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| Learner name(s): | SHERIN BABY ABRAHAM | | | | | |
| Learner number(s): | [redacted] | | | | | |
| Assignment Type:<br>Course: | Individual: ___x___<br>MSCPT/PGDPT | | | Group: _____<br>Stage/year | 1 | |
| Module: | DISSERTATION | | | | | |
| Study Mode: | Full time | x | | Part-time | | |
| Lecturer Name: | CATHERINE MCHUGH | | | | | |
| Assignment Title: | PERCEPTIONS OF DIGITAL HEALTH INFORMATION SOURCES AND THEIR INFLUENCE ON VACCINE CONFIDENCE AMONG PARENTS OF INFANTS IN IRELAND | | | | | |
| No. of pages: | | | | | | |
| Uploaded to Moodle: | Yes | X | | No | | |
| Additional Info: | | | | | | |
| Date due: | 25TH August, 2025 | | | | | |
| Date submitted: | 24TH August 2025 _____ | | | | | |

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# PERCEPTIONS OF DIGITAL HEALTH INFORMATION SOURCES AND THEIR INFLUENCE ON VACCINE CONFIDENCE AMONG PARENTS OF INFANTS IN IRELAND

**BY**

**SHERIN BABY ABRAHAM**

A thesis submitted in partial fulfilment of the requirements of the MSc in

Pharmaceutical Business & Technology

Innopharma Faculty of Pharmaceutical Science Griffith College, Dublin

August 2025

**Declaration**

I declare that the work in this dissertation titled "**Perceptions of Digital Health Information Sources and Their Influence on Vaccine Confidence Among Parents of Infants in Ireland**" which I now submit for assessment as part of the partial fulfilment for the Masters in "Pharmaceutical Business & Technology" is the result of my own work and that I have referenced the work of others and due acknowledgement is given.

Candidate Name: Sherin Baby Abraham

Signature: 

Date: 24.08.25

Supervisor Name: Catherine McHugh

Supervisor Signature:

Date:

**Acknowledgments**

First and foremost, I would like to thank God Almighty for His grace, blessings, and guidance throughout this journey.

I extend my heartfelt gratitude to my supervisor, Catherine McHugh, for her invaluable support, encouragement and guidance in the completion of this dissertation. Your constructive feedback and patient supervision were instrumental in shaping this study.

My deepest appreciation goes to my beloved husband Anish Mathew and my daughter Michelle Susan for their love, patience, and unwavering support.

I am also profoundly grateful to my parents, Ammini Abraham, Baby Abraham, and Susan Mathew, whose prayers, encouragement, and constant belief in me have been a source of strength throughout my studies.

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**List of Abbreviations**

1. Health Service Executive – HSE
2. General practitioner- GP
3. World health organization- WHO
4. Strategic Advisory Group of Experts -SAGE
5. European vaccination portal -EVIP
6. Healthcare professionals- HCP
7. Emory Vaccine Confidence Index-EVCI
8. Central Statistics Office- CSO
9. Parent Attitudes about Childhood Vaccines- PAVC
10. National Immunisation Information System- NIIS

**Abstract**

**Introduction:** Parents are increasingly turning to digital media for vaccine information, but platforms vary in credibility and emotional tone. This study aimed to evaluate how digital media influences vaccine confidence in Ireland. The study objectives were to: (1) assess parental perceptions of digital health information sources and their impact on vaccine confidence using a Likert-scale questionnaire; (2) identify commonly used digital platforms and evaluate their perceived trustworthiness and influence; (3) explore perceived risks and concerns related to online vaccine information; and (4) determine how these findings can inform pharmaceutical companies' digital communication strategies

**Methods:** This study involved a cross-sectional online survey of parents or caregivers of children aged 0–5 years in Ireland (N = 104). Items were rated on a 3-point Likert scale (Agree = 1, Neutral = 2, Disagree = 3). Analysis included: descriptive statistics; Spearman's rank correlations for ordinal data; $\chi^2$/fisher's exact tests for associations; McNemar's tests to compare platform use and trust levels; Kruskal–Wallis tests for education versus digital literacy. Significance level set at $\alpha = 0.05$

**Results:** The analysis showed that official health websites (HSE/NHS) were the most used (92/102, 90.2%) and the most trusted (88/105, 83.8%). Google Search was widely used (50/102, 49%) but infrequently trusted (7/105, 66.9%); McNemar's test confirmed a significant gap between usage and trust ($p < 0.001$). Notable correlations included: use of official digital sources with reading vaccine stories ($\rho = 0.273$, $p = 0.005$) and perceiving that some online content benefits pharmaceutical companies ($\rho = 0.222$, $p = 0.024$); use of unofficial digital sources with reporting a decision not to vaccinate ($\rho = -0.197$, $p = 0.045$); exposure to opposing views with reporting that online information influenced vaccination decisions ($\rho = 0.259$, $p = 0.009$); perceptions that stories impact confidence with online information shaping decisions ($\rho = 0.258$, $p = 0.009$). Trust in official sites was linked to fewer reports of opting out of vaccination ($\chi^2(1) = 15.75$, $p = 0.002$), while trust in social media was associated with more refusals (Fisher $p = 0.005$). Education level was not significantly associated with digital literacy ($H(3) = 6.85$, $p = 0.077$).

**Conclusions & Recommendations**: Irish parents distinguish clearly between digital sources, favoring official platforms and distrusting unofficial ones. Narrative content (opposing views and emotive stories) correlates with lower vaccine confidence, whereas trust in official sites aligns with higher confidence. The findings suggest that pairing credible information with emotionally engaging narratives and improving the visibility of official content online could enhance vaccination confidence, ultimately increasing vaccine uptake. It is recommended that pharmaceutical companies act as key communicators, supported by healthcare providers as the primary source of vaccine information.

# CHAPTER 1: INTRODUCTION

## 1.1 Vaccination and its importance

Vaccination is one of the most successful public health interventions to prevent the spread of communicable diseases. Mortality from vaccine-preventable illnesses has significantly declined due to the increase in childhood vaccinations and the wider availability of vaccines globally (Whelan et al., 2021). However, a key factor influencing vaccine uptake is the perception that parents hold towards immunisation. These perceptions can either build vaccine confidence or contribute to vaccine hesitancy. Given the impact of parental views, it becomes essential to understand the factors that shape them.

The way parents perceive vaccination is influenced by multiple factors. Their opinions may vary depending on the specific vaccine, their awareness of its importance, the timing of administration, and even changes in mindset from one child to another (Marron et al., 2023a). Concerns related to safety and efficacy often play a major role in vaccine hesitancy (Smith et al., 2010). In recent years, digital media has played a catalyst in shaping and reinforcing these views**.**

Digital media platforms can act as both enablers and barriers to vaccine awareness. While they offer quick access to health information, they can also circulate misinformation, emotionally driven content, and unverified opinions. This dual nature means that although digital tools help reach a wide audience, they can also mislead or confuse parents. Research shows that many vaccine-hesitant parents are influenced by such misleading content shared through online platforms (Sharif-Nia et al., 2024). This raises important questions about how digital sources are perceived by parents and how they impact vaccine decision-making, which this study aims to explore.

## 1.2 Vaccination in Ireland

The Health Service Executive (HSE) is the official government health care body that advises on any immunisation programmes in Ireland. The updated programme for vaccination for children aged between two months to 13 months is given in Figure 1. The healthcare system involves general practitioners (GPs) and nurses to deliver vaccinations free of cost over five consultations. While there has been a strong

progressive response to overall vaccination in Ireland, the rates are lower than those advised by the WHO (World Health Organisation).(Marron *et al.*, 2023)

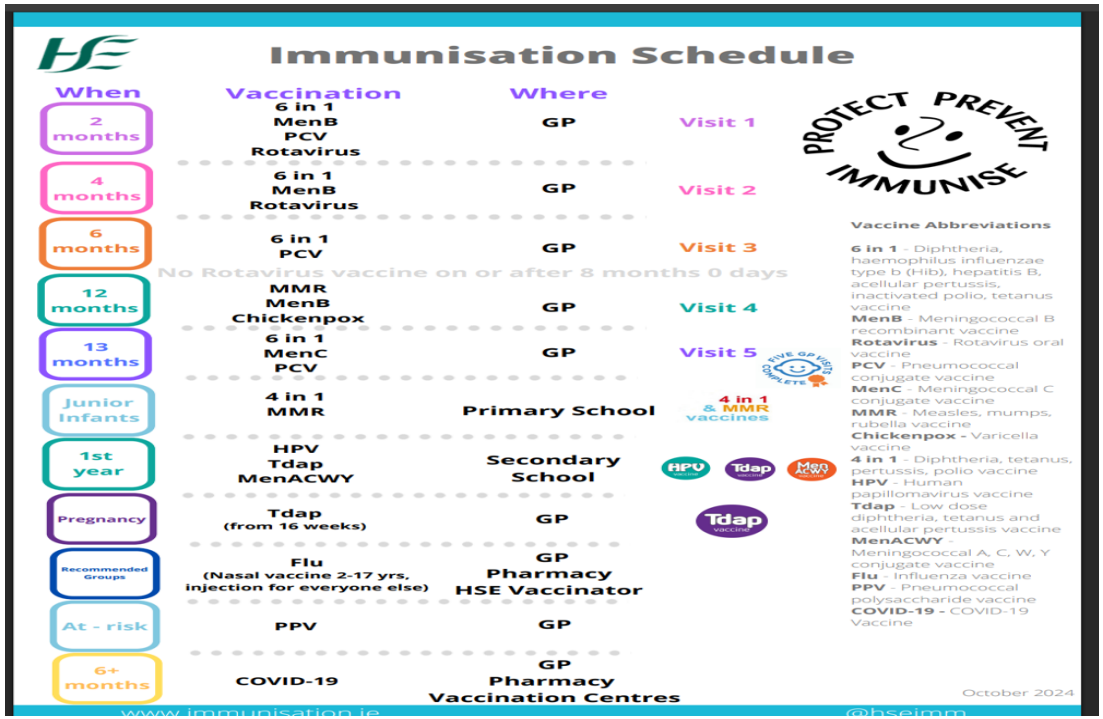



*Figure 1: Primary immunisation schedule by the HSE (HSE, 2025a)*

### 1.3 Concepts of Vaccine Hesitancy and Vaccine Confidence.

The Strategic Advisory Group of Experts (SAGE) under the World Health Organisation defines vaccine hesitancy as “a delay in acceptance, or refusal of vaccines, despite their availability.” It is considered a context-specific issue and is often explained using the 3Cs model, which includes confidence**,** complacency**,** and convenience. Confidence refers to the trust individuals have in the safety and effectiveness of

vaccines, the system that delivers them, and the motivations of policymakers. Complacency relates to the perception that the risks of vaccine-preventable diseases are low and, therefore, vaccination is not necessary. Convenience refers to how accessible, affordable, and available vaccination services are in a given setting.

Together, these three elements help explain the complex and varied reasons behind vaccine hesitancy. Hesitancy is not a fixed stance but rather exists on a continuum. It ranges from complete refusal of vaccines with no doubts, to delays in vaccination, and finally to hesitant acceptance. People along this spectrum may share similar concerns but differ in how they act on them (MacDonald, 2015). This variability is important for understanding the underlying factors that shape individual decisions.

Vaccine confidence is shaped by several interrelated elements that influence whether a parent is vaccine-hesitant or vaccine-acceptant. These include perceptions of vaccine risks and benefits, the perceived importance of vaccination, the level of trust in public health authorities, concerns about side effects, and the perceived risk of infection. Research shows that many of these concerns can be reduced when parents have a strong, trusting relationship with healthcare professionals and public health systems (Campbell et al., 2023).

### 1.4 Research Purpose

This study seeks to explore how parents of infants in Ireland perceive various digital health information sources and how these perceptions influence their confidence in vaccines. As highlighted in the introduction, digital media plays a significant role in shaping decisions around childhood vaccination. Equally important is the level of trust parents place in the sources they rely on for vaccine-related information.

Digital health sources in this context include platforms such as social media, parenting blogs and forums, government websites like the HSE and NHS, and online news outlets. The research aims to identify which of these sources parents are engaging with most frequently and how these interactions inform or influence their vaccination decisions.

A growing concern surrounding digital platforms is the spread of misinformation and the rise of vaccine-related conspiracy theories. While such issues are well documented about specific vaccines like the MMR, concerns also extend to topics such as multiple vaccinations, natural immunity, and broader scepticism toward vaccines (Rodrigues et al., 2023). This study aims to understand the perceived risks and concerns that influence Irish parents in this regard.

The findings will provide valuable insights for public health authorities and the pharmaceutical sector in enhancing digital engagement strategies, addressing misinformation, and supporting informed decision-making. Pharmaceutical companies particularly those involved in vaccine production, often face public scepticism, with some perceiving their efforts as profit-driven. This research aims to offer constructive recommendations to help these organisations build trust through appropriate digital communication and evidence-based messaging.

### 1.5 Research Question and Objectives

Recent studies on vaccination in Ireland show a generally positive attitude towards vaccines, with high levels of acceptance reported across the population. These findings also highlight the effectiveness of information provided by national health authorities, with a strong level of trust placed in official sources. However, reluctance to vaccinate has often been linked to a lack of trust in these very institutions. The emergence of COVID-19 has further complicated this landscape, not only influencing vaccine uptake and public attitudes but also amplifying the spread of misinformation through digital platforms.

Current research, including studies from both Ireland and England, suggests that trust in digital sources remains relatively low.(Campbell *et al.*, 2023)(Marron *et al.*, 2023) While official health messaging still holds considerable influence, the question remains: to what extent does digital media shape vaccine decisions, particularly among parents who delay or hesitate to vaccinate? For those who fall into the vaccine-hesitant category, it is unclear whether digital information is the main contributing factor or if other influences, such as personal beliefs, past experiences, or access issues, play a stronger role.

This brings us to these research questions

- Are all digital health information sources viewed alike?
- Do they all have equal influence in helping parents make vaccination decisions?
- Are parents aware of the risks and concerns of digital media information?

Bearing these questions in mind, the following objectives were designed for the study. They include:

1.5.1 Evaluate parental perceptions of digital health information sources and their influence on vaccine confidence using a Likert-scale-based questionnaire.

1.5.2 Identify commonly used digital platforms and assess their perceived trustworthiness and impact on users.

1.5.3 Explore perceived risks and concerns associated with online vaccine information.

1.5.4 Understand how findings can inform pharmaceutical companies' digital communication strategies.

**1.6 Limitations and Bias in the Study**

This study focuses primarily on the educational background of parents, offering valuable insights but limiting the ability to account for other influential factors such as culture or socio-economic status (Marron et al., 2023). The use of a simplified 3-point Likert scale enhanced accessibility but may have restricted the expression of strong opinions. Additionally, the possibility of multiple responses from the same household introduces a risk of response bias. These limitations do not diminish the relevance of the findings but highlight the need for cautious interpretation.

## 1.7 Layout of the dissertation

### 1.7.1 Chapter 1: Introduction

This chapter introduces the key themes of the study, including the influence of digital media, parental perceptions of vaccination, and the issue of vaccine hesitancy. It outlines the purpose and relevance of the research, clearly presenting the aims, objectives, and central research question. The chapter sets the foundation for the study by highlighting why understanding how parents interact with online vaccine information is important in today's health communication landscape.

### 1.7.2 Chapter 2: Literature Review

Chapter 2 reviews existing research on the impact of digital media on vaccine-related decision-making. It explores key factors such as misinformation, emotional responses, and the information-seeking behaviours of parents. The chapter also identifies critical gaps in the current literature—particularly around trust, confidence, and the influence of digital platforms on parental choices—which this study aims to explore in greater depth.

