PARENTAL CHILDHOOD VACCINE HESITANCY AND PREDICTING UPTAKE OF VACCINATIONS: A SYSTEMATIC REVIEW

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ABSTRACT

Aim

This review aims to: 1) identify relevant quantitative research on parental childhood vaccine hesitancy with vaccine uptake and vaccination intention being relevant outcomes; and 2) Map the gaps in knowledge on vaccine hesitancy to develop suggestions for further research and to guide interventions in this field.

Background

Vaccine hesitancy recognises a continuum between vaccine acceptance and vaccine refusal, de-polarising past anti-vaccine and pro-vaccine categorisations of individuals and groups. Vaccine hesitancy poses a serious challenge to international efforts to lessen the burden of vaccine-preventable diseases. Potential vaccination barriers must be identified to inform initiatives aimed at increasing vaccine awareness, acceptance, and uptake.

Methods

Five databases were searched for peer-reviewed articles published between 1998 and 2020 in the fields of medicine, nursing, public health, biological sciences, and social sciences. Across these datasets, a comprehensive search technique was used to identify multiple variables of public trust, confidence, and hesitancy about vaccines. Using PRISMA guidelines, 34 papers were included so long as they focused on childhood immunisations, employed multivariate analysis, and were published during the time frame. Significant challenges to vaccine uptake or intention were identified in these studies. Barriers to vaccination for the target populations were grouped using conceptual frameworks based on the Protection Motivation Theory and the WHO SAGE Working Group model and explored using the 5C psychological antecedents of vaccination.

Findings

Although several characteristics were shown to relate to vaccine hesitancy, they do not allow for a thorough classification or proof of their individual and comparative level of influence. Understudied themes were also discovered during the review. Lack of confidence, complacency, constraints, calculation, and collective responsibility have all been highlighted as barriers to vaccination uptake among parents to different degrees.

Keywords: Vaccine, Childhood Vaccines, Vaccination, Immunisation, Hesitancy, Confidence, Parents, Public Trust

1. INTRODUCTION

Apart from the provision of clean water, vaccines have had a more profound effect on global health, especially of children, than any other public health measure (Public Health England, 2014; WHO, 2019; Rodrigues & Plotkin, 2020). Despite this, millions of children around the world do not receive the recommended vaccines. In 2020, 23 million children missed out on routine childhood vaccinations, the highest number since 2009 and 3.7 million higher than in 2019 (WHO, 2020; UNICEF, 2022).

Poor vaccination coverage leads to outbreak of diseases. For example, in January and February 2022, there were over 17,338 cases of measles recorded globally, compared to 9,665 cases in the same period in 2021 (WHO, 2022). In England and Wales in 2018 there was a marked increase in confirmed measles cases with 991 cases, compared to 284 cases in 2017 (Public Health England, 2019). These developments led to the UK losing its 'measles-free' status with the World Health Organisation (WHO) barely three years after the measles virus was eliminated from the country (Wise, 2019).

Concern from parents, decision-makers, and the media regarding the safety of recommended immunisations has increased in recent years due to debates regarding the links between vaccines and autism, vaccine ingredients, and the number of injections given during a single office visit or during the first years of life (Miller & Reynolds, 2009; Gabis et al., 2022; Davidson, 2022). An increasing number of people question the safety of vaccines (Yaqub et al., 2014; Dubé, 2015; Larson et al., 2015a), seek alternative measures such as natural methods (e.g., rigorous hygiene) and antibiotic use (Dempsey et al., 2011; Robison et al., 2012; Popa et al., 2020) and sometimes delay or refuse vaccination (Gust et al., 2008; Larson et al., 2014a; Larson et al., 2014b). This delay or refusal of vaccination is termed vaccine hesitancy (VH). VH is of grave concern, such that it was listed by the WHO as one of the ten threats to global health in 2019 (WHO, 2019).

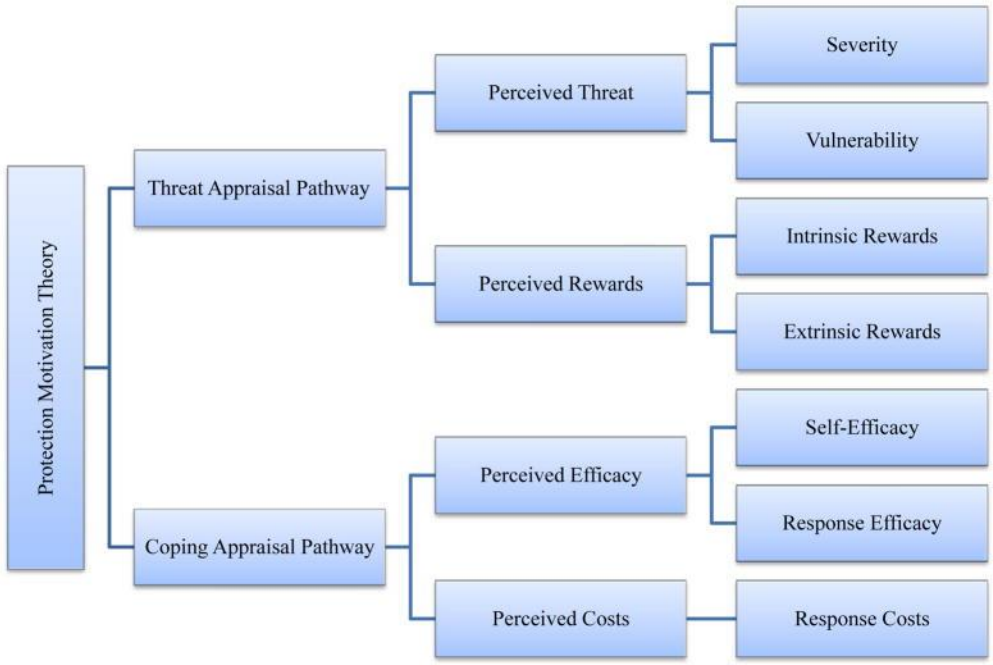
VH is determined by a wide range of factors. In the UK, a cross-sectional study of 600 participants including GPs, health visitors, practice nurses and parents of immunised children, found that socioeconomic factors, such as high social class and being a first-time parent, were important predictors of delayed childhood vaccination (Macdonald et al., 2004). Family size and parental education were identified as determinants of under-immunisation in Greece (Danis et al., 2010). In Nigeria, maternal availability, lack of knowledge and parental disapproval were associated with partial immunisation (Babalola, 2011). A combination of sociodemographic and socioeconomic factors such as marital status, maternal education and family income influenced parental decision-making in Israel (Stein-Zamir & Israeli, 2017), Saudi Arabia (Alsubaie et al., 2019), Italy (Giambi et al., 2018), Australia (Chow et al., 2017), and USA (Omer et al., 2009; Rachel et al., 2018).

Several systematic reviews have investigated factors that influence VH across different populations, with a particular focus on the influence of knowledge, attitudes, and beliefs on vaccination behaviour (Falagas & Zarkadoulia, 2008; Rainey et al., 2011; Prematungr et al., 2012; Trim et al., 2012). While it is important to identify potential determinants of VH, the proportion of parents who are vaccine hesitant needs to be estimated using widely validated, theory-based psychological scales, to inform researchers and policymakers about the burden of vaccine-preventable diseases (VPDs), which will ultimately help in identifying priorities in healthcare prevention, promotion, practices, and policy (Bloom et al., 2014; Mahase, 2020).

Few studies offer quantitative tools to measure prevalence of VH and even fewer studies have used standardised, widely validated survey instruments, such as the Parent Attitudes about Childhood Vaccinations (PACV) scale (Opel et al., 2011b), to achieve these objectives.

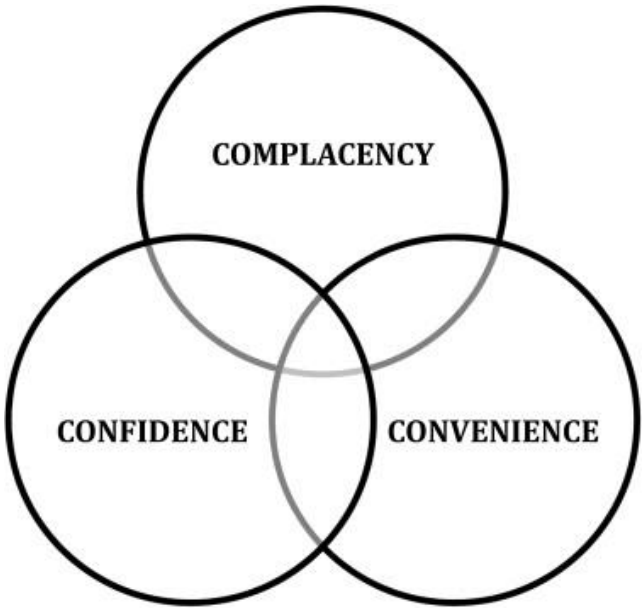
Few researchers have applied theories of health behaviour to vaccination uptake. The Protection Motivation Theory (PMT) (Rogers & Prentice-Dunn, 1997), developed to understand how people respond to health threats, is one such theory. PMT suggests that people will be likely to protect themselves (e.g., by obtaining a vaccine) if they have firm beliefs about the threat posed by the disease itself (severity and vulnerability) (Voeten et al., 2009). PMT considers the physical and psychosocial consequences of engaging in a risk behaviour (intrinsic and extrinsic rewards) and the costs (e.g., personal resources) involved in avoiding the given health threat (response costs) (Rogers & Prentice-Dunn, 1997), as displayed in Figure 1. In addition, PMT considers people's beliefs in their own abilities to adopt a protective measure (self-efficacy) as well as the outcomes of their behaviour (response efficacy) (Rogers & Prentice-Dunn, 1997). PMT thus reliably predicts behavioural intentions based on attitudes and perceptions (de Zwart et al., 2009).

Figure 1: PMT Constructs



Vaccination acceptance is a behavioural outcome that results from a complicated decision-making process that can be impacted by a variety of variables. After considering the diverse factors and the possibility of informing the development of global and country-level vaccine hesitancy indicators, the WHO's Strategic Advisory Group of Experts on Immunization (SAGE) Working Group developed the 3C model of vaccine hesitancy (MacDonald, 2015), which points out three different types of vaccine hesitancy determinants: confidence, complacency, and convenience (Figure 2).

Figure 2: 3C Model of Vaccine Hesitancy



Confidence is described in the 3C model as strong belief in the efficacy and safety of vaccinations, the system that distributes them, plus the trustworthiness and competency of health services, health systems and health professionals, and what drives the policymakers who determine which vaccines are required (MacDonald, 2015). People with little or no vaccine confidence have negative views toward immunisations, which influence their actions. The unfavourable attitude is fuelled by misinformation, conspiracy theories, and heightened perceptions of vaccine-related risks ((Betsch et al., 2015).

Complacency occurs when the dangers of VPDs are viewed as minimal and vaccination is not considered a required precautionary measure (MacDonald, 2015). Complacency about a specific vaccine, or vaccination in general, is determined by several factors, which include other general duties that are deemed more important at the time (Betsch et al., 2015). When people assess the risks of getting a specific vaccine versus the risks of getting the disease that the vaccine protects against, the success of vaccination programmes can lead to complacency and, ultimately, hesitancy (Schmid et al., 2017). The extent to which complacency affects hesitancy is also determined by self-efficacy (an individual's perceived or real ability to decide whether to be vaccinated or not) (Ernsting et al., 2015).

Convenience is a crucial determinant which might result from sentiments that are neither strongly against nor strongly in favour of vaccination, implying that vaccination is insufficiently important to actively overcome physical or psychosocial barriers (MacDonald, 2015). For example, access to immunizations may be hampered by geopolitical or economic reasons that affect production and supply reliability (Betsch et al., 2015). Furthermore, increased vaccine costs may result in a reduction in the frequency with which parents interact with healthcare services (Schmid et al., 2017). As a result, when decision-makers face obstacles such as poor access, a high cost, or a long travel time, they opt out of vaccination to avoid these issues (Betsch et al., 2015).

Grounded in the 3C model and other validated vaccine hesitancy and acceptance models (Larson et al., 2014a; Thomson et al., 2016), the 5C model captures relevant determinants of vaccination behaviour and links them to psychological theories to explain health behaviour (Betsch et al., 2018). The 5C model retains the terms ‘confidence’ and ‘complacency’, but

‘convenience’ is replaced with ‘constraints’ as it more accurately reflects the physical, structural, and psychological obstacles (e.g., access, costs) that serve as gatekeepers, preventing the transition from vaccination intention to vaccination behaviour. Time spent travelling to vaccination centres or enduring unpleasant procedures can also be categorised as *constraints* (Betsch et al., 2015).

Calculation, the fourth 'C' which applies to both the 4C (Betsch et al., 2015) and 5C models (Betsch et al., 2018) demonstrates the requirement for significant research and elaboration. People with high calculation tendencies assess the risks of infection and immunisation to make an informed decision. As a result, calculation has been linked with the risk of disease exposure and immunisation (Brewer et al., 2007). Cost-benefit analysis could indicate a risk-averse mindset, hence a negative correlation with risk-attitude (Johnson et al., 2004). The need to avoid risks could be a major incentive to people with high calculation levels, as their conscious thinking patterns suggest (Johnson et al., 2004). These individuals are also known to have a more deliberate logical and cognitive decision-making style (Betsch, 2004) and to rely less on superstitious beliefs (Wiseman & Watt, 2004).

Collective responsibility refers to a person's willingness to safeguard others through herd immunity (Fine et al., 2011). The notion includes the societal benefits of vaccination, such as the fact that most immunizations protect unvaccinated individuals owing to herd immunity. The desire to free-ride when enough people are vaccinated is the opposite effect (Fine et al., 2011; Betsch et al., 2013; Betsch et al., 2017). Collectivism, communal attitude, and empathy have been associated with collective responsibility (Clark et al., 1987; Shulruf et al., 2007; Betsch et al., 2017). Because collective responsibility has a negative correlation with individualism (Shulruf et al., 2007), those with a high sense of collective responsibility are likely to vaccinate in the interests of others. Low levels may suggest that a person is unaware of herd immunity, is unconcerned about it, or refuses to vaccinate in the interest of others (Betsch et al., 2015).

Examining psychological variables is critical for understanding vaccination intention and informing effective interventions (Schmid et al., 2017). A more comprehensive knowledge and understanding of the underlying psychology of vaccine-hesitant groups can improve the effectiveness of public health messages aimed at these populations.

This systematic review uses the PMT and the WHO SAGE Working Group model as comprehensive theoretical frameworks for understanding VH and its drivers. The models served as useful tools for predicting the intention of parents to adopt protective behaviours, such as getting their children vaccinated. The physical, psychological, contextual, and sociodemographic barriers to vaccination will be identified and clustered using these theoretical models. The hesitancy profiles of the identified risk group (parents) were discussed using the 5C model, and the findings integrated at the macro- and micro-level.

This paper examined vaccine hesitancy from a global perspective, then narrowed its focus to the UK. The purpose is to understand parental childhood vaccine hesitancy and inform gaps in research and interventions in the UK, and importantly, consider the wider determinants of vaccine hesitancy as no single intervention exists to eliminate vaccine hesitancy (WHO, 2020; Danabal et al., 2021; Wiysonge et al., 2021).

2. METHODS

2.1. Review Questions

The review questions are as follows:

(1) What is the global prevalence of parental childhood vaccine hesitancy?
(2) What are the predictors of vaccination intention?

2.2. Objectives

This systematic review will achieve the following specific objectives:

(1) Identify relevant quantitative research on parental childhood vaccine hesitancy with vaccine uptake and vaccination intention being relevant outcomes;

(2) Identify context-specific causes, behaviour, and impact of vaccine hesitancy; and

(3) Map the gaps in knowledge on vaccine hesitancy to develop suggestions for further research and to guide interventions in this field.

2.3. Search Strategy

To reflect the diverse range of subject areas covered by vaccine hesitancy, databases in medicine, nursing, public health, biological and social sciences, behavioural sciences, and psychology were used in this review. The search was also extended to relevant internet sites including Google Scholar and WHO's Global Literature on Coronavirus Disease. The database search (see Table 1) was supplemented by a manual search of the reference lists of the included studies, as well as the cited references. The search strategy incorporated MeSH or equivalent terms.

Table 1: Selected Databases

Medical Literature Analysis and Retrieval System Online (MEDLINE)
Cumulative Index of Nursing and Allied Health Literature (CINAHL)
Psychology & Behavioural Sciences Collection
Child Development & Adolescent Studies
Education Research Complete
Google Scholar
WHO's Global Literature on Coronavirus Disease

Multiple search terms were first developed and then these were combined using the Boolean operators "OR" and "AND". The search for data involved keywords, related terms, variants, or the same meaning for the terminologies (see Table 2).

Table 2: Keywords used in search strategy

	OR		OR		AND		OR
vaccination		vaccin*		hesitancy		Parent	child
immunization		immuniz*		refusal		Caregiver	children

immunisation		immunis*		denial		Guardian	childhood
prevention and control				rejection			
				Antivaccination			
				antivax			
				anti-vax			

From the identified search terms, a broad search string was first developed for MEDLINE and then adapted to all other databases. The core search around the concepts of vaccination and hesitancy is shown in Table 3.

Table 3: Search String for Selected Databases

Databases: Medical Literature Analysis and Retrieval System Online (MEDLINE), Cumulative Index of Nursing and Allied Health Literature (CINAHL), Psychology & Behavioural Sciences Collection, Child Development & Adolescent Studies, and Education Research Complete.
1. Vaccination or immunization or immunisation or prevention and control 2. Vaccin or immuniz or immunis 3. Hesitancy or refusal or denial or rejection or antivaccination or antivax 4. 1 or 2 or 3 5. Parent or caregiver or guardian 6. Child or children or childhood 7. 5 or 6 8. 4 AND 7

The publication dates of interest were limited to the period between 1 January 1998 and 31 December 2020. The starting year was chosen as it was the year of publication of the now-retracted Andrew Wakefield's article that linked measles, mumps and rubella (MMR) vaccine with the occurrence of autism and behavioural abnormalities in children (Wakefield et al., 1998). The controversy fuelled the anti-vaccination movement (Grignolio, 2018; Balakrishnan, 2019; Glasper, 2022). The initial search was conducted from 31 December 2020 to 21 January 2021. The search process and resulting analysis followed the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-analyses) approach (Page et al., 2021).

After the removal of duplicates, the remaining articles were screened by title and abstract. Articles were then excluded using a set of exclusion criteria (Table 4). As this review focused on parental childhood vaccine hesitancy with vaccine uptake and vaccination intention being relevant outcomes, articles were excluded for the following reasons: not addressing human vaccines; studies that measured hesitancy indicators on vaccines unrelated to childhood immunisation including adolescent vaccines (Human papilloma virus (HPV), Diphtheria-Tetanus-Pertussis (DTaP) booster) and adult vaccines (herpes zoster vaccine); studies not related to determinants of general vaccine hesitancy (e.g., studies about vaccine efficacy); studies with determinants not linked to a behavioural outcome; modelling studies and intervention studies. Studies without full texts were also excluded. Pre-prints, grey literature, including dissertations/theses, government publications and articles on mandates were

excluded, as these are not peer-reviewed. Other systematic reviews, meta-analysis and review articles were excluded to avoid duplication of studies. Only articles written in English were considered.

