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Factors associated with parental childhood vaccination intention and expertise: A Finnish population study on influenza and human papillomavirus (HPV) vaccines

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"طَلَبُ الْعِلْمِ فَرِيضَةٌ عَلَى كُلِّ مُسْلِمٍ"
"Seeking knowledge is an obligation upon every Muslim."
– Prophet Muhammad (PBUH)

"Aqoon la'aan waa iftiin la'aan."
"The absence of knowledge is the absence of light"
– A Somali proverb

Abstract

Vaccinations are, after clean water, the most effective public health intervention in the world in decreasing morbidity and mortality. Vaccinations have eradicated or nearly eradicated many diseases globally. However, vaccine hesitancy undermines the success of vaccination programmes, posing a significant public health threat. The World Health Organization (WHO) named vaccine hesitancy as one of ten global threats to health in 2019.

In Finland, childhood vaccinations are voluntary, free, and part of the National Vaccination Programme (NVP). Although vaccination coverage is generally high, significant geographical and vaccine-specific differences exist. Vaccination coverages in Eastern Finland are traditionally high, while coverages in Western Finland fall below the national average for all vaccines. The Human Papillomavirus (HPV) and influenza vaccines continue to have suboptimal uptake.

HPV vaccination protects against cancers and serious harms caused by the virus. HPV is linked to many genital cancers – such as cervical, anal, penile, and vaginal cancers – as well as head and neck cancers. The HPV vaccine was introduced to the Finnish NVP in 2013 for girls and in 2020 for boys. The national first-dose coverage for girls born in 2011 was 72%, ranging from 82% in Eastern Finland to 62% in Southern Finland. The WHO and the European Commission have announced a call for action to eliminate cervical cancer by having 90% of girls fully vaccinated against HPV by 2030. Finland is currently falling short of that goal.

Influenza vaccination is offered to children under 7 years of age, with coverage monitored in two age groups: 6-35 months and 3-6 years. For 2023-2024, national coverage was 38% for the younger group and 28% for the older group, with significant regional variations. Low influenza vaccination coverage has broader societal impacts, including school and work absenteeism, hospitalisations, and deaths.

Parental attitudes towards HPV vaccinations have been previously studied in Finland, but little research exists on factors influencing parental vaccination intention. Similarly, there is limited knowledge on who parents consider vaccine experts. Finland is a country where science and scientific institutions are generally well-trusted. However, public health experts have been contested throughout time. More recently, during the COVID-19 pandemic, epidemiologists and other public health experts had to advocate for their expertise. Previously, expertise has been studied from sociological and philosophical perspectives, among other fields. Understanding the factors associated with parental vaccination intention of HPV and influenza, and who parents qualify as vaccine experts, is crucial to understanding vaccination behaviour and reducing the public health burden these viruses cause.

This study aimed to first examine factors associated with parental HPV and influenza vaccination intention and the realisation of the expressed intention, and to explore who parents qualify as a vaccine expert. The study was conducted using an online survey with personal enrolment credentials for each parent. The target areas were chosen to include both high and low vaccine coverage municipalities. After specifying the target municipalities, parents and their children were randomly extracted from the Population Information System (PIS). Children's vaccination status was extracted from the National Vaccination Register (NVR) using their unique personal identity code. In addition to understanding parental preferences on vaccine expertise, this study explores who parents qualify as an expert – what qualities should a vaccine expert have?

We found that parental HPV vaccination intention was associated with adherence to the NVP, parent's mother tongue and trust in official information sources. Realised vaccination uptake was higher than the parental intention: 83% of parents indicated that their daughter either will be or has been vaccinated against HPV, while 88% of daughters received their HPV vaccination. The most reported reasons for non-vaccination were the fear of adverse effects and having heard or read something negative about the vaccine. No significant geographical differences in HPV vaccination intention were identified.

Influenza vaccination intention was influenced by municipality of residence, maternal education, number of children, trust in official sources, influenza knowledge, changes in attitudes since COVID-19, and adherence to the NVP. While 66% of parents intended to have their child vaccinated, only 51% of children were eventually vaccinated. The most reported reason for not having one's child vaccinated against influenza was vaccination not being offered by the public health nurse.

