



Vaccination, information and parental confidence in the digital age in England

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ABSTRACT

Background: Immunisation programmes have led to substantial reductions in vaccine-preventable infectious diseases globally. A variety of factors have been shown to impact parental confidence and uptake of childhood vaccines, from concerns about vaccine safety to a lack of perceived need. Determinants of vaccine decision making include information, risk perceptions, and modifying factors such as attitude, identity, norms, habit and barriers. With the rise of the internet and social media, there has been a vast increase in information available about vaccines, not all scientifically-based and well-informed.

Methods: 285 locations in England were randomly selected to survey a nationally representative sample of the English population. 1735 primary care givers of children aged between 2 months and <5 years old from England were randomly selected and surveyed via face-to-face interviews between January and March 2019.

Results: A much higher percentage of parents surveyed trust health care workers, the NHS, pharmacists and government for advice about immunisation, in comparison to media, the internet and social media. Most parents use official sources to obtain information on vaccines including parents who use the internet. The small proportion of parents who reported having seen negative information about vaccines were more likely to find it on the internet. Parents who felt they did not have enough information were more likely to have delayed or refused a vaccine for their child.

Interpretation: This study showed that for parents of young children in England, vaccination continues to be the social norm but this can rapidly change and clear, consistent messaging from trusted sources continues to be important. Although a proportion do seek vaccine information on the internet, the majority use official sources. Representative attitudinal surveys continue to be key in identifying any emerging threats to parental vaccine confidence.

Introduction

Successful immunisation programmes have led to substantial reductions in vaccine-preventable infectious diseases globally, eradicated smallpox and eliminated polio from all but two countries. The challenges in delivering and maintaining high levels of vaccine coverage across a population differ from one country to another, between different sectors of the population and for specific locations within a country. Prior to the COVID-19 pandemic, outbreaks of measles in the UK and across Europe illustrated the importance of maintaining high vaccination coverage and highlighted the challenges faced by health

professionals delivering vaccination programmes and public health authorities in maintaining optimum uptake levels. [1,2] The impact of the pandemic restrictions on uptake makes optimisation especially important.

Most vaccine-preventable diseases are well-controlled in England with high childhood vaccination coverage, for example, 93.5% of children in England vaccinated with DTaP/IPV/Hib/HepB vaccine at 24 months in 2021/22. [3] However, coverage has decreased over recent years from its peak of 94.7% in 2012/13. [3] The reasons for this downward trend in coverage are not clear.

Determinants of vaccine decisions include the information that is

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provided, risk perceptions of infection, of vaccine-adverse events and vaccine effectiveness, and modifying factors such as attitude, identity, norms, habit and barriers. [4] High levels of trust in the healthcare systems and in the health professionals delivering vaccination programmes are also key influencers in the vaccine decision-making process. [5] However, there are also long-standing issues around the ease of accessing immunisation services and the pathway to immunisation being well-mapped and straightforward. Vaccination being perceived as a societal norm is also a factor in uptake. [6] Barriers to vaccination are usually associated with higher deprivation and difficulties in accessing services such as having several young children. [7] An ecological study that looked at the correlation between immunisation coverage for the DTaP and MMR booster vaccinations by the 5th birthday across Primary Care Trusts (PCT) in England and the IMD socioeconomic deprivation score rank for each PCT [8] found a persistence of socioeconomic inequality in immunisation coverage at a national level between 2007/08 and 2010/11 during which period immunisation coverage improved.

In the past, correlations were found between confidence in MMR vaccine, the publication of now discredited studies claiming that Crohn's disease and then autism could be caused by the vaccine, traditional media activity (newspapers, television and radio) and uptake of MMR vaccine. [9] With the rise of the internet, there has been a vast increase in information as well as a population-based shift in communication towards social media designed to support and encourage viewers to upload information, views and share content on sites including Twitter and Facebook, - the so-called Web 2.0. [4] There is scientifically-based, well-informed as well as more subjective, sometimes misleading vaccination information online. [10,11] With social media, anyone can share and spread messages and unproven concerns can propagate quickly since information on most platforms is not controlled.