Table 4: Exclusion Criteria

1.	Books or book chapters	12.	Studies not addressing human vaccines
2.	Editorials or letters	13.	Studies not related to parental vaccine hesitancy and healthcare fields of research
3.	Practice guidelines	14.	Studies not related to determinants of parental vaccine hesitancy
4.	Government publications and articles on mandates	15.	Studies that are not peer-reviewed
5.	Papers without abstract	16.	Studies with determinants not linked to a behavioural outcome
6.	Abstract only reports	17.	Studies not reporting primary data (including other reviews and meta-analysis)
7.	Dissertations or theses	18.	Modelling studies
8.	Commentaries	19.	Intervention studies
9.	Preprints	20.	Studies not published in English
10.	Studies without full texts	21.	Studies not published between 1998 and 2020
11.	Studies that measure hesitancy indicators on vaccines that are not related to childhood immunisation including adolescent vaccines (HPV, DTaP booster, etc), seasonal influenza vaccine and adult vaccines (herpes zoster vaccine)	22.	Studies not reporting multivariate analysis of determinants

Filters were provided by most databases for elements of the exclusion criteria, including publication dates (1998–2020), language (English), and type of publication (peer-reviewed journal article). These filters were used during the initial search, when applicable.

2.4. Data Extraction

Included studies were coded by publication year, country, WHO region, vaccine, outcome variable (intention or behaviour), and population, among other variables. The predictors of childhood vaccine uptake or intention (p-value < .05) as well as the prevalence rates of parental childhood vaccine hesitancy were extracted from the selected studies and documented.

2.5. Quality Assessment

To assess the quality of included studies, the Joanna Briggs Institute (JBI) critical appraisal checklist for studies reporting prevalence data was used (Munn et al., 2015) (see Supplementary Material 1). This is a standard, recommended and widely used tool with a higher methodologic rigour compared to other appraisal methods (Migliavacaa et al., 2020; Ma et al., 2020). The 34 included studies met all the JBI criteria.

2.6. Data Synthesis

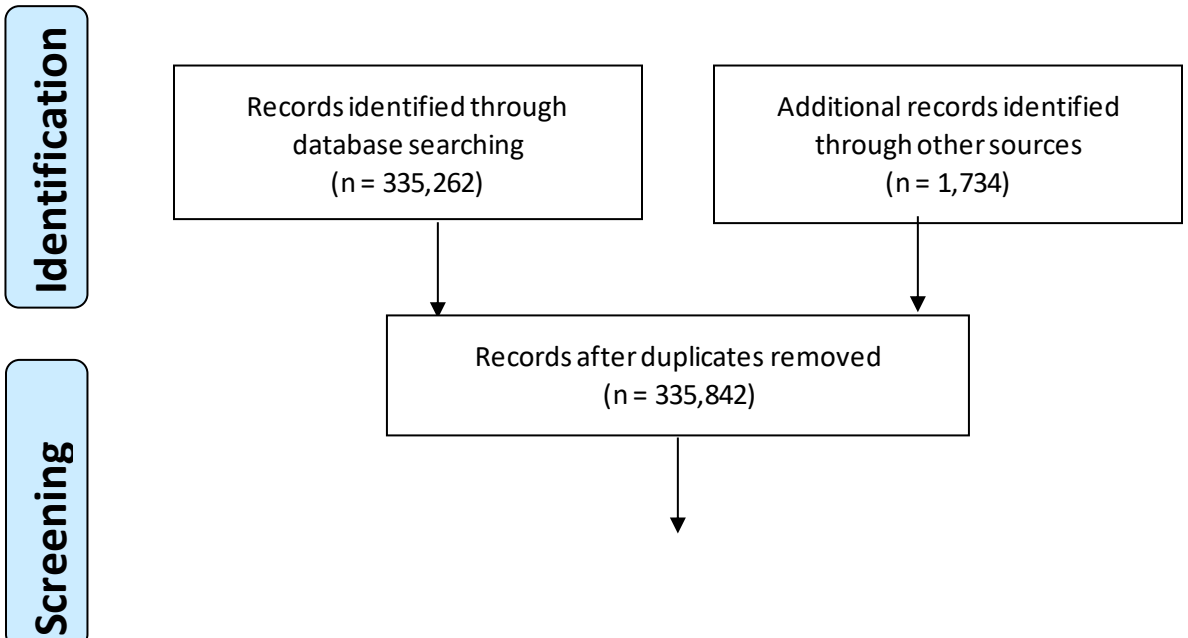
Thematic analysis was used for the synthesis, analysis, and interpretation of the patterns of meanings, attributes, and findings from the selected quantitative studies (Braun & Clark, 2006; Guest et al., 2012). A meta-analysis of numerical data was considered inappropriate for this review as the included studies are heterogenous, clinically diverse, with different metrics or outcomes evaluated, and as such too dissimilar to combine the results (Higgins et al., 2021).

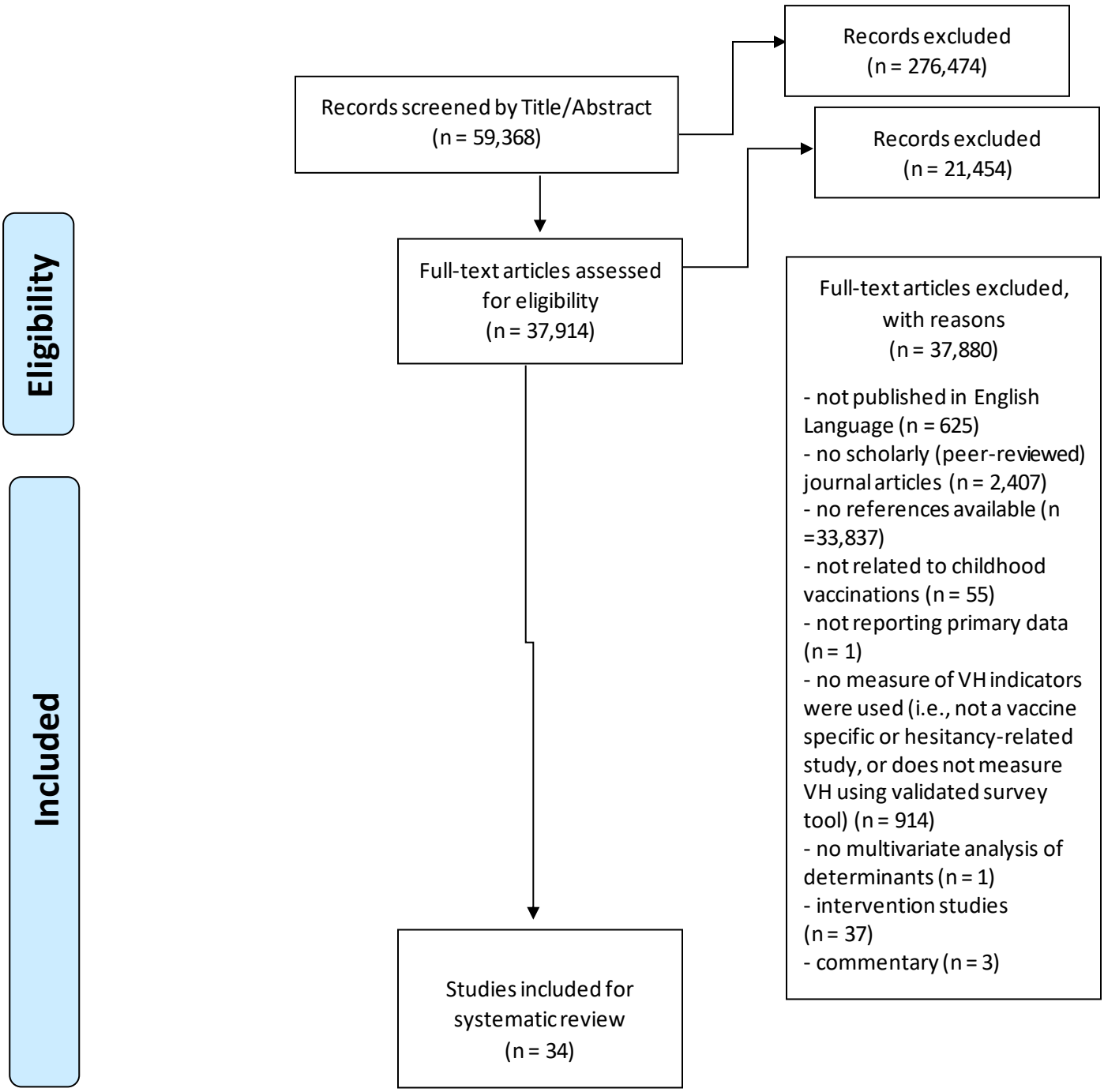
3. RESULTS

3.1. Identified Literature

In total, 335,262 records (all languages) were identified from the databases using the search strategy previously described (Table 2). An additional 1,734 articles were added from other sources (relevant internet sites including Google Scholar and WHO's Global Literature on Coronavirus Disease, and studies obtained from manual search of the reference lists of the included studies, as well as the cited references). After the removal of duplicates, 335,842 records were shortlisted for screening by title and abstract (Figure 3). A total of 276,474 papers were removed according to the exclusion criteria (Table 4). In all, 37,914 articles were eligible for the full-text assessment. After full-text analysis, 37,880 articles were removed. The remaining articles were considered for descriptive analysis and synthesis (n = 34).

Figure 3: PRISMA Flow Diagram





A total of 30 articles assessed the prevalence of parental childhood vaccine hesitancy in various populations, while four evaluated the intention of parents to vaccinate their children against VPDs (see Supplementary Material 2).

3.2. Descriptive analysis of articles

3.2.1. Study setting, design, and sampling

Relevant research about vaccine hesitancy was found across all WHO regions. Twelve articles in the current review present findings from the Americas (USA, Canada, Guatemala). From 1998, nine studies came from Europe (Italy, France, UK, Netherlands, Slovenia, Kyrgyzstan), five from Western Pacific (Malaysia, China), two from East Mediterranean (Pakistan, Saudi

Arabia), one from South-East Asia (India), one from Africa (Ghana) and four from cross-national comparisons of countries across different regions. Only two studies were conducted in the UK (two further studies included participants from the UK).

The majority of articles present data derived from cross-sectional (72.5%; n = 29) study designs. Longitudinal (n = 2) and mixed methods (n = 3) made up the remaining 15% of study designs used by the selected studies. The articles covered diverse ethnic backgrounds of sample populations. Nearly half (15/34) of the studies examined a multi-ethnic sample. Nineteen studies reported no information on race/ ethnicity.

There was an increase in research on parental childhood vaccine hesitancy across all WHO regions over the period 1998–2020. There was particular interest shown in pandemic influenza and seasonal influenza vaccines and the newly introduced COVID-19 vaccines. The main outcome variable in most studies (30/34) was actual vaccine behaviour, while the intention to vaccinate against COVID-19 or any new VPD was assessed in 4 of the 34 studies. Childhood vaccines remained a primary focus in Africa, South-Eastern Asia, and East Mediterranean regions. Studies from the Americas, Europe and Western Pacific considered all age groups, with a tendency to shift to adolescent and adult vaccines. The introduction of COVID-19 vaccines oversaw an increase in published literature on vaccine hesitancy with a shift in focus to the adult population. This research boost reflects the extent of the challenges surrounding uptake of the COVID-19 vaccines and the broader implications for vaccine confidence (Bell et al., 2020; Goldman et al., 2020).

3.2.2. Focus on specific vaccines

The majority of the selected studies (24/34) considered vaccines in general and were not focused on a specific vaccine. Studies that were specific to one vaccine looked at influenza, MMR, or COVID-19 vaccine, and this was more common in the Americas, Europe, and South-East Asia. Of the 34 articles reviewed, parents or primary caregivers were the focal point, offering their perspectives on the factors influencing their intention to recommend vaccines.

3.2.3. Use of theoretical models

Only a few of the studies expanded the field of vaccine hesitancy research using novel approaches drawn from the core concepts of social cognitive models. For example, a cross-sectional study in the Netherlands was conducted to determine parental attitudes towards future childhood immunisations (Hak et al., 2005). Guided by the HBM, the authors developed a questionnaire for distribution to 800 highly educated parents of children <5 years of age attending day-care centres. With a response rate of 35% and less than half (46%) of participants expressing desire to vaccinate their children against diseases, this study highlighted the need for continuous health education to ensure the success of vaccination programs. The low predictive capability of HBM variables was evident in this research, given the lack of depth of the questions used to assess and predict behaviour change among the respondents. For example, while questions related to perceived barriers and perceived benefits were strong predictors, questions about perceived severity were weakly correlated.

In Canada, Dubé et al. (2018) explored vaccine hesitancy among parents and examined factors associated with their intention to vaccinate their children. Informed by the TPB this cross-sectional study assessed the relationships between knowledge, attitudes, and beliefs of 2,013 parents and their intention to present their children for future vaccinations. Despite the importance of this study, the applied model did not comprehensively cover the influence of

broader contextual factors. Even the authors acknowledged that "…the predictive power of TPB could be further increased by integrating concepts of risk perception, past behaviour, knowledge, and experience into the model" (Dubé et al., 2018: 547).

A more recent cross-sectional study in China evaluated parental vaccine hesitancy and identified risk factors associated with the intention of mothers to vaccinate their children (Hu et al., 2019). Of the 770 mothers of children aged 24–35 months surveyed in Zhejiang province, 79.6% had positive attitudes towards vaccination. Like the Canadian study, this research used the TPB constructs to predict behaviour change among the sample population, and thus had similar shortcomings.

3.3. Analysis of factors (Determinants of vaccine hesitancy)

The 34 studies recognised the complex nature of vaccine hesitancy, evidenced by the range of factors identified as determinants of vaccination behaviour (Table 5). These factors clustered around the core concepts of commonly used social cognitive models such as the Health Belief Model (HBM), Theory of Reasoned Action, Theory of Planned Behaviour (TPB), Social Cognitive Theory, Health Action Process Approach, and the Protection Motivation Theory (PMT). With respect to the objectives of this review, these findings validate the determinants of vaccine hesitancy outlined in the SAGE WG model (MacDonald, 2015). These themes will be adopted for the analysis of factors identified in the selected studies.

Table 5: Determinants of vaccine hesitancy

Contextual Influences	**Individual and Social Group Influences**	**Vaccine and Vaccination-Specific Issues**
Socio-economic groups	Experience with past vaccination	Evidence-based risk/benefit analyses
Religion/culture/gender	Perceived risk/benefits	Vaccination schedule
Policies and mandates	Personal experience with and trust in health system and provider	Mode of administration
Influential leaders and individuals	Knowledge/awareness of vaccines	Mode of delivery
Communication and media environment	Beliefs, attitudes and motivation about health and prevention	Introduction of a new vaccine or new formulation
Pharmaceutical industry	Need for vaccines	Reliability of vaccine supply
Historical influences		Role of healthcare professionals
Geographic barriers		Costs
		Tailoring vaccines/vaccination to needs

3.3.1. Contextual influences

3.3.1.1. Socioeconomic Factors

Socioeconomic status (SES) was recognised as a significant determinant of vaccine hesitancy in nine of the included studies. In Netherlands (Hak et al., 2005), Malaysia (Azizi et al., 2017),

France (Bocquier et al., 2018) and China (Hu et al., 2019), low SES was identified as a promoter/enabler of vaccination, while high SES was found to be a barrier. Another study in Malaysia (Kalok et al., 2020) indicated low SES as a barrier to vaccination, whereas high SES was considered a promoter. This finding was corroborated by studies in India (Dasgupta et al., 2018) and Pakistan (Khattak et al., 2020). In China, although caregivers with high SES accepted vaccines with doubts, they did not delay or refuse vaccines for their children (Fanxing et al., 2020). The varying results obtained by different studies reflect the multidimensional nature of vaccine hesitancy, especially in the context of socioeconomic and health disparities existing among nations (Bocquier et al., 2018). Thus, it would be counterproductive to consider individual factors in isolation as multiple influences are at play (Larson et al., 2015a; Larson et al., 2015b).

3.3.1.2. Communication and media environment

The mass media remains a regular source of information about vaccination and vaccine-related issues. Constant exposure to vaccination stories could serve as a promoter of, or barrier to, vaccination (Larson et al., 2015b). Previous studies in Nigeria (Antai, 2009; Babalola & Lawan, 2009; Babalola, 2011), India (Patra, 2012), and Bangladesh (Rahman & Obaida-Nasrin, 2010) highlighted the positive association between the media and the promotion of vaccination. In this review, however, negative news stories acted as a barrier to vaccination, as seen in studies from the UK (Campbell et al., 2017), Canada (Greenberg et al., 2017; Dubé et al., 2018), France (Bocquier et al., 2018), Italy (Napolitano et al., 2018; Bianco et al., 2019), Slovenia (Ucakar et al., 2018), Malaysia (Azizi et al., 2017; Musa et al., 2019; Kalok et al., 2020), Pakistan (Khattak et al., 2020), Saudi Arabia (Alsubaie et al., 2019), and China (Hu et al., 2019; Fanxing et al., 2020).

3.3.1.3 Trust in pharmaceutical companies

In nine of the included studies, parents had a mistrust of pharmaceutical industries, believing that economic interests influenced vaccination policy (Gilkey et al., 2016; Greenberg et al., 2017; Domek et al., 2018; Giambi et al., 2018; Dubé et al., 2018; Bocquier et al., 2018; Bianco et al., 2018; Alsubaie et al., 2019; Musa et al., 2019). Parents felt the pharmaceutical sector should act in the public's best interest. Lack of trust in pharmaceutical companies was thus considered a barrier to vaccination.

Parents questioning the intentions of pharmaceutical companies may result in weak public acceptance of vaccines (Alsubaie et al., 2019). Therefore, it is important to consider how parents view the pharmaceutical sector as a major factor in the mistrust that leads to vaccine refusal.

3.3.2. Individual and social group influences

3.3.2.1. Past experiences

Negative past experiences with vaccination services, such as side effects, poor continuity of care or lack of compassionate or comprehensive care, were significant predictors of VH among parents in twelve of the studies reviewed. These studies were split across the USA (Henrikson et al., 2017), Canada (Dubé et al., 2018), Italy (Napolitano et al., 2018, Giambi et al., 2018), Bianco et al., 2019), China (Hu et al., 2019; Fanxing et al., 2020), Malaysia (Musa et al., 2019) and Ghana (Wallace et al., 2019). Three multinational studies also reported these findings (Bakhache et al., 2013; Larson et al., 2015b; Goldman et al., 2020).

3.3.2.2. Beliefs and attitudes

The importance of beliefs about vaccine safety and efficacy, and general attitudes and trust were noted by all 34 studies reviewed. These factors were significantly associated with the vaccination status of children. Having a positive attitude towards vaccination and a belief in the scientific efficacy of vaccines were identified as promoters of vaccination (Opel et al., 2011b; Opel et al., 2013; Strelitz et al., 2015; Campbell et al., 2017; Henrikson et al., 2017; Rachel et al., 2017; Azizi et al., 2017; Bocquier et al., 2018; Napolitano et al., 2018; Bianco et al., 2019; Dubé et al., 2018; Dubé et al., 2019; Musa et al., 2019; Kalok et al., 2020). On the other hand, antivaccination behaviours, preference for alternative health approaches and a belief in myths, rumours or conspiracy theories acted as barriers to vaccination (Larson et al., 2015b; Azizi et al., 2017; Greenberg et al., 2017; Dubé et al., 2018; Bocquier et al., 2018; Napolitano et al., 2018; Ucakar et al., 2018; Bianco et al., 2019; Alsubaie et al., 2019; Hu et al., 2019; Musa et al., 2019; Kalok et al., 2020; Khattak et al., 2020; Fanxing et al., 2020).