Parents' perceptions of vaccine expertise highlighted the importance of scientific education, practical experience, emotional control, and support from the scientific community. Vaccine experts were expected to communicate effectively, demonstrate ethical integrity, and remain independent from pharmaceutical companies and politics. Parental preferences were categorised under four main categories: knowledge and expertise, institutional authority, communication and interaction, and ethics and integrity.

This study reveals complex factors influencing parental childhood vaccination intention, while shedding light on the disconnect between expressed intention and actual behaviour. Regional differences in vaccination intention persisted only for influenza vaccines. The results of this study underscore the significant role of public health nurses in the implementation of the NVP. Furthermore, the findings indicate that parents demanded a vaccine expert to have both intrinsic and extrinsic qualities. The results of this thesis help in planning more effective and precise childhood vaccine communication. Understanding the factors influencing vaccination intention may help in controlling future epidemics.

Tiivistelmä

Rokotteet ovat puhtaan veden jälkeen maailman tehokkaimpia sairastuvuuden ja kuolleisuuden vähentäjiä. Rokotteet ovat hävittäneet tai lähes hävittäneet monia tauteja maailmanlaajuisesti. Rokote-epäröinti kuitenkin heikentää rokotusohjelmien menestystä ja muodostaa merkittävän kansanterveydellisen uhan. Maailman terveysjärjestö WHO nimesi rokote-epäröinnin yhdeksi kymmenestä suurimmasta maailmanlaajuisesta terveysuhasta vuonna 2019.

Suomessa lasten rokotukset ovat vapaaehtoisia, maksuttomia ja osa kansallista rokotusohjelmaa. Vaikka rokotuskattavuus on yleisesti korkea, merkittäviä maantieteellisiä ja rokotuskohtaisia eroja esiintyy. Rokotuskattavuus on perinteisesti ollut Itä-Suomessa korkeampi, kun Länsi-Suomessa se jää alle valtakunnallisen keskiarvon kaikissa rokotteissa. HPV- ja influenssarokotusten kattavuus on jatkuvasti tavoiteltua alhaisempi.

HPV-rokote suojaa viruksen aiheuttamilta syövilä ja vakavilta haitoilta. HPV liittyy moniin sukuelinten syöpiin, kuten kohdunkaulan, peräaukon, peniksen ja emättimen syöpiin, sekä pään ja kaulan alueen syöpiin. HPV-rokotetta on tarjottu osana kansallista rokotusohjelmaa tytöille vuodesta 2013 ja pojille vuodesta 2020. Vuonna 2011 syntyneiden tyttöjen ensimmäisen annoksen kattavuus oli 72 %, vaihteluvälin ollessa 82 % Itä-Suomessa ja 62 % eteläisessä Suomessa. WHO ja Euroopan komissio ovat asettaneet tavoitteeksi, että 90 % tytöistä on täysin rokotettu HPV:tä vastaan vuoteen 2030 mennessä. Suomi on tällä hetkellä jäämässä tavoitteesta.

Influenssarokotetta tarjotaan alle 7-vuotiaille lapsille, ja kattavuutta seurataan kahdessa ikäryhmässä: 6–35 kuukauden ikäiset ja 3–6-vuotiaat. Vuosina 2023–2024 kansallinen kattavuus oli nuoremmassa ryhmässä 38 % ja vanhemmassa 28 %, alueellisten erojen ollessa huomattavia. Alhaisella influenssarokotuskattavuudella on laajoja yhteiskunnallisia vaikutuksia, mukaan lukien koulu- ja työpoissaolot, sairaalahoitojaksot ja kuolemat.

Vanhempien asenteita HPV-rokotteen suhteen on tutkittu Suomessa, mutta vanhempien rokotusaikomukseen liittyvistä tekijöistä on niukasti tutkimustietoa. Vanhempien HPV- ja influenssarokotusaikomukseen liittyvien tekijöiden ymmärtäminen on keskeistä näiden tautien aiheuttaman kansanterveydellisen taakan vähentämiseksi.