There is much interest in the role of social media in forming parental views around vaccination and its use as a vehicle to spread myths and negative views on vaccination. It has been suggested in the traditional media and by leading political figures that social media content has undermined confidence in vaccination programmes in England [12,13] but it is difficult to find data to substantiate this view. In some other countries, evidence that the negative portrayal of vaccines in social media affects uptake is more compelling. [14,15,16] Aquino et al found a significant inverse correlation between MMR vaccination coverage and internet search activity, tweets and Facebook posts in Italy, for example. [17] An ecological study in the US also showed an inverse correlation between HPV vaccine coverage and exposure to messaging about safety concerns or conspiracies on Twitter. [18] There is also some evidence of benefit: social media Apps combined with web-based vaccine information during pregnancy can positively influence vaccination choices made once those infants are born. [19].

Surveys of parental attitudes to vaccinations have been undertaken in England since 1991. They have taken place during the emergence of the internet, increasing internet usage and the arrival of social media. Where appropriate, the questions in the survey have stayed consistent to enable comparison over time. Amendments and additions have been made as necessary to support developments in the national immunisation programme and changes in methods of communicating with the public. Alongside the attitudinal data from the 2019 survey, we reviewed data from previous surveys to evaluate the increasing role of the internet and social media in informing the parents of young children about vaccination. We aimed to ascertain the role and impact of different information sources in informing parental attitudes and decision-making around vaccinating their young children.

Methods

In 2019, home interviews took place in 285 randomly selected locations based on Lower Super Output Areas (LSOA) in England designed to be representative of the population by region and Index of Multiple

deprivation quintile. Interviewers were given quotas at each sampling point by age of child and working status of the parent.

Interviewers established on the doorstep whether there were eligible primary care givers (referred to as parents) of children aged between 2 months and <5 years old willing to participate. The 'parent' was defined as the person responsible for most decisions about the child's healthcare. All interviews lasted about 30 min and were conducted in person by trained interviewers using Computer Assisted Personal Interviewing techniques. The main findings presented are based on data from interviews conducted between January and March 2019. These are divided into responses from parents with a child:

- old enough to have received their first dose of vaccine at 2 months of age but not yet eligible for their pre-school booster vaccines offered from 3 years and 4 months of age (called 0y2m-3y3m) and;
- eligible for their pre-school booster vaccines, aged from 3 years and 4 months to <5 years of age (called 3y4m-4y11m).

Data from earlier surveys conducted using comparable methodology since 1991 [20] are presented where appropriate to examine trends. Such trends include data for children aged 0–2 years as parents of this age group have been included throughout. Surveys were not commissioned in 2009 or between 2011 and 2014.

To ensure that the data are representative of primary caregivers of children aged 0–4 years in England, they have been weighted by parent/child age, by region and IMD quintile. The weighting for age of primary caregiver by age of child was taken from the December 2014 Labour Force Survey. The weighting of households in England per region with dependent children aged 0–4 years, was taken from the 2011 Census.

There were 1735 face to face interviews conducted between January and March 2019. This included 1058 parents with children aged 0–2 years and 1007 parents with children aged 3–4 years; 330 parents had children in both age groups.

Between 2002 and 2010 ~ 1000 interviews were conducted yearly with parents with children aged 0–2 years, 1130 interviews were conducted in 2015, 1084 interviews in 2016, 1050 interviews in 2017 and 1050 interviews in 2018. From 2010 parents of 3–4 year olds were also included. 1792 interviews were conducted with parents with children aged 0–4 years in 2015, 1683 interviews in 2016, 1648 interviews in 2017 and 1674 interviews in 2018. The sample size was increased to achieve a minimum of 1,000 interviews among parents of 0–2 year olds and 1,000 interviews among parents of 3–4 year olds (parents of both 0–2 year olds and 3–4 year olds contributed to both sample sizes, hence the total number of parents interviewed is <2,000).