3.3.2.3. Knowledge and awareness

Knowledge about the severity of a disease and awareness of disease susceptibility were important determinants of the vaccination status of children in the UK (Campbell et al., 2017; Bell et al., 2020), USA (Opel 2011b; Strelitz et al., 2015; Henrikson et al., 2017), Canada (Greenberg et al., 2017; Dubé et al., 2019), Italy (Napolitano et al., 2018), Saudi Arabia (Alsubaie et al., 2019), Malaysia (Azizi et al., 2017; Musa et al., 2019; Kalok et al., 2020), and Ghana (Wallace et al., 2019).

3.3.2.4. Risk-benefit perception (perceived threat vs perceived rewards)

Several studies (22/34) highlighted the influence that perceived risks and benefits have on vaccination behaviour. Eight of these studies came from the Americas (Opel et al., 2011b; Gilkey et al., 2016; Frew et al., 2016; Rachel et al., 2017; Greenberg et al., 2017; Domek et al., 2018; Dubé et al., 2018; Dubé et al., 2019), six from Europe (Hak et al., 2005; Akmatov et al., 2009; Bocquier et al., 2018; Bianco et al., 2018; Napolitano et al., 2018; Bell et al., 2020), four from Western Pacific (Azizi et al., 2017; Musa et al., 2019; Hu et al., 2019; Fanxing et al., 2020), two from East Mediterranean (Alsubaie et al., 2019; Khattak et al., 2020), one from Southeast Asia (Dasgupta et al., 2018), and one from Africa (Wallace et al., 2019). Parents who intend to have their children vaccinated had a lower perceived risk of vaccination, and vice versa. If parents perceive the risk of a VPD to be lower than the risk from vaccines, they are likely to doubt the relevance of the vaccines and become vaccine hesitant. These determinants are in line with the Threat Appraisal Pathway of the PMT: Perceived Threat (Severity, Vulnerability), and Perceived Rewards (Intrinsic Rewards, Extrinsic Rewards).

3.3.2.5. Vaccination as a social norm

Vaccine uptake was influenced by the presence of peers or relatives that are in support of vaccination, as reflected in studies caried out in the USA (Rachel et al., 2017; Henrikson et al., 2017), Canada (Dubé et al., 2018), Italy (Bianco et al., 2019), Netherlands (Hak et al., 2005), Malaysia (Musa et al., 2019; Kalok et al., 2020) and Ghana (Wallace et al., 2019). These studies found that parents who view immunisation as a social responsibility and consider the importance of herd immunity are less likely to be vaccine hesitant. The need to protect others from harm is a behavioural outcome reflected in the Coping Appraisal Pathway of the PMT.

3.3.3. Vaccine and vaccination-specific issues

3.3.3.1. Accessibility

Time, distance, and cost (including cost of transport to a vaccine provider and the cost of self-paid vaccines) were identified as barriers to vaccination in five of the studies reviewed (Larson et al., 2015b; Domek et al., 2018; Dasgupta et al., 2018; Musa et al., 2019; Fanxing et al., 2020). In Guatemala (Domek et al., 2018), perceived cost (another component of the Coping Appraisal Pathway of the PMT) was more important in urban areas than rural areas. Only in Pakistan (Khattak et al., 2020) did time, distance to clinic and cost not deter parents from accessing vaccination services.

3.3.3.2. Introduction to a new vaccine

Parental concern about new vaccines carrying more risk than older vaccines had a negative association with the intention to vaccinate in the USA (Allred et al., 2005), Netherlands (Hak et al., 2005), Italy (Giambi et al., 2018), Guatemala (Domek et al., 2018), Malaysia (Musa et al., 2019), India (Dasgupta et al., 2018), Saudi Arabia (Alsubaie et al., 2019), and Pakistan (Khattak et al., 2020). However, a multinational survey of seven countries (UK, Canada, Australia, France, Spain, Germany, and Sweden) reported that parents would welcome the introduction of new vaccines, even if it requires additional clinic visits or coadministration with current vaccines (Bakhache et al., 2013).

3.3.3.3. Role of healthcare professionals

All 34 studies acknowledged that advice or recommendation from health professionals could be an important determinant of vaccine acceptance. Parents who do not trust healthcare personnel or have little faith in the health system are more likely to be vaccine hesitant. The studies suggest the need for healthcare providers to use their privileged position to address parental concerns about vaccinations, as this could influence the decision-making process.

4. DISCUSSION

For the period under review (1998–2020), relevant studies about vaccine hesitancy were found across all WHO regions, with the majority from the Americas and Europe. This does not necessarily suggest an increased prevalence of vaccine hesitancy and issues related to vaccine acceptance in these regions, as focus may not be on vaccination, but on treatment of VPDs (e.g., influenza, measles, mumps, varicella, pertussis, and meningococcal disease). However, as most of the world's population live in other regions, it is difficult to make inferences about the scarcity of available research in those parts.

Several determinants of vaccine hesitancy were identified by the studies included in this review. No single algorithm was applicable to all studies as each factor was independent and varied across time, place, and vaccines, reflecting the complex interplay of other variables and the context-specific nature of vaccine hesitancy (Clark & Sanderson, 2009; Larson et al., 2015a; Larson et al., 2015b). Even in parts of the world where research was readily available, only few studies examined the different levels of interactions that exist between factors influencing vaccine hesitancy. Different research methods were applied and most of the studies were cross-sectional, thus making it difficult to draw conclusions about the influence of single or multiple determinants of vaccine acceptance at the individual or collective level. Future research should consider qualitative studies to help fill these gaps and contribute to existing knowledge and understanding of the many factors that influence parental decision-making.

The quantitative studies considered in this review examined the determinants of vaccine acceptance such as lack of vaccination awareness, fear of side effects, mistrust in the healthcare system and health professionals, poor perception of vaccine value, and negative past experiences with vaccine services, among others. However, it is difficult to make inferences about the relative strength of influence of these determinants because the studies were rarely based on theoretical models. While these findings do not rule out the significance of identified factors, they do highlight the shortcomings in such approaches.

Most studies showed that sociodemographic factors are important drivers of vaccine hesitancy. It is crucial to emphasise, however, that most sociodemographic factors play a minor role in explaining individual vaccine hesitancy. In the sociodemographic variables section, for example, inconsistent results were commonly reported. Furthermore, sociodemographic characteristics are at best a collection of plausible causes and can never fully define a particular behaviour without additional analysis (Schmid et al., 2017). Several studies, for example, suggested a link between a study population's race/ethnicity, sex distribution and vaccination intention (Allred et al., 2005; Strelitz et al., 2015; Gilkey et al., 2016; Musa et al., 2019; Kalok et al., 2020; Khattak et al., 2020; Bell et al., 2020). These associations could be accounted for by other factors such as family size (Luyten et al., 2019), access to healthcare facilities (Lockyer et al., 2021), healthcare provider discrimination (Woolf et al., 2021), misinformation on social media (Broadbent et al., 2019), trust in government and/or health authorities (Trent et al., 2022), attitudes towards vaccination (Gravelle et al., 2022), and the fear of vaccine side effects (Karafillakis et al., 2016). As a result, sociodemographic variables such as ethnicity, race and gender are only carrier variables, not explanatory variables (Schmid et al., 2017). This suggests that these variables could be confounders of the variables that actually cause vaccine hesitancy. While such factors may be associated with vaccine hesitancy, they cannot explain the development or severity of the situation. Most significantly, they are unhelpful in informing decisions to overcome hesitancy if psychological determinants are ignored. While these carrier variables may be useful in identifying target groups for intervention programs, they should not be used to design the intervention (Schmid et al., 2017).

Across the target demographics, all the explanations for not being vaccinated as stated by the 5C model were recognised as major barriers to vaccine acceptance. Constraints and calculation, however, were less significant drivers. For pandemic influenza, the most common reasons for apprehension were a loss of faith in authorities and a diminished perception of the vaccine's safety, as well as complacency, largely caused by low perceived risk and fear about the infection. The most common causes of vaccine hesitancy for seasonal influenza vaccination were a lack of faith in authority, low vaccine effectiveness, low vaccine safety perceptions, vaccine misconceptions, and a negative attitude toward vaccines. A loss of confidence due to low perceived vaccination efficacy was commonly noted for both flu strains. COVID-19 immunisation intention was most significantly linked to confidence and collective responsibility.

The benefits of using the 5C model to design interventions can be seen in the distinctions between disease types in terms of their psychological profile of vaccine denial in target populations. The model serves as a framework for identifying, developing, and implementing effective solutions to the vaccine hesitancy crisis (Betsch et al., 2015). If one wants to enhance COVID-19 vaccine uptake in the hospital environment, for example, the findings of this review show that tackling confidence issues (by dispelling myths and making people understand the ethical and professional need to get vaccinated) is a viable mechanism. Low confidence has been demonstrated to respond well to informational interventions such as instructional

initiatives (Betsch et al., 2015). It has also been demonstrated that structural interventions such as compulsory vaccinations, which are effective in overcoming complacency, should be approached with caution, as negative attitudes regarding immunisation are substantial obstacles that can lead to reactance after structural intervention efforts (Betsch et al., 2015). When the findings of this systematic review are integrated with conceptual frameworks such as the 5C model, important revelations about modifiable behaviours can emerge.

Campaigns aimed at raising parental vaccination intention would most likely be effective if they emphasise building confidence and collective responsibility while reducing complacency. Other factors, such as constraints and calculation, had smaller negative correlations with vaccination intention. When developing solutions, the psychological characteristics that underpin these motivations should be considered. Vaccination intention is influenced by variations in levels of confidence, which are driven by the perceived risk and safety profiles of vaccines. Because parents who believe vaccines have greater risks than benefits have lower levels of confidence, the importance of faith in the government and health officials in clarifying vaccine intentions is vital. Parents that have less faith in these institutions have lower confidence levels, which leads to a lower intention to get vaccinated. Vaccination intention is also influenced by the extent to which family members and friends express their need to get vaccinated.

Complacency sets in when the perceived dangers of VPDs are low, and vaccination is not considered an essential preventive measure (MacDonald, 2015). Individuals who are unconcerned about communicable diseases do not feel threatened by them, and hence do not feel compelled to change their preventative habits (Schwarzer & Fuchs, 1996). Because of the low level of involvement, the affected people do not see the need to actively seek information and increase their knowledge and awareness of prevailing issues (Fischer et al., 2011). Preventive behaviour is also not perceived as a descriptive or injunctive norm in society; therefore, it is regarded as separate from subjective norms (Askelson et al., 2010). However, complacency should be linked to a poor perception of disease risks (Brewer et al., 2007).

Because prevention is a future-oriented behaviour, it is expected to have a negative relationship with the consideration of future repercussions (Petrocelli, 2003). Individuals with a high level of complacency should also have a favourable risk perception, showing a propensity for risk-taking behaviours, because future repercussions are irrelevant (Johnson et al., 2004). This may be linked to perceptions of invulnerability as well as a positive subjective personal health status (Lapsley & Hill, 2010).

Parents who believe the risk of VPDs in their surroundings is minimal have a decreased intention to vaccinate their children, owing to a reduced desire to safeguard others. Furthermore, personality plays a key role in understanding how vaccination is viewed as a social responsibility. Psychopathic qualities, which are linked to antisocial behaviour caused by a lack of empathy, emotion, and self-control (Jones & Paulhus, 2014), have a negative relationship with collective responsibility and, as a result, with vaccination intentions. Likewise, parents with more humane characteristics, such as those who feel greater sympathy for others and wish to help those in need, have a stronger intention to vaccinate their children because they have a larger sense of community duty.

Research suggests that attempting to boost both confidence and collective responsibility at the same time will be beneficial, as interventions that target multiple underlying factors have proved to be more effective (Frew & Lutz, 2017). The results of this study suggest that

is critical to target vaccine safety and efficacy when addressing confidence. Concerns regarding safety, vaccine side effects, speed of development, and the desire for the vaccine to be shown efficient and safe over a longer period were the most common reasons given in this review for COVID-19 vaccine hesitancy. Confidence levels in the vaccine can be boosted by debunking myths about the vaccine and offering real information on issues such as why the vaccine was produced so quickly, for example. Nevertheless, it is critical to consider the way this information is communicated, and the personnel involved, because a correction of information could backfire and lead to even more polarised sentiments among those who already have strong opinions (Glaeser & Sunstein, 2014). Because in this study, poor confidence was linked to a distrust of government and health-care agencies, safety and efficacy information should best be presented by people who are not in typical positions of authority. A viable approach would be to use people who are considered as reputable by the target audience but are not expected to give this knowledge (Glaeser & Sunstein, 2014). Campaigns involving peers or celebrities, for example, could be used to reach parents.

In this study, parents' collective responsibility was shown to significantly predict COVID-19 vaccine uptake. The potential threat of COVID-19 for other family members in a household environment indirectly influences parental vaccination intention. The presence of family members who are susceptible to COVID-19, such as those with underlying medical conditions, could motivate parents to get their children vaccinated, thus safeguarding the people around them. Vaccination programmes focused on parents may thus be more effective if they highlight the hazards to individuals in the immediate vicinity of the parents. Vaccination is an effective way to explain what herd immunity is about (Betsch et al., 2017). When deciding whether to vaccinate their children, parents can and should be made aware that they are making a collective decision, not simply an individual one. To raise awareness, campaigns could address the reasons why certain people cannot get vaccinated (e.g., those who have had an adverse reaction to immunisations, have autoimmune diseases, or have other illnesses).

Because parents with less altruistic, assertive, and gregarious personalities are less likely to feel communal responsibility, it will be difficult, if not impossible, to influence these personality traits. However, because these parents have less empathy for others, campaigns emphasising the vaccine's prosocial effects may not be enough to sway certain groups and may even compound the free-rider problem (Ibuka et al., 2014). As a result, it's critical to keep expressing the personal hazards of COVID-19 to parents, such as the possibility of long-term negative effects of COVID-19 (Mahase, 2020).

Descriptive norms can influence vaccination intention indirectly through confidence and complacency, just as they can influence the decision-making process directly. These norms have been shown to be powerful motivators of behaviour, particularly in uncertain times (Cialdini, 2009). Vaccination campaigns may be more effective if they emphasise the importance of vaccination among parents by emphasising that most families plan to get vaccinated.

When family members have already been vaccinated, the level of collective responsibility may be reduced due to a lower perceived risk of VPDs for others. As a result, it is critical that parent-focused efforts begin early on, when the importance of vaccination is most apparent, and thus positive attitudes can be formed. According to studies, once a sufficiently decision has been made to get vaccinated, it is more likely to be followed through (Auslander et al., 2019). In terms of policy, the process of getting vaccinated should be simple, quick, and free of avoidable constraints to accelerate the shift from intention to behaviour (DaCosta et al., 2005).

5. LIMITATIONS, DIRECTIONS FOR FUTURE RESEARCH AND CONCLUSIONS

5.1. Limitations

Rather than obtaining a comparison of the individual determinants of vaccine acceptance, this systematic review analysed the spectrum of parental childhood vaccine hesitancy and its drivers. Studies that investigated the different barriers but found no significant connections are not reported or considered since they were outside the scope of the research. A meta-analytic technique is required to assess the cumulative outcome measures of relevant barriers and their respective significance. However, meta-analytic approaches to addressing vaccine hesitancy have significant challenges because the outcome measures are not frequently based on the constructs of theoretical models and their use varies widely among researchers.

Most of the vaccine hesitancy studies were undertaken in the United States and Europe. All other jurisdictions were relatively poorly represented. Even though research for the target populations has increased in number over time, the number of studies focusing on children has remained comparatively low. As a result of the scarcity of data, the results of this review must be confined to the locations and populations that are accessible.

The review had other limitations, including the exclusion of databases that had articles not written in English, which may have affected the sensitivity of searches in other languages, and the exclusion of government publications and articles on mandates, which may have influenced findings around the impact of health policies and practices.

Notwithstanding the shortcomings, this research offers governments and public health experts the necessary tools for understanding the key drivers of vaccination behaviour and vaccination intention among parents. Considering the fluctuating rates of vaccine acceptance in the studies reviewed, it is hoped that the findings of this study will aid in the development and enhancement of public health interventions to improve vaccine compliance above the proportions required for herd immunity.

5.2. Directions for Future Research

Underserved regions where only limited studies were found on parental childhood vaccine hesitancy and demographics (e.g., parents of children aged 0-6 years) should be the focus in future studies. From the results of this research, the UK is one of those regions that requires further investigations. More research will provide further evidence to design interventions across the UK and all WHO regions and for all groups at risk of VPDs.

Studies should not only concentrate on regions and demographics, but on measurable outcomes. Psychological variables can help researchers further comprehend why some people reject vaccinations while others do not. These variables are not studied regularly. Psychological principles are rarely employed in the measurement of study outcomes, and the tools used to evaluate the constructs differ significantly between investigations. Furthermore, risk perception variables are hardly distinguished and used interchangeably throughout and even within articles.

Theory-based psychological scales should be adopted for use in research to obtain accurate results and allow the scientific community to compare findings across publications. This

approach will ensure scientific advancement in the relatively new field of vaccine hesitancy research and raise the standard of future investigations.

5.3. Conclusions

The emergence of vaccine hesitancy has been central to the understanding of the wider concept of vaccine acceptance. This review showed that unfavourable dispositions toward vaccinations and behavioural attitudes such as a reduced perception of vaccine effectiveness and mistrust of health authorities were the most often cited barriers to vaccine uptake. Other evaluations include concerns about vaccine safety, low perceived severity of VPDs, and low perceived disease susceptibility.

Confidence and complacency, according to available evidence, are major determinants of vaccine hesitancy. Anxiety, low perceived risk, and low disease severity were the most common signs of complacency. Doubts about vaccine safety and effectiveness, as well as lack of faith in health officials and the assumption that vaccines can cause the diseases they were meant to prevent, all contributed to a lack of confidence.

The constructs of relevant theoretical models have provided further context to the evolution of vaccine hesitancy determinants, emphasising the need for parents and stakeholders to be actively engaged in the decision-making process from an early stage. It is clear, however, that additional information sources are needed to ensure these models adequately account for the influence of broader contextual factors, particularly in regions with limited peer-reviewed literature.

Theoretical approaches to quantifying vaccine hesitancy will continue to strengthen the body of knowledge needed to develop successful evidence-based interventions. The efficacy of vaccine advocacy campaigns could be increased and the burden of VPDs could be lowered by adopting clinical, patient-centred techniques to measure and overcome vaccine hesitancy. A combination of local, regional, and universally driven initiatives will be critical in the early detection of parental concerns.