Suomessa tieteseen ja tiedeinstituutioihin yleisesti luotetaan. Tästä huolimatta kansanterveystieteilijät ovat kohdanneet vastustusta kautta aikojen. COVID-19 pandemian aikana epidemiologit ja monet muut kansanterveysasiantuntijat ovat joutuneet puolustamaan asiantuntemustaan. Aiemmin asiantuntijuutta on tutkittu muun muassa sosiologisista ja filosofisista näkökulmista. Siitä, keitä lasten vanhemmat pitävät rokoteasiantuntijoina, tiedetään kuitenkin vähän.

Tämän tutkimuksen tavoitteena oli tutkia HPV- ja influenssarokotusaikomukseen liittyviä tekijöitä ja aikomuksen toteutumista. Toiseksi tutkimus selvitti, keitä vanhemmat pitävät pätevinä rokoteasiantuntijoina. Tutkimus toteutettiin verkkokyselyllä, ja jokaiselle tutkimukseen valitulle vanhemmalle annettiin henkilökohtainen käyttäjätunnus ja salasana. Tutkimusalueiksi valittiin sekä korkean että matalan rokotekattavuuden kuntia. Tutkimukseen valituilla alueilla asuvat vanhemmat ja heidän lapsensa poimittiin satunnaisesti väestötietojärjestelmästä. Lasten rokotuskattavuus poimittiin kansallisesta rokotusrekisteristä heidän henkilötunnuksensa avulla. Ymmärtääksemme vanhempien mieltymyksiä rokoteasiantuntijuuden suhteen, tässä tutkimuksessa pyrittiin selvittämään, kenet vanhemmat näkevät rokoteasiantuntijana – millaisia ominaisuuksia rokoteasiantuntijalla tulisi olla? Tutkimuksen tulokset lisäävät ymmärrystämme tekijöistä, jotka ovat ratkaisevia vanhempien rokotuspäätöksessä.

Havaitsimme, että vanhempien HPV-rokotusaikomukseen liittyi lasten rokotusohjelman noudattaminen, vanhemman äidinkieli ja luottaminen virallisiin tietolähteisiin. Tulokset osoittivat myös, että rokotuksia annettiin aikomusta enemmän: 83 % vanhemmista ilmoitti, että heidän tyttärensä jo saaneen tai saavan HPV-rokotteen, kun taas 88 % tyttäristä lopulta sai rokotteen. Yleisimmät syyt sille, miksi vanhemmat eivät halunneet HPV-rokotetta tyttärelleen oli haittavaikutusten pelko ja rokotteeseen liittyvien negatiivisten asioiden lukeminen tai kuuleminen. HPV-rokotusaikomuksessa ei havaittu merkittäviä maantieteellisiä eroja.

Influenssarokotusaikomukseen vaikuttivat asuinpaikkakunta, äidin koulutustaso, lasten lukumäärä, virallisiin tietolähteisiin luottaminen, influenssatietämys, rokotusasenteiden muutokset COVID-19 pandemian jälkeen ja lasten rokotusohjelman noudattaminen. Vaikka 66 % vanhemmista aikoi rokotuttaa lapsensa, vain 51 % lapsista lopulta sai rokotteen. Yleisin syy rokottamatta jättämiselle oli se, ettei terveydenhoitaja tarjonnut rokotusta.

Rokoteasiantuntijuutta tutkiessamme havaitsimme, että vanhemmat korostivat tieteellisen koulutuksen, käytännön kokemuksen, tunnehallinnan ja tieteellisen yhteisön tuen tärkeyttä. Rokoteasiantuntijoiden odotettiin olevan hyviä viestijöitä, rehellisiä ja riippumattomia lääkeyhtiöistä ja politiikasta. Vanhempien asiantuntijamieltymykset luokiteltiin neljään pääluokkaan: tietämys ja kokemus, institutionaalinen auktoriteetti, viestintä ja vuorovaikutus, ja eettisyys ja rehellisyys.