### 1.7.3 Chapter 3: Methodology

This chapter employs a mono-method approach, adopting a quantitative research methodology to investigate parental perceptions of digital health information and its impact on vaccine confidence. A cross-sectional study design was used, where questions employing a Likert scale to capture responses of parental attitudes, digital information-seeking habits, and the level of trust in these sites were evaluated. Grounded in a positivist paradigm and following deductive reasoning, the study aims to find measurable associations. It also looks into the rationale behind choosing the given methodology, sample size calculation, ethical considerations and the analysis undertaken to interpret the data.

### 1.7.4 Chapter 4: Findings & Discussion

This chapter presents findings from primary research analysis looking at the vaccine acceptance, vaccine hesitancy and vaccine confidence. It looks into detailed perceptions of parents of children in Ireland under the age of five on online resources that impact decision-making. It also correlates data on digital literacy, education on vaccine confidence. Further on, the discussion is based on the primary analysis findings, drawing comparisons with the literature review on existing studies that look at vaccine confidence and perceptions on digital media. It also mentions potential strategies that can be used for vaccine communication by the pharma company to build trust among parents who consider communication from these industries to be generally biased to make profits. The chapter also looks at questions that could add value to the research and can be explored in future studies.

### 1.7.5 Chapter 5: Recommendations & Conclusions

Chapter 5 builds on the findings of the analysis in Chapter 4, presenting recommendations aimed at improving vaccine communication by pharma companies. It also provides insight into how the national vaccine coverage can be enhanced by improving vaccine acceptance. It also summarises important factors that directly and indirectly build vaccine confidence in Irish parents. It talks about the dissemination of trustworthy vaccine information from trusted sources to improve vaccination coverage. The key findings talk about the sustained investment in debunking myths and promoting evidence-based information, digitally enhancing communication and the importance of collaborative partnership with health care workers in Ireland.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Introduction

This chapter presents a comprehensive literature review on the themes of vaccination in the paediatric population and the influence of digital health resources on decision-making. An in-depth review of the literature on concepts of vaccine hesitancy, vaccine confidence, parental outlook on digital media, and the transformative strategies that can guide pharmaceutical companies in encouraging vaccination is presented in the following sections. The literature is mainly sourced from high-quality academic journals and official websites related to vaccination.

## 2.2 Vaccination History

Vaccination history can be traced back to the immunity derived from a process called variolation in Asia and Africa. It involved the exposure of individuals to smallpox contents to stimulate immunity. In the 18th century, it was introduced in Europe but posed a significant infection risk. In the article written by Kayser and Ramzan (2021), the author mentions that an alternative to variolation was discovered by Edward Jenner in the year 1796 when cowpox infection could protect from smallpox, thus laying the foundation of the modern vaccination. This work also led to the coining of the word “vaccine”(Vacca- the Latin word for cow). Eventually, smallpox was eradicated globally in the year 1980, as declared by the WHO. However, the author also talks about the ethical considerations of Jenner’s experiment. Though it was successful, it would not meet the current research standards.

The historical vaccine analysis done by Kayser and Ramzan (2021) aligns with the information provided by the European vaccination portal (EVIP)(EVIP, 2024). It talks about how the smallpox vaccine led to immunisations against deadly diseases like cholera, typhoid and rabies. Both authors concluded that in the 20th century, vaccines for measles in 1963, polio vaccine in 1954 largely reduced mortality and morbidity from infectious diseases. The methodology of using inactivated pathogens to stimulate immunity still lies as the foundation of how vaccination provides immunity. Many years of strong scientific research and the improved understanding of immunology and biotechnology have led to the rapid development of vaccines like COVID-19. The EVIP (EVIP, 2024) rightly concludes that the long history of vaccinations and the lessons learnt from them would continue in the development of future vaccinations.

## 2.3 Paediatric Immunisation

The WHO states immunisation to be the most effective public health tool in preventing mortality (2-3 million child deaths) every year.(WHO, 2024) Vaccination rates in 2024 show stability compared to 2023 rates, although they are still below the pre-pandemic figures. The third dose of the diphtheria-tetanus-pertussis (DTP3) vaccine stood at 85%, while first-dose measles coverage was 84%. This rate may lead to lower targets than expected to reach the Immunisation Agenda 2030 (IA2030). The other concern raised in this report was the 14.3 million "zero-dose" children, those who have not received any vaccine. This data. These data show that these numbers are mainly concentrated in ten countries without a robust health system. Inequalities in vaccine access are also highlighted in this article. An example of Hib vaccine coverage of 93% in the EU and 34% in the Western Pacific highlights this inequality.

The Lancet article Haeuser *et al.*, (2025) aligns with the WHO narrative and brings out deeper issues. The perception of looking at vaccination as a success based on the national coverage may not be accurate. The author rightly points out that the stagnation of the national coverage masks the difference in the regions with economic inequalities. This observation was made in regions within the country and between countries. The main concern highlighted by the author was the failure to reach the targets of global frameworks such as IA2030 if they do not give importance to these structural inequalities. Looking at the trends observed from disaggregated data, he concluded that the immunisation trends often fell prey to the political and social setting in countries with fragile health systems. This sheds light on the importance of community engagement and responsiveness rather than looking at national coverage vaccination data. It also underscores the importance of trust-building systems to have a long-lasting effect

## 2.4 Irish Paediatric Immunisation

The Health Service Executive (HSE in coordination with the National Immunisation Office (NIO), delivers the paediatric immunisation schedule in Ireland. Protection against many infectious diseases, like diphtheria, tetanus, polio, meningitis and measles is provided at various

stages of child development by the government at no cost. (HSE, 2025b) There is a drop in the national coverage of vaccination despite the good structure and accessibility of the program. The national coverage of most infant vaccines, as reported by the HSE, is around 90% while a drop to 78.4% in the HPV vaccination in the year 2023 was noted. This lies below the WHO threshold of 95% for herd immunity. The main cause identified for this percentage drop was the disruption caused by to pandemic, contributing to the service delay.(NIO, 2025)(Dodd, 2025)

Ireland's current immunisation status reflects global trends. The report by the WHO(WHO, 2024) shows that there has been a plateau in the vaccination coverage owing to the COVID-19 pandemic, and many children miss their routine immunisation. The national vaccine coverage of Ireland remains high according to international standards, though there has been a drop in the vaccine uptake. (Marron *et al.*, 2023). The national survey of 2700 Irish parents conducted by the author revealed that a proportion of the population is vaccine-hesitant and that this correlates with demographic factors. These findings align with the conclusion of Burton et al. (2023), where the author argues that inequalities, especially in the underprivileged population, are often masked by stagnating coverage. This emphasises the need for stronger communication and reforms at the system level.

NIO, in response to these challenges, offers a multilevel strategic plan for 2024-2027 targeting national coverage. It aims to achieve 95% childhood vaccination uptake and looks at issues of inequality and improved infrastructure. The absence of a National Immunisation Information System (NIIS) that would target real-time surveillance and focused intervention.(NIO, 2025) The multilevel plan involves coordination with HSE at the state level, cooperation with the general practitioners, public health nurses and schools. It also involves introducing an updated vaccination schedule from October 2024. It also aims at national vaccine coverage with the ESRI. This shows improvement from a post-pandemic situation to a proactive and data-driven immunisation system that focuses on long-term resilience.

## 2.5 Digital Media Influence

Digital health resources have become an important tool for parents to access and evaluate health information about vaccinations. Various platforms like social media, parents' blogs, and official websites all offer a vast variety of content. Some of the content stems from credible sources, and some information can be misleading. This leading dependence on social media also affects the vaccine-related information.

The rampant spread of misinformation on social media, in particular, among other digital media, is demonstrated by Wilson and Wiysonge, (2020). The author showed that the increase in social media use caused increased public doubt in regards to vaccine safety. The decreased national vaccine coverage could be attributed to factors like the foreign disinformation campaign that reduced public trust towards vaccination. Twitter bots and trolls shared information which was both pro- and anti-vaccine.(Broniatowski *et al.*, 2018) These findings reveal that social media can cause confusion and increase instability towards the public health efforts around well-established medical information.

On the other hand, there has been evidence of digital media having positive effects. Hwang and Shah, (2019) documented that parents who used structured and credible sources of health portals or scientific media viewed vaccines as beneficial and adhered to the vaccination schedule. People who relied on peer platforms like parenting blogs expressed doubts about vaccine safety. This underscores the importance of viewing digital media's influence with the right context.

The tangible effects of vaccine misinformation were explained by Loomba *et al.*, (2021). Their study showed that a minimal and short course of misinformation not only reduces participation but also gives them motives to protect others from the intention to vaccinate. This raises an important concern about the short-lived duration of vaccine confidence, especially in environments where false information is widespread and has an emotional impact.

Presenting information plays a vital role as the information itself. This was demonstrated by the author(Machackova and Smahel, 2018) who observed that people judge the information they see online based on layout design, references and how well accepted it is in society. This is especially true in stressful situations, particularly when parents need to make swift decisions under pressure.

Thus, the dual role of digital media is about in this section by various authors. These media provide their users easy access to information, but at the same time, can often be misleading if they're not judged appropriately. Public health strategies must ensure credible yet accessible information, engaging and trustworthy for use.

### 2.6 Vaccine confidence and Digital media influence

According to and Campbell *et al.*, (2023) vaccine confidence refers to trust in the system- the vaccine itself, Healthcare professionals(HCP) who administer them, people who make policies, and the safety of the vaccine. On the other hand, vaccine hesitancy is the reluctance shown towards vaccination despite it being readily available(MacDonald, 2015). Low confidence in the system leads to hesitancy. Attempts to understand vaccine confidence led to the development of the Emory Vaccine Confidence Index (EVCI), which measures the public trust by measuring factors like the perceived importance, safety, etc.(Frew *et al.*, 2019)

Vaccine confidence varies across different countries and is affected by social and cultural factors. The Wellcome Global Monitor, (2020) report stated that trust within the HCP was the most prominent factor for high vaccine confidence, while on the other hand, confidence in the government seemed to be the least trusted and thus was not reliable. This emphasises the need for communicating information from sources that are perceived as reliable by the people.

Digital media is often seen as a double-edged sword. On the one hand, it acts as a flexible channel to widely available to source information sources and on the other hand, may provide sources of misinformation and emotional outlooks that may override credible information. Similar to other studies, Campbell *et al.*, (2023) noted higher vaccine confidence in those who relied on the information from the NHS

professionals whilst compared to their counterparts who encountered negative information through online portals. It created uncertainty in their mindset.

Talking about the positive sources of influence, Finnegan *et al.*, (2018) reviewed how vaccine campaigns like the Vaccine Today initiative, which are carefully designed and tailored to the "moveable middle", could be a credible source of information. This was included in the WHO's Safety Net as it could be used as a source for storytelling and building trust rather than placing arguments that can elicit negative responses. The effects of digital media are not limited to the propagation of information. They extend to augmenting information, reinforcing beliefs and can be crucial if the misinformation is not debunked the right way. This can cause corrective efforts to backfire.(Campbell *et al.*, 2023) Thus, emotional information should be handled appropriately and thoughtfully.

Digital literacy can contribute to the perceptions of parental vaccine confidence. Marron et al. (2023) in their national survey in Ireland indicated that parental trust in official sources like HSE and the nurses had a positive attitude towards vaccination and those parents/caregivers who are associated with reading more peer group forums and social media showed low skills in knowing how to discern the information's credibility. This led to negative vaccine attitudes.

### 2.7 Perceived Risks and Concerns of Digital Health Resources

Digital health platforms have proven to be a useful resource in providing timely and easy access to information. However, when accessing information, many concerns arise regarding the trustworthiness and quality of the online information. McLean, (2023) recognises one of the major concerns in using online resources in the credibility of the resources that are distributed widely by people who may not be experts in the given field. Disproportionate visibility is gained through spreading information. The author claims that the spread of unqualified opinions causes confusion and reduces parental vaccine confidence.

Further on, McLean discusses important concerns of indecision and anxiety, which lead to repeated unstructured search for information. This indecisiveness leads to emotional fatigue that exacerbates hesitancy. Digital health literacy plays a crucial role in this context, where

skills are needed to evaluate online content. Parents with low digital health literacy are vulnerable to misinformation and its consequences. Similar views of fatigue and disengagement from factual information were established by Rodrigues *et al.*, (2023) the author reviewed the role of social media in vaccination, and found these views were strong after the Covid-19 pandemic.

Skewing of perception through the emotional nature of digital vaccine narratives is another important risk raised.(European Centre for Disease Prevention and Control., 2024) Emotionally charged stories of vaccine-related injury, or fear-based messages, were more likely to be remembered than factual information. The risk of reinforcing personal biases and limiting alternate perspectives is enumerated well with the example of echo chambers, which algorithmically expose similar views, shifting individual narratives.

Tone and framing of the information online are equally significant concerns around digital health information sources. Some of the resources fail to be transparent or appear to originate from sources that have commercial motives. This can be seen in the communication by the pharmaceutical companies or the government sectors, which amplifies scepticism. Moreover, this leads to the risk of triangulation, where patients tend to cross-check various sources to determine facts. The type of source consulted plays a major limitation in this context.(Tonsaker *et al.*, 2014)

### 2.8 Approaches to improving vaccine information by the Pharma Industry

The pharmaceutical industry is often a subject of public controversy and is particularly notable when it comes to vaccines. Though their role in vaccination development is undeniable, they are often viewed as profit-making ventures for commercial benefits. Their transparency and ethical practices are always questioned, and this often shapes how information related to vaccines from the industry is received.

The author (Finnegan *et al.*, 2018) observed that post-COVID-19, there seemed to be an increasing scepticism towards the pharma industry. Limited transparency, conflicts of interest, and minimal communication of information to the public were recurring concerns noticed through reviews. These outlooks were associated with how the information was delivered and less about the product quality. The anti-vaccine movements took advantage of these gaps, making them look more reliable than the formal institutions.

Distrust in the pharmaceutical industry emerged as a prominent theme based on the analysis of the testimonies about vaccine mandates at a Texas court.(Matthews *et al.*, 2024) This article complements the study Aw *et al.*, (2021) and adds to the intensity of the cause. In the article, people viewed the industry not only as commercial but also as politically driven, affecting the autonomy of individuals.. This distrust and lack of visibility to the public affect the credibility of the pharma industry.

Ethical concerns are important factors affecting the perception towards vaccinations. This is especially noted in certain communities that are vegan and vegetarian populations. (Díaz *et al.*, 2024) The author explores the vaccine attitudes of these communities that find the use of animal products and the use of animals in the process of testing vaccines unagreeable. Though the number of people in this subgroup was small, the outcomes point in a certain direction. The ethical values and the industry practices have a large gap. Transparency in the mode of operation, sourcing, and development may lead to greater trust in the industry.

The pharma companies are restricted from direct contact with consumers in most countries. Hence, it is important that information is passed on to people from sources that they rely on. Healthcare professionals, public health workers are all middlemen who people believe will provide information without any bias. Thus, a supportive role of the industry will be more acceptable than a direct one. This collaboration with the intermediaries helps build credibility in the system. This outlook was discussed from a healthcare point of view by (Leask *et al.*, 2012) enhancing communication in vaccine education. Put together, communication holds the key to how information is perceived by the consumer and improves the credibility of the pharmaceutical world than the product itself. Emotional intelligence and sensitivity, and the level of transparency, all determine public trust.

## 2.9 Key Findings

- National vaccine coverage data can mask inequalities between and within countries, risking stagnation of global targets like IA2030 if structural inequalities are ignored. Sustainable immunisation success requires community engagement and long-term trust-building systems (Haeuser et al., 2025).