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Conflict(s) of Interest

None

Supplementary Material 1: Quality Assessment

Study	Checklist									Overall Appraisal
	Was the sample frame appropriate to address the target population?	Were study participants sampled in an appropriate way?	Was the sample size adequate?	Were the study subjects and the setting described in detail?	Was the data analysis conducted with sufficient coverage of the identified sample?	Were valid methods used for the identification of the condition (VH or Intention to vaccinate)?	Was the condition measured in a standard, reliable way for all participants?	Was there appropriate statistical analysis?	Was the response rate adequate, and if not, was the low response rate managed appropriately?	
Akmatov et al., 2009	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include
Alsubaie et al., 2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Allred et al., 2005	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include
Azizi et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Bakhache et al., 2013	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include

Bell et al., 2020	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include
Bianco et al., 2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Bocquier et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Campbell et al., 2017	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Include
Dasgupta et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Domek et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Dube et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Dube et al., 2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Fanxing et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Frew et al., 2016	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include
Giambi et	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include

al., 2018										
Gilkey et al., 2016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Goldman et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Greenberg et al., 2017	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Include
Larson et al., 2015b	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Hak et al., 2005	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Henrikson et al, 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Hu et al., 2019	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Include
Kalok et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Khattak et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Musa et al., 2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include

Napolitano et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Opel et al., 2011b	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Opel et al., 2013	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Rachel et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Stefanoff et al., 2010	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Strelitz et al., 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Ucakar et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include
Wallace et al., 2019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Include

Supplementary Material 2: Data Extraction Table

	Study Details	**Research Parameters**	**Population And Sample Selection**	**Outcomes, Analytical Methods, Results**	**Notes**
1.	**Researcher(s):** Akmatov et al., 2009 **Title:** Attitudes and beliefs of	**What was/were the research question(s):** What are the attitudes of parents' regarding	**What population were the sample recruited from:**	**Brief description of method and analytical process:** Cross-sectional study was conducted. The questions used to	**Limitations identified by author(s):** NR **Evidence gaps and/or**

	parents about childhood vaccinations in post-Soviet countries: The example of Kyrgyzstan **Year:** 2009 **Journal:** The Paediatric Infectious Disease Journal **Volume:** 28 **Country:** Kyrgyzstan **WHO Region:** EUR **Quality Assessment:** Include	childhood vaccinations? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered questionnaire developed for the purpose of the study	Parents of first-year school children **How were they recruited:** Cluster sampling **How many participants were recruited:** 934 **Were there specific inclusion criteria:** Participants from all 4 districts of Bishkek, the capital of Kyrgyzstan. **Were there specific exclusion criteria:** None reported (NR) **Were there specific vaccines under consideration:** NR **Other details:** Most respondents had some form of education (secondary, 24%; higher education, 41%).	assess attitudes toward vaccination were analysed using factor analysis. Categorical Principal Components Analysis was also done, as well as Chi-square test for bivariate analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 3-15% of parents expressed concerns about vaccinations. Predictors of childhood vaccine uptake or intention (p-value < .25): Both parents' education levels were linked to low vaccine safety beliefs. Parents whose children had allergies, as well as non-religious respondents and Christians, were more likely to have low safety beliefs. **How the outcomes were measured:** In two separate regression models, factors associated with having a low score on vaccine safety beliefs and a high score on	**recommendations for future research:** Future research should evaluate the various dimensions of vaccine-related attitudes, such as safety concerns resulting from information about potential risks or a lack of information about general safety. **Source of funding:** NR

				antivaccine attitudes were measured. For bivariate analysis, the chi-square test was used, and all variables associated with the outcome variables at P-value < 0.25 were included in a multivariable logistic regression model. **Potential confounders:** NR **Ethical issues:** NR	
2.	**Researcher(s):** Allred et al., 2005 **Title:** Parental Vaccine Safety Concerns: Results from the National Immunization Survey, 2001–2002 **Year:** 2005 **Journal:** American Journal of Preventive Medicine **Volume:** 28 **Country:** USA	**What was/were the research question(s):** What is the association between parental safety beliefs and children's vaccination status? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The Parental Knowledge and Experiences module was adopted for the study.	**What population were the sample recruited from:** Parents of children aged 19 to 35 months who responded to the National Immunization Survey (NIS) conducted by the Centres for Disease Control and Prevention (CDC) **How were they recruited:** Random sapling	**Brief description of method and analytical process:** Research was cross-sectional in nature. All analyses were conducted using SAS, release 8.02 (SAS Institute, Cary NC), and SAS-callable SUDAAN, release 8.0.0 (Research Triangle Institute, Research Triangle Park NC). **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 6% of parents rated vaccines as neither	**Limitations identified by author(s):** Parental attitudes were examined after the bulk of vaccines had been provided at the time of interview; various factors could have impacted their immunisation attitudes over time. Also, other factors affecting vaccine uptake, such as provider practises and system barriers, were not considered. **Evidence gaps and/or recommendatio**

	WHO Region: AMR **Quality Assessment:** Include		**How many participants were recruited:** 7810 **Were there specific inclusion criteria:** Parents who responded to the NIS **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** Diphtheria and tetanus toxoids and pertussis vaccine, poliovirus vaccine, MMR vaccine, *Haemophilus influenzae* type b vaccine, and hepatitis B vaccine **Other details:** Ethnically diverse sample: Hispanic, 23.8%; Non-Hispanic white, 56.6%; Non-Hispanic black, 14.5%; Non-Hispanic other, 5.1%.	safe nor unsafe, and 1% as unsafe. Predictors of childhood vaccine uptake or intention (p-value < .05): Parental safety belief was significantly associated with a child's up-to-date vaccination status. The only significant demographic predictor was the child's race/ethnicity. Non-Hispanic whites made up 70% of children whose parents expressed the highest vaccine safety concerns, compared to 56% of children whose parents expressed less concerns. **How the outcomes were measured:** The Parental Knowledge and Experiences module was used as the measuring tool. Multivariate logistic regression analyses examined associations between attitudes and up-to-date vaccination coverage. **Potential confounders:** NR	**ns for future research:** More research is needed to understand how vaccine safety concerns among parents and providers interact to influence vaccine coverage. Studies should be conducted to determine why there are racial and ethnic differences in vaccine safety. **Source of funding:** NR

				Ethical issues: NR	
3.	**Researcher(s):** Alsubaie et al., 2019 **Title:** Vaccine hesitancy among Saudi parents and its determinants: Result from the WHO SAGE working group on vaccine hesitancy survey tool **Year:** 2019 **Journal:** Saudi Medical Journal **Volume:** 40 **Country:** Saudi Arabia **WHO Region:** EMR **Quality Assessment:** Include	**What was/were the research question(s):** 1) What is the prevalence of vaccine hesitancy and its determinants among Saudi parents? 2) What is the relationship between vaccine hesitancy and a child's immunization status? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The 11-item vaccine hesitancy scale (VHS), designed by the WHO SAGE working group, was adopted for the study.	**What population were the sample recruited from:** Parents of children aged 2 months to 7 years who were visiting outpatient clinics at King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia, between July 2017 and October 2018. **How were they recruited:** Purposive sampling **How many participants were recruited:** 500 **Were there specific inclusion criteria:** Participants visiting outpatient clinics at King Khalid	**Brief description of method and analytical process:** Cross-sectional study was conducted. Statistical analysis was done using SPSS version 21 (IBM Corp., Armonk, NY, USA). **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 20% of the parents were reluctant or hesitant to get their child vaccinated. Predictors of childhood vaccine uptake or intention (p-value < .05): Male gender and parents with a postgraduate degree, such as a master's or PhD, were more vaccine hesitant than parents with a bachelor's or school degree (p<0.001). Furthermore, when compared to parents with older children, parents with children aged	**Limitations identified by author(s):** Because KSA lacks a central immunisation registry and the child's vaccination status was reported by parents, this could be underestimated or overestimated due to social desirability or recall bias. **Evidence gaps and/or recommendations for future research:** A longitudinal study based on region could look at how the population's attitudes toward vaccines change as parents are exposed to more negative information in the media. **Source of funding:** NR

			University Hospital, Riyadh, Kingdom of Saudi Arabia, between July 2017 and October 2018. **Were there specific exclusion criteria:** Non-Saudi parents and parents of children with an immunodeficiency **Were there specific vaccines under consideration:** NR **Other details:** Most parents surveyed (90.8%) were female and had a bachelor's degree or higher (60.4%)	4 years or younger were more likely to report partial vaccination status ($p<0.013$). **How the outcomes were measured:** VHS was the measuring tool. Multivariate logistic regression was used to investigate which variables predicted parents' vaccine hesitancy and partial immunisation status of their child, while controlling for the parents' sociodemographic characteristics (age, gender, education level, number of children in their care, as well as age of youngest child in care). **Potential confounders:** NR **Ethical issues:** Research was approved by the Institutional Review Board of College of Medicine, King Saud University in Riyadh, KSA.	
4.	**Researcher(s):** Azizi et al., 2017 **Title:**	**What was/were the research question(s):** 1) What is the prevalence of	**What population were the sample**	**Brief description of method and analytical process:** Cross-sectional study was	**Limitations identified by author(s):** Because the immunisation

	Vaccine hesitancy among parents in a multi-ethnic country, Malaysia **Year:** 2017 **Journal:** Vaccine **Volume:** 35 **Country:** Malaysia **WHO Region:** WPR **Quality Assessment:** Include	vaccine hesitancy among parents and how does it relate to their socio-demographic characteristics? 2) How can the test-retest reliability of the Parent Attitudes about Childhood Vaccines (PACV) questionnaire be evaluated in Malay? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The PACV scale was adopted for this cross-sectional study.	**recruited from:** Parents attending the Paediatrics and Antenatal clinics of a tertiary hospital in Kuala Lumpur, the capital city of Malaysia. **How were they recruited:** Convenience sampling **How many participants were recruited:** 545 **Were there specific inclusion criteria:** (a) parents who are at least 18 years old, (b) parents who have at least one child under the age of seven, and (c) a mother who is currently expecting a child. **Were there specific exclusion criteria:** Parents from other countries as they may be	conducted. Data were analysed using the SPSS software, version 23.0. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 11.6% of parents were found to be vaccine hesitant (PACV score ≥ 50). Predictors of childhood vaccine uptake or intention (p-value < .05): Unemployed parents, parents of younger children, non-Muslims, and mothers expecting their first child were substantially more vaccine hesitant than the non-vaccine hesitant group. Other socio-demographic factors such as ethnicity, education level, household income, and gender had no significant influence on vaccine hesitancy. **How the outcomes were measured:** The PACV scale was used as the measuring tool. Univariate and	delays and refusals were self-reported, social desirability bias could be present. The results may be skewed by convenience sampling of participants and data collection in a hospital setting. The authors were unable to assess the validity of the Malay-PACV in their scenario since they did not collect data on actual vaccine uptake. The original PACV, on the other hand, had high validity in other populations and clinical settings. **Evidence gaps and/or recommendations for future research:** To avoid the rising trend of vaccine hesitancy, which may eventually lead to vaccine refusal, targeted preventative efforts should be implemented, focusing on the

			unfamiliar with Malaysia's vaccination schedule. **Were there specific vaccines under consideration:** NR **Other details:** When compared to those who already had one or more children, pregnant mothers expecting their first child were nearly four times more likely to be vaccine hesitant. Parents who were unemployed were likewise more likely to be vaccine hesitant. In the multivariate analysis, religion had no significant correlation with vaccine hesitancy.	multivariate logistic regression analyses were done to evaluate the influence of several vaccine hesitancy determinants such as ethnicity/religion, unemployment and multiparity. **Potential confounders:** NR **Ethical issues:** The Medical Research Ethics Committee (MREC) of the University of Malaya Medical Centre in Kuala Lumpur, Malaysia, as well as the tertiary hospital's Departments of Paediatrics and Obstetrics & Gynaecology, approved the study.	identified high-risk categories. **Source of funding:** NR
5.	**Researcher(s):** Bakhache et al., 2013 **Title:**	**What was/were the research questions (relevant to this review):**	**What population were the sample recruited from:**	**Brief description of method and analytical process:** A cross-sectional study was conducted.	**Limitations identified by author:** The scenarios in the questionnaire were realistic,

	Health care providers' and parents' attitudes toward administration of new infant vaccines—a multinational survey NB: As this specific research article has two separate sections (one for healthcare providers and the other for parents), only parental attitudes are considered in the review. **Year:** 2013 **Journal:** European Journal of Paediatrics **Volume:** 172 **Country:** Multi-national **WHO Region:** Multi-regional **Quality Assessment:** Include	1) What are parents' attitudes and perceptions of vaccine efficacy and safety, as well as their general beliefs about childhood vaccinations? 2) What are parents' feelings about co-administering new infant vaccines, such as their preferences for the most vaccine injections per office visit, the variables that influence their decision to vaccinate their child, and their preferences for adding a new vaccine to their child's immunisation schedule? 3) What is the state of meningococcal disease knowledge and attitudes, as well as opinions and perspectives on meningococcal vaccination among parents? **What theoretical approach (e.g., Grounded Theory) does**	Parents from seven countries (Australia, Canada, France, Germany, Spain, Sweden, and the UK) who were heavily involved in at least one infant's immunisation decisions between the ages of 0 and 23 months (recruited from Ipsos Healthcare databases) **How were they recruited:** Convenience sampling **How many participants were recruited:** 2460 **Were there specific inclusion criteria:** (a) Parents ranged in age from 20 to 50 years; (b) there were at least two peopl e living in the respondent's house; (c) there was at	McNemer's test and Hierarchical Bayes estimation were used for weighting and statistical analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 16% would not accept the vaccines recommended in the national schedule. Predictors of childhood vaccine uptake or intention (p-value < .05): 10% of parents thought their child had too many immunisations (needlesticks) during a single appointment. According to 18% of parents, if a vaccine was not on the official schedule, it was not worth getting. When asked how many vaccine injections parents were okay with their child having during a single medical visit, 15% said one injection and 42% said two injections. When parents were asked what variables influenced their	but hypothetical, and it was impossible to know whether parents would truly carry out their supposed intentions. As with any survey, the results may be influenced by the respondents' recall bias and response bias. As a result, some survey participants may be tempted to exaggerate their experience or interest in order to please the researcher. Final ly, the online survey included parents who had internet access, implying a higher socioeconomic and educational level; this potential selection bias may affect the generalisability of the findings to the entire population. **Evidence gaps and/or recommendatio ns for future research:** NR **Source of funding:**

		the study take (if specified): The New Vaccinations of Infants in Practice online survey was developed for the study (20 minutes)	least one child aged 0 to 23 months in the respondent's house (parents who had multiple children responded with their youngest child in mind); (d) the parent was completely or heavily involved in making vaccine decisions for their youngest child.; and (e) the child had received or would receive at least one vaccination against any disease. **Were there specific exclusion criteria:** Parents who had no child between 0 and 23 months of age. **Were there specific vaccines under consideration:** Meningococcal vaccine **Other details:** 61% of parents were unsure	comfort level with their child receiving the maximum number of injections per office visit, 38% expressed concern about "overworking" their child's immune system. **How the outcomes were measured:** Online survey instrument, McNemer's test, Hierarchical Bayes estimation **Potential confounders:** NR **Ethical issues:** NR	Novartis Vaccines and Diagnostics, Cambridge, *Massachusetts, USA*

			whether their child was at risk for types of meningitis not covered by routine immunisations. Only about 40% of parents knew whether or not their child had had a meningococcal vaccine.		
6.	**Researcher(s):** Bell et al., 2020 **Title:** Parents' and guardians' views on the acceptability of a future COVID-19 vaccine: A multi-methods study in England **Year:** 2020 **Journal:** Vaccine **Volume:** 38 **Country:** England **WHO Region:** EUR **Quality Assessment:** Include	**What was/were the research question(s):** What are parents' and guardians' views on the acceptability of a future COVID-19 vaccine? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Mixed-methods approach (online cross-sectional survey and semi-structured interviews developed for the purpose of the study)	**What population were the sample recruited from:** Parents and guardians (aged 16 and above) who lived in England with a child under the age of 18 months **How were they recruited:** Convenience sampling **How many participants were recruited:** 1252 **Were there specific inclusion criteria:** 1) Parents and guardians who were aged 16	**Brief description of method and analytical process:** Mixed-methods study was conducted. Data analysed using logistic regression analysis, paired samples t-test, Hosmer-Lemeshow test. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: Respondents cited a lack of trust in vaccinations, science, or the medical profession as a reason for refusing to accept a vaccine (4.0% for themselves and 1.6% for their child) Predictors of childhood vaccine	**Limitations identified by author:** The study was conducted during the peak of the COVID-19 epidemic in England, and a poll conducted now that the pandemic has passed its 'peak' of cases and deaths and the lockdown has been lifted may provide different results. The sample was not representative of the general population in terms of household income and race, despite being geographically representative. **Evidence gaps and/or recommendatio**

			and above, 2) Parents and guardians who said they lived in England, 3) Parents and guardians who had a child under the age of 18 months **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** COVID-19 **Other details:** Participants with a lower household income (£35,000) were nearly twice as likely to reject a COVID-19 vaccine for themselves (OR: 2.08, 95% CI: 1.31–3.3) as those with a medium household income (£35,000-£84,999). Participants in the highest income band (>£85,000) were nearly three times as likely to	uptake or intention (p-value < .05): People who self-identified as Black, Asian, Chinese, Mixed, or Other ethnicity were 2.74 times (95% CI: 1.35–5.57) more likely than White British, White Irish, and White Other participants to reject a novel COVID-19 vaccination for their child. Participants in the lowest household income group (£35,000) were 1.8 times (95% CI: 1.17–2.82) as likely to refuse a COVID-19 vaccine for their child as participants in the middle household income bracket (£35,000-£84,999). Participants with more than four children were shown to be four times (OR 4.13; 95% CI: 1.873–9.104) more likely than those with only one child to refuse the immunisation for their children. **How the outcomes were measured:** Online questionnaires, Paired samples t-test, Logistic regression analysis,	**ns for future research:** Longitudinal studies to assess the acceptability of COVID-19 vaccination over time. **Source of funding:** National Institute for Health Research Health Protection Research Unit (NIHR HPRU)) in Immunisation at the London School of Hygiene and Tropical Medicine (LSHTM) in partnership with Public Health England (PHE)

			receive the vaccine (OR: 0.35, 95% CI: 0.17–0.73) as those in the intermediate income bracket (£35,000-£84,999). Persons who self-identified as Black, Asian, Chinese, Mixed, or Other ethnicity were 2.7 times (95% CI: 1.27–5.87) more likely than White British, White Irish, or White Other participants to refuse the COVID-19 vaccine. Those who identified their occupation as homemaker were more likely to refuse the immunisation than those who were employed full-time or on parental leave.	Hosmer-Lemeshow test. **Potential confounders:** NR **Ethical issues:** Observational Research Ethics Committee of London School of Hygiene & Tropical Medicine approved the study protocol.	
7.	**Researcher(s):** Bianco et al., 2019 **Title:** Parent perspectives on childhood vaccination:	**What was/were the research question(s):** 1) What are the attitudes of parents about childhood vaccines and	**What population were the sample recruited from:** Parents with at least one child aged 1–5 years	**Brief description of method and analytical process:** Study was cross-sectional. For categorical data, frequencies and percentages were used, whereas for	**Limitations identified by author:** The cross-sectional design made it impossible to draw conclusions on