Väitöskirjatutkimus osoittaa, että vanhempien rokotusaikomukseen vaikuttavat tekijät ovat moninaisia. Lisäksi tutkimus osoittaa rokotusaikomuksen ja toiminnan välillä olevan eron. Alueellisia eroja rokotusaikomuksessa havaittiin vain influenssarokotteen suhteen. Tulokset korostavat terveydenhoitajien keskeistä roolia kansallisen rokotusohjelman toteuttamisessa. Lisäksi tulokset osoittavat, että vanhemmat vaativat rokoteasiantuntijalta sekä sisäisiä että ulkoisia ominaisuuksia. Tämän väitöskirjan tulokset auttavat suunnittelemaan tehokkaampaa ja täsmällisempää rokotusviestintää. Lisäksi rokotusaikomukseen vaikuttavien tekijöiden ymmärtäminen voi auttaa tulevien epidemioiden hallinnassa.

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Abbreviations

95% CI	95% Confidence Interval
AGW	Anogenital warts
ASIR	Age-standardised Incidence Rate
BCG	Bacillus Calmette-Guérin
CIN	Cervical intraepithelial neoplasia
HA	Haemagglutinin
HPV	Human Papillomavirus
LAIV	Live Attenuated Vaccine
LEEP	Loop electrosurgical excision procedure
MMR	Measles, Mumps, Rubella
NA	Neuraminidase
NASIR	Nordic Age-standardised Incidence Rate
NIDR	National Infectious Diseases Register
NVP	National Vaccination Programme
NVR	National Vaccination Register
OR	Odds Ratio
SAGE	Strategic Advisory Group of Experts
SCC	Squamous cell carcinoma
SCCHN	Squamous cell carcinoma of head and neck
THL	Finnish Institute for Health and Welfare
WHO	World Health Organization

List of original publications

This thesis is based on the following publications:

I Hussein, I., Vänskä, S., Sivelä, J., Leino, T., & Nohynek, H. (2023). Factors associated with parental intention to vaccinate their child against influenza, Finland, February to March 2022: a web-based survey. *Eurosurveillance*, 28(49), 2200828.

II Hussein, I., Vänskä, S., Sivelä, J., Leino, T., & Nohynek, H. (2024). Factors associated with parental Human Papillomavirus (HPV) vaccination intention of daughter: A national survey in Finland. *Vaccine*, 42(3), 701-712.

III Hussein, I., Väliaverronen, E., Nohynek, H., & Lämsä, R. (2025). What makes an expert in childhood vaccinations? Perceptions of parents in Finland. *Vaccine*, 46, 126645.

The publications are referred to in the text by their roman numerals.

1 Introduction

Vaccinations are among of the most important public health interventions in decreasing disease, disability, and death (Andre et al., 2008). Excluding safe water, no other intervention has had such a major impact on mortality reduction (Andre et al., 2008; Orenstein et al., 2022). However, these same public health achievements are threatened by parents who choose to delay or decline vaccines or are unable to access vaccines, as poor coverage leads to outbreaks (E. Dubé et al., 2013). Vaccine hesitancy has been increasing during the past decades, so much so, that the World Health Organization (WHO) defined vaccine hesitancy as one of the ten threats to global health in 2019 (WHO, 2019).

In Finland, health and social services are publicly funded (Tynkkynen et al., 2023). Childhood vaccinations are voluntary and offered free of charge in Finland, as a part of the Finnish National Vaccination Programme (NVP). Childhood vaccination coverage is generally high in Finland – only 1.7% of children born in 2021 are unvaccinated. However, there are differences between geographical regions and between different vaccines. Historically, Eastern Finland has experienced high vaccination coverage while vaccination coverage in Western Finland has been lower than the national average. The two vaccines with consistently suboptimal vaccination coverages are Human Papillomavirus (HPV) vaccine and influenza vaccine. HPV has been proven to be associated with multiple anogenital cancers such as cervical, anal, penile, and vulvar cancer. In addition to anogenital cancers, HPV is associated with many head and neck cancers (Chaturvedi, 2012). HPV vaccination protects against cancers and harms related to the human papillomavirus. Vaccination against HPV has been available in the NVP since 2013 for girls, and since 2020 for boys, and it is currently offered to children between the ages of 10–12 years. Influenza vaccine protects from influenza and influenza-related illnesses, such as bronchitis and pneumonia. Influenza vaccine has been offered to children between the ages of 6 and 36

