles-mumps-rubella, diptheria and tetanus toxoids with acellular pertussis, or hepatitis B vaccines by children? Arch Pediatr Adolesc Med 2004;158(6):569-75. https://doi.org/10.1001/archpedi.158.6.569

[40] Bardenheier BH, Yusuf HR, Rosenthal J, Santoli JM, Shefer AM, Rickert DL, Chu SY. Factors associated with underimmunization at 3 months of age in four medically underserved areas. Public Health Rep 2004;119(5):479-85. https://doi. org/10.1016/j.phr.2004.07.005

[41] Barnack JL, Reddy DM, Swain C. Predictors of parents’ willingness to vaccinate for human papillomavirus and physicians’ intentions to recommend the vaccine. Womens Health Issues 20 https://doi.org/10.20 (1): 28-34. https://doi.org/10.1016/j.who.2009.08.007

[42] Barnack-Taverlisl JR, Garcini LM, Macera CA, Brodine S, Klo- noff EA. Human Papillomavirus Vaccination Awareness and Acceptability Among U.S.-Born and U.S. Foreign-Born Women Living in California. Health Care Women Int 2016;37(4): 444-62. https://doi.org/10.1080/07399332.2014.954702

[43] Bazzano A, Zeldin A, Schuster E, Barrett C, Lehrer D. Vaccine-related beliefs and practices of parents of children with autism spectrum disorders. Am J Intel Dev Disabil 2012;117(3): 233-42. https://doi.org/10.1352/1944-7558-117.3.233

[44] Bedford H, Lansley M. More vaccines for children? Parents’ views. Vaccine 2007;25(45):7818-23. https://doi.org/10.1016/j.vaccine.2007.08.057

[45] Beel ER, Rench MA, Montesinos DP, Mayes B, Healy CM. Knowledge and attitudes of postpartum women toward immunization during pregnancy and the peripartum period. Hum Vaccin Immunother 2013;9(9):1926-31. https://doi.org/10.4161/hv.25096

[46] Ben Natan M, Aharon O, Palickhivili S, Gurman V. Attitude of Israeli mothers with vaccination of their daughters against human papilloma virus. J Pediatr Nurs 2011;26(1):70-7. https://doi.org/10.1016/j.pedn.2010.09.006

[47] Ben Natan M, Kabha S, Yehia M, Hamza O. Factors That Influence Israeli Muslim Arab Parents’ Intention to Vaccinate Their Children Against Influenza. J Pediatr Nurs 2016;31(3):293-8. https://doi.org/10.1016/j.pedn.2015.12.014

[48] Ben Natan M, Mudle K, Mitelman O, Vafiliev K. Intention of Mothers in Israel to Vaccinate their Sons against the Human Papilloma Virus. J Pediatr Nurs 2017;33:41-5. https://doi. org/10.1016/j.pedn.2017.01.001

[49] Berenson AB, Lax TH, Hirth JM, McGrath CJ, Rahmann M. Effect of the decision-making process in the family on HPV vaccination rates among adolescents 9-17 years of age. Hum Vaccin Immunother 2014;10(7):1807-11. https://doi.org/10.4161/hv.28779

[50] Bettinger JA, Greyson D, Money D. Attitudes and Beliefs of Pregnant Women and New Mothers Regarding Influenza Vaccination in British Columbia. J Obstet Gynaecol Can 2016;38(11): 1045-52. https://doi.org/10.1016/j.jogc.2016.08.004

[51] Bhavn S, Saeed F, Shah M. Routine Immunization in Children and Unsatisfactory Polio Campaigns: A Cross Sectional Survey Conducted at Darul Sehat Hospital, Karachi. Annals Abbasi Shaheed Hospital & Karachi Medical & Dental College 2016; 21(1):29-36.

[52] Bianco A, Pileggi C, Izzo F, Nobile CG. Vaccination against human papilloma virus infection in male adolescents: knowledge, attitudes, and acceptability among parents in Italy. Hum Vaccin Immunother 2014;10(9):2536-42. https://doi.org/10.4161/21645515.2014.996614

[53] Bigham M, Remple VP, Pielak K, McIntyre C, White R, Wu W. Uptake and behavioural and attitudinal determinants of immunization in an expanded routine infant hepatitis B vaccination program in British Columbia. Can J Public Health 2006; 97(2): 90-5.

[54] Alder S, Gustafsson S, Perinetti C, Mints M, Sundstrom K, Andersson S. Mothers’ acceptance of human papillomavirus (HPV) vaccination for daughters in a country with a high prevalence of HPV. Oncol Rep 2015; 33(5):2521-8. https://doi.org/10.14312/2015.3817

[55] Basu P, Mittal S. Acceptability of human papillomavirus vaccine among the urban, affluent and educated parents of young girls residing in Kolkata, Eastern India. J Obstet Gynaecol Res 2011;37(5):393-401. https://doi.org/10.1111/j.1447-0756.2010.01371.x
[56] Blair A, Davies E, Nebauer M, Pirozzo S, Saba S, Turner C. Why immunise. Care giver understanding of childhood immunisation. Collegian 1997;4(3):10-7. https://doi.org/10.1016/s1322-7696(08)60235-8

[57] Blyth CC, Richmond PC, Jacoby P, Thornton P, Regan A, Robins C, Kelly H, Smith DW, Effier PV. The impact of pandemic A(H1N1)pdm09 influenza and vaccine-associated adverse events on parental attitudes and influenza vaccine uptake in young children. Vaccine 2014;32(32):4075-81. https://doi.org/10.1016/j.vaccine.2014.05.055

[58] Bodson J, Warner EL, Kepka D. Moderate Awareness and Limited Knowledge Regarding to Cervical Cancer, HPV, and the HPV Vaccine Among Hispanics/Latinos in Utah. Health Promot Pract 2016;17(4):548-56. https://doi.org/10.1177/1524839916640271

[59] Bonanni P, Bergamini M. Factors influencing vaccine uptake in Italy. Vaccine 2001;20 Suppl 1:S8-12; discussion S1. https://doi.org/10.1016/s0264-410x(01)00284-5

[60] Borena W, Luckner-Hornischer A, Katzgraber F, Holm-von Laer D. Factors affecting HPV vaccine acceptance in west Austria: Do we need to revise the current immunization scheme? Papillomavirus Res 2016;2:173-7. https://doi.org/10.1016/j.pvr.2016.10.001

[61] Borras E, Dominguez A, Fuentes M, Batalla J, Cardenosa N, Plasencia A. Parental knowledge of paediatric vaccination. BMC Public Health 2009; 9:154. https://doi.org/10.1186/1471-2334-9-154

[62] Brabin L, Roberts SA, Farzaneh F, Kitchener HC. Future acceptance of adolescent human papillomavirus vaccination: a survey of parental attitudes. Vaccine 2006;24(16):3087-94. https://doi.org/10.1016/j.vaccine.2006.01.048

[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. https://doi.org/10.1016/0033-3506(89)80042-3

[64] Breitkopf CR, Pearson HC, Dinh TA, Tran BC, Vu T, Phan GA, Ngo QV, Tran VD, Rosenthal SL. Human papillomavirus vaccine decision-making in Da Nang, Vietnam: perceived spousal and adolescent-parent concordance. Vaccine 2009;27(17):2367-71. https://doi.org/10.1016/j.vaccine.2009.02.021

[65] Brieger D, Edwards M, Mudgil P, Whitehall J. Knowledge, attitudes and opinions towards measles and the MMR vaccine across two NSW cohorts. Aust N Z J Public Health 2017;41(6):641-646. https://doi.org/10.1111/1753-4455.12720

[66] Brown B, Gabra MI, Pellman H. Reasons for acceptance or refusal of Human Papillomavirus Vaccine in a California pediatric practice. Papillomavirus Res 2017;3:42-5. https://doi.org/10.1016/j.pvr.2017.01.002

[67] Brown KE, Shanley R, Cowley NA, van Wijgerden J, Toff P, Falconer M, Ramsay M, Hudson MJ, Green J, Vincent CA. Knowledge and demographic predictors of measles, mumps and rubella (MMR) vaccine acceptance: development and validation of an evidence-based measurement instrument. Vaccine 2011;29(8):1700-9. https://doi.org/10.1016/j.vaccine.2010.12.030

[68] Brunson EK. The impact of social networks on parents’ vaccination decision-making. Pediatrics 2013;131(5):e1397-404. https://doi.org/10.1542/peds.2012-2452

[69] Buls M, Beauchef DJ, Richards JD, van Steenbergen JE, Voeten HA. Pandemic influenza A (H1N1) vaccination in The Netherlands: parental reasoning underlying child vaccination choices. Vaccine 2011;29(37):6226-35. https://doi.org/10.1016/j.vaccine.2011.06.075

[70] Burdette AM, Gordon-Jokinen H, Hill TD. Social determinants of HPV vaccination delay rationales: Evidence from the 2011 National Immunization Survey-Teen. Prev Med Rep 2014;1:21-6. https://doi.org/10.1016/j.pmedr.2014.09.003