Results

Where do parents see, hear or read information about childhood vaccines?

In the 2019 survey, when prompted to think specifically about childhood immunisation, 49% (852) of all parents of children aged 0–4 years reported they had seen, heard or read about childhood immunisation or immunisation in pregnancy in the last year, increasing from 46% in 2018 and 43% in 2017. Looking back over the last 5 years of surveys, in those who recalled immunisation information, the sources most frequently cited were healthcare professionals and NHS leaflets, with a quarter of parents of children aged <2 years receiving information in this way in 2019 (Fig. 1). In 2019 other official sources of information were also important with 18% parents mentioning NHS posters and 18% mentioning the parent held child health record known as the 'red book'. Although almost 89% of all parents reported using the internet daily/almost daily, only 13% cited this as their source for vaccination information in 2019.

What do parents recall about the immunisation information they have seen, heard or read?

The 852 parents who recalled coming across immunisation

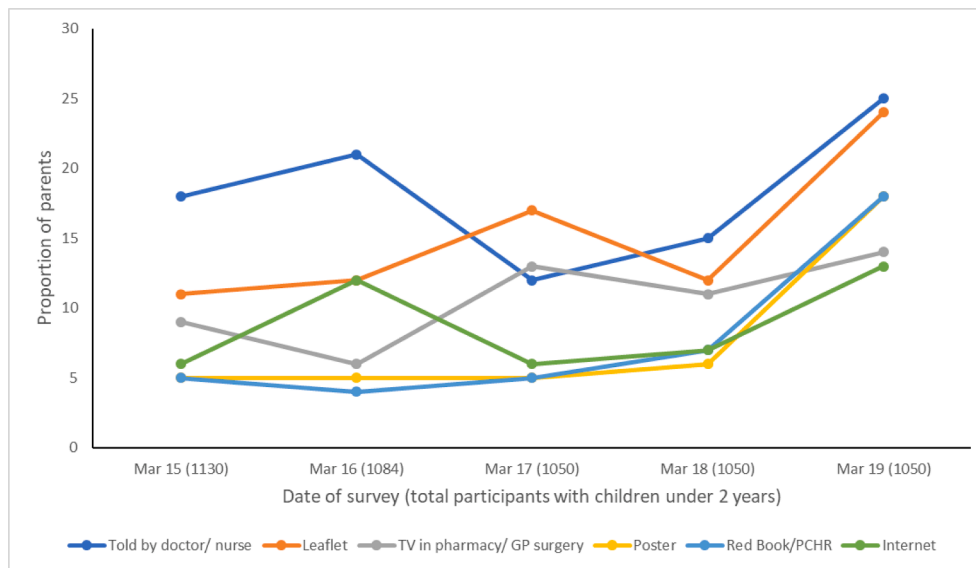


Fig. 1. Sources of information or publicity on childhood immunisation seen, heard or read by parents of children under 2 years of age, 2015-2019.

information in the last year in the 2019 survey were asked whether this was in support of or against immunisation. Most parents recalled positive messaging with 85% saying that the content was supportive of immunisation, 8% that it presented both sides and only 5% that the content was negative. When parents were asked what they remembered about what they had seen, heard or read they reported that the messaging was mainly around the importance of vaccination, although 29% could not recall anything specific about the content (Fig. 2).

Only 7% (127/1735) of all parents of children aged 0–4 years said they had heard or seen anything that concerned them or made them consider not having their child immunised, the lowest proportion since this wider group of parents had been included in the surveys (Fig. 3). Taking an 18-year perspective, the proportion of parents who reported that they had concerns fell from 33% (of parents of children aged 0–2 years) in 2002 to 8–10% over the four most recent surveys (Fig. 3).