months since 2007 as part of the NVP, and to children between the ages of 3 to 6 years since 2018 (Finnish Institute for Health and Welfare, 2024d). Suboptimal vaccination coverage in terms of HPV and influenza is known, but little is known about the factors relating to the intention to vaccinate. This thesis aims to investigate how sociodemographic factors, attitude and knowledge are associated with parental childhood vaccination intention in terms of HPV and influenza vaccines. To explore the realisation of the parental intention to have their children vaccinated, vaccination coverage data of their offspring was extracted from the National Vaccination Register (NVR).

In addition to examining parental childhood vaccination intention and the realisation of intention, this thesis aims to shed light on the topic of vaccine expertise. There is a high level of public trust in science and research in Finland (Finnish Institute for Health and Welfare, 2024g; Tieteen Tiedotus ry, 2022). However, the authority of experts is increasingly contested in the media (Blume, 2006; Kata, 2010). It has even been hypothesized that the very notion of expertise and expert advice is losing authority (Nichols, 2018). People, and especially parents of children, increasingly search for health-related information online (Harmsen et al., 2013). Simultaneously, research shows that the prevalence of vaccine misinformation on social media platforms is high (Suarez-Lledo & Alvarez-Galvez, 2021). In the past, expertise has been studied from sociological and philosophical perspectives among other fields. The most common definition of an expert dictates that an expert is someone who has knowledge or skills in a given domain, that the lay person does not have. Experts are generally demanded to hold professional qualifications, be impartial and have good communication skills. Current studies show that the majority of parents rely on professionals and official information sources for vaccine-related information. However, there is little knowledge on who parents qualify as a vaccine expert.

This thesis was motivated by the persistent phenomenon of geographical differences and differences between vaccines in childhood vaccination coverages in Finland, despite the unified process of vaccine distribution and vaccination. This thesis examines HPV and influenza vaccines, as their uptake is constantly suboptimal. Owing to the NVR, this study has the unique advantage of examining the realisation of parental childhood vaccination intention. In addition, this thesis

was driven by the need to understand what information sources parents trust in terms of vaccination information and who parents qualify as an expert of childhood vaccinations. This thesis has the potential to help us understand the complex process of vaccination decision-making. Furthermore, the results aid us in increasing knowledge of factors associated with parental vaccination intention, and to describe the type of an expert parents deem qualified to be a childhood vaccine expert.

2 Review of the literature

2.1 Maternity and child health in the Finnish healthcare system

Healthcare in Finland is publicly financed, and services such as maternity and child health clinics are offered free of charge (Keskimäki et al., 2019). Maternity and child health clinic services are universal, and services cover health examinations for the expectant mother, and at least 15 visits between the ages of 0-6 for the child (Ministry of Justice, 2010; Ministry of Social Affairs and Health, 2024a). In addition, maternal and child health clinics are tasked with providing vaccinations specified in the National Vaccination Programme (NVP) (Finnish Institute for Health and Welfare, 2025b; Ministry of Social Affairs and Health, 2024a). Healthcare services are organised by 21 regional Well-Being Service Counties (WBSC) and the city of Helsinki, which are governed by democratically elected councils (Tynkkynen et al., 2024). The WBSCs are responsible for organising primary and secondary health care in addition to social and rescue services for the residents of the counties (Tynkkynen et al., 2024).