[71] Busse JW, Walji R, Wilson K. Parents’ experiences discussing pediatric vaccination with healthcare providers: a survey of Canadian naturopathic patients. PLoS One 2011;6(8):e22737. https://doi.org/10.1371/journal.pone.0022737

[72] Buyuktiryaki B, Soyer OU, Erkocoglu M, Dogan A, Azkur D, Kocabas CN, Dallar Y, Tuncer A, Sekerel BE. What a pandemic teaches us about vaccination attitudes of parents of children with asthma. Vaccine 2014;32(20):2275-80. https://doi.org/10.1016/j.vaccine.2014.02.076

[73] Cacciatore MA, Nowak G, Evans NJ. Exploring The Impact Of The US Measles Outbreak On Parental Awareness Of And Support For Vaccination. Health Aff (Millwood) 2016;35(2):334-40. https://doi.org/10.1377/hlthaff.2015.1093

[74] Campbell H, Edwards A, Letley L, Bedford H, Ramsay M, Yearwood J. Changing attitudes to childhood immunisation in English parents. Vaccine 2017;35(22):2979-85. https://doi.org/10.1016/j.vaccine.2017.03.089

[75] Carlos RC, Dempsey AF, Resnicow K, Ruffin M, Patel DA, Straus CM, Vanessa KD. Maternal characteristics that predict a preference for mandatory adolescent HPV vaccination. Hum Vaccin 2011;7(2):225-9. https://doi.org/10.4161/hvi.7.2.13691

[76] 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. https://doi.org/10.1016/j.vaccine.2005.07.063

[77] Cassell JA, Leach M, Poltorak MS, Mercer CH, Iversen A, Fairhead JR. Is the cultural context of MMR rejection a key to an effective public health discourse? Public Health 2006;120(9):783-94. https://doi.org/10.1016/j.puhe.2006.03.011

[78] Cataldi JR, Dempsey AF, O’Leary ST. Measles, the media, and MMR: Impact of the 2014-15 measles outbreak. Vaccine 2016;34(50):6375-80. https://doi.org/10.1016/j.vaccine.2016.10.048

[79] Chan JY, Leung KM, Tam WW, Lee A. Varicella vaccine uptake and associated factors in children in Hong Kong. Epidemiol Infect, 2014; 142(5): 994-1001. https://doi.org/10.1017/S0950268813001994

[80] Chaparro RM, Em Vargas V, Zorzo LR, Genaro S, Cayre A. Acceptance of human papillomavirus vaccination and associated factors in the city of Resistencia, Argentina. Arch Argent Pediatr 2016;114(1):36-43. https://doi.org/10.5536/aap.2016.eng.36

[81] Chau JPC, Lo SHS, Choi KC, Chau MHK, Tong DWK, Kwong TKY, Thompson DR. Factors Determining the Uptake of Influenza Vaccination Among Children With Chronic Conditions. Pediatr Infect Dis J 2017;36(7):e197-e202. https://doi.org/10.1097/INF.0000000000001550

[82] Chen CH, Chiu PJ, Chih YC, Yeh GL. Determinants of influenza vaccination among young Taiwanese children. Vaccine 2015; 3(16):1993-8. https://doi.org/10.1016/j.vaccine.2015.01.032

[83] Chen MF, Wang RH, Schneider JK, Tsai CT, Jiang DD, Hung MN, Lin LJ. Using the Health Belief Model to understand caregiver factors influencing childhood influenza vaccinations. J Community Health Nurs 2011;28(1):29-40. https://doi.org/10.1080/07370016.2011.539087

[84] Cheruvu VK, Bhatta MP, Drinkard LN. Factors associated with parental reasons for “no-intent” to vaccinate female adolescents with human papillomavirus vaccine: National Immunization Survey - Teen 2008-2012. BMC Pediatr 2017;17(1):52. https://doi.org/10.1186/s12887-017-0804-1

[85] Chung Y, Schamel J, Fisher A, Frew PM. Influences on Immunization Decision-Making Among US Parents of Young Children. Matern Child Health J 2017;21(12):2178-87. https://doi.org/10.1007/s10995-017-3236-6

[86] Cipriano JJ, Scloveno R, Kelly A. Increasing Parental Knowledge Related to the Human Papillomavirus (HPV) Vaccine. J Pediatr Health Care 2018;32(1):29-35. https://doi.org/10.1016/j.pedhc.2017.06.006

[87] Clark SJ, Cowan AE, Filipp SL, Fisher AM, Stokley S. Understanding Non-Completion of the Human Papillomavirus Vaccine Series: Parent-Reported Reasons for Why Adoles-
cents Might Not Receive Additional Doses, United States, 2012. Public Health Rep 2016;131(3):390-5. https://doi.org/10.1177/003335491613100304

[86] Clark SJ, Cowan AE, Filipp SL, Fisher AM, Stokley S. Parental Perception of Provider Interactions Influences HPV Vaccination Status of Adolescent Females. Clin Pediatr (Phila) 2016;55(8):701-6. https://doi.org/10.1177/0009922816510629

[87] Clark SJ, Cowan AE, Filipp SL, Fisher AM, Stokley S. Parent HPV vaccine perspectives and the likelihood of HPV vaccination of adolescent males. Hum Vaccin Immunother 2016;12(1):47-51. https://doi.org/10.1080/21654515.2015.1073426

[88] Cockcroft A, Usman MU, Nyanucherera OF, Emori H, Duke B, Umar NA, Andersson N. Why children are not vaccinated against measles: a cross-sectional study in two Nigerian States. Arch Public Health 2014;72(1):48. https://doi.org/10.1186/2049-3258-72-48

[89] Colon-Lopez V, Toro-Meijas LM, Conde-Toro A, Serra-Rivera MJ, Martinez TM, Rodriguez V, Rios AM, Berdell L, Villanueva H. Views on HPV and HPV Vaccination: The Experience at a Federal Qualified Clinic in Puerto Rico. J Health Care Poor Underserved 2016;27(3):1411-26. https://doi.org/10.1353/hpu.2016.0126

[90] Colon-Lopez V, Quinones V, Del Toro-Meijas LM, Conde-Toro A, Serra-Rivera MJ, Martinez TM, Rodriguez V, Berdell L, Villanueva H. HPV Awareness and Vaccine Willingness Among Dominican Immigrant Parents Attending a Federal Qualified Health Clinic in Puerto Rico. J Immigr Minor Health 2015;17(4):1086-90. https://doi.org/10.1007/s10903-014-0067-y

[91] Coniglio MA, Platania M, Privitera D, Giammanco G, Pignato S. Parents’ attitudes and behaviours towards recommended vaccinations in Sicily, Italy. BMC Public Health 2011;11:305. https://doi.org/10.1186/1471-2458-11-305

[92] Constantine NA, Jerman P. Acceptance of human papillomavirus vaccination among Californian parents of daughters: a representative statewide analysis. J Adolesc Health 2007;40(2):108-15. https://doi.org/10.1016/j.jadohealth.2006.10.007

[93] Cooper Robbins SC, Leask J, Booy R. Parents’ attitudes towards the influenza vaccine and influencing factors. J Paediatr Child Health 2011;47(7):419-22. https://doi.org/10.1111/jpc.13790

[94] Davis K, Dickman ED, Ferris D, Dias JK. Human papillomavirus vaccine acceptability among parents of 10- to 15-year-old adolescents. J Low Genit Tract Dis 2011;15(4):1086-90. https://doi.org/10.1097/OLQ.0b013e318211c248

[95] Dawar M, Dobson S, Kallos A, LaJeunesse C, Weatherill S, Daly P. Measuring hepatitis B uptake in a new universal infant program. Can J Public Health 2002;93(4):281-4.

[96] de Courval FP, Del Serres G, Duval B. Variella vaccine: factors influencing uptake. Can J Public Health 2003;94(4):268-71.

[97] de Visser R, McDonnell E. Correlates of parents’ reports of acceptability of human papilloma virus vaccination for their school-aged children. Sex Health 2008;5(4):331-8. https://doi.org/10.1071/dh08042

[98] Dempsey AF, Butchart A, Singer D, Clark S, Davis M. Factors associated with parental intentions for male human papillomavirus vaccination: results of a national survey. Sex Transm Dis 2011;38(8):769-76. https://doi.org/10.1097/OLQ.0b013e318227a127

[99] Dempsey AF, Maertens J, Beatty B, O’Leary ST. Characteristics of users of a tailored, interactive website for parents and its impact on adolescent vaccination attitudes and uptake. BMC Res Notes 2015;8:739. https://doi.org/10.1186/s13104-015-1721-8

[100] Dempsey AF, Zimet GD, Davis RL, Koutsky L. Attitudes of users of a tailored, interactive website for parents and its impact on adolescent vaccination attitudes and uptake. Can J Public Health 2014;105(4):281-4.