- Increased use of social media has fuelled public doubt about vaccine safety (Wilson & Wiysonge, 2020).

- Twitter bots and trolls amplified both pro- and anti-vaccine narratives, creating confusion and weakening trust in public health efforts (Broniatowski et al., 2018).

- Parents who accessed structured and credible portals viewed vaccines positively and adhered to schedules, whereas reliance on peer blogs was associated with greater doubts (Hwang & Shah, 2019).

- Even minimal exposure to misinformation was shown to reduce vaccine uptake and encourage individuals to dissuade others from vaccinating (Loomba et al., 2021).

- Trust in healthcare professionals remains the strongest driver of vaccine confidence, while governments are the least trusted sources of information (Wellcome Global Monitor, 2020).

- In Ireland, parents who trusted HSE and nurses demonstrated higher vaccine confidence, while those engaging more with peer forums and social media displayed lower digital health literacy (Marron et al., 2023).

- Parents relying on NHS professionals for information reported higher vaccine confidence compared to those exposed to negative online content (Campbell et al., 2023).

- Parents with low digital health literacy were particularly vulnerable to misinformation, leading to disengagement from factual information, a trend heightened during the COVID-19 pandemic (Rodrigues et al., 2023).

- Emotionally charged online narratives—such as fear-based or injury stories—were remembered more strongly than factual information, and echo chambers further reinforced existing biases (European Centre for Disease Prevention and Control, 2024).

- Lack of transparency, commercial motives, and the tendency of users to triangulate multiple sources often increased scepticism towards online health information (Tonsaker et al., 2014).

- The pharmaceutical industry is often perceived as politically driven and profit-oriented, which undermines public autonomy (Matthews et al., 2024).

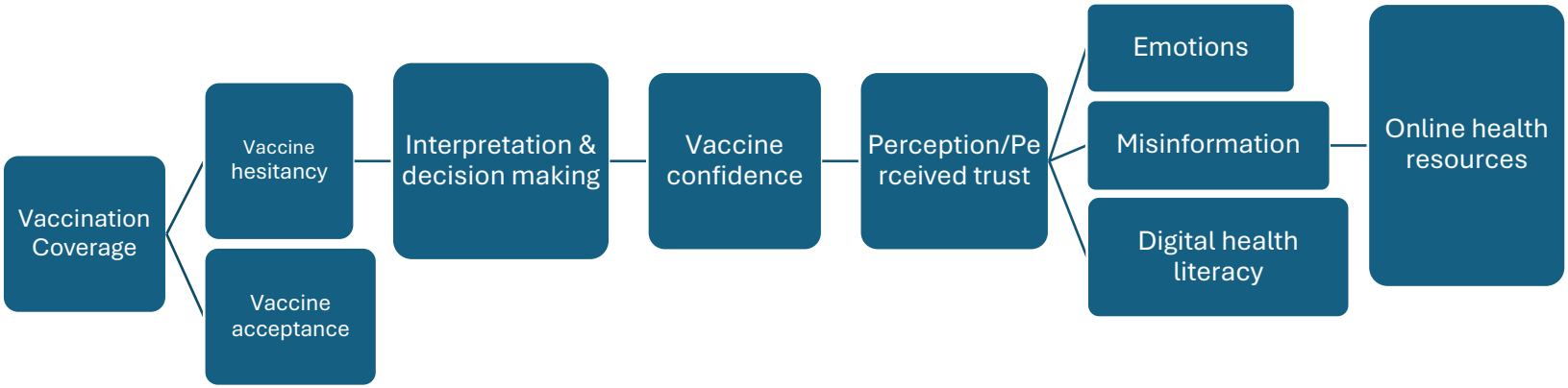
- Collaboration with trusted intermediaries such as healthcare professionals and public health workers enhances credibility in vaccine communication more effectively than direct industry messaging (Leask et al., 2012)

### 2.10 Research Gaps

Although a number of studies have explored digital perceptions of vaccine confidence, there remains a lack of in-depth, Ireland-specific analysis on the role of digital media in shaping parental vaccination decisions. Marron et al. (2023), in a national Irish survey, examined digital health literacy and parental trust in official sources; however, few studies have directly addressed the nuanced interplay between specific digital platforms (such as social media and HSE websites) and parental vaccine confidence. Much of the existing literature treats online resources as a single, broad category—often grouped under the umbrella of “social media” or “online platforms”—thereby overlooking important differences between platforms. Furthermore, there has been little evaluation of how the frequency of use of these resources aligns with the degree of trust parents place in them.

Another clear gap lies in understanding the emotional power of digital narratives in shaping vaccine confidence. While Loomba et al. (2021) and ECDC (2024) have shown that emotional, anecdotal content can outweigh factual information in influencing perceptions, very little evidence exists on how this dynamic plays out in the Irish context. Finally, there is limited research on the role of pharmaceutical companies in vaccine communication in Ireland. This opens a space to examine how parents perceive industry involvement, and which communication strategies or platforms they consider most acceptable and trustworthy.

### 2.11 Conceptual framework




1) *Figure 2: Conceptual framework showing the influence of digital health resources on vaccination decision making, an adaptation from Vaccine Hesitancy(Dubé et al., 2013)*

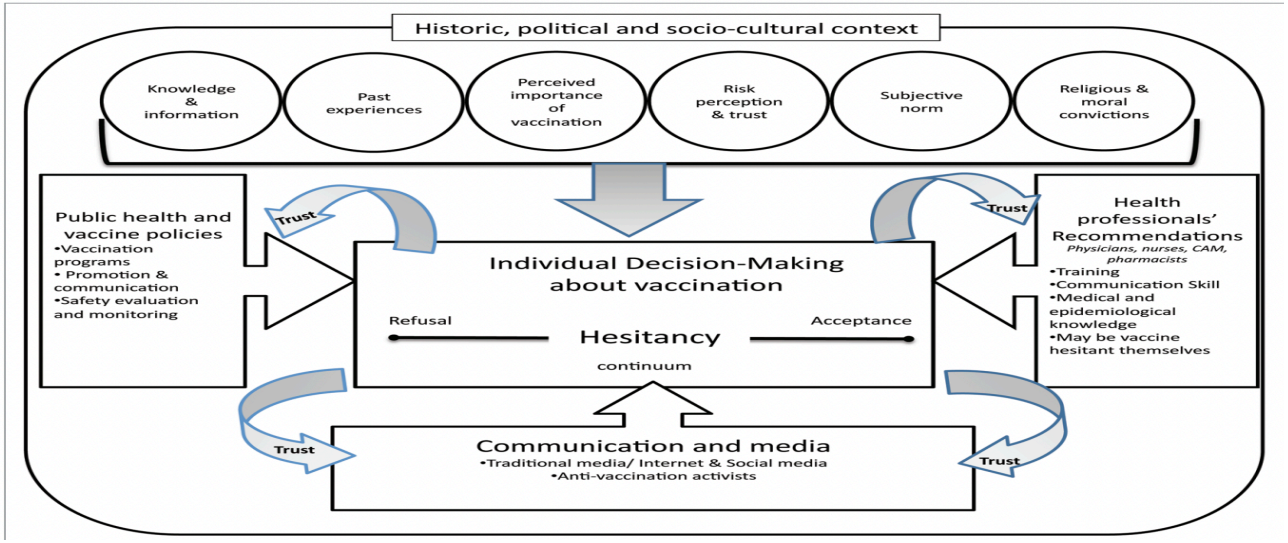



*Figure 3: Conceptual framework for vaccine hesitancy (Dubé et al., 2013)*

This conceptual framework of the current study is built on the vaccine hesitancy model in the paper by Dubé *et al* (2013) as shown in Figure 3. It aims to showcase the link between parental decisions to vaccinate and the influence of online health resources on their decision. It projects various factors that combine to lead to vaccine acceptance or vaccine hesitancy.

Vaccine confidence emerges from the parental perception and the way they interpret and trust information obtained from digital sources. Trust in turn is influenced by emotional factors, ability to interpret digital information, measured by digital literacy and the amount of misinformation that parents are exposed to, which makes or breaks the vaccine confidence.

It also highlights the fact that the national vaccine coverage is influenced by vaccine hesitancy or acceptance, both of which are influenced by the digital environment. These health behaviours are shaped by the quality and the content of the information encountered by the parents, and thus imply the importance of digital health resources not only as information carriers but as agents that can strengthen or weaken vaccine confidence

# CHAPTER 3: METHODOLOGY

## 3.1 Introduction

This chapter outlines the methodology used to explore how digital health information sources can influence parents of children aged 0 to 5 in Ireland regarding vaccines. It discusses the research philosophy and design by the research objectives. It covers sample collection, survey structure, and online data gathering, which will be utilised for data analysis and results presented in Chapter 4. The statistical methods employed in this study align with the conceptual framework connecting the literature review and the collected data. The research onion shown in the figure below is used as a guide for the research methodology.

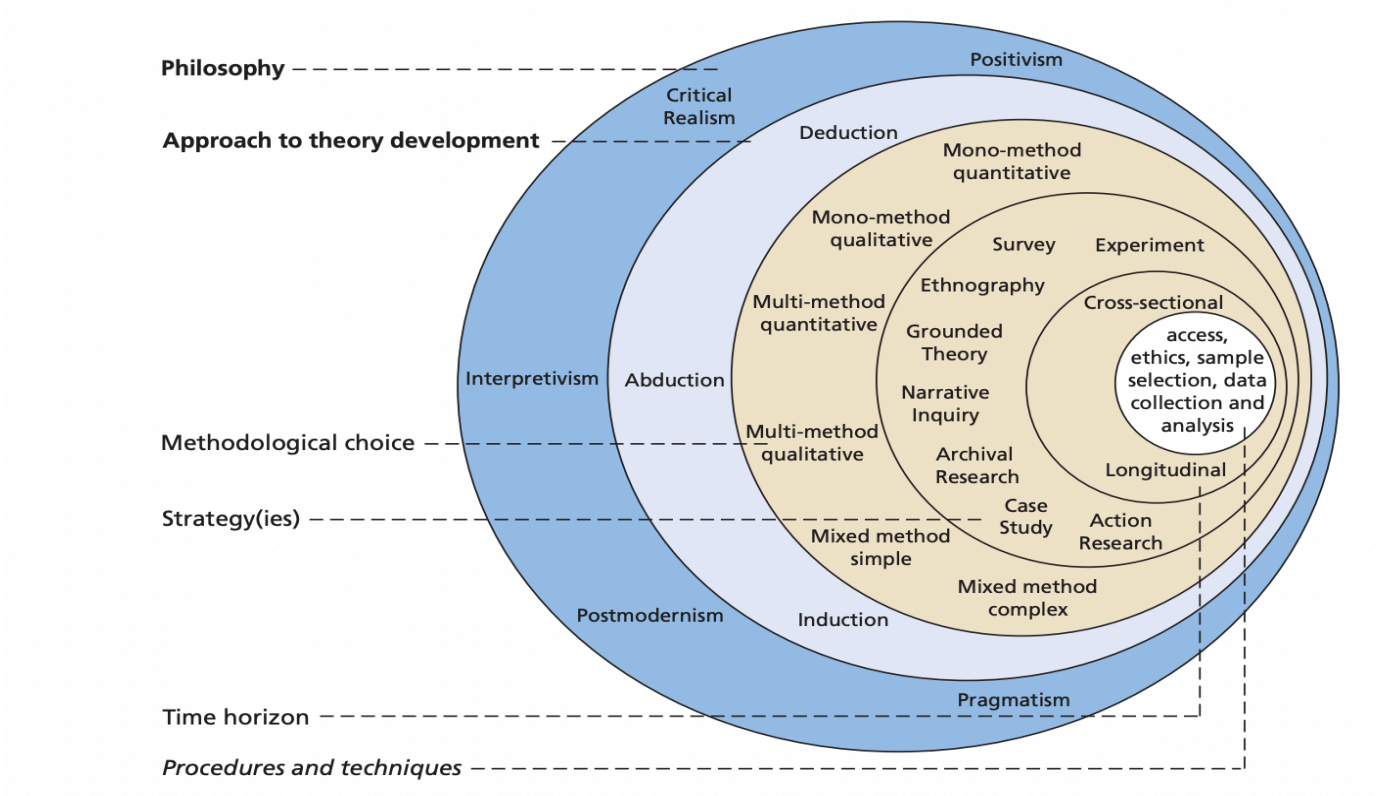



*Figure 4: The Research Onion(Saunders et al., 2023)*

### 3.2 Research Philosophy and Approach

The term research philosophy refers to a system of beliefs and assumptions about the development of knowledge. A positivist research philosophy was chosen based on the scope of the study, which focuses on gathering measurable data and analysing the relationship between digital platforms' influence on vaccination decision-making. This makes it suitable to obtain data through survey-based methods and statistical analysis. Using surveys ensures consistency in data collection to meet the objectives. Based on the key themes identified from the literature review, a clear theoretical stance was established, including perceptions of risk when using online health resources and trust

in these resources, employing a deductive approach. It aimed to test whether the patterns observed in the literature also appeared among parents in Ireland. In Ireland, parents play a central role in making vaccination decisions for their children. The survey enabled parents to express their beliefs, their trust in sources they considered reputable, and to identify reforms they believe could help build trust in information shared by pharmaceutical companies.

### 3.3 Research Design

As mentioned, the research design provides a comprehensive plan for answering the research question, thus aligning with the aims and objectives of the study. The chosen research design was an exploratory–descriptive approach, suitable for investigating patterns and relationships without establishing causality. The descriptive design allows for the identification of trends within the target population. It employs a quantitative method where data are collected as numerical values. Since this study is conducted at a single point in time, it adopts a cross-sectional design. The study employs only one quantitative method (survey), followed by statistical analysis due to time and cost limitations of an MSc research project. Therefore, the research design is a "Mono method quantitative study.”.

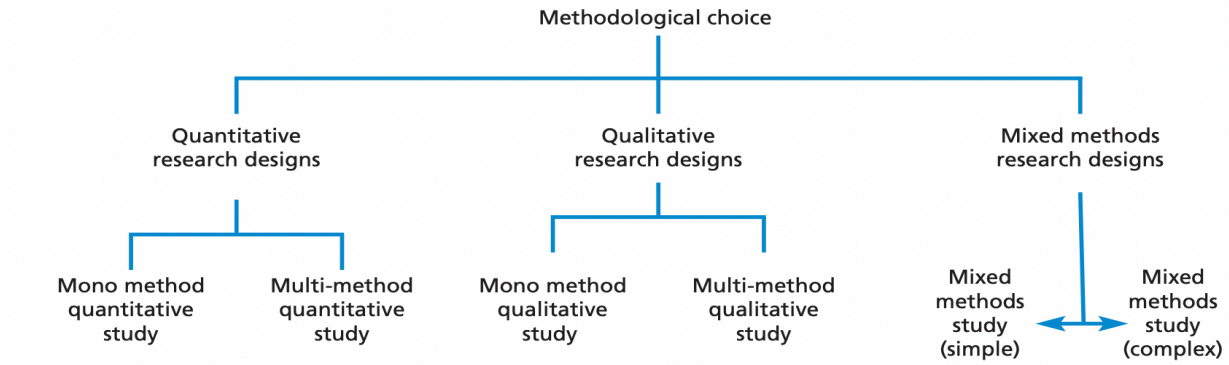



*Figure 5 Methodological choice (Saunders et al., 2023)*

### 3.4 Sampling Strategy and Sample Size Justification

A non-probability convenience sampling method was selected for the study. The aim was to target parents and caregivers of children aged 0 to 5 years, as they are the decision makers for childhood vaccination in Ireland, in line with the national immunisation schedule. Participation was voluntary. This researcher invited the participants through community pharmacy outreach as she works in a similar setting. The target population was reached through church groups and online parenting forums, allowing for a wider range of participants to be accessed.