In the past, the Finnish child health system went through many changes to find its current, globally unique form. In the 1920s, Finnish child welfare rested on the shoulders of philanthropic organisations, before children became a “national asset”, on which European governments wanted to spend on (Laurent, 2017). In the 1940s, supporting motherhood, children and families became the main topics of political discussions in Finland, leading to the Act on Municipal Prenatal and Child Care Clinics of 1944 (224/1944), ordaining local authorities to organise maternity and child health clinic services as part of primary health care (Edilex, 1972; Harjula, 2007; Laurent, 2017). This health reform brought families with children under the scope of healthcare rapidly, with only 5% of parturient mothers and 10% of children not using the services provided at the clinics in the 1950s (Harjula, 2007). In the 1960s, the idea of free, universal primary care was brewing, leading to the 1972 Primary Health Care Act, which obligated municipalities to establish and maintain health centres (Harjula, 2007; Kokko, 2009). Preventive services, such as antenatal care and child health clinics were included in the services offered by these health centres (Kokko, 2009). The system was dismantled in 1993, due to heavy regulation and complex administration (Häkkinen, 2005;

Keskimäki, 2022). After many failed attempts to reform Finland's health care system, in 2021 the Parliament passed a legislation entering into force in January 2023, which allowed Finnish healthcare to be reformed away from the previous highly decentralised and fragmented system, where over 300 municipalities were responsible for organising care (Keskimäki, 2022; Keskimäki et al., 2019; Kuntaliitto, 2024; Tynkkynen et al., 2023). As of January 2023, health care, including childhood vaccinations, is organised by 21 Well-Being Service Counties and the city of Helsinki (Tynkkynen et al., 2023).

The effects of the maternal and child health clinics were seen almost immediately, with a decrease in maternal and childhood mortality and infectious disease prevalence (Riihonen, 2021). Childhood mortality has decreased in Finland since the 1960s, showing that the healthcare system as a whole has functioned well in Finland (Lantto et al., 2008). Today, maternal and child health clinics are a standard part of healthcare and 99.7% of pregnant women utilise the services provided by the clinics (Klemetti et al., 2023). Furthermore, the Finnish maternal and child health system has been recognised as a key component in achieving good vaccination coverage (Riihonen, 2021).

2.2 Finnish national vaccination programme for children

Between the years 1802 and 1941, the smallpox vaccine was mandatory and systematically administered in Finland (Laurent, 2017). Due to rapid vaccine technology development, the Finnish NVP was expanded during the next decades, with vaccines against tuberculosis, diphtheria, pertussis and tetanus, and polio being included in the NVP (Finnish Institute for Health and Welfare, 2024d). Establishing maternal and child health clinics enabled the distribution of vaccinations. The vaccination law of 1951 (no. 361/1951) expanded the vaccination programme to include diphtheria, typhoid fever, tuberculosis and other epidemic diseases in addition to smallpox (Edilex, 1951; Harjula, 2007). In addition, the law decreed that vaccines should be distributed at the child health clinics and school nurses' reception on voluntary basis (Laurent, 2017). The Finnish NVP currently includes vaccinations against 13 different diseases, and the vaccinations are given free of charge and on voluntary basis (Finnish Institute for Health and Welfare, 2025b; Ministry of Social Affairs and Health, 2023). During their first year of life, children in Finland receive vaccinations against rotavirus, pneumococcal disease, diphtheria-tetanus-pertussis-haemophilus B-vaccine (DTaP-IPV-HiB), measles-mumps-rubella (MMR), varicella and influenza (Finnish Institute for Health and Welfare, 2025b). Between the ages of one to fifteen, children receive booster shots for some of the previously mentioned vaccines, and in addition, the human papillomavirus (HPV) vaccine (Finnish Institute for Health and Welfare, 2025b).

In addition to the basic vaccinations covered by the NVP, some risk groups are offered vaccinations, tailored to their specific needs (Finnish Institute for Health and Welfare, 2025b). These include vaccines against *Bacillus Calmette-Guérin* (BCG), hepatitis A and B, influenza (for those above 7 years of age), meningococcal diseases, pneumococcal disease and tick-borne encephalitis (Finnish Institute for Health and Welfare, 2025b).