[101] Danetun E, Tegnell A, Giesecke J. Parents’ attitudes towards hepatitis B vaccination for their children. A survey comparing paper and web questionnaires, Sweden 2005. BMC Public Health 2007;7:86. https://doi.org/10.1186/1471-2458-7-86

[102] Danchin MH, Costa-Pinto J, Attwell K, Willaby H, Wiley K, Hoq M, Leask J, Perrett KP, O’Keeffe J, Giles ML, Marshall H. Vaccine decision-making begins in pregnancy: Correlation between vaccine concerns, intentions and maternal vaccination with subsequent childhood vaccine uptake. Vaccine 2018;36(44):6473-9. https://doi.org/10.1016/j.vaccine.2017.08.003

[103] Danis K, Georgakopoulou T, Stavrou T, Laggas D, Panagiotopoulos T. Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece. Vaccine 2010;28(7):1861-9. https://doi.org/10.1016/j.vaccine.2009.11.078

[104] Dannetun E, Tegnell A, Hermansson G, Giesecke J. Parents’ reported reasons for avoiding MMR vaccination. A telephone survey. Scand J Prim Health Care 2005;23(3):149-53. https://doi.org/10.1080/02813430510031306

[105] Danova J, Salek J, Kocourkova A, Celko AM. Factors Associated with Parental Refusal of Routine Vaccination in the Czech Republic. Cent Eur J Public Health 2015;23(4):321-3. https://doi.org/10.21101/cejph.a4395

[106] Darden PM, Thompson DM, Roberts JR, Hale JJ, Pepe C, Naifeh M, Jacobson RM. Reasons for not vaccinating adolescents: National Immunization Survey of Teens, 2008-20. https://doi.org/10.1016/j.pediatrics.2013.11.046. https://doi.org/10.1542/peds.2012-2384

[107] Davis J, Dobson S, Kallos A, La Jeunesse C, Weatherill S, Daly P. Measuring hepatitis B uptake in a new universal infant program. Can J Public Health 2002;93(4):281-4.

[108] de Visser R, McDonnell E. Correlates of parents’ reports of acceptability of human papilloma virus vaccination for their school-aged children. Sex Health 2008;5(4):331-8. https://doi.org/10.1071/dh08042

[109] Dempsey AF, Butchart A, Singer D, Clark S, Davis M. Factors associated with parental intentions for male human papillomavirus vaccination: results of a national survey. Sex Transm Dis 2011;38(8):769-76. https://doi.org/10.1097/OLQ.0b013e318227a127

[110] Dempsey AF, Maertens J, Beatty B, O’Leary ST. Characteristics of users of a tailored, interactive website for parents and its impact on adolescent vaccination attitudes and uptake. BMC Res Notes 2015;8:739. https://doi.org/10.1186/s13104-015-1721-8

[111] Dempsey AF, Zimet GD, Davis RL, Koutsky L. Factors that are associated with parental acceptance of human papillomavirus vaccines: a randomized intervention study of written information about HPV. Pediatrics 2006;117(5):1486-93. https://doi.org/10.1542/peds.2005-1381

[112] Danis K, Georgakopoulou T, Stavrou T, Laggas D, Panagiotopoulos T. Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece. Vaccine 2010;28(7):1861-9. https://doi.org/10.1016/j.vaccine.2009.11.078

[113] Dorell C, Yankey D, Jeyarajah J, Stokley S, Fisher A, Markowitz L, Smith PJ. Delay and refusal of human papillomavirus vaccine for girls, national immunization survey-teen, 2010. Clin Pediatr (Phila) 2014;53(3):261-9. https://doi.org/10.1177/0009922813520070
among Amish children in Pennsylvania: reasons for persistent disease. Pediatrics 2001;108(4): E60. https://doi.org/10.1542/peds.108.4.e60

[133] Fuchs EL, Rahman M, Berenson AB. Examining maternal beliefs and human papillomavirus vaccine uptake among male and female children in low-income families. Papillomavirus Res 2016;2: 8-40. https://doi.org/10.1016/j.pvr.2016.02.002

[134] Garcia LD, Velandia-Gonzalez M, Trumbo SP, Pedreira MC, Bravo-Alcántara H, Duñovaro-Holliday MC. Understanding the main barriers to immunization in Colombia to better tailor communication strategies. BMC Public Health 2014;14:669. https://doi.org/10.1186/1471-2458-14-669

[135] Gargano LM, Herbert NL, Painter JE, Sales JM, Morfaw C, Rask K, Murray D, Di Clemente, RJ, Hughes JM. Impact of a physician recommendation and parental immunization attitudes on receipt or intention to receive adolescent vaccines. Hum Vacc Immunother 2013;9(12):2567-33. https://doi.org/10.4161/hvi.25823

[136] 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. https://doi.org/10.1016/j.vaccine.2011.12.006

[137] Gelenafeite G, Smit M, Nijman HW, Tami A, Drijffhout IH, Pas-cal A, Postma MJ, Wolters BA, van Delden JJ, Wilshout JC, Hak E. Comparatively low attendance during Human Papillomavirus catch-up vaccination among teenage girls in the Netherlands: Insights from a behavioral survey among parents. BMC Public Health 2012;12:498. https://doi.org/10.1186/1471-2458-12-498

[138] Gellaty J, McVittie C, Tiliopoulos N. Predicting parents’ decisions on MMR immunisation: a mixed method investigation. Fam Pract 2005;22(6):658-62. https://doi.org/10.1093/fampra/cml066

[139] Gellin BG, Maibach EW, Marcuse EK. Do parents understand immunizations? A national telephone survey. Pediatrics 2000;106(5):1097-102. https://doi.org/10.1542/peds.106.5.1097

[140] Gentile A, Juarez M, Hernandez S, Moya A, Bakir J, Lucion M. Influenza vaccine: Delayed vaccination schedules and missed opportunities in children under 2 years old. Vaccine 2015;33(32):3913-7. https://doi.org/10.1016/j.vaccine.2015.06.065

[141] Gerend MA, Weibley E, Bland H. Parental response to human papillomavirus vaccine availability: uptake and intentions. J Adolesc Health 2009;45(5):528-31. https://doi.org/10.1016/j.jadohealth.2009.02.006

[142] Gesser-Edelsburg A, Shir-Raz Y, Green M. Why do parents who usually vaccinate their children hesitate or refuse? General good vs. individual risk. Journal of Risk Research 2016;19(4):405-24.

[143] Giambi C, D’Ancona F, Del Manzo D, Dei Be, Giovannelli I, Battaroni C, Bosetti V, Dei S., Local Representatives for Vaccination. Factors related to non-compliance to HPV vaccination in Romagna-Brazil: a region with a high incidence of cervical cancer. BMC Heal Serv Res 2016;16(1):417. https://doi.org/10.1186/s12913-016-1677-y

[144] Flood EM, Rouscule MD, Ryan KJ, Beusterien KM, Divino VM, Toback SL, Sasane M, Block SL, Hall MC. Mahadevia PJ. Parents’ decision-making regarding vaccinating their children against influenza: A web-based survey. Clin Ther 2010;32(8):1448-67. https://doi.org/10.1016/j.clinthera.2010.06.020

[145] Flynn M, Ogden, J. Predicting uptake of MMR vaccination: a prospective questionnaire study. Br J Gen Pract 2004;54(504): 526-30.

[146] Freeman VA, Freed GL. Parental knowledge, attitudes, and demand regarding a vaccine to prevent varicella. Am J Prev Med 1999;17(2):153-5. https://doi.org/10.1016/S0749-3779(99)00063-x

[147] Frew PM, Fisher AK, Basket MM, Chung Y, Schamel J, Weiner M, Rosenstein NE. Haemophilus influenzae Type b disease among Amish children in Pennsylvania: reasons for persistent disease. Pediatrics 2001;108(4): E60. https://doi.org/10.1542/peds.108.4.e60
Taylor VM, Bastani R. Understanding HPV vaccination among Latino adolescent girls in three U.S. regions. J Immigr Minor Health 2015;17(1):96-103. https://doi.org/10.1007/s10903-014-9996-8

[148] Gomez Y, Leguen F, Zhang G, O’Connell E. Correlates of 2009 H1N1 influenza vaccination among day care-aged children, Miami-Dade County, Vaccine 2012;30(27): 4002-6. https://doi.org/10.1016/j.vaccine.2012.04.057

[149] Gottlieb SL, Brewer NT, Sternberg MR, Smith JS, Ziamowski K, Liddon N, Markowitz LE. Human papillomavirus vaccine initiation in an area with elevated rates of cervical cancer. J Adolesc Health 2009;45(5):430-7. https://doi.org/10.1016/j.jadohealth.2009.03.029

[150] Gowda C, Schaffer SE, Kopec K, Markel A, Dempsey AF. Does the relative importance of MMR vaccine concerns differ by degree of parental vaccine hesitancy?: An exploratory study. Hum Vaccin Immunother 2013;9(2):438-6. https://doi.org/10.4161/hv.22065