In 2019, of the 127 parents of children aged 0–4 years with concerns, only 35% (44 parents) said this information came from the internet and/or social media, the same proportion as in 2018 (35%, 52 parents), and 21% through speaking to friends, family or other parents (27 parents). Therefore, <3% of all parents interviewed had encountered information on the internet or social media that might have persuaded them not to immunise compared to 2% who had come across such information through speaking to family, friends and/or other parents, 1% on a television programme and 1% in a magazine or newspaper.

How do parents find out more about vaccination?

In 2019, 17% of parents reported using one source, 26% used two sources and 16% three sources, 10% used four sources and 19% used five or more sources. The use of these sources has been relatively stable for the three most recent surveys. Nine percent of parents said they did not use any sources of information. Of these, 21% lacked confidence in the immunisation programme, and 30% felt they did not have enough information. Parents whose child(ren) had missed one or more vaccines were significantly more likely not to use any sources of information (22%). The use of multiple data sources did not appear to affect confidence or the likelihood of parents accepting childhood vaccines. Most parents said they had the information they needed to make an informed decision about immunisation (85%), whilst 11% did not. Of parents that had never refused or delayed a vaccine, 14% felt they did not have enough information, compared with 37% of those that had refused or delayed a vaccine.

The internet and social media

The 1712 (99%) parents who had access to the internet were asked whether they used this to find out more about vaccinations. The proportion who had used this resource dropped from 40% in 2017 to 34% in 2019, with 66% of parents stating they did not use the internet to find out more about vaccinations in 2019. Of the 34% (587) of parents who used the internet to find out more about immunisations, 71% reported using the official NHS website (<https://www.nhs.uk>).¹ The next two most used internet sources were Mumsnet (32%) and GOV.uk (22%). In comparison, 71% of all parents, when prompted visually, reported that they had seen at least one of a range of NHS branded leaflets produced by PHE to support the routine immunisation programmes (51% without visual prompting).

Thirteen percent of those who used the internet to find out about vaccinations stated that they had seen information that might make them doubt having their child immunised, compared to 4% among those who did not use the internet. Notably, those who indicated that negative messages had caused them to have doubts were more likely to have used the internet for immunisation information than those who did not use the internet (61% cf. 31%). It is not clear whether the internet searches were the source of the doubt or whether the searches were prompted by previously held negative views or prior exposure to negative messages around vaccination.

Parental immunisation choices for their children

In 2019, 92% of parents (91% in 2018) said they had all their child or children's immunisations done when they were due and this proportion has been stable at around 90% for the last four years. Amongst the 138 (8%) parents who said they had refused or delayed an immunisation for their child, many went on to get their child immunised later (42% 2019, 27% 2018, 35% 2017). A further 14% intended to get their child immunised, and 7% were unsure whether to get their child immunised. In 2019 only 3% of all parents refused one or more vaccinations for their child (47/1735 parents). This is broadly similar to the last few years. The vaccine that was most often refused (26/47, 55% of refusers) was

¹ Parents were given the following list as options (listed here alphabetically but randomly ordered at the time): Facebook or Twitter, GOV.uk, Mumsnet, Net doctor, Netmums, NHS, Patient.co.uk, Search engine (e.g. Google), Other, Don't know.