Prevention of communicable diseases is the responsibility of the Ministry of Social Affairs and Health (MSAH) with support from the Finnish Institute for Health and Welfare (THL) (Finnish Institute for Health and Welfare, 2025b; Keskimäki et al., 2019). THL is a national public health agency governing several national healthcare and social welfare registers (Finnish Institute for Health and Welfare, 2024f, 2024e; Ministry of Justice, 2025). Among other tasks, THL investigates infectious diseases and their occurrence, and provides guidance to professionals in addition to monitoring the implementation, effectiveness and safety of vaccinations under the Communicable Diseases Act (no. 1227/2016) (Keskimäki et al., 2019; Ministry of Justice, 2024). The effectiveness of the vaccination programme and its' coverage is evaluated through the nationwide National Vaccination Register (NVR). THL has established and maintained the NVR since 2009 (Baum et al., 2017).

The national vaccination coverage in young children in Finland is generally speaking good, and being completely unvaccinated is rare (Finnish Institute for Health and Welfare, 2024g). However, there are significant regional differences in the uptake of childhood vaccines, in addition to differences between vaccines. The two vaccines with continuously suboptimal coverages are the HPV and influenza vaccines (Finnish Institute for Health and Welfare, 2024c, 2024a). The HPV vaccine is administered as a school-based vaccine by the school nurse in Finland, while the influenza vaccine for children is administered at the maternal and child welfare clinic by the public health nurse. Parents must book an influenza vaccination appointment for their child independently (Finnish Institute for Health and Welfare, 2024b).

2.3 Influenza

2.3.1 Clinical features and transmission

Influenza is a highly infectious airborne disease that impacts a significant percentage of the world's population annually, affecting both humans and animals (Palese, 2004). Influenza is caused by a number of single-stranded, enveloped RNA viruses of the Orthomyxoviridae family (Barberis et al., 2016; Webster et al., 2013). As influenza viruses do not form long-term host-virus relationship within the infected host, their survival depends on host-to-host transmission (Webster et al., 2013). Influenza viruses are divided into three types: A, B, and C, with only A and B causing disease in humans (Carrat & Flahault, 2007; Paules & Subbarao, 2017). Influenzas A and B are associated with significant seasonal morbidity and mortality, occurring as annual epidemics in humans (Carrat & Flahault, 2007; Cox & Subbarao, 2000; Paules & Subbarao, 2017; Webster & Govorkova, 2014). Although sporadic influenza cases are reported round the year, seasonal influenza causes respiratory infection during the winter months in Northern and Southern Hemispheres, and all year round in tropical and subtropical regions due to weaker seasonality (Monto, 2008; Ryu & Cowling, 2021; Tyrrell et al., 2021; Webster et al., 2013). In addition to seasonal influenza epidemics, influenza viruses cause influenza pandemics and outbreaks. Four influenza pandemics have occurred in the past century: H1N1 Spanish influenza pandemic in 1918, H2N2 Asian influenza in 1957, H3N2 Hong Kong influenza in 1968, and H1N1 swine flu in 2009 (Paules & Subbarao, 2017; Webster et al., 2013).

The long-term epidemiologic success of influenza viruses is primarily due to antigenic variation, taking place in the two surface antigens of the virus, haemagglutinin (HA) and neuraminidase (NA) (Cox & Subbarao, 2000). In contrast to other infectious viruses, influenza is caused by viruses that evade the immune system by undergoing continuous antigenic shifts and drifts, leading to a virus that is continually evolving. This continuous evolving allows the virus to both evade immune memory responses and infect individuals previously exposed to similar virus strains (Macias et al., 2021). Due to this unceasing change, new epidemics and pandemics are likely to occur in the future (Palese, 2004).