[151] Grabiel M, Reutzell TJ, Wang S, Rubin R, Leung V, Ordonez A, Wong M, Jordan E. HPV and HPV vaccines: the knowledge levels, opinions, and behavior of parents. J Community Health 2013;38(6):1015-21. https://doi.org/10.1007/s10900-013-9725-6

[152] Grandahl M, Oscarsson M, Stennhammer C, Neveus T, Westerling R, Tyden T. Not the right time: why parents refuse to let their daughters have the human papillomavirus vaccination. Acta Paediatr 2014;103(4):436-41. https://doi.org/10.1111/apa.12545

[153] Grandahl M, Tyden T, Westerling R, Neveus T, Rosenblad A, Hedin E, Oscarsson M. To Consent or Decline HPV Vaccination: A Pilot Study at the Start of the National School-Based Vaccination Program in Sweden. J Sch Health 2017;87(1):62-70. https://doi.org/10.1111/josh.12470

[154] Greenberg J, Dube E, Driedger M. Vaccine Hesitancy: In Search of the Risk Communication Comfort Zone. PLoS Curr 2017;9. https://doi.org/10.1371/currents.outbreaks.5061a01117ad1f9596e2494e8690b

[155] Greenfield LS, Page LC, Kay M, Li-Voellmer M, Breuner CC, Dulin JS. Strategies for increasing adolescent immunizations in diverse ethnic communities. J Adolesc Health 2015;56(Suppl):S47-53. https://doi.org/10.1016/j.jadohealth.2014.10.274

[156] Griebeler M, Feferman H, Gupta V, Patel D. Parental beliefs and knowledge about male human papillomavirus vaccination in the US: a survey of a pediatric clinic population. Int J Adolesc Med Health 2012;24(4):315-20. https://doi.org/10.1515/ijamh.2012.045

[157] Guerry SL, De Rosa CJ, Markowitz LE, Walker S, Liddon N, Kerndt PR, Gottlieb SL. Human papillomavirus vaccine initiation among adolescent girls in high-risk communities. Vaccine 2011;29(12):2355-41. https://doi.org/10.1016/j.vaccine.2011.01.052

[158] Gundogdu Z, Gundogdu O. Parental attitudes and varicella vaccine in Kocaeli, Turkey. Prev Med 2011;52(3-4):278-80. https://doi.org/10.1016/j.ypmed.2011.01.011

[159] Gunduz S, Yuksel NC, Aktoprak HB, Canbal M, Kaya M. Attitudes towards influenza vaccination in high socioeconomic status children. Turk J Med Sci 2014;44(4):649-55. https://doi.org/10.3906/sag.1305-43

[160] Gupta R, Alkhateeb FM, Latif DA, Farley KN. Parental attitudes affecting compliance with the recommendation for two doses of 2009 pandemic influenza A (H1N1) vaccine in children less than 10 years of age in West Virginia. W V Med J 2013;109(2):10-4.

[161] Gust D, Brown C, Sheedy K, Hibbs B, Weaver D, Nowak G. Immunization attitudes and beliefs among parents: beyond a dichotomous perspective. Am J Health Behav 2005;29(1):81-92. https://doi.org/10.5993/ahbj.29.1.7

[162] Gust DA, Campbell S, Kennedy A, Shui I, Barker L, Schwartz B. Parental concerns and medical-seeking behavior after immunization. Am J Prev Med 2006;31(1):32-5. https://doi.org/10.1016/j.amepre.2006.03.017

[163] Gust DA, Darling N, Kennedy A, Schwartz B. Parents with doubts about vaccines: which vaccines and reasons why. Pediatrics 2008;122(4):718-25. https://doi.org/10.1542/peds.2007-0538

[164] Gust DA, Kennedy A, Shui I, Smith PJ, Nowak G, Pickering LK. Parent attitudes toward immunizations and healthcare providers the role of information. Am J Prev Med 2005;29(2):105-12. https://doi.org/10.1016/j.amepre.2005.04.010

[165] Gust DA, Strine TW, Maurice E, Smith P, Yusuf H, Wilkinson M, Battaglia M, Wright R, Schwartz B. Underimmunization among children: effects of vaccine safety concerns on immunization status. Pediatrics 2004;114(1):e16-22. https://doi.org/10.1542/peds.114.1.e16

[166] Gust DA., Woodruff, R., Kennedy, A., Brown, C., Sheedy, K., and Hibbs, B. Parental perceptions surrounding risks and benefits of immunization. Semin Pediatr Infect Dis,2003;14(3): 207-12. https://doi.org/10.1016/s1045-1870(03)00035-9

[167] Gustafson R, Skowronska DM. Disparities in varicella vaccine coverage in the absence of public funding. Vaccine 2005;23(27):3519-25. https://doi.org/10.1016/j.vaccine.2005.02.001

[168] Hasebeuert J, Lutringer-Magnin D, Kacleinski J, Barone G, Jacquard AC, Regnier V, Leocmach Y, Vanhems P, Chauvin F, Lasset C. French women’s knowledge of and attitudes towards cervical cancer prevention and the acceptability of HPV vaccination among those with 14 - 18 year old daughters: a quantitative-qualitative study. BMC Public Health 2012;12:1034. https://doi.org/10.1186/1471-2458-12-1034

[169] Hagan D, Phethlu DR. Determinants of parents’ decisions on childhood immunisations at Kumasi Metropolitan in Ghana. Curetations 2016;39(1): e1-e. https://doi.org/10.10. https://doi.org/10.4102/curetations.v39i1.1554

[170] Hagemann C, Strengr A, Kraemer A, Liese JG. Heterogeneity in coverage for measles and varicella vaccination in toddlers - analysis of factors influencing parental acceptance. BMC Pub Health 2017;17(1):724. https://doi.org/10.1186/s12889-017-4725-6

[171] Hak E, Schonbeck Y, De Melker H, Van Essen GA, Sanders EA. Negative attitude of highly educated parents and health care workers towards future vaccinations in the Dutch childhood vaccination program. Vaccine 2005;23(24):3103-7. https://doi.org/10.1016/j.vaccine.2005.01.074

[172] Hamann-Raz Y, Ginosar-David E, Ben-Ezra M. Parental regret regarding children’s vaccines-The correlation between anticipated regret, altruism, coping strategies and attitudes toward vaccines. Isr J Health Policy Res 2016;5:55. https://doi.org/10.1186/s13584-016-0116-1

[173] Han K, Zheng H, Huang Z, Qiu Q, Zeng H, Chen B, Xu J. Vaccination coverage and its determinants among migrant children in Guandong, China. BMC Public Health 2014;14:203. https://doi.org/10.1186/1471-2458-14-203

[174] Hanley SJ, Yoshioka E, Ito Y, Konno R, Hayashi Y, Kishi R, Sakuragi N. Acceptance of and attitudes towards human papillomavirus vaccination in Japanese mothers of adolescent girls. Vaccine 2012;30(39):5740-7. https://doi.org/10.1016/j.vaccine.2012.05.003

[175] Hanley SJ, Yoshioka E, Ito Y, Konno R, Sasaki Y, Kishi R, Sakuragi N. An exploratory study of Japanese fathers’ knowledge of and attitudes towards HPV and HPV vaccination: does marital status matter? Asian Pac J Cancer Prev 2014;15(4): 1837-43. https://doi.org/10.7314/apjcp.2014.15.4.1837

[176] Harmens IA, Lambmooij R, Ruiter RA, Molelma L, Veldwijk J, van Weert YJ, Koh G, Paulussen TG, de Wit GA, de Melker HE. Psychosocial determinants of parents’ intention to vaccinate their newborn child against hepatitis B. Vaccine 2012;30(32): 4771-7. https://doi.org/10.1016/j.vaccine.2012.05.034

[177] He L, Liao QY, Huang YQ, Feng S, Zhan XM. Parents’ per-
Impeccable and their decision on their children's vaccination against seasonal influenza in Guangzhou. Chin Med J (Engl) 2015; 128(3):327-41. https://doi.org/10.4103/0366-6999.150099

[178] Healy CM, Montesinos DP, Middelman AB. Parent and provider perspectives on immunization: are providers overestimating parental concerns? Vaccine 2014;32(5): 579-84. https://doi.org/10.1016/j.vaccine.2013.11.076

[179] Henrikson NB, Anderson ML, Opel DJ, Dunn J, Marcase EK, Grossman DC. Longitudinal Trends in Vaccine Hesitancy in a Cohort of Mothers Surveyed in Washington State, 2013-2015. Public Health Rep 2017;132(4):451-4. https://doi.org/10.1177/0033354917711175

[180] Hertweck SP, LaJoie AS, Pinto MD, Flaminii L, Lynch T, Logsdon MC. Health care decision making by mothers for their adolescent daughters regarding the quadrivalent HPV vaccine. J Pediatr Adolesc Gynecol 2013;26(2):96-101. https://doi.org/10.1016/j.jpag.2012.10.009