	How to deal with vaccine hesitancy and refusal? **Year:** 2019 **Journal:** Vaccine **Volume:** 37 **Country:** Italy **WHO Region:** EUR **Quality Assessment:** Include	vaccine refusal or delay? 2) What are the roles of the variables mapped as potential determinants? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The study, which was cross-sectional in nature, was conducted from April to June 2017. The PACV scale was adopted for the study.	who attended kindergartens in the Catanzaro and Cosenza regions of southern Italy. **How were they recruited:** Multi-stage sampling **How many participants were recruited:** 575 **Were there specific inclusion criteria:** Parents with at least one kid aged 1–5 years who attended kindergartens in the Catanzaro and Cosenza areas of southern Italy. There were 51 nursery schools in this area, with 900 registered pupils. **Were there specific exclusion criteria:** NR **Were there specific vaccines**	continuous data, mean and standard deviations were used. Variables with $p < 0.25$ in the univariate analyses were forced into multiple logistic regression models, which were adjusted for potential confounders. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 7.7 % of parents were classified as vaccine hesitant, and 24.6 % reported refusing or delaying at least one vaccine dose for their child. Predictors of childhood vaccine uptake or intention (p-value < .05): VH was more likely in parents who chose not to vaccinate their children after receiving information from the media, in those who opposed mandatory vaccinations, and in those who concurred with anti-vax political leaders. Vaccine-	causality about the observed relationships, and to the self-reporting of practises. The study faced the same difficulty as earlier studies in that parental behaviour was self-reported. Because the data was limited to a region of Southern Italy, there may be concerns regarding the results' generalizability. **Evidence gaps and/or recommendations for future research:** Longitudinal studies are required to better characterise trends in the incidence of VH and vaccine refusal or delay. **Source of funding:** NR

			under consideration: NR **Other details:** Majority of participants (8 0.3%) were mothers, with an average age of 37.2 years. Only 63% was employed. The average age of index children was 4.1 years, with males accounting for 50.5%. 68.8% of the parents had two or more children.	refusing/delaying parents were more likely to think that infant vaccinations are primarily a profit-making venture for pharmaceutical firms, and to disagree that only vaccinated children should be permitted to attend kindergarten. **How the outcomes were measured:** The PACV scale was used as measuring instrument. To investigate how potential determinants of VH impacted on the dependent variables, the authors employed the t-test (for continuous variables) and Pearson's chi-square (for categorical variables) in the primary analysis. **Potential confounders:** Gender, age, marital status, educational level, work activity, and parent's nationality **Ethical issues:** The Institutional Ethical Committee (Italy) granted	

				approval to the study protocol.	
8.	**Researcher(s):** Bocquier et al., 2018 **Title:** Social differentiation of vaccine hesitancy among French parents and the mediating role of trust and commitment to health: A nationwide cross-sectional study **Year:** 2018 **Journal:** Vaccine **Volume:** 38 **Country:** France **WHO Region:** EUR **Quality Assessment:** Include	**What was/were the research question(s):** 1) What is the association between parental socioeconomic status (SES) and VH levels? 2) What roles do levels of commitment and trust play in shaping VH? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** In this study, the 2016 Baromètre santé questionnaire was used, which is a national cross-sectional telephone survey addressing health issues in representative population samples. The French Public Health Agency (Santé publique France) designed and administered the questionnaire.	**What population were the sample recruited from:** All households with at least one French-speaking person aged 15 to 75. **How were they recruited:** Random sampling of households. The study employed an overlapping dual-frame design of landline and mobile phone numbers, which were created at random from prefixes assigned by the electronic communicatio ns regulatory authority. For landline phones, one respondent was chosen at random from eligible household members, while for mobile phones, one respondent	**Brief description of method and analytical process:** In this cross-sectional study, Chi-square tests were used for bivariate analyses to investigate the relationships between VH levels and respondents' demographic and socioeconomic factors. Then, after controlling for additional sociodemographic factors, the authors used multiple multinomial logistic regression models that included SES and EHI (equivalent household income per month). **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 26% of the parents were refusers, 7% delayers, and 13% acceptors with doubts Predictors of childhood vaccine uptake or intention (p-value < .05): The prevalence of different VH levels	**Limitations identified by author:** To begin with, the Baromètre santé survey's cross-sectional nature limits definitive conclusions about the patterns of relationships between VH and its predictors, as well as causality. Second, this study suffers from the standard flaws of quantitative telephone surveys, such as a low response rate (50%). Finally, VH items did not allow for analysis of the reasons why parents chose to refuse or delay a vaccine for their children, as well as the number and type of vaccines they chose. **Evidence gaps and/or recommendatio ns for future research:**

			was chosen at random from eligible regular mobile users. **How many participants were recruited:** 3927 **Were there specific inclusion criteria:** All households with at least one French-speaker aged 15 to 75. **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** Measles, hepatitis B, and HPV **Other details:** 57% of the respondents were mothers, 49% were under the age of 40, 91% lived with a partner, 68% had one or two children, and 32% had a	varied significantly depending on parental education. VH was also more prevalent among mothers than fathers, and among parents living with a partner. **How the outcomes were measured:** The 2016 Baromètre santé questionnaire was used as the measuring tool. Univariate and multivariate logistic regression analyses were done to evaluate the association between SES and various VH levels. **Potential confounders:** NR **Ethical issues:** The survey was approved by the French National Commission for Computer Data and Individual Freedom (CNIL).	Future study may find it useful to include additional items linked to other elements of parents' lifestyles. Use of complementary and alternative medicine, organic food consumption, and breastfeeding practises are just a few of such examples. **Source of funding:** The Agence Nationale de Sécurité du Médicament et des Produits de Santé (ANSM) and the Agence Nationale de la Recherche (ANR) funded this research. The French government also financed this work through the "Investissements d'avenir" (Investments for the Future) programme, which is handled by ANR.

			child under the age of three.		
9.	**Researcher(s):** Danis et al., 2010 **Title:** Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece **Year:** 2010 **Journal:** Vaccine **Volume:** 28 **Country:** Greece **WHO Region:** EUR **Quality Assessment:** Include	**What was/were the research question(s):** What are the predictive factors of complete and age-appropriate vaccination status in Greece? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered questionnaire validated in a pilot study	**What population were the sample recruited from:** Parents of children enrolled in the first year of the Greek Grammar school (about 6 years of age) **How were they recruited:** Stratified cluster sampling **How many participants were recruited:** 3434 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR	**Brief description of method and analytical process:** Cross-sectional study was conducted. STATA software (Stata Corporation, TX, USA, version 10) was used for data analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 1.5% had negative opinions about vaccines Predictors of childhood vaccine uptake or intention (p-value < .05): Being a member of a minority group, having additional siblings, and considering the distance to the immunisation location to be a barrier were all independent predictors of both incomplete and delayed vaccination status. Complete vaccination related to maternal age under 30 years and the belief that natural disease is	**Limitations identified by author:** Due to the low incidence of school attendance, Roma children attending school may not be representative of all Roma children. The same may be said for their parents/guardians, since those who take their children to school are more likely to follow immunisation guidelines. The authors also compared current views and attitudes to those gained from past vaccinations. Because the views were measured after vaccination, the immunisation experiences may have altered some of the attitudes. As a result, if parental opinions were examined prospectively (i.e. before the immunisation began), some of

			Other details: Of the respondents, 80% were mothers, 19% fathers, with the remainder including grandparents, aunts, uncles and older sisters	preferable to vaccine, whereas paternal education of high school or higher was the other independent driver of age-appropriate immunisation. Underimmunisatio n was explained by socioeconomic factors rather than parental beliefs and attitudes toward vaccination. **How the outcomes were measured:** Questionnaire served as measuring instrument. Univariate and multivariate logistic regression models were performed. **Potential confounders:** NR **Ethical issues:** Ethics Committee of the Institute of Child Health, Athens, Greece approved the study protocol	the findings would have been different. They also calculated vaccination coverage among 6-year-olds, who had been immunised nearly 5 years earlier. As a result, the information needed to guide interventions is not as timely as it should be. **Evidence gaps and/or recommendatio ns for future research:** NR **Source of funding:** NR
10.	**Researcher(s):** Dasgupta et al., 2018 **Title:** Vaccine Hesitancy for Childhood Vaccinations in	**What was/were the research question(s):** What are the proportion and factors contributing to vaccine hesitancy for	**What population were the sample recruited from:** Parents of children aged 0–59 months'	**Brief description of method and analytical process:** Cross-sectional study was conducted. Binary logistic regression was used to conduct univariate	**Limitations identified by author:** Aside from the inherent limitations of cross-sectional research, vaccine-specific

	Slum Areas of Siliguri, India **Year:** 2018 **Journal:** Indian Journal of Public Health **Volume:** 62 **Country:** India **WHO Region:** SEAR **Quality Assessment:** Include	childhood vaccinations in the slums of Siliguri, India? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Study was community-based study with cross-sectional design. A predesigned pretested interview schedule following the pattern of the validated version of the vaccine hesitancy survey tool initially developed by the WHO SAGE working group on vaccine hesitancy was used for the study.	residing in slums of Siliguri in 2016 **How were they recruited:** Cluster sampling **How many participants were recruited:** 194 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** Most participants were females (58.8%), first birth order (59.3%), nuclear households (51.0%), and lower socioeconomic position (60.3%).	and multivariate analyses. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 83% of parents were vaccine-hesitant Predictors of childhood vaccine uptake or intention (p-value < .05): The most common reason for vaccine hesitancy was a desire to avoid vaccination (26.1%). 20.5% were unaware or confused about when and where to get vaccinated; that health care providers did not adequately explain dates and vaccines; and that they had no credible information. The child was unwell or irritable in the other 18.0% of cases. Vaccine hesitancy was shown to be substantially more common among nuclear households, mothers with less than 5 years of schooling, SES Class I, II, and male children, as	reasons for hesitancy could not be fully elicited due to the possibility of recall bias. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** NR

			73.7% had completed at least five years of education.	well as children born in the second or higher birth order. **How the outcomes were measured:** Survey instrument, Binary logistic regression (univariate and multivariate analyses) **Potential confounders:** NR **Ethical issues:** Institutional Ethics Committee approved the study protocol	
11.	**Researcher(s):** Domek et al., 2018 **Title:** Measuring vaccine hesitancy: Field testing the WHO SAGE Working Group on Vaccine Hesitancy survey tool in Guatemala **Year:** 2018 **Journal:** Vaccine **Volume:** 36 **Country:**	**What was/were the research question(s):** **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Vaccine Hesitancy Scale (VHS) developed by WHO SAGE Working Group on Vaccine Hesitancy (Spanish version)	**What population were the sample recruited from:** Parents of infants aged 6 weeks to 6 months who came in for their first wellness visit were registered (March to November 2016). **How were they recruited:** Convenience sampling **How many participants**	**Brief description of method and analytical process:** Cross-sectional study was conducted. The significance levels in survey differences were assessed using the Chi-square or Fisher's exact test for categorical variables and the ANOVA test for continuous variables. To evaluate the Likert scale questions, factor analysis was used. **Key outcomes relevant to this review**:	**Limitations identified by author:** Infants who were presenting for their first wellness check, which included the start of the primary immunisation series, were included in the study. As a result, the sample was skewed toward individuals who were likely to vaccinate, and hesitancy may have been lower than usual. It is also possible that in face-to-face interviews,

	Guatemala **WHO Region:** AMR **Quality Assessment:** Include		**were recruited:** 720 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** Only 0.4% of parents did not believe that vaccines could prevent children from major diseases, and no parent could conceive of a reason why they should not be vaccinated.	Prevalence rates of parental childhood vaccine hesitancy: 1.1% were vaccine-hesitant Predictors of childhood vaccine uptake or intention (p-value < .05): Most parents (59.2%) believed that parents like them do not vaccinate their children with all of the vaccines that are recommended, with more urban parents (69.7% vs. 48.6%; p 0.0001) holding this belief. Time, distance, and cost to get to the clinic, as well as clinic timing and wait time, were found to be important variables preventing immunisation in the urban population when compared to the rural population (12.5% vs. 6.1%; p = 0.0032). **How the outcomes were measured:** Chi-square or Fisher's exact test for categorical variables and the ANOVA test for continuous variables. To evaluate the Likert	parents were less likely to admit to vaccine hesitancy than in anonymous questionnaires. **Evidence gaps and/or recommendations for future research:** Field testing of the VHS is required in other low- and middle-income countries. It may be useful to track vaccine uptake in the infants studied to see if there is a link between intention and behaviour. To evaluate the validity and reliability of the VHS, more research will be needed in larger groups with higher vaccine hesitancy. **Source of funding:** The Eunice Kennedy Shriver National Institute of Child Health & Human Development at the National Institutes of Health

				scale questions, factor analysis was used. **Potential confounders:** NR **Ethical issues:** Study protocol was approved by the Colorado Multiple Institutional Review Board, Universidad del Valle Ethics Committee, and Guatemala National Ethics Committee of the Ministry of Public Health and Social Assistance.	
12.	**Researcher(s):** Dube et al., 2018 **Title:** Measuring vaccine acceptance among Canadian parents: A survey of the Canadian Immunization Research Network **Year:** 2018 **Journal:** Vaccine **Volume:** 36 **Country:**	**What was/were the research question(s):** 1) What is the prevalence of vaccine hesitancy among Canadian parents? 2) What factors are associated with the intention of parents to vaccinate their children? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The Theory of Planned	**What population were the sample recruited from:** Canadian parents of children aged 24–59 months **How were they recruited:** Convenience sampling **How many participants were recruited:** 2013 **Were there specific**	**Brief description of method and analytical process:** Cross-sectional study, with data collected between 14th to 29th March 2015. To find differences between parents who strongly intended to vaccinate their child in the future and those who had weaker intentions, researchers used univariate analysis with chi-square and independent-sample t tests. A multivariable logistic regression was used to identify predictors of parents' intention	**Limitations identified by author:** An online panel was used, and participants may differ from the general population in terms of specific traits and responses. While the online panel was designed to be representative of the Canadian population in terms of age, region of residence, income, and education, selection bias and non-

	Canada **WHO Region:** AMR **Quality Assessment:** Include	Behaviour (TPB) was used to examine associations between parents' vaccination knowledge, attitudes, and beliefs and their intention to vaccinate their children in the future.	**inclusion criteria:** 1) Parents from Canada who could read English or French, 2) Parents or caregivers of at least one child between the ages of 24 and 59 months, 3) Parents who had access to the Internet, and 4) Parents who volunteered to take part in a panel study. **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** Most of the participants (78.8%) had only one child, ranging in age from 24 to 59 months. 61.5% were women, and a similar proportion (63.1%) were between the ages of 30 and 39. 54% lived	to vaccinate their children. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 50.2% had no intention to vaccinate their children in the future Predictors of childhood vaccine uptake or intention (p-value < .05): Parents who regularly sought vaccine information, believed it was their job as parents to question vaccines, or who had previously had trouble obtaining vaccination services were less likely to vaccinate their children in the future. Parents who placed a high level of faith in doctors and public health officials were more likely to vaccinate their children. Almost half of the participants (47.8%) said their religious or spiritual beliefs have an impact on their health decisions.	response bias cannot be eliminated. Other limitations include the lack of actual behavioural outcomes (child vaccination) and the fact that vaccination intention in parents of young children were measured at a time when most recommended infant vaccines should have been administered. **Evidence gaps and/or recommendations for future research:** A longitudinal design could provide useful information to better understand what motivates parents to shift from intention to actual vaccination behaviour. **Source of funding:** Public Health Agency of Canada and the Canadian Institutes of Health Research

			in a large city or town. 87.0% were married or in civil partnerships an d 68.4% had a college, undergraduate, or graduate degree.	**How the outcomes were measured:** Univariate analysis with chi-square and independent-sample t tests. Multivariable logistic regression. **Potential confounders:** NR **Ethical issues:** The study was approved by the research ethics committee at the *Centre de recherche du CHU de Québec – Université Laval.*	
13.	**Researcher(s):** Dube et al., 2019 **Title:** Overview of knowledge, attitudes, beliefs, vaccine hesitancy and vaccine acceptance among mothers of infants in Quebec, Canada **Year:** 2019 **Journal:** Human Vaccines & Immunotherape utics **Volume:** 15	**What was/were the research question(s):** What is the level of vaccine hesitancy and vaccination knowledge, attitudes, and beliefs among mothers? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV survey	**What population were the sample recruited from:** Mothers of newly born infants in four maternity wards in Quebec (Canada) **How were they recruited:** Cluster sampling **How many participants were recruited:** 2645	**Brief description of method and analytical process:** In this cross-sectional study, the PACV survey was used to determine VH scores. SAS version 9.4 was used for data analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 15% of mothers had PACV score of 50 or higher. In comparison to 74.1% of mothers who were unsure or did not intend to vaccinate their	**Limitations identified by author:** It is impossible to eliminate selection bias and non-response bias. Younger mothers (under 18), mothers who did not give birth in one of the designated hospitals, and mothers who did not speak English or French were excluded. As with most surveys, there is the possibility of social desirability bias, which means people reply to

	Country: Canada **WHO Region:** AMR **Quality Assessment:** Include		**Were there specific inclusion criteria:** In each participating maternity ward, recruitment was limited to mothers aged 18 and above who spoke English or French. **Were there specific exclusion criteria:** The study did not include newborns or mothers who required acute care. **Were there specific vaccines under consideration:** NR **Other details:** At the time of childbirth, mos t mothers were aged 20–29 years (38.2%) or 30–39 years (56.6%), and the majority were born in Canada (74.3 percent). M ost of the children were either the mother's first	newborn, nearly half of the mothers (48.9%) who were certain to get their infant vaccinated planned to conduct extensive research before making a final decision ($p < 0.0001$). Predictors of childhood vaccine uptake or intention (p-value < .05): The perceived necessity of vaccinating a child at 2 months of age, a VH score less than 30, anticipated remorse of non-vaccination, and feeling knowledgeable about vaccines were the primary drivers of vaccination intention. **How the outcomes were measured:** The PACV survey was used to determine VH scores. To find variables linked to vaccination intention, the researchers used multivariate logistic regression. **Potential confounders:** NR **Ethical issues:** Each participating facility's Research	what they think the researchers want to hear. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** The Fonds de recherche du Québec – Santé and the Québec Ministry of Health and Social Services supported this research.