The sample frame was based on statistics provided by the Central Statistics Office (CSO) and served as the reference population, as shown in Figure 5. Further, a pivot table was used to obtain the total population of children under five years. A total of 356,125 was obtained as the population size to calculate the sample size for the study, as shown in Figure 6. The tool from SurveyMonkey was used to calculate the sample size. Using a 95% confidence level and a margin of error of 5%, the required sample size for this study was calculated at 380 participants. While a 5% margin of error is generally preferred for higher precision, this was adjusted to 8% in consideration of the study's limited timeframe and available resources. The original calculation indicated a sample size of approximately 380 participants; however, achieving this within the short study duration was not feasible. The adjusted target of 150 was obtained by increasing the margin of error to 8%. The sample size of 150 participants balances statistical validity and the practical constraints of data collection. (Figure 7). The sampling was non-random, with efforts made to include diverse groups of participants. Participation was voluntary and anonymous.

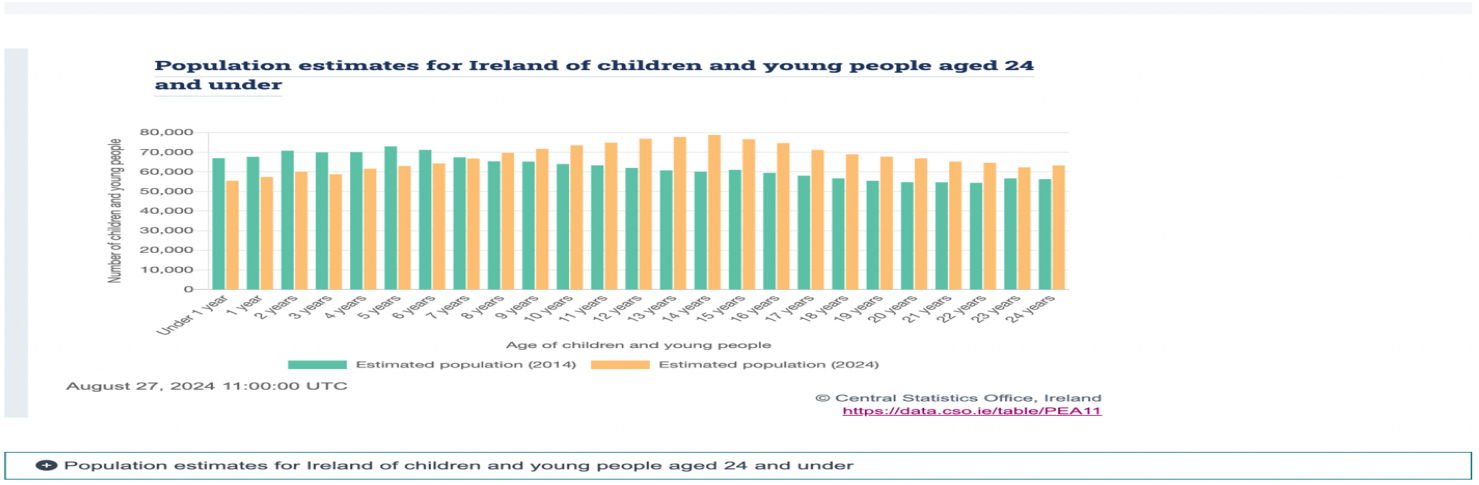
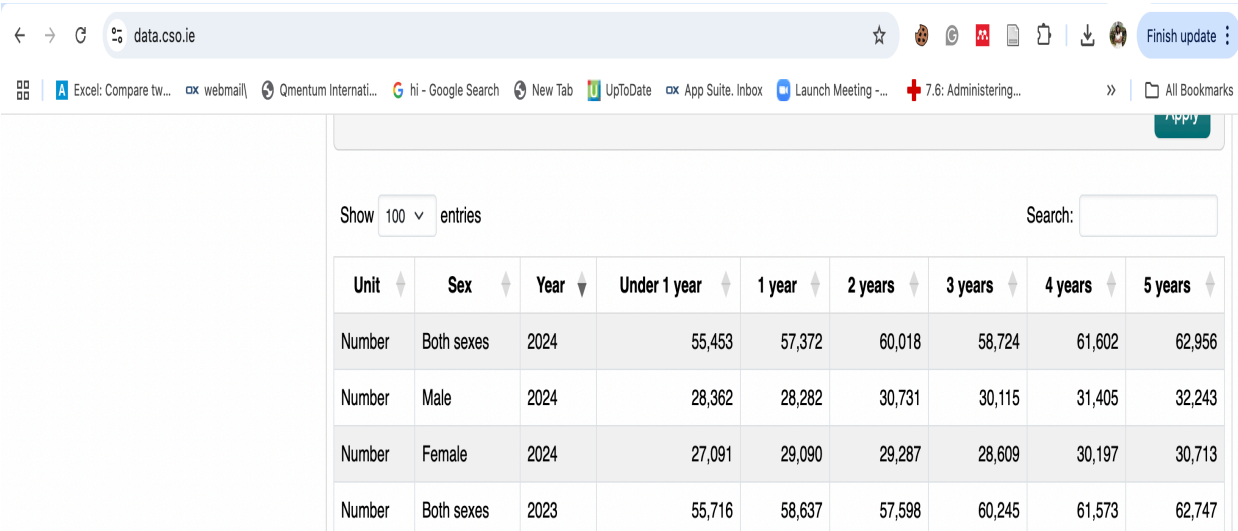



*Figure 6: Population estimates of Children and Young adults in Ireland from the CSO as per 2024.(CSO, 2025b)*




| Unit | Sex | Year | Under 1 year | 1 year | 2 years | 3 years | 4 years | 5 years |
|---|---|---|---|---|---|---|---|---|
| Number | Both sexes | 2024 | 55,453 | 57,372 | 60,018 | 58,724 | 61,602 | 62,956 |
| Number | Male | 2024 | 28,362 | 28,282 | 30,731 | 30,115 | 31,405 | 32,243 |
| Number | Female | 2024 | 27,091 | 29,090 | 29,287 | 28,609 | 30,197 | 30,713 |
| Number | Both sexes | 2023 | 55,716 | 58,637 | 57,598 | 60,245 | 61,573 | 62,747 |

*Figure 7: Population of Children in Ireland below five years for 2024.(CSO, 2025a)*

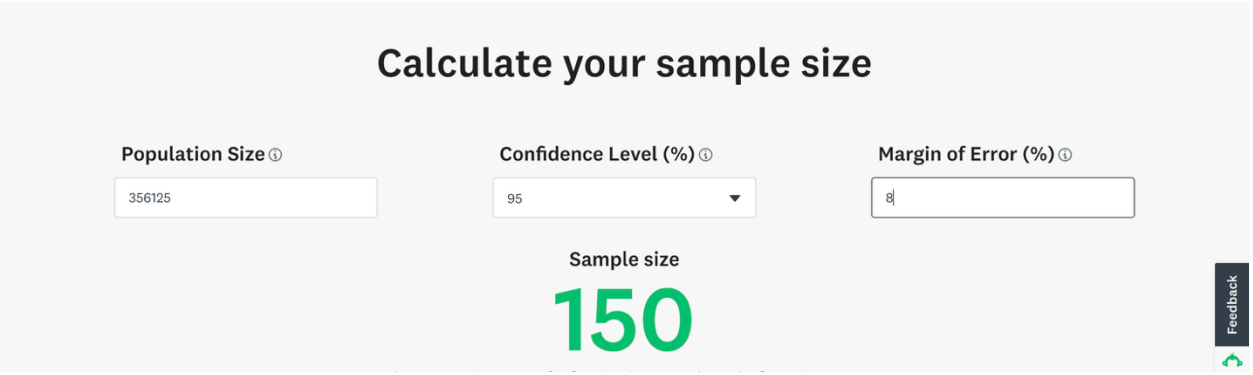



*Figure 8: Calculation of sample size using SurveyMonkey.(SurveyMonkey, 2025)*

### 3.5 Data Collection Method and Questionnaire Design

The survey was developed by adapting questions from validated questionnaires, including PAVC(Parent Attitudes about Childhood Vaccines) and EVIC (Emory Vaccine Confidence Index) by Frew et al. (2019). It comprised 20 questions, including mandatory informed consent required to proceed with the survey. A brief participation information leaflet outlined the study details and assured anonymity of responses.

The survey was designed to take no longer than ten minutes to complete. It was created using Google Forms and distributed via sharing links on Facebook groups, WhatsApp contacts, and flyers with QR codes that directed to the survey link.

The survey instrument consisted of 21 questions, structured around the study objectives. The first section focused on consent and eligibility, ensuring that only parents or caregivers of children aged strictly 0–5 years could proceed. Informed consent was mandatory, with participants required to acknowledge their understanding of the study before continuing.

The questionnaire was divided into four main domains:

- **Digital health behaviour** – Questions captured the platforms parents used to access vaccine-related information (e.g., HSE, NHS, social media, parenting forums, Google Search).
- **Perceptions of online information** – Items measured views on digital health content, including trust in different sources, perceptions of misinformation, and the influence of online stories or contradictory content.
- **Perceptions of the pharmaceutical industry** – Questions explored parental trust in pharmaceutical companies, concerns regarding bias or commercial motives, and preferences for communication style (e.g., multimedia vs. text).
- **Demographic information** - This included the age of the child and parental education level, enabling comparisons across subgroups.

### 3.6 Data Reliability and Validity

Validity in terms of content, construct, and criterion was ensured along with face validity. The conceptual framework and literature review served as the baseline to ensure that all key constructs leading to vaccine confidence and coverage were addressed appropriately. Construct validity was checked by having consistency with theoretical expectations from the vaccine confidence literature, strengthening the credibility of the instrument. A few examples include digital literacy, which can lead to higher vaccine confidence, and relying on unofficial digital sites, which can contribute to vaccine hesitancy. Criterion validity was established by aligning results with international findings. The consistency of the findings with the literature reviewed establishes their external validity. Further on, before commencing the survey, Face validity was ensured by having the questionnaire reviewed by the research supervisor before distribution, ensuring the survey was appropriate for an Irish population..

Internal consistency reliability was assessed using Cronbach's alpha across grouped perception items. The first set yielded an alpha of 0.587, and the second set an alpha of 0.502. Although these scores are below the usual 0.7 threshold, they are acceptable in exploratory research involving multidimensional constructs like attitudes and perceptions. Based on these findings, items were analysed individually rather than combined into composite indices, allowing for more nuanced interpretation of parental perceptions.

### 3.7 Data Analysis Techniques

Quantitative data through Likert-scale-based questionnaire (Q3–Q21) completed by parents of children aged 0–5 years in Ireland were analysed. The data preparation involved coding ordinal responses (Agree = 1, Neutral = 2, Disagree = 3) and categorising demographic variables like the child's age and the highest educational level. Blank responses were left untouched for the Minitab to exclude from inferential statistics to avoid results skewing.

The primary statistical software was the Minitab free trial version, while MS Excel was used to clean data, code data and obtain basic descriptive tabulations. Descriptive statistics like frequencies, percentages, and measures of central tendency (mode) were generated to summarise demographics, patterns in usage of digital health information and perceptions of online vaccine information. Bar charts and Pie charts were used to show tends and response patterns.

The study objectives were kept in mind while conducting statistical analyses evaluating parental perceptions of digital health information sources, identifying commonly used platforms and extending results for pharmaceutical companies to enhance strategies for digital health communication.

Four tests were mainly used in inferential statistics. Chi-Square test of independence to examine associations between nominal /ordinal data. Spearman's rank correlation coefficients were calculated when two ordinal variables were involved. The level of significance (alpha) was set at 0.05 for all test hypotheses. The McNamara's test was used to check the use vs trust between digital platforms, while the Kruskal-Wallis test was used for education Level and digital Literacy

The cross tabulation functions were used to generate observed and expected frequencies, Chi-Square testing, while correlation analyses were run using its nonparametric correlation module. To help with the appropriate interpretation, the degrees of freedom, p-value and confidence intervals were used as output tables. These findings are discussed in detail in Chapter 4.

### 3.8 Ethical Considerations

The anonymised survey targeted parents of children under five years of age residing in Ireland. Recruitment was facilitated through the researcher's professional access in a community pharmacy setting, where she worked as a pharmacy technician. Additional participants were reached via church groups with eligible parents, as well as through parent support groups and Facebook parenting communities, following permission to post the survey link. These cohorts were selected as they represent the population actively making vaccination decisions for young children.

Care was taken to ensure that all survey questions were neutrally phrased, avoiding language that could be perceived as leading, offensive, or biased. The study adhered to principles of confidentiality and transparency, with all data anonymised and no element of deception employed. Participants were informed of their right to withdraw at any stage.

Ethical approval for the study design was obtained from the appointed Griffith College supervisor, with confirmation that formal submission to the Griffith College Research Ethics Committee was not required. Informed consent was obtained through an introductory paragraph at the start of the survey outlining the study's purpose, scope, and assurances of confidentiality. Participants were required to confirm their understanding and agreement before proceeding (Appendix 1).

### 3.9 Limitations of the Methodology

Parental attitudes toward vaccination are shaped by a complex mix of factors, including education level, cultural background, demographics, and socioeconomic status. These factors often influence how vaccine-related information is perceived, trusted, and acted upon. In many cases, such variables can also contribute to patterns of suboptimal vaccination coverage in different regions.(Marron et al., 2023) In this study, the primary focus is on the educational background of parents, which offers valuable insights but also presents a limitation. By not capturing a broader range of influencing factors, the findings may offer only a partial view of the deeper drivers behind vaccine confidence or hesitancy.

To make the questionnaire accessible and easy to complete across diverse educational levels, a 3-point Likert scale was chosen for the survey. This format includes options for Agree, Neutral, and Disagree, which are simple and widely understood. However, the trade-off is that this limited scale may not fully capture the depth or strength of participants' opinions. For instance, parents who feel strongly about an issue might struggle to express the intensity of their views. This lack of granularity can lead to the data being somewhat flattened, making it harder to distinguish between mild and strong sentiments. Nonetheless, simplicity was prioritised to ensure inclusiveness across a general population sample.

Another consideration in the study design is the unit of response. While the survey aims to collect answers from individual parents or caregivers, more than one parent from the same household may complete the questionnaire. If this happens, the responses may reflect shared opinions, shaped by mutual discussions or shared values. This introduces a potential for response bias, particularly if both parents tend to think alike or influence each other's views. While this is not uncommon in family-based research, it is important to acknowledge the risk of overlapping perspectives reducing diversity in the data. Efforts were made to encourage individual responses, but complete control over participation cannot be guaranteed. These limitations do not invalidate the findings but highlight areas where interpretation should be made with care. Recognising these methodological boundaries allows for a more balanced and transparent understanding of the results.

# CHAPTER 4: ANALYSIS AND FINDINGS

### 4.1 Sample Description

Of the 104 respondents approached for the study, three declined to participate, resulting in a final sample size of 101 respondents. All participants were parents of children aged between 0–60 months. The distribution of children's ages is presented in Figure 6.