[181] Hilyard KM, Quinn SC, Kim KH, Musa D, Freeimuth VS. Determinants of Parental Acceptance of the H1N1 Vaccine. Health Educ Behav 2014;41(3):307-14. https://doi.org/10.1177/1090198113515244

[182] Hofman R, van Empele P, Richards HJ, de Kok IM, de Koning HJ, Vanlagoijen M, Kerlage JJ. Predictors of HPV vaccination uptake: a longitudinal study among parents. Health Educ Res 2014;29(1):83-96. https://doi.org/10.1093/her/cty992

[183] Hofstetter AM, Barrett A, Stockwell MS. Factors impacting influenza vaccination of urban low-income Latino children under nine years requiring two doses in the 2010-2011 season. J Community Health 2015;40(2):227-34. https://doi.org/10.1007/s10900-014-9921-z

[184] Hon KL, Tsang YC, Chan LC, Ng DK, Miu TY, Chan JY, Lee A, Leung TF. Hong Kong Society of Paediatric Research and Allergy. A community-based cross-sectional immunisation survey in parents of primary school students. NPI Prim Care Respir Med 2016;26:16011. https://doi.org/10.1038/npjpcrm.2016.11

[185] Houlemez JA, Hahne SJ, Oomen P, de Melker H. Parental attitude towards childhood HBV vaccination in The Netherlands. Vaccine 2010; 10.8: 6338-43. https://doi.org/10.1016/j.vaccine.2010.06.092

[186] Horn L, Howard C, Waller J, Ferris DG. Opinions of parents about school-entry mandates for the human papillomavirus vaccine. J Low Genit Tract Dis 2010;14(1): 43-8. https://doi.org/10.1097/LGT.0b013e3181a0f0a4

[187] How CH, Phua See Chun P, Shafi J, Jacques RW. Parental knowledge, attitudes and perception of pneumococcal disease and pneumococcal conjugate vaccines in Singapore: a questionnaire-based assessment. BMC Public Health 2016;16:923. https://doi.org/10.1186/s12889-016-3597-5

[188] Hu Y, Li Q, Chen Y. Timeliness of Childhood Primary Immunization and Risk Factors Related with Delays: Evidence from the 2014 Zhejiang Provincial Vaccination Coverage Survey. Int J Environ Res Public Health 2017;14(9). https://doi.org/10.3390/ijerph14091086

[189] Hwang JH, Lim CH, Kim DH, Eun BW, Jo DS, Song YH, Kim YK. A Survey of Parental Perception and Pattern of Action in Influenza-like Illness in Their Children: Including Healthcare Use and Vaccination in Korea. J Korean Med Sci 2017;32(2):204-11. https://doi.org/10.3346/kcms.2017.32.2.204

[190] Ilter E, Celik A, Halligolu B, Unlugedik E, Mizi A, Gündüz T, Ozekici U. Women’s knowledge of Pap smear test and human papillomavirus vaccine intentions of college-aged males: an examination of nurses. J Pediatr Adolesc Gynecol 2013;26(2):96-101. https://doi.org/10.1016/j.jpag.2012.10.009

[191] Impicciatore P, Bosetti C, Schiavi S, Pandolfini C, Bonati M, Mothers as active partners in the prevention of childhood diseases: maternal factors related to immunization status of preschool children in Italy. Prev Med 2000;31(1):49-55. https://doi.org/10.1006/pmed.2000.0677

[192] Jani JV, De Schacht C, Jani IV, Bjuve G. Risk factors for incomplete vaccination and missed opportunity for immunization in rural Mozambique. BMC Public Health 2008;8:161. https://doi.org/10.1186/1471-2458-8-161

[193] Jaspers L, Budningh S, Wolterbeek R, Henderson FC, Peters AA. Parental acceptance of human papillomavirus (HPV) vaccination in Indonesia: a cross-sectional study. Vaccine 2011;29(44):7785-93. https://doi.org/10.1016/j.vaccine.2011.07.107

[194] Jessop LJ, Murrin C, Lotya J, Clarke AT, O’Mahony D, Falon UB, Johnson H, Bury G, Kelleher, CC, Murphy AW. Lifeways Cohort Study Steering G. Socio-demographic and health-related predictors of uptake of first MMR immunisation in the Lifeways Cohort Study. Vaccine 2020; https://doi.org/10.1016/j.vaccine.2020.06.092

[195] Jolley D, Douglas KM. The effects of anti-vaccine conspiracy theories on vaccination intentions. PLoS One 2014;9(2): e89177. https://doi.org/10.1371/journal.pone.0089177

[196] Joseph NP, Clark JA, Bauchner H, Walsh JP, Mercilus G, Figaro J, Bibbo C, Perkins KB. Knowledge, attitudes, and beliefs regarding HPV vaccination: ethnic and cultural differences between African-American and Haitian immigrant women. Womans Health Issues 2012;22(6): e571-9. https://doi.org/10.1016/j.whi.2012.09.003

[197] Joseph NP, Shea K, Porter CL, Walsh JP, Belizaire M, Estevine G, Perkins R. Factors Associated with Human Papillomavirus Vaccine Acceptance Among Haitian and African-American parents of Adolescent Sons. J Natl Med Assoc 2015;107(2):80-8. https://doi.org/10.1016/S0027-9684(15)30028-6

[198] Jung M, Lin L, Viswanath K. Associations between health communication behaviors, neighborhood social capital, vaccine knowledge, and parents’ H1N1 vaccination of their children. Vaccine 2013;31(42):4860-6. https://doi.org/10.1016/j.vaccine.2013.07.068

[199] Kadis JA, McRee AL, Gottlieb SL, Lee MR, Reiter PL, Ditus TJ, Brewer NT. Mothers’ support for optional provision of HPV vaccine in schools. Vaccine 2011;29(14):2542-7. https://doi.org/10.1016/j.vaccine.2011.01.067

[200] Kahn JA, Ding L, Huang B, Zimet GD, Rosenthal SL, Frazier AL. Mothers’ intention for their daughters and themselves to receive the human papillomavirus vaccine: a national study of nurses. Pediatrics 2009;123(6):e1439-45. https://doi.org/10.1542/peds.2008-1536

[201] Kalucka S, Lopata E. Age-conditioned differences in parents’ attitudes towards compulsory vaccination. Family Medicine and Primary Care Review 2016;18(4):425-8.

[202] Katz ML, Kam JA, Krieger JL, Roberto AJ. Predicting human papillomavirus vaccine intentions of college-aged males: an examination of parents’ and sons’ perceptions. J Am Coll Health 2012;60(6):449-59. https://doi.org/10.1080/07448481.2012.673523

[203] Haasebaturt J, Lutringer-Magnin D, Kalemics J, Barone G, Jacques AC, Leomachi Y, Regnier V, Vanhems P, Chauvin F, Laszky PJ, Brewer NT. Mothers’ support for voluntary provision of HPV vaccine in schools. Vaccine 2011;29(14):2542-7. https://doi.org/10.1016/j.vaccine.2011.01.067

[204] Haneberg J, Luttringer-Magnin D, Kalemics J, Barone G, Jacquard AC, Leomachi Y, Regnier V, Vanhems P, Chauvin F, Laszky PJ, Brewer NT. Mothers’ support for voluntary provision of HPV vaccine in schools. Vaccine 2011;29(14):2542-7. https://doi.org/10.1016/j.vaccine.2011.01.067

[205] Kaya A, Altinel N, Karakaya G, Cetinkaya F. Knowledge and attitudes among parents with asthma and parents and physicians towards influenza vaccination. Allergol Immunopathol (Madrid) 2017;45(3):240-3. https://doi.org/10.1016/j.aller.2016.11.014

[206] Kelley CA, Velasco CS, Delaney TV, Bensimhon A, Huang KN, Jarvis PR, Jolin JS, Schaberg KB, Burke M, Finley C, Carney JK. Factors contributing to suboptimal rates of childhood vac-

---

E367
An actor-partner model of college-age women’s human papillomavirus vaccine for their daughters: II. Qualitative results. Hum Vaccin Immunother 2015;10.1080/21645515.2014.1004030

Krawczyk A, Knauper B, Gilca V, Dube E, Perez S, Joyal-Desmemes C. Perceptions and attitudes of parents. Vaccine 2015; 33(30):3463-70. https://doi.org/10.1016/j.vaccine.2015.05.073

Leechuga J, Swain G, Weinhardt LS. Perceived need of a parental decision aid for the HPV vaccine: content and format preferences. Health Promot Pract 2012;13(2):214-21. https://doi.org/10.1177/1524839910388622

Lee KN, Chang KH, Cho SS, Park SH, Park ST. Attitudes Regarding HPV Vaccinations of Children among Mothers with Adolescent Daughters in Korea. J Korean Med Sci 2017;32(1):130-4. https://doi.org/10.3346/jkms.2017.32.1.130