			(47.0%) or second (36.3%). More than half of the mothers (55.7%) had a university degree, and the majority (53.6%) were either living with a partner or legally married (37.3%).	Ethics Board approved the study protocol.	
14.	**Researcher(s):** Fanxing et al., 2020 **Title:** The determinants of vaccine hesitancy in China: A cross-sectional study following the Changchun Changsheng vaccine incident **Year:** 2020 **Journal:** Vaccine **Volume:** 38 **Country:** China **WHO Region:** WPR **Quality Assessment:** Include	**What was/were the research question(s):** What is the prevalence and determinants of vaccine hesitancy following the Changchun Changsheng vaccine incident (CCVI)? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV survey. The 3C model was used to explore reasons for vaccine hesitancy.	**What population were the sample recruited from:** Caregivers of all children who visited sampled vaccination clinics and kindergartens **How were they recruited:** Cluster sampling **How many participants were recruited:** 2124 mothers of children under 6 **Were there specific inclusion criteria:** NR	**Brief description of method and analytical process:** Cross-sectional survey. The Wenjuanxing online platform (https://www.wjx.cn/) and Epidata 3.1 were used for data analyses. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 60% of caregivers were hesitant about getting vaccinated. Among this hesitant population, 26% vaccinated their children with doubts, 31% delayed vaccination, and 3% refused specific vaccines. Predictors of childhood vaccine	**Limitations identified by author:** Firstly, the questionnaires were self-administered, which may have resulted in some items being misunderstood. Second, due to the sample approach, there may be some selection bias. Participants were recruited through vaccination clinics, and caregivers who bring their children to clinics for immunisation may be less likely to have vaccine hesitancy than those who do not. As a result, the prevalence of vaccine

			Were there specific exclusion criteria: NR **Were there specific vaccines under consideration:** NR **Other details:** Higher-educated parents who practised Buddhism or other religions were much less likely to vaccinate their children.	uptake or intention (p-value < .05): Hearing or reading negative information about vaccines (62.2%) and having a terrible experience with past vaccinations for their children (25.3%) were the main reasons for vaccine hesitancy stated by caregivers. Concer ns about vaccine safety among caregivers (24.6%), children's fear of needles (20.6%), indifference about vaccine-preventable diseases (20.5%), and the cost of self-paid vaccines (19.6%) were all significant factors. When compared to 'acceptors with doubts' or 'delayers', 'refusers' reported considerably more loss of confidence, inconvenience, and negative vaccination experiences. **How the outcomes were measured:** For categorical data, Chi-square or Fisher's exact tests (if expected frequency < 5) were used, and ANOVA for	hesitancy may have been underestimated in the study. Finally, the "refusers" group's small sample size (n = 64) may have diminished the power to identify differences between the refusers and the no hesitancy group. Finally, the researchers did not inquire about caregivers' conc erns regarding specific childhood vaccines, and hesitancy levels may differ by vaccine. **Evidence gaps and/or recommendatio ns for future research:** A follow-up survey to describe the trend of vaccine hesitancy following the CCVI. **Source of funding:** The National Institute for Health Research Health Protection

				continuous measures, to evaluate the levels of vaccine hesitancy by participants' demographic characteristics and vaccine confidence. The determinants of vaccine hesitancy were measured using multinomial logistic regression. **Potential confounders:** NR **Ethical issues:** The study protocol was approved by the Ethics Committees of Fudan University School of Public Health and the London School of Hygiene & Tropical Medicine.	Research Unit (NIHR HPRU) in Immunisation at the London School of Hygiene and Tropical Medicine, in collaboration with Public Health England (PHE), funded this study.
15.	**Researcher(s):** Frew et al., 2016 **Title:** Changes in childhood immunization decisions in the United States: Results from 2012 & 2014 National Parental Surveys **Year:** 2016	**What was/were the research question(s):** What are the changes in vaccine decisions made by parents of young children? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):**	**What population were the sample recruited from:** Parents of children less than 7 years **How were they recruited:** Random sampling	**Brief description of method and analytical process:** Cross-sectional studies. SPSS version 22.0 and SPSS Complex Sample Module (IBM SPSS Inc., Chicago, IL, USA) were used for statistical analyses. **Key outcomes relevant to this review**:	**Limitations identified by author:** Exclusion of parents less than 18 years, recall bias, response bias, social desirability bias **Evidence gaps and/or recommendations for future research:** NR

	Journal: Vaccine **Volume:** 34 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	Web-based national survey based on federal quality requirements (e.g., the CDC-sponsored National Immunization Survey (NIS)), including survey pilot testing with parents of young children via cognitive interviews.	**How many participants were recruited:** 2603 in 2012, 2518 in 2014 **Were there specific inclusion criteria:** 1) Parents and guardians aged ⩾18 2) Parents and guardians living in the U.S. 3) Parents and guardians with children **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** In both 2012 and 2014, most respondents were females between the ages of 25 and 44, non-Hispanic whites who were employed, married, had some college	Prevalence rates of parental childhood vaccine hesitancy: In 2012, 5.5% intentionally delayed one or more vaccines, while 5.4% refused one or more vaccines. Refusal rates in 2014 were 5.6% and 3.6%, respectively. Predictors of childhood vaccine uptake or intention (p-value < .05): There was no statistically significant difference in intentional and ongoing delay or refusal of any of the recommended childhood vaccinations between 2012 and 2014. All nine non-influenza vaccines had relatively consistent refusal rates. Most parents were more certain of their refusal decisions than of their delay decisions, and they were more certain of their refusal of MMR and chickenpox vaccines than of other vaccines. DTaP, HepB, and PCV vaccines were the least frequently refused.	**Source of funding:** U.S. Centres for Disease Control and Prevention (CDC)

			degree or more, lived in a metropolitan area, and had a household income of $20,000 to $150,000.	**How the outcomes were measured:** Bivariate survey-weighted chi-square analyses were done. **Potential confounders:** NR **Ethical issues:** The surveys were approved by FHI360 and Westat Institutional Review Boards (IRBs). Studies were also reviewed by the Emory University IRB.	
16.	**Researcher(s):** Giambi et al., 2018 **Title:** Parental vaccine hesitancy in Italy – Results from a national survey **Year:** 2018 **Journal:** Vaccine **Volume:** 36 **Country:** Italy **WHO Region:** EUR	**What was/were the research question(s):** What is the prevalence and determinants of vaccine hesitancy among parents of children aged 16–36 months? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered questionnaires as well as online surveys.	**What population were the sample recruited from:** Parents of children aged 16–36 months, in two categories: 1) an online panel of Italian families, stratified by macro region to mirror the geographic distribution of the reference population (Northern, Central and Southern Italy), and 2) parents visiting	**Brief description of method and analytical process:** Cross-sectional study. Stata/MP version 13 (Stata Corp, Texas, USA) was used for data analyses. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 15.6% of respondents were vaccine hesitant Predictors of childhood vaccine uptake or intention (p-value < .05):	**Limitations identified by author:** The sample's geographic distribution varied slightly from that of the study population. Because of the likely link between hesitancy and area of residence, families residing in north central Italy were over-sampled in several regions, which could have contributed a bias in the estimations.

	Quality Assessment: Include		paediatricians' offices and nurseries in five Italian Regions (Emilia-Romagna, Friuli Venezia Giulia, Marche, Piemonte, and Puglia). **How were they recruited:** Stratified sampling **How many participants were recruited:** 3130 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** Tetanus, poliomyelitis, diphtheria, pertussis, *Haemophilus influenzae* type b (Hib),	1) not receiving a recommendation from a paediatrician to fully vaccinate their child; 2) receiving conflicting vaccination advice; 3) meeting parents of children who had adverse vaccine side effects; and 4) employing non-traditional medical therapies. **How the outcomes were measured:** The connection between vaccine hesitancy and socio-demographic variables of parents was investigated using multivariable logistic regression comparing hesitant vs. pro-vaccine parents. **Potential confounders:** NR **Ethical issues:** NR	**Evidence gaps and/or recommendations for future research:** NR **Source of funding:** Italian Ministry of Health

			hepatitis B, MMR **Other details:** Even though numerous studies have found no increased risk of autism following vaccination, 21% of parents in this study believed that vaccines can cause autism. Furthermore, even though thimerosal is no longer used as a vaccine preservative (except for multidose influenza vaccine), 44% of parents believed that many vaccines contain "mercury." Again, 32% of parents were concerned that vaccination will weaken their child's immune system.		
17.	**Researcher(s):** Gilkey et al., 2016 **Title:** Vaccination Confidence and Parental Refusal/Delay	**What was/were the research question(s):** **What theoretical approach (e.g., Grounded**	**What population were the sample recruited from:** Parents of children aged 19 to 35	**Brief description of method and analytical process:** Cross-sectional survey was conducted. Data were analysed using SAS 9.3 (Cary, NC).	**Limitations identified by author:** The cross-sectional design of this study restricts the capacity to determine the

	of Early Childhood Vaccines **Year:** 2016 **Journal:** PLoS ONE **Volume:** 11 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	**Theory) does the study take (if specified):** The 2011 National Immunisation Survey (NIS) Parental Concerns Module and the Vaccination Confidence Scale were used to assess parents' vaccination beliefs.	months. Data was derived from the 2011 NIS, a population-based survey conducted annually by the Centres for Disease Control and Control (CDC). **How were they recruited:** Random sampling **How many participants were recruited:** 9354 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** MMR, varicella, seasonal flu **Other details:** Male (53%) and female	**Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 27% were vaccine-hesitant, 15% were vaccine refusers Predictors of childhood vaccine uptake or intention (p-value < .05): Vaccination confidence was linked to early childhood vaccination behaviours, as well as measures of vaccine refusal, vaccine delay and vaccination status. Mean scores on the Vaccination Confidence Scale were strongly associated with these measures, with each one-point increase in mean scale scores corresponding to a reduction in the odds of refusal ranging from 42% for any vaccine to 61% for MMR, and the odds of delay ranging from 19% for any vaccine to 33% for varicella vaccine. These findings show that	directionality of the connection between vaccination confidence and behaviour. The study's focus on the vaccination beliefs of parents was also a limitation. Although this focus fulfilled the study's primary purpose of validating the Vaccine Confidence Scale, other drivers of early childhood vaccination coverage, such as provider recommendations and clinical systems for patient recall and reminders, are also essential. Another limitation is that the measure of trust was particular to healthcare providers; trust in other entities, such as pharmaceutical corporations or government authorities, as well as trust in vaccinations themselves, may also be relevant. Furthermore, the high mean value

			(47%) children were reported by parents in almost similar proportions. Most children were non-Hispanic white (61%) or non-Hispanic black (14%) or Hispanic (15%). Mothers or female guardians made up about three-quarters of the parents (78%). A significant proportion of parents (39%) had a high school diploma or less schooling and lived in poverty (29%).	vaccination confidence is especially important for parents of young children who must make frequent decisions about whether or not to give their children vaccines. **How the outcomes were measured:** To determine associations between parents' mean scores on the 8-item Vaccination Confidence Scale and vaccine refusal, vaccine delay, and vaccination status, researchers used multivariable logistic regression models. **Potential confounders:** NR **Ethical issues:** The University of North Carolina Institutional Review Board approved the study protocol.	for this construct shows a possible ceiling effect, in which respondents gave such high ratings to trust questions that there was little fluctuation. **Evidence gaps and/or recommendations for future research:** Future research can develop and evaluate items that better capture variation in parents' faith in their children's immunisation providers, as well as the healthcare system as a whole. **Source of funding:** 1) The Academic Paediatric Association Young Investigator Award 2. The National Cancer Institute
18.	**Researcher(s):** Goldman et al., 2020 **Title:** Caregiver willingness to	**What was/were the research question(s):** What are the predictors associated with caregivers'	**What population were the sample recruited from:**	**Brief description of method and analytical process:** Cross-sectional study across six countries. Univariate	**Limitations identified by author:** First, because the survey was conducted in a hospital ED

	vaccinate their children against COVID-19: Cross sectional survey **Year:** 2020 **Journal:** Vaccine **Volume:** 38 **Country:** Multi-national **WHO Region:** Multi-regional **Quality Assessment:** Include	intention to vaccinate their children against COVID-19? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Studies were conducted as part of the COVID-19 Parental Attitude Study (COVIPAS) of parents and caregivers seeking emergency care for their children during the COVID-19 era. Survey tool was available in English, French, German, Spanish, Japanese, Italian, and Hebrew.	Caregivers bringing their children to 16 paediatric Emergency Departments (ED) across six nations from March 26 to May 31, 2020 **How were they recruited:** Convenience sampling **How many participants were recruited:** 1541 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** COVID-19 **Other details:** The median age of the children was 7.5 (SD = 5.0) years, and the caregivers' median age	analysis was used t o determine which factors were significantly linked to the decision to vaccinate children: the Mann-Whitney test for non-normal continuous variables, the independent t-test for normally distributed continuous variables, and the Chi-square or Fisher's exact test for categorical variables. Using all of the variables that indicated significance ($p < 0.1$) in the univariate analysis, the researchers conducted multivariable logistic regression analysis to obtain the adjusted odds ratio of agreeing to vaccinate children. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 33% had no intention to vaccinate their children against COVID-19 Predictors of childhood vaccine uptake or intention (p-value < .05):	during the peak of COVID-19, the population of parents and other caregivers who responded is not representative of all caregivers in the six countries where it was conducted. In addition, requiring a smartphone to take the poll may prevent some people from taking part. Second, caregivers discussed their concerns about vaccinating their child at a period of high uncertainty (no school, work-at-home), and their willingness to vaccinate against COVID-19 may differ when community life returns to normal and the number of infected patients decreases. Finally, the researchers developed a hypothetical vaccine, which, once available and tested, may provide caregivers with fresh knowledge

			was 39.9 (SD = 7.6) years. Parents (97.5%) completed most of the surveys, as opposed to other caregivers. 12% had children with a chronic condition, and 15% had a probable contraindicatio n to live vaccinations (such as cancer or being on immunosuppre ssive medicines). 21 % of the surveys were completed in the United States, 35% in Canada, 28% in Switzerland, 8% in Spain, 6% in Israel, and 2% in Japan.	Several factors were associated with vaccination intention, including children who were older, children without a chronic illness, when fathers completed the survey, children up-to-date on their vaccination schedule, recent history of influenza vaccination, and caregivers concerned their child had COVID-19 at the time of survey completion in the ED all had higher intended uptake. The most common reason given by caregivers for wanting to vaccinate their children was to protect them (62%), while the most common reason given by caregivers for refusing immunisation was the vaccine's novelty (52%). **How the outcomes were measured:** Univariate analysis (Mann-Whitney test, independent t-test, Chi-square test, Fisher's exact test) and multivariable logistic regression analysis	that causes them to reconsider their decision to vaccinate their children. **Evidence gaps and/or recommendatio ns for future research:** Future study should take regional and geographic disparities into account, particularly when determining parental reasons for not planning to vaccinate their children. **Source of funding:** NR

				Potential confounders: NR **Ethical issues:** The Institutional Review Boards (IRB) of participating countries approved the study protocol.	
19.	**Researcher(s):** Greenberg et al., 2017 **Title:** Vaccine Hesitancy: In Search of the Risk Communication Comfort Zone **Year:** 2017 **Journal:** PLoS Currents **Volume:** 9 **Country:** Canada **WHO Region:** AMR **Quality Assessment:** Include	**What was/were the research question(s):** What are parental attitudes regarding childhood vaccinations in Canada? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The Angus Reid Forum Panel, a prominent consumer panel of over 150,000 Canadian adults aged 18 and older spread throughout all geographic regions of Canada, was used to administer closed and open-ended questions in November 2015.	**What population were the sample recruited from:** Canadian parents of children aged 5 and younger **How were they recruited:** The Angus Reid Online Forum panel was used to recruit eligible participants. **How many participants were recruited:** 1,000 **Were there specific inclusion criteria:** Parents with vaccine-aged children **Were there specific**	**Brief description of method and analytical process:** Cross-sectional survey was conducted. Online survey consisted of 25 questions split into 4 main sections: perceptions regarding vaccines and vaccination; perspectives on the public debate about vaccinations and vaccine-preventable disease; information seeking needs and practises, including media usage and trust in institutional sources; and communication techniques. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: A significant proportion of parents believe or	**Limitations identified by author:** First, while the online panel for the survey was designed to be representative of the Canadian population in terms of age, residence region, income, and education, selection bias and non-response bias could not be entirely out. Second, parents self-reported their child's MMR vaccination decision, which could lead to recall bias, and there was no additional measure in the study to examine parental vaccine hesitancy attitudes throughout the spectrum. As a

			exclusion criteria: NR **Were there specific vaccines under consideration:** MMR **Other details:** Most parents (57%) prefer to get their health news and information from online sources (e.g., Google, social media, websites, etc.), followed by television or radio (29%). A very small percentage (5 %) said they frequently use scientific sources, such as medical journals, to navigate the ever-changing health information landscape.	are unsure whether there is a link between vaccines and autism (28%), are concerned that vaccines may cause major harm to their children (27%), or believe the pharmaceutical industry is driving the campaign for mandatory immunisation (33%). Predictors of childhood vaccine uptake or intention (p-value < .05): Even though more than 90% of parents have had their children vaccinated, 44% believe vaccination should remain a personal choice (49% disagreed, and 7% were unsure). When asked if, except for medical exemptions, schools and day-care institutions should deny children who have not been vaccinate, about 65% of respo ndents replied affirmatively, and 66% agreed that "parents who do not have their children immunised (except in cases involving medical exemptions) are	result, because most parents said their child had been vaccinated, their reflections on the standard public health messages used to persuade parents about the benefits of vaccination, as well as any suggestions made by parents that might be persuasive in encouraging parents to vaccinate their children, cannot be expected to be effective specifically for vaccine hesitant parents. **Evidence gaps and/or recommendatio ns for future research:** Future research should build on these findings by putting risk communication strategies to the test with parents who fall on different sides of the vaccine hesitancy spectrum. **Source of funding:** Canadian Immunization

				irresponsible." Furthermore, while most parents have had their children vaccinated and many feel that there is scientific consensus on vaccine safety and effectiveness, only 33% agree that "drug companies are behind the government's push for mandatory vaccination." **How the outcomes were measured:** NR **Potential confounders:** NR **Ethical issues:** NR	Research Network and Canadian Institutes for Health Research and Public Health Agency of Canada.
20.	**Researcher(s):** Hak et al., 2005 **Title:** Negative attitude of highly educated parents and health care workers towards future vaccinations in the Dutch childhood vaccination program **Year:** 2005 **Journal:** Vaccine	**What was/were the research question(s):** What are the attitudes of parents towards possible future vaccinations for their children, as well as the behavioural variables linked to a negative attitude? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):**	**What population were the sample recruited from:** Parents of children aged between 3 months and 5 years attending day-care centres **How were they recruited:** NR **How many participants**	**Brief description of method and analytical process:** Mixed-methods study involving polytomous logistic regression analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: One-tenth (11%) had no intention of complying with any new immunisation.	**Limitations identified by author:** The study was subjected to response bias. When compared to the Dutch parental population, the percentage of highly educated parents who participated in the study (48% agai nst 30%) and health care employees (18% versus 8%) was higher, which increased

	Volume: 23 **Country:** The Netherlands **WHO Region:** EUR **Quality Assessment:** Include	Focus group session explored possible determinants of parental attitudes. Outcome of the discussion informed the development of a questionnaire, of which most questions were based on determinants of health behaviour outlined by the Health Belief Model (HBM).	**were recruited:** 283 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** According to 89% of respondents, there is a critical need to improve current parental health education. Most respondents (47%) prefer oral education from health-care providers, whereas 27% prefer receiving an information booklet at home and 14% prefer educational television programmes.	Predictors of childhood vaccine uptake or intention (p-value < .05): A high education level of the parent, being a health care worker, lack of religion, perception of vaccine ineffectiveness, and the belief that vaccinations cause asthma or allergies. **How the outcomes were measured:** Univariate and multivariate logistic regression analysis **Potential confounders:** NR **Ethical issues:** NR	the statistical power to detect statistically significant relationships. Finally, the research was probably insufficient in detecting statistically significant relationships with rare determinants. For example, none of the participants were orthodox-reformed (a religious group that is known to oppose vaccination in general) and there were no parents from non-European nations. As a result, it is unclear if the findings could be applied to these groups. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** University Medical Centre Utrecht

21.	**Researcher(s):** Henrikson et al, 2017 **Title:** Longitudinal Trends in Vaccine Hesitancy in a Cohort of Mothers Surveyed in Washington State, 2013-2015 **Year:** 2017 **Journal:** Public Health Reports **Volume:** 132 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	**What was/were the research question(s):** How does parental vaccine hesitancy change among parents as their children age? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Mothers were surveyed at their baby's birth, age 6 months, and age 24 months using the validated PACV tool	**What population were the sample recruited from:** Mothers of 24-month-old children who participated in a two-arm clinic-level cluster randomised study that was completed in Washington State in 2013. **How were they recruited:** Participants in original trial were readministered the PACV when their child was 24 months old. **How many participants were recruited:** 237 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR	**Brief description of method and analytical process:** Longitudinal study **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 9.7% were vaccine-hesitant compared to 13.6% at baseline Predictors of childhood vaccine uptake or intention (p-value < .05): Fear that a vaccine might have a serious adverse effect in a child ((42.2% at baseline to 33.8% at 24 months, P = .12), concern that childhood shots might not be safe (34.2% to 24.9%, P = .26), concern that a vaccine would not prevent the disease (27.4% to 22.8%, P = .13), belief that children receive more shots than they need ((16.5% to 13.1%, P = .07). **How the outcomes were measured:** PACV survey instrument, Friedman test,	**Limitations identified by author:** Limitations included the use of a complete-case strategy, which excluded mothers who did not complete all surveys. Sensitivity studies that included data from all mothers who completed a baseline survey, on the other hand, yielded comparable results. **Evidence gaps and/or recommendations for future research:** Replication of the research findings in maternal populations from various geographic regions. **Source of funding:** The Group Health Foundation