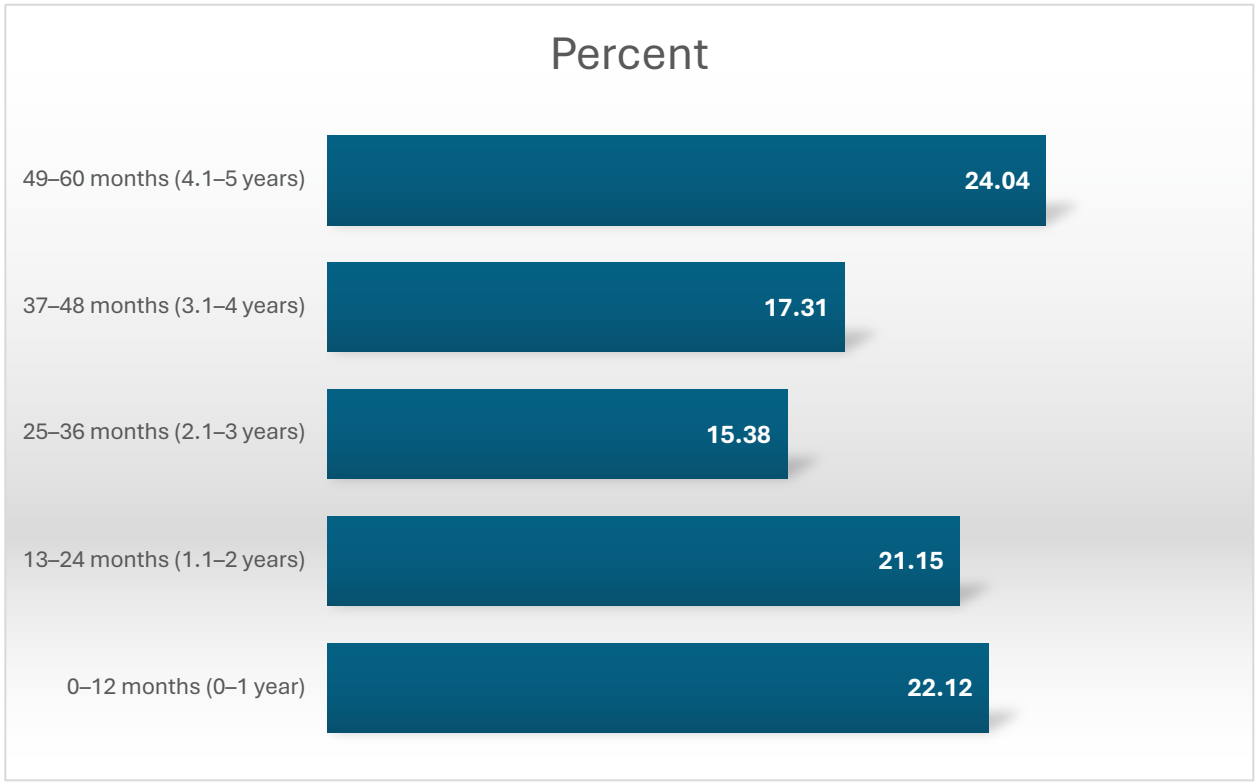



*Figure 9 Age distribution of children*

The sample demonstrated a balanced distribution across age groups, though slightly weighted toward older children (49–60 months, 24.0%). This demographic balance ensured representation across different parental decision-making stages. Data quality was ensured through careful collection and handling procedures.

### 4.2 Objective 1: Evaluate parental perceptions of digital health information sources and their influence on vaccine confidence

#### 4.2.1 Information Sources Used

Parents reported multiple sources of vaccine-related information, as shown in Figure 7.

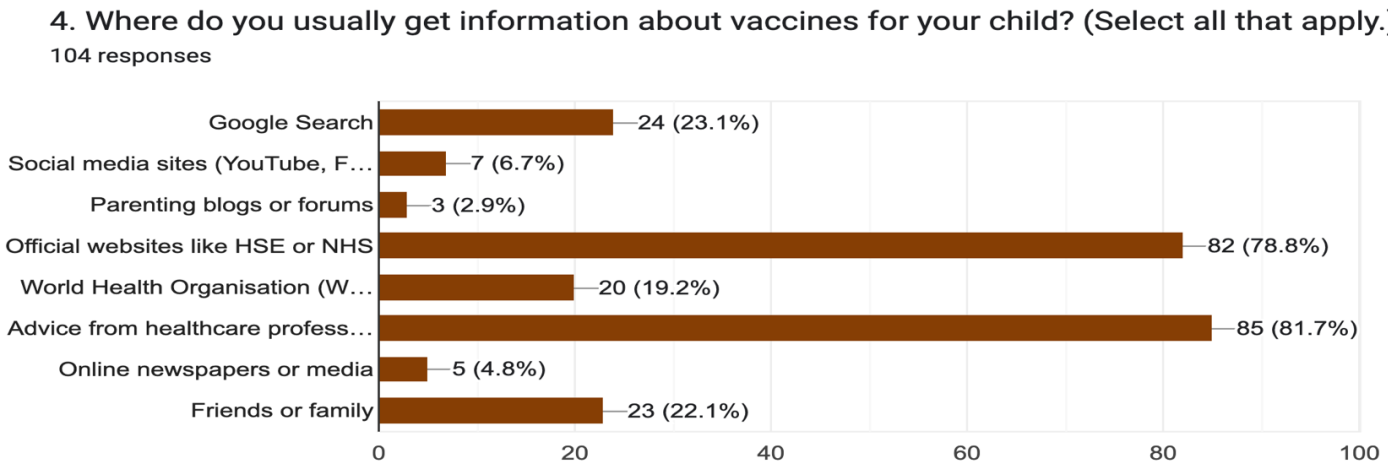



*Figure 10: Sources of vaccine-related information (Q4)*

The analysis reveals that the predominant source of information is Official websites like HSE or NHS, which accounts for 35.58% of the responses, indicating a strong reliance on authoritative health resources. Following this, advice from healthcare professionals (e.g., GP, nurse, pharmacist) is also significant, with 12.50% of respondents citing it as their primary source.

Other notable sources include Google Search and various combinations of social media and official websites(8.7%). The data suggests that while digital platforms like Google and social media play a role, traditional sources such as healthcare professionals and official health websites remain crucial in shaping public health knowledge. This reliance on authoritative channels reflects a preference for formal, trusted intermediaries, aligning with Marron et al. (2023), who highlighted the strong parental trust in HSE and nurses in Ireland

### 4.2.2 Descriptive Statistics

#### 4.2.2.1 Perceptions of online information

| Variable | Mean | SD | Median | Interpretation |
|---|---|---|---|---|
| Q5. Digital literacy | 1.60 | 0.87 | 1 | High digital literacy reported |
| Q6. Stories increasing VC | 2.23 | 0.77 | 2 | Neutral stance on story influence |
| Q7. Vaccine info misleading | 1.39 | 0.77 | 1 | Strong agreement that misinformation exists |
| Q8. Decision to vaccinate | 2.06 | 0.39 | 2 | Positive leaning toward vaccination |
| Q11. Trust social media | 2.12 | 0.40 | 2 | Low trust in social media |
| Q12. Trust official sites | 1.18 | 0.56 | 1 | Strong trust in official websites |
| Q13. Opposing views online | 1.79 | 0.85 | 2 | Mixed experiences of opposition |
| Q14. Choosing right sites | 1.38 | 0.76 | 1 | High confidence in site selection |

| Variable | Mean | SD | Median | Interpretation |
|---|---|---|---|---|
| Q15. Vaccine content beneficial | 1.99 | 0.86 | 2 | Agreement on content benefits |
| Q16. Online info influence | 1.92 | 0.80 | 2 | Online content moderately influential |
| Q17. Stories affecting VC | 2.03 | 0.68 | 2 | Neutral–agree: stories affect confidence |

*Table 1:Perceptions of online information (N = 104)*

For questions that evaluated the perception of parents regarding digital sources, Likert scale questions were used. The responses obtained were coded as follows: Agree = 1, Neutral = 2, Disagree = 3, with lower scores indicating higher agreement. Parents showed very high trust in official websites (M = 1.18) and low trust in social media (M = 2.12), echoing findings from Campbell et al. (2023) that parents associate formal health agencies with reliability. Importantly, the majority agreed that misleading information exists (M = 1.39), reflecting Wilson & Wiysonge (2020), who observed that misinformation circulating on social media undermines public trust. Overall, participants display relatively high digital literacy, strong trust in official sources, awareness of misleading information, and selective use of accurate sites. However, trust in social media is low, and the impact of online stories on vaccine confidence is mixed.

#### 4.2.2.2 Inferential Analysis

#### 4.2.2.3 Perception vs Vaccine Confidence

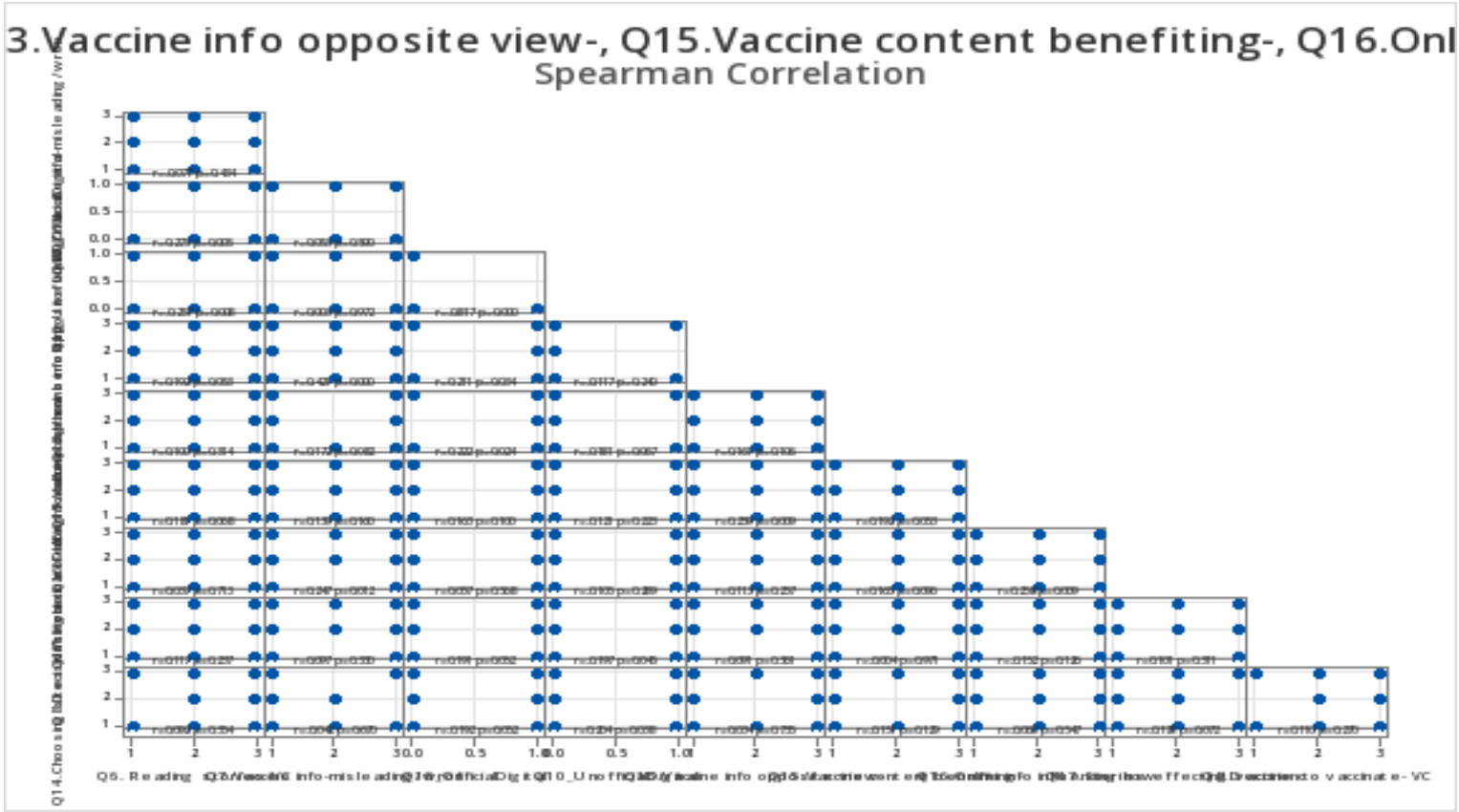



*Figure 11:Correlation heatmap (Spearman's rho)*

| S.No | Pair of Variables | ρ (Spearman's) | p-value | Direction | Interpretation |
|---|---|---|---|---|---|
| 1 | Q10_OfficialDigital × Q6. Reading stories-VC | 0.273 | 0.005 | Positive | Parents engaging with official digital sources were more likely to read vaccine-related stories. |
| 2 | Q10_UnofficialDigital × Q6. Reading stories-VC | -0.257 | 0.008 | Negative | Reliance on unofficial sources reduced engagement with vaccine-related stories. |
| 3 | Q13. Vaccine info opposite view × Q7. Vaccine info misleading | 0.421 | 0 | Positive | Parents encountering opposing views also perceived higher levels of misleading vaccine information. |
| 4 | Q17. Stories affecting VC × Q7. Vaccine info misleading | 0.247 | 0.012 | Positive | Misleading vaccine info was linked to greater influence of stories on vaccine confidence. |
| 5 | Q10_OfficialDigital × Q13. Vaccine info opposite view | 0.211 | 0.034 | Positive | Using official digital sources was associated with increased recognition of opposing vaccine views. |
| 6 | Q10_OfficialDigital × Q15. Vaccine content beneficial | 0.222 | 0.024 | Positive | Official digital sources were linked to perceiving vaccine content as beneficial. |
| 7 | Q8. Decision to vaccinate × Q10_UnofficialDigital | -0.197 | 0.045 | Negative | Reliance on unofficial sources was associated with reduced confidence in vaccination decisions. |
| 8 | Q14. Choosing correct sites × Q10_UnofficialDigital | 0.204 | 0.038 | Positive | Parents using unofficial sources also reported more confidence in selecting correct sites (possible overconfidence effect). |

| | | | | | |
|---|---|---|---|---|---|
| 9 | Q16. Online info influencing how × Q13. Vaccine info opposite view | 0.259 | 0.009 | Positive | Parents exposed to opposing views were more likely to report online information influencing how they vaccinate. |
| 10 | Q17. Stories affecting VC × Q16. Online info influencing how | 0.258 | 0.009 | Positive | Parents who found online information influenced how they vaccinate also reported that stories shaped their vaccine confidence. |
| 11 | Q10_OfficialDigital × Q10_UnofficialDigital | -0.817 | 0 | Strong Negative | Strong inverse relationship: reliance on unofficial sources was associated with reduced reliance on official digital resources. |

*Table 2: Spearman's Correlation On Statistically Significant Perceptions Of Online Information Vs Vaccine Confidence*

To explore how parents' perceptions of digital health information relate to vaccine confidence, Spearman's rank correlation was applied, as the survey variables were ordinal. The findings highlighted several important patterns, as shown in Table 2. Parents who engaged more with official digital sources were not only more likely to read vaccine-related stories ($\rho = 0.273$, $p = 0.005$) but also more likely to agree that some vaccine information online is written in ways that benefit pharmaceutical companies ($\rho = 0.222$, $p = 0.024$). This suggests that trust in authoritative sources can sit alongside a degree of scepticism about pharmaceutical influence, reflecting a nuanced outlook rather than blind acceptance.

On the other hand, greater reliance on unofficial digital sources was linked to a reduced likelihood of vaccination ($\rho = -0.197$, $p = 0.045$) and showed a strong negative association with engagement with official sources ($\rho = -0.817$, $p < 0.001$). Parents who recognised the presence of misleading information were also more likely to report that stories had influenced their vaccine confidence ($\rho = 0.247$, $p = 0.012$). Similarly, those exposed to opposing views online tended to say that digital content had shaped their vaccination behaviour ($\rho = 0.259$, $p = 0.009$). Finally, a close link was observed between parents who felt that stories affected their confidence and those who believed that online information influenced their vaccination decisions ($\rho = 0.258$, $p = 0.009$), underscoring the emotional weight carried by digital narratives.