Lee Mortensen G, Adam M, Iftaleab L. Parental attitudes towards male human papillomavirus vaccination: a pan-European cross-sectional survey. BMC Public Health 2015;15:624. https://doi.org/10.1186/s12889-015-1863-6

Lehmann BA, de Melker HE, Timmermans DRM, Mollema L. Informed decision making in the context of childhood immunization. Patient Educ Couns 2017;100(12):2339-45. https://doi.org/10.1016/j.pec.2017.06.015

Lewis T, Osborn LM, Lewis K, Brockert J, Jacobsen J, Cherry JD. Influence of parental knowledge and opinions on 12-month diphtheria, tetanus, and pertussis vaccination rates. Am J Dis Child 1998;142(3):283-6. https://doi.org/10.1001/archpedi.1988.0215030053018

Liao Q, Lam WW, Cowling BJ, Fielding R. Psychosocial Influences on Parental Decision-Making Regarding Vaccination Against Seasonal Influenza for Young Children in Hong Kong: a Longitudinal Study, 2012-2013. Int J Behav Med 2016;23(5):621-34. https://doi.org/10.1007/s12265-016-9551-1

Lin CJ, Nowalk MP, Zimmerman RK, Ko FS, Zell E, Hooberman A, Kearney DH. Beliefs and attitudes about influenza immunization among parents of children with chronic medical conditions over a two-year period. J Urban Health 2006;83(5):874-83. https://doi.org/10.1177/1524839910388622

Linam WM, Gilliam CH, Honeycutt M, Wisdom C, Swearingen CJ, Romero JR. Parental perceptions about required influenza immunization of pediatric healthcare personnel. Infect Control Hosp Epidemiol 2014;35(10):1301-3. https://doi.org/10.1086/678061

Lindley MC, Jeyarajah J, Yankey D, Curtis CR, Markowitz LE, Stokley S. Comparing human papillomavirus vaccine knowledge and intentions among parents of boys and girls. Hum Vaccin Immunother 2016;12(6):1519-27. https://doi.org/10.1080/21645515.2016.1157673

Livni G, Wainstein A, Birk E, Chodick G, Levy I. Influenza Vaccine Rate and Reasons for Nonvaccination in Children Against Seasonal Influenza for Young Children in Hong Kong: a Longitudinal Study, 2012-2013. Int J Behav Med 2016;23(5):621-34. https://doi.org/10.1007/s12265-016-9551-1

Lavail KH, Kennedy AM. The role of attitudes about vaccine safety, efficacy, and value in explaining parents’ reported vaccination behavior. Health Educ Behav 2013;40(5):544-51. https://doi.org/10.1177/1090198112463022

Le Ngoc Tho S, Ader F, Ferry T, Floret D, Arnal M, Fargeas S, Chidiac C, Valour F. Vaccination against serogroup B Neisseria meningitidis: Perceptions and attitudes of parents. Vaccine 2015; 33(30):3463-70. https://doi.org/10.1016/j.vaccine.2015.05.073

Lee CH, Kim KH, Park JH. Parental decision-making about the HPV vaccine: content and format preferences. Health Promot Pract 2012;13(2):214-21. https://doi.org/10.1177/1524839910388622

Kepka D, Warner EL, Kinney A, Spigarelli MG, Mooney K. Latino parents’ awareness and receipt of the HPV vaccine for sons and daughters in a State with Low Three-Dose Completion. J Cancer Educ 2015;30(4):808-12. https://doi.org/10.1007/s13187-014-0781-0

Kepka DL, Warner EL, Kinney A, Spigarelli MG, Mooney K. Latino parents’ awareness and receipt of the HPV vaccine for sons and daughters in a State with Low Three-Dose Completion. J Cancer Educ 2015;30(4):808-12. https://doi.org/10.1007/s13187-014-0781-0

Kepka DL, Warner EL, Kinney A, Spigarelli MG, Mooney K. Latino parents’ awareness and receipt of the HPV vaccine for sons and daughters in a State with Low Three-Dose Completion. J Cancer Educ 2015;30(4):808-12. https://doi.org/10.1007/s13187-014-0781-0
Luthy KE, Beckstrand RL, Meyers CJ. Common perceptions of parents requesting personal exemption from vaccination. J Sch Nurs 2013;29(2):95-103. https://doi.org/10.1177/1059840512455365

Luthy KE, Beckstrand RL, Peterson NE. Parental hesitancy as a factor in delayed childhood immunization. J Pediatr Health Care 2009;23(6):388-93. https://doi.org/10.1016/j.pedhc.2008.09.006

Maayan-Metzer 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. https://doi.org/10.1016/j.vaccine.2004.10.015

MacDonald SE, Schopflocher DP, Vaudry W. Parental concern about vaccine safety in Canadian children partially immunized at age 2: a multivariable model including system level factors. Hum Vaccin Immunother 2014;10(9):2603-11. https://doi.org/10.4161/hvi.2014.970075

MacDougall DM, Halperin BA, Langley JM, MacKinnon-Cameron D, Li L, Halperin SA, Maritime Universal Rotavirus Vaccination Program. Knowledge, attitudes, beliefs, and behaviors of parents and healthcare providers before and after implementation of a universal rotavirus vaccination program. Vaccine 2016;34(5):687-95. https://doi.org/10.1016/j.vaccine.2015.09.089

Madhivanan P, Li T, Srinivas V, Marlow L, Mukherjee S, Krupp K. Human papillomavirus vaccine acceptability among parents of adolescent girls: obstacles and challenges in Mysore, India. Prev Med 2014;64:69-74. https://doi.org/10.1016/j.ypmed.2014.04.002

Mamele C, Faccini M, Mazzali C, Picca M, Colella G, Duca PG, Zuccotti GV. Acceptability of meningococcal serogroup B vaccine among parents and health care workers in Italy: a survey. Hum Vaccin Immunother 2014;10(9):3004-10. https://doi.org/10.4161/hvi.2014.971602

Marlow LA, Waller J, Wardle J. Trust and experience as predictors of HPV vaccine acceptance. Hum Vaccin Immunother 2007;3(5):171-5. https://doi.org/10.4161/hvi.3.5.4310

Marlow LA, Waller J, Wardle J. Parental attitudes to pre-pubertal HPV vaccination. Vaccine 2007;25(11):1945-52. https://doi.org/10.1016/j.vaccine.2007.01.059

Marshall H, Clarke M, Sullivan T. Parental and community acceptance of the benefits and risks associated with meningococcal B vaccines. Vaccine 2014;32(3):338-44. https://doi.org/10.1016/j.vaccine.2013.11.042

Marshall H, Ryan P, Roberton D, Baghurst P. A cross-sectional survey to assess community attitudes to introduction of Human papillomavirus vaccine. Aust N Z J Public Health 2007;31(3):235-42. https://doi.org/10.1111/j.1467-842x.2007.00054.x

Mayet AY, Al-Shaikh GK, Al-Mandeel HM, Alsaleh NA, Hamad AF. Knowledge, attitudes, beliefs, and barriers associated with the uptake of influenza vaccine among pregnant women. Saudi Pharm J 2017;25(1):76-82. https://doi.org/10.1016/j.jsps.2015.12.001

McAsuley MM, Kennedy A, Basket M, Sheedy K. Exploring the choice to refuse or delay vaccines: a national survey of parents of 6- through 23-month-olds. Acad Pediatr 2012;12(5):375-83. https://doi.org/10.1016/j.acap.2012.06.007

McCale P, Keenan A, Ghebrehewet S. Reasons for measles cases not being vaccinated with MMR: investigation into parents’ and carers’ views following a large measles outbreak. Epidemiol Infect 2016;144(4):870-5. https://doi.org/10.1017/S0950268815001909

Melman ST, Nguyen TT, Ehrlich E, Schorr M, Anbar RD. Parental compliance with multiple immunization injections. Arch Pediatr Adolesc Med 1999;153(12):1289-91. https://doi.org/10.1001/archpedi.153.12.1289

Meszaros JR, Asch DA, Baron J, Hershey JC, Krunanther H, Schwartz-Buzzaglo J. Cognitive processes and the decisions of some parents to forego pertussis vaccination for their children. J Clin Epidemiol 1996;49(6):697-703. https://doi.org/10.1016/0378-5959(95)00007-8

Michael CA, Ogbanu IU, Storms AD, Oluwabunwo CJ, Corkum M, Ashenafi S, Achari P, Biya O, Nguku P, Mahoney F, Team NORS. An assessment of the reasons for oral poliovirus vaccine refusals in northern Nigeria. J Infect Dis 2014;210 Suppl 1:S125-30. https://doi.org/10.1093/infdis/jiu436

Michael EC, Olagbujii BN. Human papilloma virus vaccine: determinants of acceptability by mothers for adolescents in Nigeria. Afr J Reprod Health 2014;18(3):154-8.