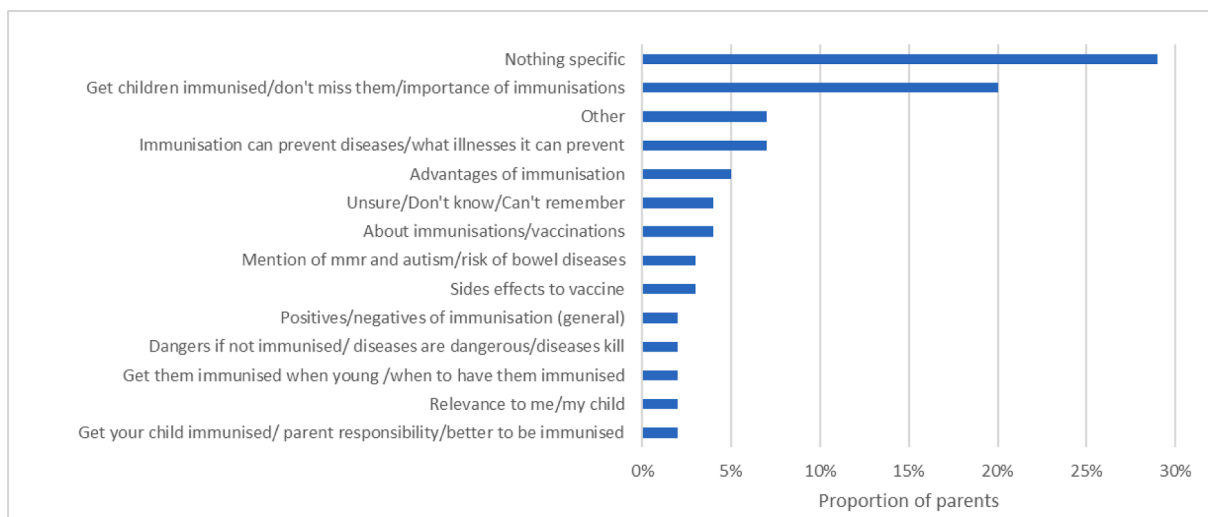


Fig. 2. What parents remember about the immunisation information they have seen or heard (based on 852 parents from 2019 survey who said they had seen such information in the past year).

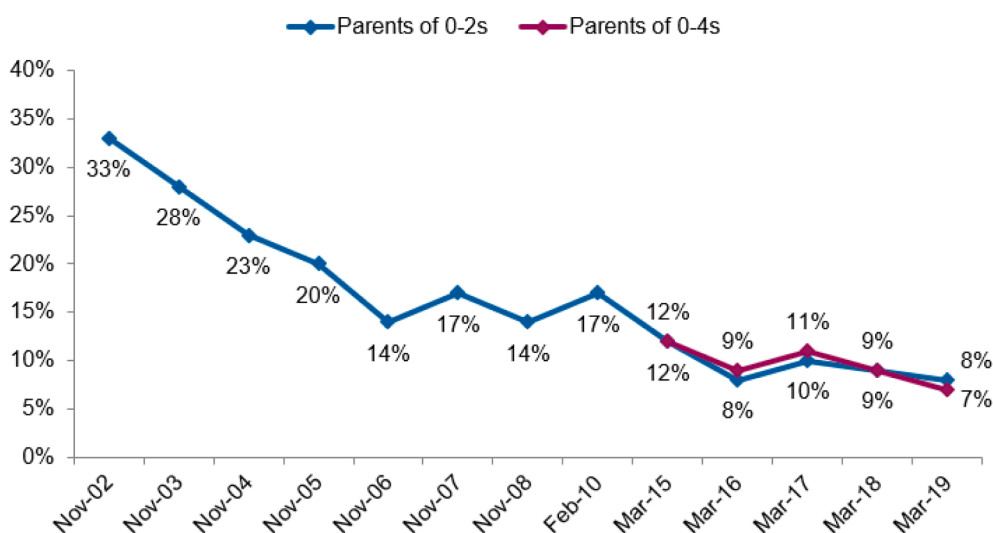


Fig. 3. Whether parents have come across information that might persuade them not to immunise.

childhood flu vaccine, given annually from 2 years of age. <1% of all 1735 parents had explicitly refused a vaccine on the grounds of perceived safety. The most common reason for delaying a vaccine was a child being ill at the time of the appointment (Fig. 4). Of parents who postponed any vaccination for their child (49/88), over half (57%) postponed only one vaccine.