#### 4.2.2.4 Association of Perception with vaccine confidence.

| S.No | Question Pair | $\chi^2$ (df, N) | *p* (Fisher's) | Cramer's V | Interpretation |
|---|---|---|---|---|---|
| 1 | Q8 (Decision not to vaccinate) × Q10 (Trust in official websites) | 15.75 (1, 105) | 0.002 | 0.39 | Significant, moderate–strong association**.** Parents who trusted official websites were less likely to let online information deter vaccination. |
| 2 | Q14 (Confidence in choosing correct sites) × Q10 (Trust in official websites) | 3.63 (1, 103) | 0.084 | 0.19 | Not significant, small effect. Trend suggests trust in official websites may improve confidence in evaluating information. |
| 3 | Q14 (Confidence in choosing correct sites) × Q11 (Trust in social media) | 1.00 (1, 103) | 0.383 | 0.1 | Not significant. Trust in social media was not related to confidence in site selection. |
| 4 | Q8 (Decision not to vaccinate) × Q11 (Trust in social media) | 26.63 (1, 107) | 0.005 | 0.4 | Significant, moderate–strong association**.** Parents who trusted social media were more likely to report online information leading them not to vaccinate. |

*Table 3: Chi-sq test showing association between parental perception and vaccine confidence*

Based on the Chi-squared test, the following associations between perception and vaccine confidence were obtained. A null hypothesis and an alternative hypothesis were formulated. The results include

- **Q8 × Q10 (Decision not to vaccinate × Trust in official websites)**

The alternative hypothesis (**$H_1$**) was **accepted**. A statistically significant association was found between trust in official websites and parents' decision not to vaccinate, $\chi^2(1, N = 105) = 15.75$, $p = .002$, Cramer's V = .39, indicating a moderate–to–strong effect. Parents who trusted official websites were less likely to allow online information to discourage vaccination.

- **Q14 × Q10 (Confidence in choosing correct sites × Trust in official websites)**

The alternative hypothesis (**$H_1$**) was **not accepted**. The test did not reach statistical significance, $\chi^2(1, N = 103) = 3.63$, $p = .057$, Cramer's V = .19, although a positive trend was observed. Parents who trusted official websites tended to report higher confidence in evaluating online vaccine information, but the effect was small and not statistically reliable.

- **Q14 × Q11 (Confidence in choosing correct sites × Trust in social media)**

The alternative hypothesis (**$H_1$**) was **not accepted**. No statistically significant association was found between trust in social media and confidence in choosing credible online vaccine information, $\chi^2(1, N = 103) = 1.00$, $p = .383$. This suggests that parental confidence in selecting information sources was independent of their trust in social media.

- **Q8 × Q11 (Decision not to vaccinate × Trust in social media)**

The alternative hypothesis (**$H_1$**) was **accepted**. A statistically significant association was observed between trust in social media and parents' decision not to vaccinate, $\chi^2(1, N = 107) = 26.63$, $p = .005$ (Fisher's Exact Test), with a moderate–strong effect. Parents with higher trust in social media were significantly more likely to allow online information to dissuade them from vaccination.

#### 4.2.2.5 Kruskal–Wallis: Education and Digital Literacy

To ensure key concepts of the conceptual framework were tested, a Kruskal–Wallis test was performed between education and digital literacy to see if the education levels played a role in levels of digital literacy. The results for the question "I find it easy to identify which online information I can trust for my child" can be assumed as the level of digital literacy in their ability to find trustworthy information. The results from Figure 9 showed that

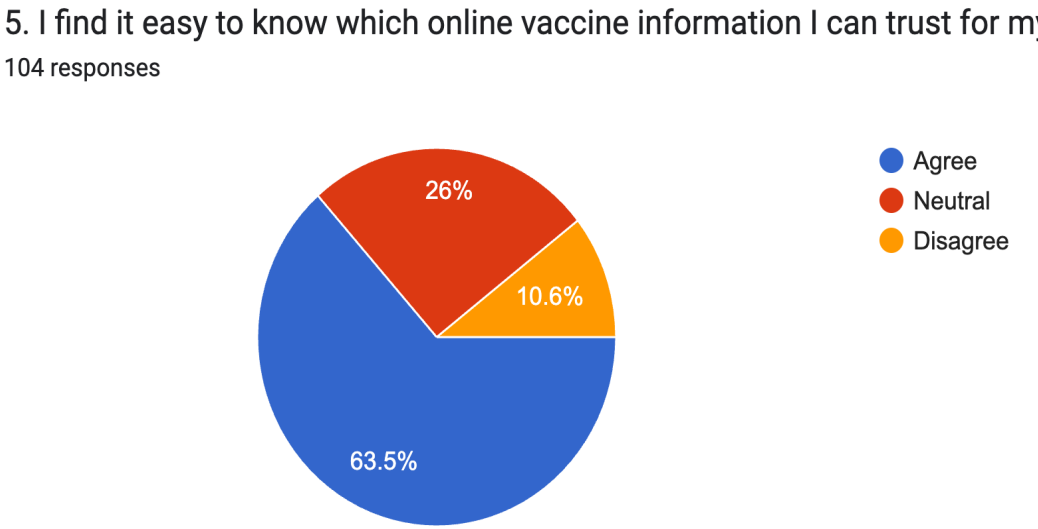



*Figure 12:Information on the ease of finding trustworthy online information (Q5)*

63.5% of the respondents found it easy to find trustworthy information, while 26% found it difficult to identify trustworthy sites. Further, to evaluate the influence of education on the easy-to-find information, a Kruskal-Wallis test was performed. Table 4 shows education levels with associated digital literacy expressed as mean ranks. The higher the mean rank, the greater the digital literacy.

| Education Level | N | Median Digital Literacy | Mean Rank |
|---|---|---|---|
| Level 2 (Junior Cert) | 1 | 1.0 | 34.0 |
| Level 4 (Leaving Cert) | 2 | 1.5 | 53.3 |
| Level 6 (Bachelor's) | 41 | 1.0 | 59.1 |
| Level 7 (Postgraduate) | 58 | 1.0 | 46.4 |

*Table 4: Education level and digital literacy (Q21 vs Q5)*

Test

Null hypothesis $H_o$: All medians are equal

Alternative hypothesis $H_1$: At least one median is different

| Method | DF | H-Value | P-Value |
|---|---|---|---|
| Not adjusted for ties | 3 | 4.8 | 0.187 |
| Adjusted for ties | 3 | 6.85 | 0.077 |

*Table 5: Kruskal-Wallis test between Digital literacy and Education*

**Test result:** H(3) = 6.85, p = 0.077

Table 5 represents Kruskal–Wallis testing, which revealed no statistically significant differences in digital literacy across education levels (H = 6.85, p = 0.077), though there was a near-significant trend. The analysis further showed that parents with Bachelor's degrees (mean rank

= 59.1) rated higher in digital literacy than postgraduates (mean rank = 46.4), contradicting assumptions of a linear positive relationship. The test, though, showed positive trends that cannot be accounted for as significantly contributing to the small size of the study.

### 4.3 Discussion

The results of this study provide valuable insights into how parents in Ireland perceive digital health information sources and how these perceptions influence both vaccine confidence and, by extension, national vaccination coverage. In line with findings by Marron et al. (2023), parents showed a clear preference for official health websites such as the HSE/NHS and advice from healthcare professionals as the most trusted sources of vaccine information. This reliance on authoritative intermediaries highlights the importance of institutional expertise, even within a digital environment saturated with diverse content of varying quality.

The inferential analysis further revealed the complexity of these perceptions. Spearman's correlation indicated that parents who engaged with official digital sources were not only more likely to read vaccine-related stories that promoted confidence ($\rho = 0.273$, $p = 0.005$), but they also agreed that vaccine content could be written in ways that benefit pharmaceutical companies ($\rho = 0.222$, $p = 0.024$). This suggests that trust in official information coexists with scepticism toward industry motives, echoing Wilson & Wiysonge (2020), who highlighted that confidence in scientific expertise often overlaps with concerns about corporate influence.

Conversely, reliance on unofficial digital sources showed a negative association with vaccination decisions ($\rho = –0.197$, $p = 0.045$) and a strong inverse correlation with engagement in official sources ($\rho = –0.817$, $p < 0.001$). Trust in social media was also significantly associated with parents' decision not to vaccinate ($\chi^2(1, N = 107) = 26.63$, $p = .005$), underscoring the risks posed by informal networks where misinformation is widespread. These findings align with international evidence that unregulated online content can undermine vaccine confidence (Loomba et al., 2021; ECDC, 2024).

The role of digital narratives was also evident. Parents who believed that online content included misleading information were more likely to report that stories influenced their vaccine confidence ($\rho = 0.247$, $p = 0.012$). A similar pattern was observed among those exposed to

opposing views online, who were more likely to state that online information shaped their vaccination behaviour (ρ = 0.259, p = 0.009). Importantly, parents who reported that stories shaped their vaccine confidence also reported that online information influenced their vaccination decisions (ρ = 0.258, p = 0.009). These results reinforce Loomba et al. (2021), who emphasised that emotionally charged, story-based appeals can outweigh factual information in vaccine decision-making.

Overall, these findings suggest that while Irish parents are digitally literate and discerning, vaccine confidence remains vulnerable to narrative-driven content from unofficial sources. Public health communication strategies must therefore move beyond reliance on factual dissemination alone. To strengthen vaccine confidence, campaigns should incorporate emotionally engaging narratives that can compete with misinformation, while preserving scientific accuracy and credibility.

### 4.4 Objective 2: Identify commonly used digital platforms and assess their perceived trustworthiness and impact

#### 4.4.1 Descriptive Statistics

#### 4.4.1.1 Sources of vaccine information

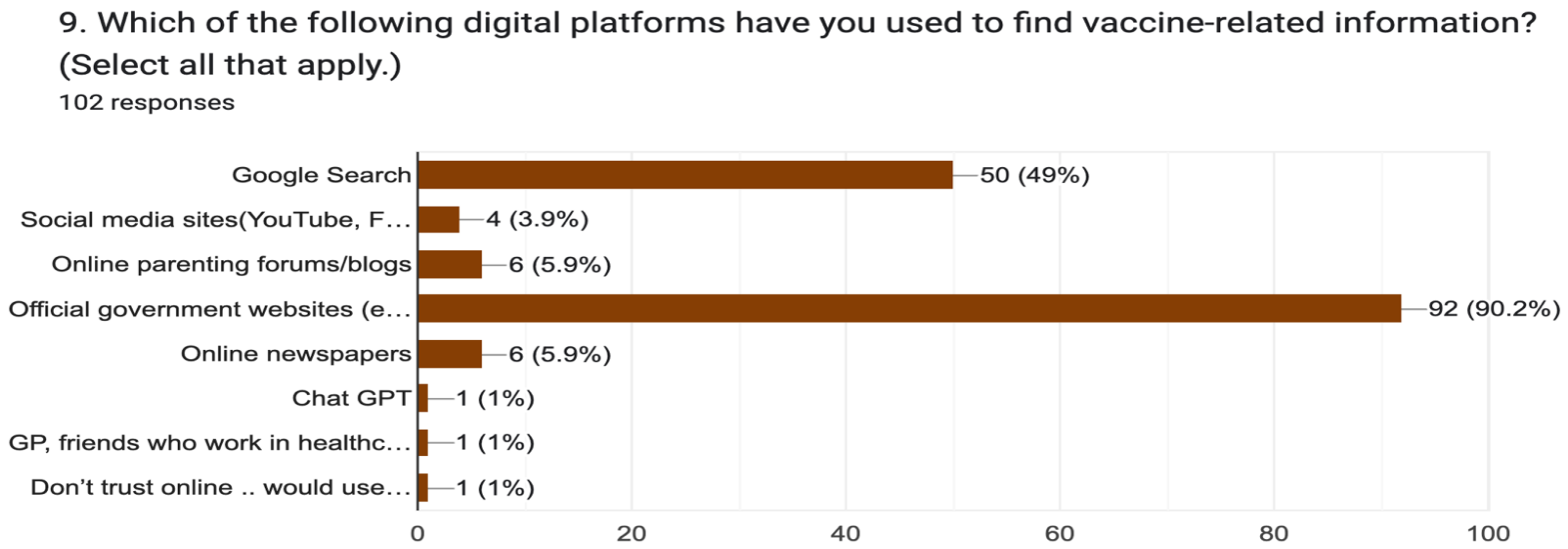



*Figure 13: Platforms used for vaccine information (Q9)*

As shown in Figure 10**,** official government websites were the most frequently used source of vaccine-related information (n = 92, 90.2%**),** followed by Google Search (n = 50, 49%**).** In contrast, usage of social media platforms such as YouTube or Facebook was limited (n = 4**,** 3.9**%**), while online parenting forums/blogs (n = 6, 5.9%**)** and online newspapers (n = 6, 5.9%) were also rarely cited. Notably, only one respondent each mentioned ChatGPT (n = 1, 1%**)** and a healthcare professional friend (n = 1, 1**%**), underscoring the very limited but emerging role of artificial intelligence tools and informal professional networks within the digital vaccine information landscape

Official websites were by far the most common source (90.2%), while peer-to-peer forums and social media were rarely used (<6%). This mirrors Hwang & Shah (2019), who found structured portals associated with higher vaccine adherence.

#### 4.4.1.2 Trust in digital platforms

| Platform | Frequency | Percentage (%) |
|---|---|---|
| Official health websites | 88 | 83.8 |
| Google Search | 7 | 6.9 |
| Social media | 5 | 4.9 |
| Online newspapers | 3 | 2.9 |
| Parenting forums, WHO, WebMD, friends | <2 each | — |

*Table 6: Trust in digital platforms (N = 105)*

Table 6 highlights that official health websites were overwhelmingly the most trusted source (83.8%). Google Search (6.9%), social media (4.9%), and online newspapers (2.9%) were trusted by only a small minority. Parenting forums, WHO, WebMD, and friends were mentioned occasionally, but each by fewer than 2% of respondents. This reveals a pronounced divergence between high use and low trust in Google, compared with consistently high trust in official sources.

### 4.4.2 Inferential Statistic

#### 4.4.2.1 Official digital platforms vs Unofficial digital platforms use

| Source Type | Mean | SD |
|---|---|---|
| Official digital | 0.89 | 0.31 |
| Unofficial digital | 0.59 | 0.49 |

*Table 7: Use of official vs unofficial sources*

a) **Table 7 shows mean engagement with** official platforms **was 0.89 (SD = 0.31), compared with 0.59 (SD = 0.49) for** unofficial platforms**. This reflects a higher and more consistent reliance on official sources, while use of unofficial platforms varied considerably between respondents.**

#### 4.4.2.2 Official digital platforms vs Unofficial digital platform trust

| Source Type | Mean | SD |
|---|---|---|
| Official digital | 0.84 | 0.37 |
| Unofficial digital | 0.11 | 0.32 |

*Table 8: Trust in official vs unofficial sources*

Table 8 demonstrates that the mean trust score for official platforms was **0.84 (SD = 0.37)**, indicating that the majority of parents placed their trust in official sites. In contrast, the mean trust in unofficial platforms was much lower at **0.11 (SD = 0.32)**, showing that very few parents regarded these sources as trustworthy.

#### 4.4.2.3 Use Vs Trust in digital platforms

The analysis compared parents' reported usage of digital platforms (Q9) with their trust in these same platforms (Q10). To examine whether significant differences existed between usage and trust for each source, McNemar's test was applied. In addition, a Chi-squared test was conducted to assess the overall association between type of digital source and parental trust. For clarity, digital sources were further categorised into official platforms (e.g., HSE/NHS websites, WHO) and unofficial platforms (e.g., social media, parenting blogs, online forums), allowing for a more structured evaluation of how usage patterns align with perceived credibility.