Middleman AB, Guajardo AD, Sunwoo E, Sanarsicz Q, Parent knowledge and attitudes about school-based hepatitis B immunization programs. J Sch Health 2002;72(8):348-51. https://doi.org/10.1111/j.1746-1561.2002.tb07923.x

Milteer RM, Jonna S. Parental reasons for delayed immunizations in children hospitalized in a Washington, DC, public hospital. J Natl Med Assoc 1996;88(7):433-6.

Morales-Campos DY, Parra-Medina D. Predictors of Human Papillomavirus Vaccine Initiation and Completion Among Latina Mothers of 11- to 17-Year-Old Daughters Living Along the Texas-Mexico Border. Fam Community Health 2017;40(2):139-49. https://doi.org/10.1097/FCH.0000000000000144

Morhason-Bello IO, Wallis S, Adedokun BO, Adewole IF. Willingness of reproductive-aged women in a Nigerian community to accept human papillomavirus vaccination for their children. J Obstet Gynaecol Res 2015;41(10):1621-9. https://doi.org/10.1111/jog.12775

Morrone T, Napolitano F, Albano L, Di Giuseppe G. Meningococcal serogroup B vaccine: Knowledge and acceptability among parents in Italy. Hum Vaccin Immunother 2017;13(8):1921-7. https://doi.org/10.1080/21645515.2017.1313940

Moulds P, Grant A, Fletcher M, Finn A. Parents’ perceptions of influenza and why they accept or decline the nasal vaccine for their child. Nurs Child Young People 2017;29(3):28-33, https://doi.org/10.7748/ncyp.2017.e854

Muhwezi WW, Banura C, Turinho AK, Mirembe F. Parental knowledge, risk perception and willingness to allow young males to receive human papillomavirus (HPV) vaccines in Uganda. PLoS One 2014;9(9):e106686. https://doi.org/10.1371/journal.pone.0106686

Murakami H, Kobayashi M, Hachiya M, Khan ZS, Hassan SQ, Sakurada S. Refusal of oral polio vaccine in northwestern Pakistan: a qualitative and quantitative study. Vaccine 2014;32(12):1382-7. https://doi.org/10.1016/j.vaccine.2014.01.018

My C, Danchin M, Willaby HW, Pemberton S, Leask J. Parental attitudes, beliefs, behaviours and concerns towards childhood vaccinations in Australia: A national online survey. Aust Fam Physician 2017;46(3):145-51.

Naeem M, Adil M, Abbias SH, Khan MZ, Naz SM, Khan A, Khan, MJ. Coverage and causes of missed oral polio vaccine in urban and rural areas of Peshawar. J Ayub Med Coll Abbottabad 2011;33(4):1382-7. https://doi.org/10.1016/j.vaccine.2014.01.018

Naeem M, Khan MZ, Abbias SH, Adil M, Khan MU, Naz SM. Factors associated with low hepatitis B vaccination; a user and provider perspective study in Peshawar. J Pak Med Assoc 2011;61(11):1125-7.

Namugi P, Phanuwoonoom S. Barriers to measles immunization: the beliefs and attitudes of caregivers in Goroka, Eastern Highlands Province, Papua New Guinea. P N G Med J 2005;48(3-4):183-7.

Niederhauser VP, Markowitz M. Barriers to immunizations: Multithread parents of under- and unimmunized children speak. J Am Acad Nurse Pract 2007;19(1):15-23. https://doi.org/10.1097/00001745-192006050185.x

Oladokun RE, Adefokun BO, Lawoyin TO. Children not receiving adequate immunization in Ibadan, Nigeria: what reasons and beliefs do their mothers have? Niger J Clin Pract 2010;17(2):173-8.
Methodological challenges and initial results of a pan-Canadian longitudinal study. BMC Public Health 2016;16(1):1223. https://doi.org/10.1186/s12889-016-3828-9

[284] Podolsky R, Cremer M, Atri J, Hochman T, Arslan AA. HPV vaccine acceptance by Latino parents: a comparison of U.S. and Salvadoran populations. J Pediatr Adolesc Gynecol 2009; 22(4):205-15. https://doi.org/10.1016/j.jpag.2008.05.010

[285] Pot M, van Keulen HM, Ruiter RAC, Eekhout I, Moll lemma L, Paulussen T. Motivational and contextual determinants of HPV-vaccination uptake: A longitudinal study among mothers of girls aged and attend the HPV-vaccination. Prev Med 2017;100: 41-49. https://doi.org/10.1016/j.ypmed.2017.04.005

[286] Reiter PL, Katz ML, Paskett ED. Correlates of HPV vaccination among adolescent females from Appalachia and reasons why their parents do not intend to vaccinate. Vaccine 2013;31(31): 3121-5. https://doi.org/10.1016/j.vaccine.2013.04.068

[287] Restivo V, Napoli G, Marsala MG, Bonanno V, Sciuto V, Amadio E, Calamusa G, Vitale F, and Firenze A. Factors associated with poor adherence to MMR vaccination in parents who follow vaccination schedule. Hum Vaccin Immunother 2015;11(1): 140-5. https://doi.org/10.1080/16160760.2014.94416

[288] Roberts JR, Thompson D, Rogacki B, Hales JS, Jacobson RM, Opel DJ, Darden PM. Vaccine hesitancy among parents of adolescents and its association with vaccine uptake. Vaccine 2015; 33(14):1748-55. https://doi.org/10.1016/j.vaccine.2015.01.068

[289] Robitz R, Gottlieb SL, De Rosa CJ, Guerry SL, Liddon N, Zaidi A, Walker S, Smith JS, Brewer, N.T., and Markowitz, L.E., Parent attitudes about school requirements for human papillomavirus vaccine in high-risk communities of Los Angeles, California. Cancer Epidemiol Biomarkers Prev 2011;20(7):1421-9. https://doi.org/10.1158/1055-9965.EPI-10-1236

[290] Rogers C. Parents’ vaccine beliefs: a study of experiences and attitudes among parents of children in private pre-schools. R I J (2013), 2014(7):24-37. https://doi.org/10.1001/archpedi.2011.6865

[291] Ruffin MTT, Hade EM, Gorsline MR, DeGraffenreid CR, Katz ML, Kobrin SC, Paskett ED. Human papillomavirus vaccine knowledge and hypothetical acceptance among women in Appalachia, Ohio. Vaccine 2012;30(36):5349-57. https://doi.org/10.1016/j.vaccine.2012.06.034

[292] 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. https://doi.org/10.1001/archpedi.159.5.470

[293] Salmon DA, Sotir MJ, Pan WK, Berg JL, Omer SB, Stokley S, Hopfensperger DJ, Davis JP, Halsey NA. Parental vaccine refusal in Wisconsin: a case-control study. WMJ, 2009;108(1):17-23.

[294] Sam IC, Wong LP, Rampal S, Leong YH, Pang CF, Tai YT, Te HC, Kahar-Bador M. Maternal acceptance of human papillomavirus vaccine in Malaysia. J Adolesc Health 2009;46(6): 610-2. https://doi.org/10.4161/hv.34416

[295] Sampson R, Wong L, Mavicar R. Parental reasons for non-uptake of influenza vaccination in young at-risk groups: a qualitative study. Br J Gen Pract 2011;61(588):e386-91. https://doi.org/10.3399/bjgp11X583155

[296] Rickert VI, Rehm SJ, Aalsma MC, Zimet GD. The role of parental attitudes and provider discussions in uptake of adolescent vaccines. Vaccine 2015;33(5):642-7. https://doi.org/10.1016/j.vaccine.2014.12.016

[297] Rickert VI, Rehm SJ, Aalsma MC, Zimet GD. The role of parental attitudes and provider discussions in uptake of adolescent vaccines. Vaccine 2015;33(5):642-7. https://doi.org/10.1016/j.vaccine.2014.12.016

[298] Rose SB, Lawton BA, Lanumata TS, Hibma M, Baker MG. Predictors of intent to vaccinate against HPV/cervical cancer: a multi-ethnic survey of 769 parents in New Zealand. N Z Med J 2012;125(1350):51-62.

[299] Santibanez TA, Kennedy ED. Reasons given for not receiving an influenza vaccination, 2011-12 influenza season, United States. Vaccine 2016;34(24):2671-8. https://doi.org/10.1016/j.vaccine.2016.04.039

[300] Saqer A, Ghazal S, Bargawi H, Babi JA, Al Khafaji R, Elmekresh MM. Knowledge and Awareness about Cervical Cancer Vaccine (HPV) Among Parents in Sharjah. Asian Pac J Cancer Prev 2017;18(5):1237-41. https://doi.org/10.22034/APJCP.2017.18.1237
[300] Schollin Ask L, Hjern A, Lindstrand A, Olen O, Sjogren E, Blennow M, Orqvist A. Receiving early information and trusting Swedish child health centre nurses increased parents’ willingness to vaccinate against rotavirus infections. Acta Paediatr 2017;106(8):1309-16. https://doi.org/10.1111/apa.13872

[301] Schwarz NG, Gysels M, Pell C, Gabor J, Schlue M, Issitou S, Lelli B, Krensener PG, Grobusch MP, Pool R. Reasons for non-adherence to vaccination at mother and child care clinics (MC-Cs) in Lambarene, Gabon. Vaccine 2009;27(39):5371-5. https://doi.org/10.1016/j.vaccine.2009.06.100

[302] Selimou F, Zidouh A, Nejjari C, Bekkali R. Acceptability of the human papilloma virus vaccine among Moroccan parents: a population-based cross-sectional study. East Mediterr Health J 2015;21(8):555-63. https://doi.org/10.26729/2015.21.8.555

[303] Sengupta B, Sinha RN, Sarkar GN, Biswas AB, Mukherjee KL. Perception and practice regarding pulse polio immunisation in an urban community of Calcutta. Indian Med Assoc 1998;96(8):247-8.