Parental trust and the importance of health professionals

Parents trusted health professionals (94%) and the NHS (93%), agreeing, or agreeing strongly that they trusted the advice on immunisation given by each source (Fig. 5). Only two percent of parents said that they did not trust immunisation advice from these sources. Social media was the least trusted source of immunisation advice with 22% of parents stating that they trusted it, whereas 50% did not. Overall, 95% of parents said they were confident in the immunisation programme, with 55% saying they were very confident. Just 5% of parents indicated that they were not very or not at all confident.

Seventy-four percent of all parents (1289/1735) and 82% of parents of children under 2 years of age discussed immunisation with a health professional before their child's vaccinations were due. Before these

discussions with health professionals, a clear majority (91%) of parents felt that they would immunise their child with all offered vaccines. Only 3% of parents said they would immunise their child with some but not all vaccines and 2% that they would not immunise their child with any vaccines. The remaining 4% were undecided prior to their discussion.

Almost all parents who planned to immunise their child(ren) with all vaccines said that they either felt more confident or 'about the same' following their discussion with the health professional (99%). For those who planned not to immunise with some/any vaccines (57 parents) or were undecided (48 parents), the majority said that they either felt more confident (26% and 44% respectively) or about the same (58% and 39% respectively). After discussion with the health professional, 38% of parents who were previously undecided agreed to immunise their child (ren).

Discussion

Health professionals and PHE (now known as UKHSA)-produced NHS branded leaflets were the most important sources of immunisation information for parents. The NHS provides government-funded medical and health care services, including vaccines recommended on

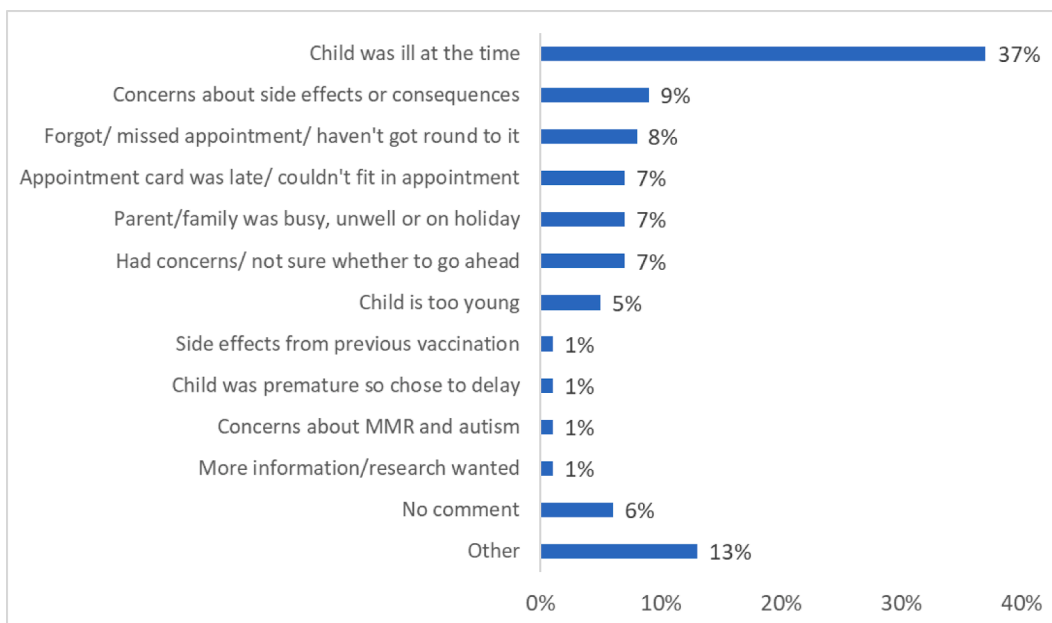


Fig. 4. The reasons given for postponing immunisations by 5% (88) of parents who delayed.