#### 4.4.2.4 Evaluating individual platforms: Trust vs Use

| Digital Source | Estimated Difference | 95% CI (Lower, Upper) | p-value |
|---|---|---|---|
| Google Search | -0.4206 | (-0.5304, -0.3108) | 0 |
| Social Media | 0 | (-0.0542, 0.0542) | 1 |
| Official Government Sites | 0.0561 | (-0.0258, 0.1379) | 0.21 |
| WHO Website | 0.00935 | (-0.01823, 0.03692) | 1 |
| Online News/Media | -0.0374 | (-0.1042, 0.0295) | 0.344 |

*Table 9: McNemar's Test among individual platforms evaluating use vs trust*

Based on McNemar's test in Table 9, the following key differences were observed:

- Google Search**: S**ignificant gap between high use (49%) and low trust (7%), $p < 0.001$.
- Social Media**:** Both use and trust were very low, with no significant difference ($p = 1.00$).
- Official Websites**:** Both highly used and trusted; no significant gap ($p = 0.21$**).**
- WHO and Online News/Media: Minor, non-significant differences in use vs trust.

#### 4.4.2.5 Evaluating the association between official platform use vs trust

| | Chi-Square | DF | P-Value |
|---|---|---|---|
| Pearson | 70.133 | 1 | 0 |
| Likelihood Ratio | 54.033 | 1 | 0 |

*10: Chi-square cross-tabulation for official vs unofficial digital platform usage*

The Chi-square result from Table 10 suggests that there is a statistically significant association between OfficialDigital use in Q9 and OfficialDigital trust in Q10 ($p < 0.001$). $\chi^2(1) = 70.13$, $p < 0.001$. This indicated a strong association between use and trust. Parents who reported using official sources also trusted them greatly.

### 4.5 Discussion

The findings of this objective highlight how Irish parents engage with and place trust in digital platforms for vaccine-related information. Consistent with Marron et al. (2023), parents reported a strong reliance on official health websites, with 92 of 102 respondents (90.2%) identifying them as their most frequently used source and 88 of 105 (83.8%) citing them as the most trusted. This pattern reinforces insights from Objective 1, underscoring the importance of authoritative health portals such as the HSE and NHS in supporting vaccine confidence.

In contrast, Google Search emerged as the most widely used unofficial platform, reported by 50 respondents (49%), yet it was trusted by only 7 respondents (6.9%). This striking use–trust gap of 42.1 percentage points suggests that while parents turn to search engines for quick access to information, they remain sceptical of the credibility of the results. This aligns with Wilson & Wiysonge (2020), who warned of the influence of unverified digital content in shaping public health decisions.

Trust in social media platforms (5 respondents, 4.9%), online newspapers (3 respondents, 2.9%), and parenting forums (≈6 respondents, 5.9%) was very limited. This echoes international evidence (Loomba et al., 2021; ECDC, 2024) linking informal online networks and media

channels to the spread of misinformation and declining vaccine confidence. The very low usage and trust in these sources in the present study also suggest that Irish parents exercise selective caution by prioritising official platforms over informal ones.

The inferential analysis reinforced this pattern. Mean engagement with official platforms was M = 0.89, SD = 0.31, compared with M = 0.59, SD = 0.49 for unofficial platforms (Table 7). Similarly, mean trust was substantially higher for official platforms (M = 0.84, SD = 0.37) compared with unofficial platforms (M = 0.11, SD = 0.32) (Table 8), indicating minimal reliance on non-authoritative sources.

McNemar's test revealed a significant gap between use and trust for Google Search (estimated difference = –0.421, 95% CI [–0.530, –0.311], $p < 0.001$), confirming that it is widely used but poorly trusted. No significant differences were found for official websites ($p = 0.21$), social media ($p = 1.00$), or other platforms (Table 9). Furthermore, the chi-square test demonstrated a strong association between use and trust of official platforms, $\chi^2(1, N = 105) = 70.13$, $p < 0.001$, showing that parents who used official digital sources were also highly likely to trust them.

Taken together, these findings suggest that Irish parents demonstrate discernment in evaluating digital health information, showing a clear preference for institutional expertise while remaining cautious of unofficial sources. At the same time, the reliance on Google Search (49% use vs 6.9% trust) despite low credibility underscores a potential vulnerability, as parents may still encounter misinformation before validating content against official websites. This points to a need for optimising the visibility of official vaccine-related information in search engines, ensuring that credible health content is prioritised in parents' information-seeking journeys.

### 4.6 Objective 3: Perceived risk and concerns of digital health online resources

#### 4.6.1 Perceived Risks and Concerns of Digital Health Resources

The analysis of Questions 7 to 17 provided valuable insights into how parents perceive the risks associated with digital health information sources. Findings from Q7 "Some vaccine information can be wrong or misleading" indicated that 77% of parents believed vaccine

information online can be misleading (Median = 1, SD = 0.77), as shown in Figure 11. This strong skew towards agreement reflects widespread scepticism about the reliability of online content. Such concerns are consistent with McLean (2023), who argued that unverified opinions and disproportionate visibility in digital environments exacerbate confusion and reduce confidence in vaccines. The results, therefore, highlight that misinformation remains a central driver of parental concern in the Irish context.

In Q13, “I often come across online vaccine information that has opposite views about my child’s vaccines”, which explored exposure to contradictory views, 48% of respondents agreed that online vaccine information frequently presents opposing perspectives (Mean = 1.79, SD = 0.85). Figure 15 shows the distribution across all three Likert responses; however, it suggests variability in how parents experience and process these contradictions. This aligns with findings from the European Centre for Disease Prevention and Control (2024), which emphasised how algorithm-driven content often exposes users to emotionally charged or polarised narratives. Such inconsistency in information can heighten parental uncertainty, fostering indecision and, in some cases, vaccine hesitancy.

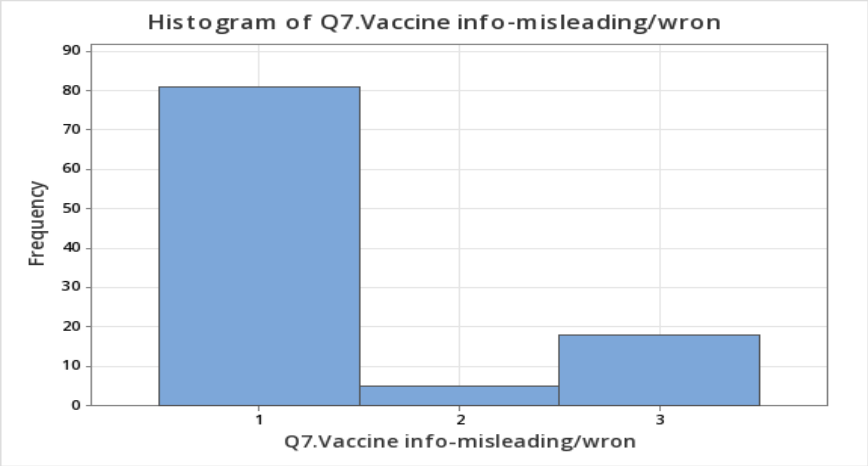



*Figure 14: Histogram showing results of "Vaccine information can be wrong or misleading"(Q7); Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

By contrast, Q15 ("Vaccine content is written in a way that benefits pharmaceutical companies") revealed a more divided response, with a Mean = 1.99 and SD = 0.86, close to a 50–50 split between agreement and disagreement. This indicates ambivalence among parents: while some perceive vaccine content as biased toward pharmaceutical interests, others reject such claims. Tonsaker et al. (2014) emphasised that source credibility and transparency are pivotal in shaping whether online health information is trusted or dismissed. Within the Irish context, this reflects cautious engagement rather than outright distrust, with parents remaining alert to potential commercial influence in vaccine messaging.

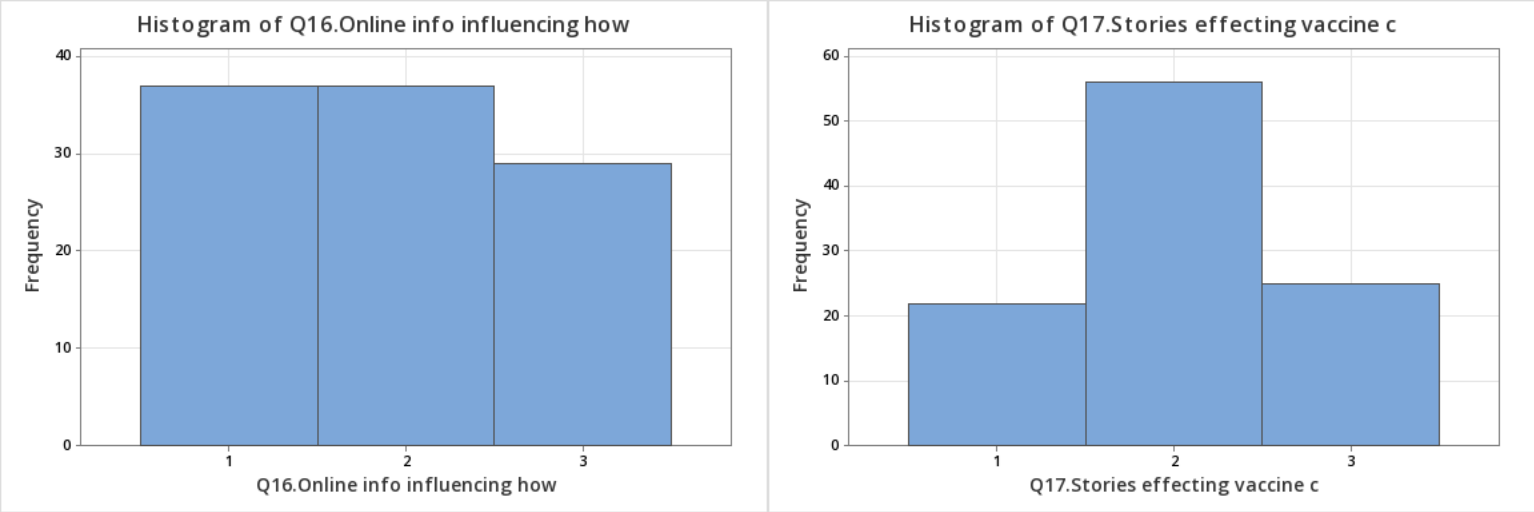



*Figure 15: Histogram showing results of "What I read online about my child's vaccines influences how I think about side effects".(Q16); Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

*Figure 16: Histogram showing results of "Emotional stories I read online affect my thoughts about giving vaccines to my child" (Q17) Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

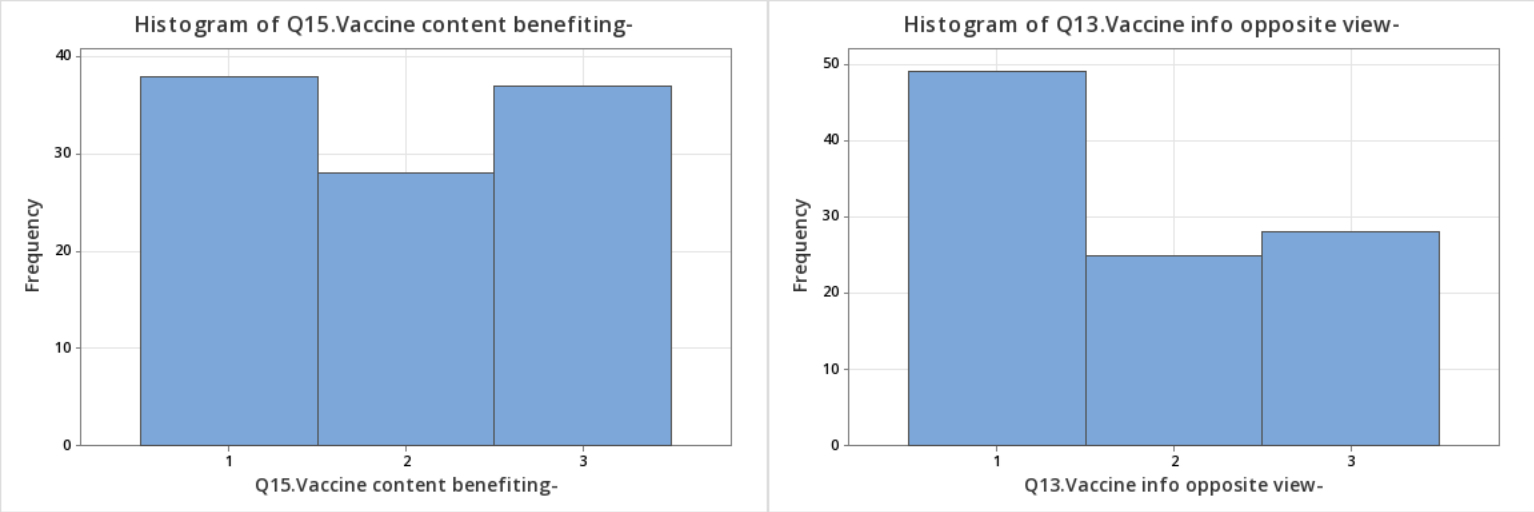



*Figure 17: Histogram showing results of "I believe some online vaccine information is written in a way that benefits pharmaceutical companies"(Q15). Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

*Figure 18: Histogram showing results of "I often come across online vaccine information that has opposite views about my child's vaccines". (Q13). Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

Turning to online narratives, Figure 12 shows that Q16 ("Online information influencing vaccination behaviour") reported a balanced distribution (Mean = 1.92, SD = 0.80; Median = 2, Neutral), indicating that while many parents acknowledge being influenced, a considerable proportion report little to no effect. This implies that not all parents were strongly influenced by how they perceived vaccine side-effects online resources, especially unofficial resources like social media, with intensified and total reports of adverse events, which makes memorable and emotional impact than factual information.

In contrast, Q17 (“Stories affecting confidence”) revealed a stronger emotional dimension: 54% of parents agreed, with a Mean = 2.03 and SD = 0.68, that vaccine-related stories they encountered online shaped their confidence. (Figure 13) The tilt towards agreement underscores that emotionally charged, story-driven narratives resonate more strongly than factual information alone. Rodrigues et al. (2023) similarly observed that narrative-driven misinformation during the COVID-19 pandemic exerted greater influence on parental attitudes than factual rebuttals, reinforcing the role of stories as persuasive drivers of hesitancy

These results demonstrate that Irish parents’ concerns about digital vaccine information are shaped by three interlinked risks: distrust of online accuracy, exposure to contradictory content, and vulnerability to emotionally resonant narratives. The findings underscore that vaccine confidence is fragile when confronted with misinformation and narrative-driven content. This reflects the wider international literature (McLean, 2023; ECDC, 2024; Rodrigues et al., 2023), which warns that digital health environments often destabilise confidence by prioritising emotional engagement over factual clarity.

Addressing these risks requires more than disseminating information through official channels. Public health communication strategies must strengthen digital literacy, foster critical evaluation skills, and embed empathetic, narrative-based approaches that compete with the persuasive power of misinformation while maintaining transparency and credibility.