			Were there specific vaccines under consideration: NR **Other details:** The mean age was 32.3 years, 78.5% of the population were college educated, and 80.5% were w hite. Respondents were more likely to be married, to have a greater income, and to have a better level of education com pared to all mothers who took part in the study.	linear regression analysis **Potential confounders:** NR **Ethical issues:** NR	
22.	**Researcher(s):** Hu et al., 2019 **Title:** Measuring childhood vaccination acceptance of mother in Zhejiang province, East China **Year:** 2019 **Journal:** Human Vaccines &	**What was/were the research question(s):** What is the prevalence of vaccine hesitancy and the risk factors associated with mother's intention to vaccinate in Zhejiang province, China? **What theoretical approach (e.g., Grounded**	**What population were the sample recruited from:** Mothers of children aged 24–35 months in Zhejiang province, China **How were they recruited:** **How many participants**	**Brief description of method and analytical process:** Cross-sectional study was conducted. Univariate and multivariate analyses were used to compare mothers with strong intentions to immunise their children in the future to mothers with weaker intentions.	**Limitations identified by author:** First, because only two items were included, the internal consistency of the two TPB constructs was minimal. Second, the intention to vaccinate children was assessed at the time when most of the recommended vaccinations

	Immunotherapeutics **Volume:** 15 **Country:** China **WHO Region:** WPR **Quality Assessment:** Include	**Theory) does the study take (if specified):** Attitudes toward vaccination, perceived social support, perceived behavioural control, and mothers' intention to immunise their children were all constructed using the Theory of Planned Behaviour (TPB). Vaccine hesitancy was estimated using questionnaire developed by Zhejiang provincial centre for disease control and prevention (ZJCDC)) (~15 minutes).	**were recruited:** 770 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** Most mothers were under 30 years old (63.5%), had a senior middle school or higher degree of education (82.5%), and worked (70.6%). 53.1% lived in rural areas (53.1%). 61.9% were residents, and a similar proportion had a monthly income of 5000–10,000 CNY (64.4%). 8.1% had more than three children.	**Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 12.7% had weak intentions to vaccinate their children. Predictors of childhood vaccine uptake or intention (p-value < .05): A small proportion had difficulty getting a vaccination appointment due to inconvenient work hours (15.2%) or finding time to phone the clinic (11.2%).19.5% reported that vaccination was inconvenient and/or that waiting time at the clinic was unreasonable, and 24.9% did not know when immunisations were needed. **How the outcomes were measured:** Mothers with strong intentions to immunise their children in the future were compared to mothers with weaker intentions using univariate and multivariate analyses.	were scheduled to be given. Third, face-to-face interview was used to develop the study. As a result, potential recall and social desirability bias may not be ruled out, affecting the findings. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** NR

				Potential confounders: NR **Ethical issues:** The ethical review board of ZJCDC approved the manuscript.	
23.	**Researcher(s):** Kalok et al., 2020 **Title:** Vaccine hesitancy towards childhood immunisation amongst urban pregnant mothers in Malaysia **Year:** 2020 **Journal:** Vaccine **Volume:** 38 **Country:** Malaysia **WHO Region:** WPR **Quality Assessment:** Include	**What was/were the research question(s):** What is the prevalence of vaccine hesitancy amongst urban pregnant mothers? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV questionnaire	**What population were the sample recruited from:** Women who received their prenatal care at a teaching hospital in Kuala Lumpur **How were they recruited:** Convenience sampling **How many participants were recruited:** 1081 **Were there specific inclusion criteria:** Women who were pregnant and had at least one child older than one year **Were there specific**	**Brief description of method and analytical process:** Cross-sectional study. SPSS (IBM SPSS Statistics, Version 24.0 Armonk, NY: IBM Corp) was used for data analysis **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 8% of participants were vaccine hesitant Predictors of childhood vaccine uptake or intention (p-value < .05): Vaccine hesitancy was linked to ethnicity, religion, the number of children, educational level, and employment status. Non-Malay and non-Muslim mothers were more likely to be vaccine hesitant. Vaccine hesitancy was less	**Limitations identified by author:** Selection bias may have been caused by convenience sa mpling and data collection in a hospital setting. Because the teaching hospital was largely sponsored by the government, the price of consultation and treatment may be prohibitive for those with lesser incomes. The fact that over 75% of the women had a tertiary education suggests that the study cohort was made up of highly educated women. As a result, the results may not accurately reflect the genuine level of vaccine hesitancy among

			exclusion criteria: 1) Women who were pregnant and had a miscarriage or a foetal congenital abnormality. 2) Mothers who failed or postponed vaccinations for their infants due to a lack of vaccines, limited access to vaccines, or medical reasons such as immunosuppression. **Were there specific vaccines under consideration:** NR **Other details:** Most of the expectant mothers in this study (64.1%) were over 30 years old. Most (78.7%) were Malay and Muslim (80.3%). More than two-thirds (76.5%) had a diploma or higher educational degree, and	common among employed pregnant women and those with monthly salaries surpassing MYR2000. Those with more than one child were similarly less likely to be hesitant. **How the outcomes were measured:** The PACV Survey was used to assess vaccine hesitancy in both English and validated Malay versions. Using bivariate and multivariate logistic regression, the association between demographic variables, information source and vaccine hesitancy was analysed. **Potential confounders:** NR **Ethical issues:** University of Kuala Lumpur (UKM) Medical Research and Ethics Committee	Malaysia's urban population. **Evidence gaps and/or recommendations for future research:** A multicentre study will provide a more accurate depiction of the research population. The goal of the cross-sectional study was to determine whether there was an association rather than a causal relationship. A longitudinal study could be useful in determining if vaccination hesitancy leads to childhood vaccine refusal, particularly in new-borns. Because the PACV is designed to assess immunisation behaviour through past vaccination of existing children, the researchers solely used multiparous women in their

			over 80% were employed. A little more than half of them had only one child.		study. As a result, they lacked information on primigravidas. Future research into vaccine hesitancy among nulliparous women will necessitate PACV score adjustments. **Source of funding:** UKM
24.	**Researcher(s):** Khattak et al., 2020 **Title:** Prevalence of Parental refusal rate and its associated factors in routine immunization by using WHO Vaccine Hesitancy tool: A Cross sectional study at district Bannu, KP, Pakistan **Year:** 2020 **Journal:** International Journal of Infectious Diseases **Volume:** 104	**What was/were the research question(s):** 1) What is the vaccination refusal rate of parents who refuse routine immunisation for their children? 2) What are the associated factors and perceptions of parents who refuse routine immunisation for their children? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered survey instrument	**What population were the sample recruited from:** Parents with children aged 0–59 month who have at least 12 months of residence in Bannu District, Khyber Pakhtunkhwa Province, Pakistan. **How were they recruited:** Multi-stage cluster sampling **How many participants were recruited:** 610	**Brief description of method and analytical process:** Cross-sectional survey. SPSS Version 22 (IBM Corp., Armonk, NY, USA) was used for data analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 27.9% of parents were vaccine refusers Predictors of childhood vaccine uptake or intention (p-value < .05): Parental vaccine rejection was found to be linked to parental education, employment status, household	**Limitations identified by author:** Because it was impossible to interview mothers due to cultural constraints, only fathers were surveyed. Also, it was difficult to evaluate if polio campaigns have a positive or negative effect on vaccination rejection (polio campaigns for children aged 5 years are held virtually every month in Pakistan); it is still unclear whether polio campaigns have a positive or negative effect on vaccination refusal. Finally,

	Country: Pakistan **WHO Region:** EMR **Quality Assessment:** Include	(WHO SAGE WG Vaccine Hesitancy Tool)	**Were there specific inclusion criteria:** 1) Parents with children aged 0–59 months; and 2) Parents with at least 12 months of residence in the chosen geographic area. **Were there specific exclusion criteria:** Parents who were involved in the delivery of any form of health service, notably healthcare workers **Were there specific vaccines under consideration:** Polio **Other details:** Mothers were less likely than fathers to own a mobile phone (14.1% vs 89.4%), and most of the hesitant population had minimal education (85.3%). The immunisation rejection rate	income and food insecurity. There was no link between parental immunisation refusal and gender, age, possession of certain amenities, or depression. Most parents who declined to have their children vaccinated believed that vaccination had substantial side effects. As a result, 19.4% of parents disagreed with doctors' advice that their children be vaccinated. The statement that vaccination can safeguard children was disputed by more than half of parents (50.6%). **How the outcomes were measured:** The World Health Organization (WHO) SAGE Working Group on Vaccine Hesitancy Survey Tool. For associations, logistic regression was used, and multi-regression was used to identify potential confounders. **Potential confounders:** NR **Ethical issues:**	due to the cross-sectional study design, it was impossible to demonstrate causal relationships between parental vaccination refusal status and any of the independent factors. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** NR

			was greater in parents with food security (51.8%) than in parents with mild food insecurity (36.5%) or high food insecurity (11.8%). Fathers with a high degree of education and a job were less likely to reject vaccinations for their children.	The Institutional Review Board and Ethics Committee of Khyber Medical University, Peshawar approved the study protocol.	
25.	**Researcher(s):** Larson et al., 2015b **Title:** Measuring Vaccine Confidence: Introducing a Global Vaccine Confidence Index **Year:** 2015 **Journal:** PLoS Currents **Volume:** 7 **Country:** Multi-national **WHO Region:** Multi-regional **Quality Assessment:**	**What was/were the research question(s):** What is the level of parental trust in vaccines and immunisation programmes from a global perspective? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** The Vaccine Confidence Index (VCI) was developed by the researchers, taking cues from other social science tools such as the Consumer Confidence Index (CCI) that	**What population were the sample recruited from:** Georgian, Indian, Nigerian, Pakistani, and British parents of children under the age of five **How were they recruited:** Stratified/Random sampling **How many participants were recruited:** Georgia (n=1000); India (n=1259); Pakistan	**Brief description of method and analytical process:** Country-specific data collection methods were employed, including random sampling, stratified sampling, face-to-face in-house interviews, online interviews, computer-assisted telephone interviewing (CATI), computer assisted personal interviewing (CAPI) **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: Georgia had the largest percentage	**Limitations identified by author:** First, survey techniques differed slightly between countries. In Nigeria, for example, data was gathered through face-to-face interviews done within houses, whereas in the United Kingdom, the survey was completed online. Responses could have been influenced by the different forms. Even though the same fundamental questions were asked in each of

	Include	measure confidence more generally, placing a finger on the pulse of a set of public sentiments, which influence vaccination behaviours, with consequences for the whole population. The sentiments measured by the VCI are trust in vaccination and the entities with whom it is linked, and vaccine sentiments, like the sentiments evaluated by the CCI, are influenced by broader social dynamics.	(n=2609); UK (n=2055); Nigerian households (n=12554); Nigerian health providers (n=1272) **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** In comparison to the other nations studied, the UK sample had less respondents with children under the age of five (RCU5s). When compared to RCU5s from other nations, UK RCU5s were more hesitant to vaccinate. In Georgia,	of vaccine refusers (60%) among those who reported hesitancy, followed by Nigeria, where 22.7% of hesitancy-reporting families refused immunisation. Predictors of childhood vaccine uptake or intention (p-value < .05): **How the outcomes were measured:** The researchers developed the Vaccine Confidence Index as a measuring tool. **Potential confounders:** NR **Ethical issues:** NR	the five countries, the whole collection of survey questions was not identical in each. This limited the range of comparisons feasible, as surveys in India and the United Kingdom, for example, queried respondents about their confidence in emergency services, but not in other nations. Furthermore, the local team in Georgia did not include questions about trust in immunisation programmes or other health services, so this phenomenon could not be compared. In Georgia, respondents were also questioned if they had children under the age of 15, as compared to the age of five in the other nations examined. These factors could lead to unaccounted-for differences in

			however, hesitant parents made up a smaller percentage of RCU5s, but most of those who hesitated did not receive the vaccine. In all nations except India, RCU5s were more likely to believe that all or most people in their community get their children vaccinated, and less likely to indicate they "don't know" how many get their children vaccinated, compared to respondents who did not have children under the age of five.		findings among countries. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** NR
26.	**Researcher(s):** Musa et al., 2019 **Title:** Vaccine hesitancy among parents in Kuala Lumpur: a single centre study **Year:** 2019 **Journal:** F1000 Research	**What was/were the research question(s):** 1) What is the prevalence of VH among parents in Kuala Lumpur, Malaysia? 2) What are the predictors associated with a VH attitude in parents in Kuala Lumpur, Malaysia?	**What population were the sample recruited from:** Parents attending Tanglin Health Community Clinic, Kuala Lumpur **How were they recruited:**	**Brief description of method and analytical process:** Cross-sectional study. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 14.5% of respondents	**Limitations identified by author:** Firstly, the study design eliminated the possibility of causality between the variables examined for VH. Second, the study's findings are dependent on the parent's self-perception at a specific

	Volume: 8 **Country:** Malaysia **WHO Region:** WPR **Quality Assessment:** Include	**What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV survey (10-15 minutes)	Convenience sampling **How many participants were recruited:** 337 **Were there specific inclusion criteria:** 1) competent to speak and interpret English or Malay languages; 2) aged 20 or older; and 3) provided written consent. **Were there specific exclusion criteria:** 1) being too unwell or unsettled to complete the questionnaire, and 2) not being Malaysian citizens. **Were there specific vaccines under consideration:** NR **Other details:** Females made up 60.2% of the	Predictors of childhood vaccine uptake or intention (p-value < .05): 1) The introduction of a new vaccine, 2) Previous negative vaccination experiences, 3) Mistrust of pharmaceutical firms, 4) Mistrust of health institutions and healthcare providers, and 5) Being male **How the outcomes were measured:** PACV scale; univariate analysis; multivariate analysis **Potential confounders:** NR **Ethical issues:** The Human Research Ethics Committee of Monash University and the Medical Research Ethics Committee of the Malaysian Ministry of Health approved the study protocol.	point in time. This could change depending on the time, place, and situation. Third, there were some missing data that could not be accounted for in the study since the participants were given the option of whether or not to answer each question. It is unclear whether this was due to a lack of understanding of the questions or other factors. Fourth, participants were only included if they could read and understand Malay or English. This resulted in selection bias, impacting on the results because it left out other Malaysian languages like Mandarin and Tamil. Fifth, parents we re recruited using convenience sampling, which resulted in a highly skewed ethnic and

			participants. In comparison to all other ethnic groups, Malays accounted for 80.3%.		religious group, with Malays and Muslims accounting for over 90% of the population. Because this does not represent the entire Malaysian population, the findings cannot be applied to all Malaysian parents. To obtain a more generalisable sample, a simple random sampling method could be used to recruit participants. Finally, this research is based in a specific location in Kuala Lumpur's urban area. In a semi-urban or rural population, the responses and outcomes may differ. **Evidence gaps and/or recommendations for future research:** Other elements that may be associated with VHPs in a multi-ethnic country, such as a link between cultural or social differences and VH in parents,

					should be investigated further. To investigate this knowledge gap in a varied population, a qualitative research design may be required. **Source of funding:** Global Public Health Polling Network
27.	**Researcher(s):** Napolitano et al., 2018 **Title:** Investigating Italian parents' vaccine hesitancy: A cross-sectional survey **Year:** 2018 **Journal:** Human Vaccines & Immunotherapeutics **Volume:** 14 **Country:** Italy **WHO Region:** EUR **Quality Assessment:** Include	**What was/were the research question(s):** What is the prevalence of vaccine hesitancy among parents and its associated factors? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV survey (Italian version)	**What population were the sample recruited from:** Parents of children aged 2 to 6 years old who attend five pre-schools in the Naples area **How were they recruited:** Cluster sampling **How many participants were recruited:** 437 **Were there specific inclusion criteria:** NR	**Brief description of method and analytical process:** Cross-sectional study. Stata version 10.1 was used for data analysis. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 34.7% of parents were vaccine hesitant (PACV score ≥50) Predictors of childhood vaccine uptake or intention (p-value < .05): Vaccine hesitancy was more common among parents concerned about vaccine side effects and safety. None of the respondents' sociodemographic characteristics were	**Limitations identified by author:** Firstly, the researchers were unable to draw any conclusions about the causal relationship between VH variables due to the cross-sectional study design. Second, there is a risk of recall bias in all research based on retrospective data obtained using self-administered questionnaires and not confirmed by medical records, because participants may not remember or report certain events. Third, because some of the study's volunteers may

			Were there specific exclusion criteria: NR **Were there specific vaccines under consideration:** NR **Other details:** The participants were mostly female (82.1%) and married (86.2%), with an average age of 37.1 years, almost half had a high school education (46.9%), more than half were employed (60.5%), and 69.2% had more than one child. More than half of the parents (53.8%) desired more information regarding their children's vaccines.	found to be significant determinants. Parents who did not trust paediatricians were more hesitant. Furtherm ore, more than half of the participants require d more knowledge about childhood immunisations, with parents of first-born children being more affected by this outcome compared to parents of second-born children. **How the outcomes were measured:** PACV scale; univariate analysis; multivariate analysis **Potential confounders:** NR **Ethical issues:** Ethics Committee of the Teaching Hospital of the University of Campania "Luigi Vanvitelli" approved the study protocol.	have been sensitive to certain topics, the replies may not be objective and may differ from their genuine feelings. As a result, there is a risk of overestimation of vaccination coverage as well as the possibility of social desirability bias. Finally, the fact that mothers made up most of the sample could be considered a shortcoming. **Evidence gaps and/or recommendatio ns for future research:** NR **Source of funding:** NR
28.	**Researcher(s):** Opel et al., 2011b **Title:**	**What was/were the research question(s):** What is the construct validity and	**What population were the sample recruited from:**	**Brief description of method and analytical process:** Study was cross-sectional in nature. Data analysis was	**Limitations identified by author:** First, given the low response rate, the results

	Validity and reliability of a survey to identify vaccine-hesitant parents **Year:** 2011 **Journal:** Vaccine **Volume:** 29 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	reliability of the Parent Attitudes about Childhood Vaccines (PACV) survey? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV questionnaire (5-7 minutes)	Parents of 19–35-month-old children in a closed model Health Maintenance Organisation (HMO) **How were they recruited:** Simple random sampling **How many participants were recruited:** 230 **Were there specific inclusion criteria:** 1) English-speaking parents 2) Parents ≥18 years old 3) Parents had children aged 19-35 months old singleton children born between April 2007 and August 2008 4) Parents belonged to a large, integrated, US health care delivery system (Group Health Cooperative (GHC), Seattle, Washington	done with Stata 10 (Stata Corp, College Station, TX). **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: For reasons other than illness or allergy, 27% of parents reported delaying and 16% reported refusing a recommended vaccine. More than half (53%) believed that their child would benefit from receiving fewer immunisations at the same time, were afraid that their child would experience an adverse effect from a vaccine (64%) and were worried that childhood vaccines might not be safe (58%). Predictors of childhood vaccine uptake or intention (p-value < .05): Parents with at least some college education, mothers, and parents with a household income of more than $75,000 were less likely to agree that getting sick is a	may reflect response bias. Second, the sample population may not be representative, since many were white married mothers with at least a high school diploma and a household income of more than $50,000. Third, by polling parents about their immunisation attitudes, beliefs, and behaviours after the timeframe in which they were making immunisation decisions (i.e.. after their child turned 19 months rather than during the first 19 months), the survey results may reflect current immunisation perceptions rather than perceptions at the time they were making immunisation decisions. It is difficult to tell if the link between a child's immunisation status and their parent's PACV responses

			Were there specific vaccines under consideration: NR **Were there specific exclusion criteria:** NR **Other details:** Children with a parent who was 18–29 years old, had a high school education or less, and was white were under-immunised for a higher percentage of days than children with parents who were 30 or older (17% vs. 9%, P =.04), had at least some college education (23% vs. 10%, P =.01), and were non-white (13% vs. 5%, P =.04). In comparison to non-Asian children, Asian children had a lower mean percentage of days under-immunized (2% vs. 12%,	better way for their child to develop immunity than getting a shot than parents with a high school education or less and parents with a household income of $75,000, respectively. Parents with at least some college education, on the other hand, were more likely to be concerned that any of the childhood vaccinations might be unsafe. Mothers and parents with a household income of more than $75,000 were more likely to be unconcerned about their child suffering a serious side effect from a vaccination. Parents of black children were more likely than non-black parents to distrust their child's paediatrician. Parents who were married or living with a partner, as well as those who were 30 years old or older, were less likely to have doubts about their child's doctor. There was no statistically significant difference in socioeconomic characteristics	represents their current or previous immunisation attitudes or beliefs because immunisation perceptions can change over time. **Evidence gaps and/or recommendations for future research:** NR **Source of funding:** Seattle Children's Centre for Clinical and Translational Research Paediatric Pilot Fund Award