[304] Seven M, Guvenc G, Sahin E, Akyuz A. Attitudes to HPV Vaccination among Parents of Children Aged 10 to 13 Years. J Pediatr Adolesc Gynecol 2015;28(5):382-6. https://doi.org/10.1016/j.jpag.2014.11.005

[305] Shao SJ, Nurse C, Michel L, Joseph MA, Suss AL. Attitudes and Perceptions of the Human Papillomavirus Vaccine in Caribbean and African American Adolescent boys and Their Parents. J Pediatr Adolesc Gynecol 2015;28(5):373-7. https://doi.org/10.1016/j.jpag.2014.11.003

[306] Shapiro GK, Holding A, Perez S, Ansnel R, Rossherber Z. Validation of the vaccine conspiracy beliefs scale. Papillomavirus Res 2016;2:167-72. https://doi.org/10.1016/j.pvr.2016.09.001

[307] Shapiro GK, Perez S, Naz A, Tatar O, Guichon JR, Ansnel R, Zimet GD, Rossherber Z. Investigating Canadian parents’ HPV vaccine knowledge, attitudes and behaviour: a study protocol for a longitudinal national online survey. BMJ Open 2017; 7(10):e017814. https://doi.org/10.1136/bmjopen-2017-017814

[308] Shaw DH, Gold R. Survey of parents’ attitudes to the recommended Haemophilus influenzae type b vaccine program. CMAJ 1987;136(10):1038-40.

[309] Sheikh A, Iqbal B, Ehtamam A, Rahim M, Shaikh HA, Usman HA, Nasir J, Ali S, Zaki M, Wahab TA, Wajax M, Aftab AA. Reasons for non-vaccination in pediatric patients visiting tertiary care centers in a polio-prone country. Arch Public Health 2017;72(1):19. https://doi.org/10.1186/s13693-017-0236-0

[310] Shuaib FM, Kimbrough D, Roofe M, McGwin GJr, Jolly P. Reasons for non-vaccination in pediatric patients visiting tertiary care centers in an urban community of Calcutta. J Indian Med Assoc 2017;96(8):247-8.

[311] Skinder J, March L, Simpson JM. A retrospective cohort study of childhood immunisation status in northern Sydney. Aust J Public Health 1995;19(1):58-63. https://doi.org/10.1111/j.1753-6405.1995.tb00298.x

[312] Smailbegovic MS, Laing GJ, Bedford H. Why do parents decide against immunization? The effect of health beliefs and health perceptions important for HPV vaccine initiation among low-income adolescent girls. Vaccine 2012;30(46):6163-9. https://doi.org/10.1016/j.vaccine.2014.06.009

[313] Stefanoﬀ P, Mamulend SE, Robinson M, Nettlerd E, Tuells J, Bergsaker MA, Heijbel H, Yarwood J, Europe V. Tracking parental attitudes to vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VACSATC). Vaccine 2012;30(35):5731-7. https://doi.org/10.1016/j.vaccine.2010.06.009

[314] Stein Zamir C, Israeli A. Knowledge, Attitudes and Perceptions About Routine Childhood Vaccinations Among Jewish Ultra-Orthodox Mothers Residing in Communities with Low Vaccination Coverage in the Jerusalem District. Mater Child Health J 2017;21(5):1010-17. https://doi.org/10.1007/s10995-017-2272-5

[315] Stephenson JD. Survey of parents’ attitudes to the recommended Haemophilus influenzae type b vaccine program. CMAJ 1987;137(5):371-2.

[316] Stockwell MS, Irigoyen M, Andres Martinez R, Findley SE. Failure to return: parental, practice, and social factors affecting missed immunization visits for urban children. Clin Pediatr (Phila). 2014;53(5):420-7. https://doi.org/10.1177/0009922814527497

[317] Strelitz B. Gritton J, Klein EJ, Bradford MC, Follmer K, Zerr DM, Englund JA, Oepel DJ. Parental vaccine hesitancy and acceptance of seasonal influenza vaccine in the pediatric emergency department. Vaccine 2015;33(15):1802-7. https://doi.org/10.1016/j.vaccine.2015.02.034

[318] Stretch R, Roberts SA, McCann R, Baxter D, Chambers G, Kitchener H, Brabin L. Parental attitudes and information needs in an adolescent HPV vaccination programme. Br J Cancer 2008;99(11):1908-11. https://doi.org/10.1038/sj.bjc.6604766

[319] Suarez-Castaneda E, Pezzoli L, Elas M, Baltrons R, Crespin-Elias EO, Pletze OA, de Campos MI, Danovaro-Holliday MC. Routine childhood vaccination programme coverage, El Salvador, 2011-In search of timeliness. Vaccine 2014;32(4):437-44. https://doi.org/10.1016/j.vaccine.2013.11.072
people google for vaccination: Qualitative and quantitative insights from a systematic search of the web-based activities using Google Trends. Hum Vaccin Immunother 2017;13(2):464-9. https://doi.org/10.1080/21645515.2017.1264742

[362] Bragazzi NL, Gianfredi V, Villarini M, Rosselli R, Nasr A, Hussein A, Martini M, Behzadifar M. Vaccines Meet Big Data: State-of-the-Art and Future Prospects. From the Classical 3Is (“Isolate-Inactivate-Inject”) Vaccinology 1.0 to Vaccinology 3.0, Vaccinomics, and Beyond: A Historical Overview. Front Public Health 2018;6:62. https://doi.org/10.3389/fpubh.2018.00062

[363] Gianfredi V, Bragazzi NL, Mahamid M, Bisharat B, Mahroum N, Amital H, Adawi M. Monitoring public interest toward pertussis outbreaks: an extensive Google Trends-based analysis. Public Health 2018;165:9-15. https://doi.org/10.1016/j.puhe.2018.09.001

[364] Kazi AM, Khalid W. Questionnaire designing and validation. J Pak Med Assoc 2012;62(5):514-6.

[365] Gianfredi V, Nucci D, Ceccarelli F, Villarini M, Moretti M. PILATES (Physical Activity and Diet Survey): An Italian Self-Administered Questionnaire Evaluating Diet Habits of Gym-Goers. Validation Process. J Diet Suppl 2019;16(3):307-17. https://doi.org/10.1080/19390211.2018.1456501

[366] Nucci D, Licitra L, Sciara S, Moretti M, Gianfredi V. PRuNUS: design and validation of a questionnaire among prisoners - data of pilot study in the Penitentiary Institute of Perugia, Italy. Int J Prison Health 2019;16(2):165-83. https://doi.org/10.1108/IJPH-01-2019-0001

[367] Cuda A, Gentile L, Voglino G, Gianfredi V and Gruppo di lavoro Vaccini e Vaccine Hesitancy Consulta degli Specializzandi, SII. [Design and validation of a questionnaire for assessing Public Health residents’ opinions and knowledge regarding the new mandatory vaccination law in Italy (DL 73/2017)]. Ig Sanita Pubbli 2018;74(2):137-52.

[368] Derrough T, Olsson K, Gianfredi V, Simonond F, Heijbel H, Danielsson N, Kramarz P, Pastore-Celentano L. Immunisation Information Systems - useful tools for monitoring vaccination programmes in EU/EEA countries, 2016. Euro Surveill 2017;22(17). https://doi.org/10.2807/1560-7917.ES.2017.22.17.30519

[369] Gianfredi V, Balzarini F, Gola M, Mangano S, Carpagnano LF, Colucci ME, Gentile L, Piscitelli A, Quattrone F, Scuri S, Montovani LG, Auxilia F, Castaldi S, Capolongo S, Pelissero G, Odone A, Signorelli C. Leadership in Public Health: Opportunities for Young Generations Within Scientific Associations and the Experience of the “Academy of Young Leaders”. Front Public Health 2019;7:378. https://doi.org/10.3389/fpubh.2019.00378

[370] Gianfredi V, Moretti M, Lopalco PL. Countering vaccine hesitancy through immunization information systems, a narrative review. Hum Vaccin Immunother 2019;1:1-19. https://doi.org/10.1080/21645515.2019.1599675

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