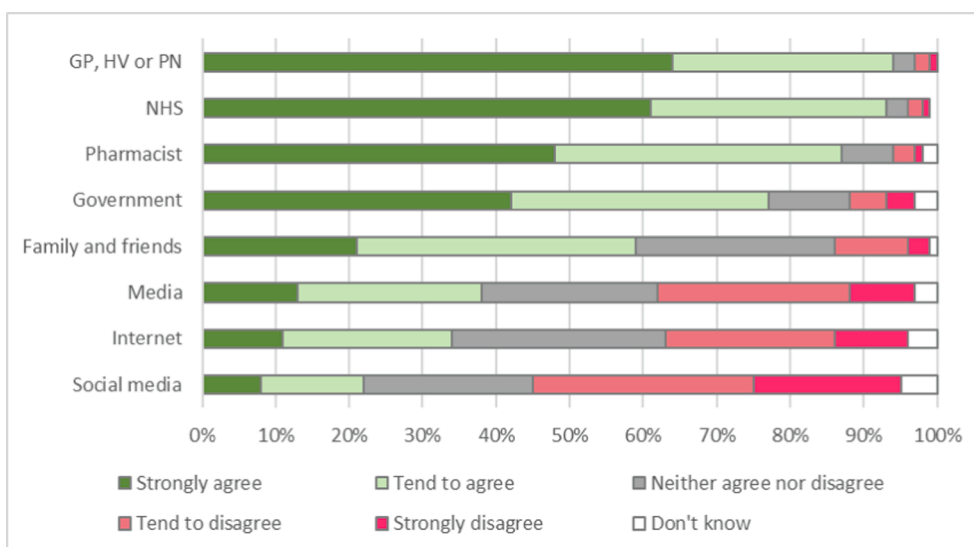


Fig. 5. Trust in sources of advice about immunisation in 2019. Base: All Parents (1735). Q58. Please tell me how much you personally agree or disagree with each statement. *I trust the advice on immunisation given by...*

the national schedule that are free for UK residents. [21] Parents had high levels of trust in health professionals (94%) and the NHS (93%) agreeing that they trusted the advice on immunisation given by each source, whilst only 22% of parents trusted immunisation advice on social media. Health professionals are key parental influencers and provide a trusted interface for reassurance and advice on immunisation for parents. Of the minority of parents who used the internet to inform themselves about childhood immunisation, most used recommended sites, including the NHS website. Whilst 34% of parents did use the internet to search for information on immunisation, the majority (71%) had used the official NHS website.

Very few parents (3%) in England used social media sites or chat rooms for immunisation information. Parents who used the internet to find out about vaccinations were more likely to report having concerns, although this was similar to the proportion of parents reporting concerns after speaking to family, friends and/or other parents. In addition,

among the 3% who had refused at least one vaccine for their child(ren), 22% of parents had not used any sources of information. Over 90% of parents had their children immunised as a matter of course when their vaccines were due. Reviewing the misinformation literature beyond vaccines, it is worth highlighting that misinformation goes beyond social media and existed before the internet. [22,23]

The World Health Organization (WHO) highlighted “vaccine hesitancy” as one of the ten leading threats to global health in 2019 [24] and Dr Tedros Adhanom Ghebreyesus, WHO’s director-general, warned of the need to fight an infodemic alongside the COVID-19 pandemic. [25] The definition of “vaccine hesitancy” adopted by the WHO’s Strategic Advisory Group of Experts on Immunization (SAGE) is a “delay in acceptance or refusal of vaccines despite availability of vaccine services”. [26] From our survey findings, the proportion of parents who fall into this category is currently very small in England. Vaccine hesitancy is recognised as a multi-factorial concept that encompasses

“complacency, convenience, and confidence”. [26] In this context, complacency relates to the perceived risk of disease and value of the vaccine, vaccine confidence to trust in the effectiveness and safety of vaccines and in the healthcare system together with perceived importance of vaccination, whilst convenience is an indication of the ease with which vaccine services can be reached. Thus, several important factors that may influence vaccine decision-making have been encompassed by the single term ‘hesitancy’.