			P =.03). Other parent socio-demographic factors (marital status, income, and first-born status) were not linked to the mean percentage of days under-immunised.	between parents who refused or delayed a recommended childhood immunisation for reasons other than illness or allergy and those who did not. **How the outcomes were measured:** Multivariate linear regression models, Factor analysis, Cronbach's α **Potential confounders:** NR **Ethical issues:** The Human Subjects Review Committee of Group Health Research Institute approved the study protocol.	
29.	**Researcher(s):** Opel et al., 2013 **Title:** The Relationship Between Parent Attitudes About Childhood Vaccines Survey Scores and Future Child Immunization Status: A Validation Study **Year:** 2013	**What was/were the research question(s):** What is the predictive validity and test-retest reliability of the Parent Attitudes About Childhood Vaccines survey (PACV)? **What theoretical approach (e.g., Grounded Theory) does**	**What population were the sample recruited from:** English-speaking parents of children born between July 10 and December 10, 2010, and who were members of a Seattle-based integrated health care	**Brief description of method and analytical process:** Prospective cohort study. Data analysed using Pearson $\chi 2$ tests, Fisher test, McNemer test, Multivariate linear regression models. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy:	**Limitations identified by author:** Given the low response rate, one of the study's limitations was the possibility of response bias. Second, the PACV was not given to the full cohort at the same time, which could have resulted in sampling

	Journal: JAMA Paediatrics **Volume:** 167 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	**the study take (if specified):** Self-administered PACV questionnaire (5-7 minutes)	delivery system. **How were they recruited:** Random sampling **How many participants were recruited:** 310 completed the baseline PACV survey, 220 were involved in the follow-up survey **Were there specific inclusion criteria:** English-speaking parents of 2-month-old children born between July 10 and December 10, 2010, and who were part of a large, integrated US health-care delivery system (Group Health Cooperative [GHC], Seattle) **Were there specific exclusion criteria:** NR	30.4% were very or somewhat hesitant about childhood vaccinations, 23.9% delayed a vaccination for their child for reasons other than illness or allergy, and 7.7% decided not to have their child receive a vaccination for reasons other than illness or allergy. Predictors of childhood vaccine uptake or intention (p-value < .05): More than half of parents were concerned that a vaccination may cause a major adverse reaction in their child (57.7%) or that any of the childhood vaccinations may not be safe (51.5%). **How the outcomes were measured:** PACV survey tool, Pearson $\chi 2$ tests, Fisher test, McNemer test, Multivariate linear regression models. **Potential confounders:** NR **Ethical issues:** The Group Health Human Subjects Review Committee	variance. Third, the study sample set comprised paren ts who worked for a Seattle-based health-care delivery system. As a result, the findings may not be applicable to different situations or geographic areas. Fourth, most of the respondents in the sample were white, married mothers with a household income of more than $75,000. Although the study population in race/ethnicity and household income closely mirrored the larger GHC population and the 2011 King County population in race/ethnicity, th is homogeneity may have hampered the researchers' abili ty to detect differences in PACV scores or days underimmunized by these characteristics. Finally, the 3-tier PACV

			Were there specific vaccines under consideration: NR **Other details:** There was a higher number of Hispanic or Latino parents and lower mean PACV scores among those who stayed continuously enrolled. The demographics of continuously enrolled respondents and test-retest respondents showed no significant variations.	approved the study protocol.	categorization was done after the fact. Because of the timing, the classification may be prone to overfitting the relationship between the PACV score and days underimmunised, as well as a lack of reproducibility. This categorisation, as well as the associated results, need validation in other samples. **Evidence gaps and/or recommendations for future research:** Validation in other settings or geographic areas **Source of funding:** The Centre for Clinical and Translational Research Mentored Scholar Program, Seattle Children's Research Institute funded the study.
30.	**Researcher(s):** Rachel et al., 2017	**What was/were the research question(s):**	**What population were the**	**Brief description of method and analytical process:**	**Limitations identified by author:**

	Title: Prevalence of Vaccine Hesitancy Among Expectant Mothers in Houston, Texas **Year:** 2017 **Journal:** Academic Paediatrics **Volume:** 18 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	What is the prevalence of vaccine hesitancy among expectant mothers? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered PACV survey (modified for use with expectant mothers attending a single obstetric practice in Houston, Texas)	**sample recruited from:** Women who, between July 2014 and September 2015, were between 12 and 31 weeks pregnant and received care at Baylor College of Medicine Obstetrics and Gynaecology practice at the Texas Children's Pavilion for Women **How were they recruited:** Convenience sampling **How many participants were recruited:** 648 **Were there specific inclusion criteria:** 1) Participants spoke English, 2) The pregnant parent was between 12 and 31 weeks pregnant, 3) Both parents were 18 years old or older,	Cross-sectional study. Data analysed using univariate and multivariate linear regression models. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 8.2% of the mothers were vaccine hesitant Predictors of childhood vaccine uptake or intention (p-value < .05): Between hesitant and nonhesitant expectant moms, there was no significant difference in the proportion of first-born children, age group, marital status, household income, number of children in the family, race, or high-risk pregnancies (P >.10). **How the outcomes were measured:** PACV scale (modified for use with expectant mothers) **Potential confounders:** NR	First, the researchers used convenienc e sampling to recruit participants and missed 46% (n=660) of them due to short waiting room times, which could have resulted in response bias. Second, they were unable to link 10 expectant fathers with their expectant partne rs, reducing the size of the ample. Third, the PACV survey that was modified for use with pregnant mothers may not have kept the construct and predictive validity that was observed when it was given to parents. Fourth, the PACV is a generic instrument for assessing vaccine hesitancy that uses 15 validated items across three domains to assess parental vaccine decision-

			and 4) Neither parent had previously participated in a vaccine study at the study institution. **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** Most participants we re non-Hispanic white pregnant wom en who were 30 years old or older and married. About half of the mothers were expecting their first child, and most of them did not perceive their pregnancy to be high-risk.	**Ethical issues:** Study was approved by the institutional review board of Baylor College of Medicine.	making. It does not specify whether any vaccines are of primary interest to the respondents, nor does it cover all possible vaccine concerns. As a result, before giving targeted vaccine advice to VHPs identified by the PACV, further information from the parents may be required. Finally, because enrolled parents reported a high income and high educational attainment, the study cohort may not be generalizable to other communities or representative of people of the greater Houston area. Furthermore, the participants in this study were all parents who were having treatment at a large medical facility. Vaccine hesitancy may vary among parents who obtain obstetric care from various types of providers, including

					private practise physicians and midwives. **Evidence gaps and/or recommendations for future research:** Future research should consider more representative samples in the Houston area as well as in other settings or geographic regions. **Source of funding:** NR
31.	**Researcher(s):** Stefanoff et al., 2010 **Title:** Tracking parental attitudes on vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VACSATC) **Year:** 2010 **Journal:** Vaccine **Volume:** 28	**What was/were the research question(s):** What are parental attitudes on vaccinations across countries in Europe? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Cross-sectional surveys were used by the Vaccine Safety, Attitudes, Training, and Communication Project (VACSATC) to	**What population were the sample recruited from:** Parents in England, Norway, Poland, Spain, and Sweden with children under the age of three **How were they recruited:** Stratified/Random sampling **How many participants were recruited:** 6611	**Brief description of method and analytical process:** Cross-sectional studies were conducted. Country-specific bivariate analyses were done. Because of the diverse sampling and measuring methods used, the study did not include pooled results analysis or computation of confidence intervals. **Key outcomes relevant to this review**:	**Limitations identified by author:** Non-response bias, sample representativeness **Evidence gaps and/or recommendations for future research:** Detailed information on non-responders should be collected in future cross-country comparisons of parental attitudes on vaccinations. Researchers should continue

	Country: Multi-national **WHO Region:** Multi-regional **Quality Assessment:** Include	track parental attitudes toward vaccinations in different European countries.	**Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** NR **Other details:** English parents (88%) cited MMR as the vaccine they were most worried about. In comparison, 66% of Swedish doubters, 57% of Norwegian doubters, and only 7% of Polish doubters expressed concerns about the MMR vaccine (the type of vaccine that prompted questions among sceptics was not surveyed in Spain). Polish	Prevalence rates of parental childhood vaccine hesitancy: A sizable proportion of respondents had reservations regarding vaccination. Parents in England were the most doubtful (28%), followed by Poles and Norwegians (about 20%), and parents in Sweden and Spain (17% and 12% respectively). Predictors of childhood vaccine uptake or intention (p-value < .05): Fear of adverse events following vaccination (12% in Spain; 14% in England; 40% in Sweden; 76% in Norway), the alleged link between autism and MMR vaccination (22% in England; 30% in Sweden), vaccine safety and its long-term effects (England 40%; Norway 40%) were the most common reasons for doubt among the doubters. In Norway, doubters were also concerned because they believed there was some debate among experts on	the work of standardising attitudinal surveys, both to allow for comparison of clearly defined indicators and to identify shifts in parental perceptions and beliefs that could lead to non-compliance with recommended childhood immunisations. **Source of funding:** Directorate-General for Health and Consumers (DG SANCO)

			doubters were more concerned about pneumococci vaccinations (55%) than the MMR vaccine (7%). A third of the English doubters expressed reservations about the combined pent avalent vaccine, which contains DTaP, IPV, and Hib.	vaccine safety (31%), while in Spain, 24% of doubters said their doubt stemmed from a lack of information regarding vaccination in general. In Poland, the grounds for vaccination hesitancy were not investigated. **How the outcomes were measured:** All the studies used questionnaires from the Department of Health England's attitudinal survey. Bivariate analyses were done in all countries. **Potential confounders:** NR **Ethical issues:** NR	
32.	**Researcher(s):** Strelitz et al., 2015 **Title:** Parental vaccine hesitancy and acceptance of seasonal influenza vaccine in the paediatric emergency department **Year:**	**What was/were the research question(s):** 1) What is the feasibility of administering the PACV modified for influenza vaccination in the Paediatric Emergency Department (PED) setting? 2) Are parental PACV scores	**What population were the sample recruited from:** Parents attending the PED of an urban, tertiary paediatric hospital in Seattle, Washington	**Brief description of method and analytical process:** Cross-sectional study in the PED of a tertiary paediatric hospital in Seattle, Washington during the 2013–2014 influenza season. Multivariate linear regression models were used for analysis.	**Limitations identified by author:** Because only parents who presented to a single PED were recruited, the data may not be generalisable. The study was also prone to selection bias due to the convenience sampling of

	2015 **Journal:** Vaccine **Volume:** 33 **Country:** USA **WHO Region:** AMR **Quality Assessment:** Include	associated with patient receipt of influenza vaccine in the PED? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** PACV survey tool (modified for influenza vaccination) (5-7 minutes response time)	**How were they recruited:** Convenience sampling **How many participants were recruited:** 152 **Were there specific inclusion criteria:** 1) English-speaking parents of children aged 6 months to 7 years, 2) Parents who were afebrile and medically stable enough to be discharged from the PED, and 3) Parents who had not yet received an influenza vaccine that season. **Were there specific exclusion criteria:** 1) Non-English-speaking parents, and 2) Parents of children older than 7 years. **Were there specific**	**Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 26% of parents were found to be vaccine hesitant (PACV score ≥ 50). 63% of this hesitant sample refused the influenza vaccine when it was offered in the PED. Predictors of childhood vaccine uptake or intention (p-value < .05): When compared to parents with more than a high school education, parents with a high school education or less had a lower likelihood of refusing the influenza vaccine (odds ratio [OR] 0.4, 95% CI: 0.2–0.9). When compared to parents of children with lower acuity ratings, parents of children with higher acuity ratings had a higher likelihood of refusing the influenza vaccine (OR 2.0, 95% CI: 1.2–3.6). In addition, Hispanic parents were less likely than non-	parents, as well as sampling bias due to study personnel not being blinded to the parents' vaccination decision. Finally, the study was limited by enrolling participants for five months in a row during a single influenza season. Furthermore, researchers began enrolling participants in November, even though the seasonal influenza vaccine had been available since September. A greater proportion of non-hesitant (vs. hesitant) parents may have already vaccinated their children by the start of the study, making them ineligible to participate. Furthermore, as the season progressed, parents may have been more inclined to refuse the influenza vaccine merely

			vaccines under consideration: Influenza vaccine **Other details:** Most of the participants were non-Hispanic White (53%), over 30 years old (68%), married (71%), had some college degree or higher educati on (75%), and had less than or equal to $75,000 (65%) in household income; just under half of the children had public insurance (49%).	Hispanic White parents to refuse the influenza vaccine (OR 0.2, 95% CI: 0.1–0.6). **How the outcomes were measured:** PACV scale, Multivariate logistic regression models. **Potential confounders:** NR **Ethical issues:** The Western Institutional Review Board approved the study protocol.	because the perceived benefit of the vaccine was lower than it had been earlier in the season. **Evidence gaps and/or recommendatio ns for future research:** More research is required to determine the impact of administering the PACV in the PED on physician behaviour and parental vaccine uptake. **Source of funding:** 1) Translational Research Ignition Projects Program of the Seattle Children's Research Institute Centre for Clinical and Translational Research 2) The National Centre for Advancing Translational Sciences of the National Institutes of Health.
33.	**Researcher(s):** Ucakar et al., 2018	**What was/were the research question(s):**	**What population were the**	**Brief description of method and analytical process:**	**Limitations identified by author:**

	Title: Vaccine confidence among mothers of young children, Slovenia, 2016 **Year:** 2018 **Journal:** Vaccine **Volume:** 36 **Country:** Slovenia **WHO Region:** EUR **Quality Assessment:** Include	What is the vaccine confidence level among mothers of young children in Slovenia? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):** Self-administered questionnaire developed for the study	**sample recruited from:** Mothers who gave birth in 2014–15 (sampled from the national perinatal information system) **How were they recruited:** Simple random sampling **How many participants were recruited:** 1704 **Were there specific inclusion criteria:** Women who gave birth in the years 2014–15 and were recorded in the Perinatal Information System of the Republic of Slovenia database (a medical registry collecting data on all deliveries and births in Slovenia). **Were there specific**	Cross-sectional study. Data analysis was done using STATA package version 12.1 (Stata Statistical Software: release 12.1 College Station. TX: Stata Corporation) and R (A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria). **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 34.2% were undecided about vaccines Predictors of childhood vaccine uptake or intention (p-value < .05): Vaccine confidence was linked to confidence in the health system and confidence in a child's paediatrician. No significant differences were observed in the number of mothers who were vaccine confident across the country or according to other	Because of the survey's simple random sampling technique, there was a risk of selection bias, as more women with specific vaccine sentiments (positive or negative) were more or less likely to answer. Due to this bias, vaccine confidence may have been overe stimated or underestimated. The study only included mothers of young children, therefore generalising the findings to all parents in Slovenia should be done with caution. Another limitation of this study is that the questions were not vaccine specific, therefore mothers were unable to express their confidence in specific vaccines. **Evidence gaps and/or recommendations for future research:**

			exclusion criteria: Having a stillborn child, giving birth numerous times during the stipulated term, citing a place of residence outside Slovenia, or not having a reported place of residence **Were there specific vaccines under consideration:** NR **Other details:** 51.9% of mothers who were not at all confident in immunisations cited friends as reliable sources of information.	variables such as marital status, social class, or level of education. Except for age, there was no significant differences between the socio-demographic parameters and vaccine confidence. Older mothers were more likely to be vaccine confident than younger mothers. **How the outcomes were measured:** Survey instrument, Spearman's rank correlation coefficient **Potential confounders:** NR **Ethical issues:** Study protocol was approved by the Republic of Slovenia National Medical Ethics Committee	Because vaccine confidence may be linked to behaviour, the disparity between the low proportion of vaccine confident mothers and Slovenia's comparatively high vaccination coverage merits additional investigation. More research is needed to see how this overwhelmingly negative attitude toward vaccination among Slovenian mothers translates into a reduction in childhood vaccination coverage. **Source of funding:** 1) Slovenian Research Agency 2) Slovenian Ministry of Health
34.	**Researcher(s):** Wallace et al., 2019 **Title:** Development of a valid and reliable scale to assess parents' beliefs and	**What was/were the research question(s):** 1) Developing a validated scale to measure parents' attitudes towards vaccinations in	**What population were the sample recruited from:** Ghanaian parents of children aged 12– 35 months	**Brief description of method and analytical process:** The study was cross-sectional in nature. The researchers employed exploratory factor analysis (EFA) to	**Limitations identified by author:** Because the survey was cross-sectional, the researchers collected data for both the scale

	attitudes about childhood vaccines and their association with vaccination uptake and delay in Ghana **Year:** 2019 **Journal:** Vaccine **Volume:** 37 **Country:** Ghana **WHO Region:** AFR **Quality Assessment:** Include	low and middle-income countries 2) What is the proportion of vaccine confident mothers from Northern Region of Ghana? **What theoretical approach (e.g., Grounded Theory) does the study take (if specified):**	**How were they recruited:** Random sampling **How many participants were recruited:** 373 **Were there specific inclusion criteria:** NR **Were there specific exclusion criteria:** NR **Were there specific vaccines under consideration:** DTP, oral polio, rotavirus, MMR, pneumococcal conjugate **Other details:** A significant minority (23%) believed that healthy children did not require immunizations and expressed concerns about the number of vaccinations given, with	determine the validity of the CVAS content, whereas parallel analysis was performed to determine the number of factors to extract. Factor extraction was done using principal axis factor analysis. The scale's reliability was determined using McDonald's Omega coefficient. **Key outcomes relevant to this review**: Prevalence rates of parental childhood vaccine hesitancy: 22% were vaccine hesitant while 15% were vaccine refusers Predictors of childhood vaccine uptake or intention (p-value < .05): Children of non-schooling mothers were less likely than children of school-going mothers to receive the third dose of diphtheria-tetanus-pertusis-containing vaccine (DTPcv3) (88% versus 95% respectively). Similarly, children of Traditionalist parents were less likely to have	validation and vaccination status at the same time; thus, the criterion validity was restricted to concurrent rather than predictive validity. The sample size was adequate for EFA, but the team were unable to divide the sample into two sets to perform confirmatory factor analysis, which could have further strengthened their findings. **Evidence gaps and/or recommendations for future research:** Continued development of the scale and validation in other settings and geographical areas **Source of funding:** The United States Centres for Disease Control and Prevention (CDC)

			41% agreeing that children receive more vaccinations than they need and 23% disagreeing that children should receive two injectable vaccinations in one visit rather than one per visit.	received DTPcv3 than children of Christian and Muslim parents (81% versus 92% and 90%, respectively). Firstborn children were slightly more likely than later-born children to have received DTPcv3 (93% versus 90%), as were female children compared to male children (93% versus 88%). **How the outcomes were measured:** Caregiver vaccination attitudes scale (CVAS), Exploratory factor analysis (EFA), McDonald's Omega coefficient, Generalised estimating equation (GEE) models **Potential confounders:** NR **Ethical issues:** Study protocol was approved by the Ghana Health Services ethics review board, the CDC Human Subjects Office, and the Emory University Institutional Review Board	

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