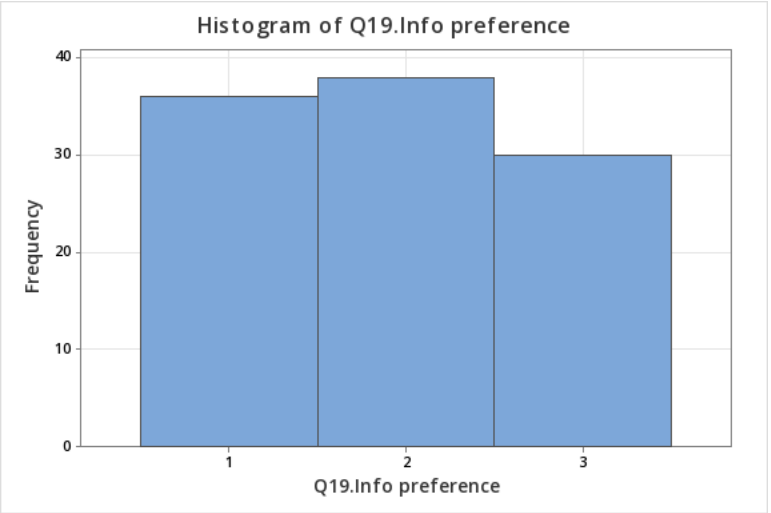
### 4.7 Objective 4. Pharmaceutical Companies and Digital Communication

Responses to Q18, Q19, and Q20 provide valuable insights into how parents perceive the role of pharmaceutical companies in digital vaccine communication.

For Q18, which asked whether parents would trust vaccine information more if pharmaceutical companies used official platforms such as the HSE or WHO, the results, as shown in Figure 18, showed a mean of 1.66 (SD = 0.87), with 60.6% of respondents agreeing. This indicates that parents are more likely to accept pharmaceutical company information when it is endorsed and disseminated through credible intermediaries. Such findings mirror those of Leask et al. (2012), who highlighted the importance of public health authorities in bridging

communication gaps between industry and the public. Within the Irish context, this reinforces that parents value pharmaceutical expertise but place greater trust in institutional bodies such as the HSE, WHO, or NHS to deliver vaccine-related information.

Q19 examined parental preferences for communication format, specifically videos or infographics versus text-based articles. The results shown in Figure 16 yielded a mean of 1.94 (SD = 0.80), showing that responses were nearly evenly distributed: about one-third agreed with a preference for multimedia formats, one-third disagreed, and the remainder were neutral. This variability suggests that while visual content may enhance accessibility and engagement, it is not universally preferred. Parents with higher levels of digital literacy may continue to favour text-based resources, perceiving them as more comprehensive and transparent. This aligns with Tonsaker et al. (2014), who argued that credibility and perceived usefulness of digital health content depend heavily on presentation format and transparency of source.



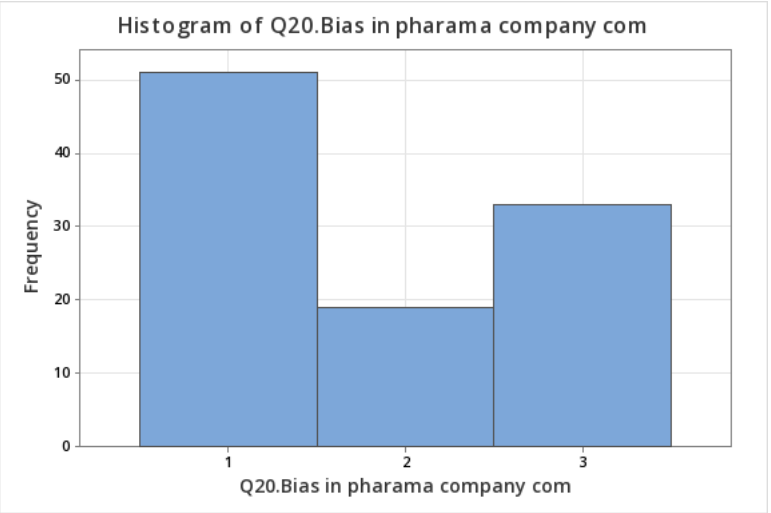




*Figure 19: Histogram showing results of "Preferences for videos or infographics versus text-based articles"(Q19**).** Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

*Figure 20: Histogram showing results of "Concerns about bias in pharmaceutical communications"(Q20). Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

Finally, Q20 investigated concerns about bias in pharmaceutical communications. The findings in Figure 17 showed a mean of 1.83 (SD = 0.89), with 50% of respondents agreeing that information from pharmaceutical companies may not always be fair or balanced. This scepticism echoes prior research: Finnegan et al. (2018) highlighted persistent concerns about commercial bias in health communications, while Matthews et al. (2024) noted that post-COVID, public trust in pharmaceutical companies has been further eroded by perceptions of profit-driven motives and lack of transparency. This highlights an enduring challenge for pharmaceutical companies in acting as direct communicators of vaccine information.

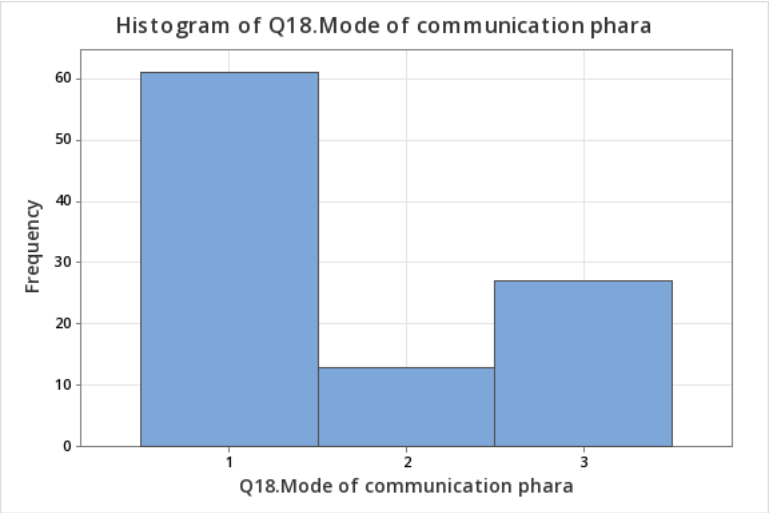



*Figure 21: Histogram showing results of "Mode of communication of information using **official platforms such as HSE or WHO**"(Q18). Likert scale readings(Agree=1, Neutral=2, Disagree=3)*

In conclusion, these results highlight a fundamental tension. While parents recognise the expertise of pharmaceutical companies, they prefer information to be mediated through trusted public health bodies (e.g., HSE, WHO, NHS). Furthermore, although communication style matters, multimedia approaches such as videos or infographics alone are insufficient to overcome scepticism about source credibility. The findings therefore suggest that pharmaceutical companies should adopt a supportive rather than primary role, working collaboratively with

public health authorities to promote transparent, empathetic, and emotionally resonant vaccine communication. This approach not only ensures credibility but also aligns with parents' demonstrated preferences for trusted, authoritative intermediaries.

# CHAPTER 5: CONCLUSION

This chapter presents the conclusions of the study, integrating the key findings of the analysis with the research objectives and questions outlined at the outset. It discusses how the results address the research gaps identified in the literature review, compares them with existing evidence, and acknowledges the study's limitations. The chapter concludes by providing practical recommendations for pharmaceutical companies and public health stakeholders to strengthen vaccine confidence and improve national vaccination coverage, while also outlining potential avenues for future research.

This study aimed to examine parental perceptions of digital health information sources and their influence on vaccine confidence in Ireland. By addressing key gaps identified in the literature review, the research offered an Ireland-specific perspective on how digital platforms shape vaccine-related decision-making. In terms of data collection, of the 104 participants who participated in the study, three participants decided not to participate in the study. Missing data were minimal (≤ 3 responses per item) and handled listwise during statistical testing. When assumptions were not met (e.g., expected cell counts < 5 in Chi-square analysis), robust alternatives such as Fisher's exact test were utilised. Overall, these measures provide confidence that the dataset is both reliable and valid, offering a solid foundation for examining how digital health information influences vaccine confidence among parents in Ireland.

Summarising the primary objective of the study, Irish parents demonstrated consistently high trust in official health websites, whereas social media attracted very low levels of trust. Exposure to misleading or contradictory information was strongly correlated with reduced vaccine confidence, consistent with concerns raised in the wider literature (Wilson & Wiysonge, 2020; Loomba et al., 2021). Among the different platforms used, official websites such as the HSE and NHS were by far the most frequently accessed (90.2%) and the most trusted (83.8%). Google Search emerged as the second most commonly used platform (49%), yet only 6.9% of parents trusted it, highlighting a significant use–trust gap of more than 40%. Social media, online newspapers, and parenting forums were trusted by fewer than 5% of respondents.

The study further explored perceived risks and concerns associated with online vaccine information. A majority of parents (77%) agreed that vaccine information online can be misleading, while nearly half reported encountering contradictory content. Emotional narratives also

played an influential role, with 54% of parents acknowledging that online stories had affected their vaccine confidence. Together, these findings confirm that digital health information exerts a significant influence over vaccine-related attitudes and decisions.

With regard to pharmaceutical communication, findings revealed a high degree of scepticism. Half of respondents (50%) believed that pharmaceutical company communications were biased and not entirely balanced, reflecting ongoing concerns about commercial motives (Matthews et al., 2024). However, 60.6% of parents indicated they would be more likely to trust such information if it were disseminated through official intermediaries such as the HSE or WHO. This suggests that parents prefer pharmaceutical companies to act as secondary sources of information, while primary care providers and official health portals remain the preferred and most trusted sources. Finally, when asked about format preferences, parents reported near-equal preference for multimedia resources (e.g., videos or infographics) and traditional text-based materials, underscoring the need for diverse communication strategies. Overall, the study confirms that parents in Ireland clearly distinguish between official and unofficial digital platforms, placing strong trust in official health websites while exercising caution toward other sources.

About the conceptual framework, the study successfully captured all key constructs: vaccine hesitancy, interpretation and decision-making, vaccine confidence, and perceived trust. These were mediated by misinformation, emotion, and digital health literacy. As anticipated, parents with higher digital literacy favoured official portals, and trust in official sites translated into higher vaccine confidence. Conversely, reliance on social media correlated with lower vaccine confidence and greater hesitancy.

Several limitations must be acknowledged. First, while one respondent mentioned ChatGPT as an information source, the survey design did not explicitly include AI tools, representing a missed opportunity to examine the evolving role of artificial intelligence in parental health information-seeking. Second, the calculated sample size (n = 150) was not reached, with 104 responses collected, of which three were incomplete. This smaller sample limits the generalisability of the findings. Finally, while AI (ChatGPT) was consciously used in this study to cross-check the validity of outputs from Minitab, ensure consistency in statistical test interpretation, and verify response trends, its role was analytical rather than as a studied platform.

The implications for pharmaceutical communication are clear. Pharmaceutical companies are more likely to be effective as secondary mediators, working through trusted intermediaries such as healthcare providers and public health authorities, rather than as direct communicators. Parents consistently reported higher trust in information from primary care providers compared with information directly disseminated by pharmaceutical companies. Scepticism persists regarding the influence of commercial motives, underscoring the need for transparent, clear, and accessible communication. Official health portals should serve as the primary channels for dissemination, with search engines optimised to prioritise credible, government-backed sources. Since misinformation often circulates with stronger emotional impact than factual information, strategies must also consider emotional resonance. Finally, AI holds potential for mitigating echo chambers—where individuals' views are continually reinforced by repetitive content—by promoting exposure to balanced and credible vaccine information.

Looking ahead, future research should explicitly include AI-driven platforms such as ChatGPT within the range of digital sources studied. This would ensure the evolving role of AI in shaping health information-seeking behaviours is adequately captured, particularly as generative AI tools are becoming increasingly integrated into everyday parental decision-making. Moreover, comparative studies examining Irish parental perceptions before and after the COVID-19 pandemic would be valuable. Such research could clarify whether the influence of digital media on vaccine confidence has intensified post-pandemic, providing insights into the long-term impact of digital communication environments on vaccine-related behaviours.

In closing, this study provides valuable Ireland-specific evidence on how digital health information sources influence parental vaccine confidence. By distinguishing between official and unofficial digital platforms and highlighting the emotional and cognitive risks posed by digital narratives, it advances understanding of how online platforms shape parental opinions in today's complex information environment. The findings underscore the challenge parents face in identifying high-quality information while navigating biases and misinformation. Importantly, the study also lays a foundation for future research on the evolving role of AI in shaping vaccine confidence. Ultimately, the results reinforce that vaccine confidence is a fragile construct one that requires a coordinated approach to strengthen acceptance and, in turn, improve national vaccine coverage.

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# CHAPTER 7: APPENDIX

**Annexure1**

**Survey Questions**

**1. Do you understand the study?**

[ ] Yes [ ] No

**2. Do you consent to take part in this survey?**

[ ] Yes [ ] No

**3. What is your child's age (in months)?**

- 0–12 months (0–1 year)

- 13–24 months (1.1–2 years)

- 25–36 months (2.1–3 years)

- 37–48 months (3.1–4 years)

- 49–60 months (4.1–5 years)

**4. Where do you usually get information about vaccines for your child? (Select all that apply.)**

- Google Search

- Social media sites (YouTube, Facebook, Instagram, WhatsApp)

- Parenting blogs or forums

- Official websites like HSE or NHS

- World Health Organization (WHO) website

- Advice from healthcare professionals (e.g., GP, nurse, pharmacist)

- Online newspapers or media

- Friends or family

- Other (please specify): _____

**5. I find it easy to know which online vaccine information I can trust for my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**6. Reading stories and discussions from online parents' groups has helped me feel more confident about vaccinating my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**7. Some vaccine information online can be wrong or misleading.**

[ ] Agree [ ] Neutral [ ] Disagree

**8. Information I found online has made me decide not to vaccinate my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**9. Which of the following digital platforms have you used to find vaccine-related**

information? (Select all that apply)

- Google Search

- Social media sites(YouTube, Facebook, Instagram, WhatsApp)

- Online parenting forums/blogs

- Official government websites (e.g., HSE, NHS)

- Online newspapers

- Other (please specify): _____

**10. If you're unsure about vaccine information, which online source do you trust the most to give you accurate answers? (Select one)**

-Google Search

-Social media sites(YouTube, Facebook, Instagram, WhatsApp)

- Online parenting forums/blogs

- Official government websites (e.g., HSE, NHS)

- Online newspapers

- Other (please specify): _____

**11. I trust vaccine information from social media platforms when deciding what's best for my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**12. I trust vaccine information from official health websites when deciding what's best for my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**13. I often come across online vaccine information that has opposite views about my child's vaccines.**

[ ] Agree [ ] Neutral [ ] Disagree

**14. I feel confident about which websites give the right information about my child's**

vaccines.

[ ] Agree [ ] Neutral [ ] Disagree

**15. I believe some online vaccine information is written in a way that benefits pharmaceutical companies.**

[ ] Agree [ ] Neutral [ ] Disagree

**16. What I read online about vaccines affects how I think about side effects.**

[ ] Agree [ ] Neutral [ ] Disagree

**17. Emotional stories I read online affect my thoughts about giving vaccines to my child.**

[ ] Agree [ ] Neutral [ ] Disagree

**18. I would trust vaccine information more if pharmaceutical companies used official platforms (e.g., HSE, WHO) to share it.**

[ ] Agree [ ] Neutral [ ] Disagree

**19. I find it easier to trust videos or infographics from pharmaceutical companies than long text-based articles.**

[ ] Agree [ ] Neutral [ ] Disagree

**20. I sometimes worry that vaccine information from pharmaceutical companies may not be completely fair or balanced.**

[ ] Agree [ ] Neutral [ ] Disagree

**21. What is your highest level of education? (Based on the Irish education system)**

- Primary education

- Junior Certificate (or equivalent)

- Leaving Certificate (or equivalent)

- Post-Leaving Certificate course (e.g., QQI Level 5/6, FETAC)

- Apprenticeship or trade qualification

- Bachelor’s degree (Level 7/8)

- Postgraduate degree (master’s or PhD)

- Other (please specify)