Our data shows that confidence in childhood vaccination is very high in England and this contrasts with media coverage reporting parental distrust and lack of confidence in childhood vaccines. This may obscure other challenges affecting uptake, such as barriers to access. However, confidence in vaccines and vaccination may vary over time and across settings. A 2018 population survey in 28 EU member states and amongst general practitioners (GP) in ten EU member states shows that confidence in vaccination has improved since 2015 in several countries, including the UK, but has fallen in others. [27] This is consistent with this PHE survey which found that parents in England have high levels of confidence in the immunisation programme and trust in immunisation information provided by health professionals.

Vaccine coverage has been affected previously by sudden drops in confidence for specific vaccines such as HPV vaccine in Ireland, Denmark and Japan, and the MMR vaccine in the UK following the now discredited and retracted paper published by Andrew Wakefield et al in the Lancet in 1998 falsely linking the MMR vaccine to autism. [16,28,29] Our study showed that the time to recover confidence in the programme from the so called “Wakefield effect” took many years, illustrated by the decrease in parental concerns about vaccination from 33% to 8% from 2002 to 2019. A study tracking the global spread of Japan’s suspension of the HPV vaccine recommendation, following unfounded concerns around the vaccine’s safety in 2013, illustrated how news of events can travel quickly and globally through online media and social media networks. [29] The increased role of social media may have also magnified rumours, conspiracy theories and distrust related to COVID-19 vaccines in multiple settings, raising concerns of possible negative impacts on confidence in routine vaccination. [30] In addition, trolls and bots have been discovered in US-based research purposefully spreading uncertainty and polarisation around vaccination, with a mixture of both positive and negative messages. [31] Mixed messaging was seen to promote political discord whilst antivaccine advocates may use pre-existing infrastructures of bot malware to promote antivaccine messaging and are hence organised rather than grassroots led. Other studies have found that pro and anti-vaccination messaging on social media tends to fall within discrete groups with very little overlap suggesting that individuals seek information that supports their personal view and thus the consumption of vaccine information via social media is dominated by this ‘echo chamber’ effect. [32,33] Looking beyond vaccination, a US study exploring the connection between access to different types of websites and perceptions about politics identified that although consumption of untrustworthy websites increased misperceptions, people who consume untrustworthy websites tend to have more polarized feelings towards political parties and more negative views of the media. [34] In addressing misconception, Scheufele et al. discuss the difficulties in identifying misinformation in ‘rapidly-changing information ecologies’ as well as the difficulties of debunking misinformation without amplifying it, [23] which is also addressed by ECDC. [35].

As Dube and MacDonald [36] highlight, however, acceptance of vaccination is the current social norm in many countries and needs to be supported; it is important that this positive context is not overlooked. They identify the need to develop and maintain resilience within immunisation programs so that they can withstand and adapt to ensure high vaccine acceptance and uptake can both be sustained if unsubstantiated safety concerns arise and are widely propagated by the media.

Conclusions

Evidence from our survey of parents in England in 2019 suggests high levels of confidence in vaccines and vaccine programmes alongside high trust in the health professionals delivering the programmes. Most parents use official sources to obtain information on vaccines and, whilst some parents do use the internet to research vaccination, they are most likely to access official websites. For parents of young children in England, vaccination continues to be the social norm but this can rapidly change and clear, consistent messaging from trusted sources continues to be important. Representative attitudinal surveys play a key role in ensuring sources remain relevant to maintaining parental vaccine confidence, although in an ever changing environment, especially given the COVID-19 pandemic since these surveys it is key to continue to run these surveys regularly.

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CRediT authorship contribution statement

H. Campbell: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Project administration. **P. Paterson:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **L. Letley:** Conceptualization, Methodology, Writing – review & editing. **V. Saliba:** Conceptualization, Methodology, Writing – review & editing. **S. Mounier-Jack:** Writing – review & editing, Supervision, Funding acquisition. **J. Yarwood:** Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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