When an infected person coughs or sneezes, infectious droplets are dispersed into the air, and those in close proximity get infected by breathing these droplets in (Killingley & Nguyen-Van-Tam, 2013; Webster et al., 2013; World Health Organization, 2023). In addition, influenza spreads by hands via fomites contaminated with the virus (Macias et al., 2021; Webster et al., 2013). Influenza infection is characterised by an abrupt onset of fever, respiratory symptoms and muscle fatigue, with fever being the most prominent sign of influenza in children (Eccles, 2005; Heinonen et al., 2012; Potter, 2001; Rothberg et al., 2008;

Silvennoinen et al., 2009; Webster et al., 2013). Gastrointestinal symptoms, such as vomiting, diarrhoea and abdominal pain are less common, but more likely to occur in children (Orenstein et al., 2022). Additionally, children suffer from influenza-related complications such as acute otitis media and pneumonia (Heikkinen et al., 2004; Mattila et al., 2021; Munoz, 2002; Webster et al., 2013). Although rare, influenza is also associated with a range of neurological complications in children, such as seizures and encephalopathy (Ekstrand, 2012; Macias et al., 2021; Mistry et al., 2014). In addition to having more severe influenza-related outcomes, children also play a critical role in the transmission of influenza: children can shed virus for up to two weeks, and have higher virus titres in their upper airway, which is one factor promoting transmission in the community (Orenstein et al., 2022; Ruf & Knuf, 2014a; Viboud et al., 2004). Influenza treatment is mainly symptomatic and most healthy people recover from influenza within a week without requiring medical attention (Eccles, 2005; World Health Organization, 2023).

2.3.2 The global epidemiology of influenza

The WHO estimates that there are approximately 1 billion human influenza cases annually, including 3-5 million severe cases, leading to between 290 000 to 650 000 respiratory deaths globally (World Health Organization, 2019, 2023). Due to most influenza cases being mild and not requiring medical attention, it is challenging to measure the exact incidence of influenza infection in a population (Ryu & Cowling, 2021). In addition, much of the resulting morbidity and mortality caused by influenza A and B viruses are not due to the influenza itself, but to complications of underlying diseases and secondary infections which are not unique to influenza (Gordon & Reingold, 2018). The nonpharmaceutical control measures applied during the COVID-19 pandemic had an impact on the incidence rates of influenza: a decrease in influenza cases was observed during the seasons of 2020/21 and 2021/22 (Soo et al., 2020). However, during the influenza season 2022/2023, influenza rates almost returned to the pre-pandemic rates in the European region (European Centre for Disease Control, 2023).

Although most influenza cases are mild, influenza causes substantial morbidity and mortality in some population groups. Children under the age of 1 year, and adults over 65 years, pregnant women and people with comorbidities are at highest risk of influenza and related illnesses (Paules & Subbarao, 2017; Rothberg et al., 2008; Webster et al., 2013). The influenza-related burden children bear is substantial. Children under the age of 5 years have more severe outcomes compared to older children and adults, with rates of hospitalisation and complications being higher in the younger children (Ampofo et al., 2006;

Heikkinen et al., 2004; Monto, 2008; Ruf & Knuf, 2014b; Silvennoinen et al., 2009). It is estimated that seasonal influenza is responsible for over 100 million influenza-associated episodes globally among children under the age of 5 years, 870 000 influenza virus associated hospital admissions and over 34 000 overall influenza-associated deaths (X. Wang et al., 2020). Moreover, influenza-related hospitalisations are the highest among children younger than 1 year of age (Silvennoinen et al., 2011). In addition to direct medical costs, influenza creates indirect economic costs. Influenza causes significant absence from day care and school for the children themselves and work loss for their parents. Influenza causes a greater economic burden for children under the age of 5, with the most workdays lost occurred in the parents of children under the age of three (Heikkinen et al., 2004; Mattila et al., 2021; Villani et al., 2022).

2.3.3 Prevention and vaccination coverage

Vaccines against influenza A and B were first invented in the late 1930s (Barberis et al., 2016; Krammer & Palese, 2015). Currently authorised influenza vaccines can be divided into two main categories: inactivated vaccines (including standard-dose, high-dose, adjuvanted and recombinant influenza vaccines) and live attenuated vaccines (LAIV) (Orenstein et al., 2022). Due to the antigenic drift of the influenza virus, the vaccines need to be updated almost annually through a complex, costly, and time-consuming process (Orenstein et al., 2022). Selecting an antigenically correct strain that matches the current circulating influenza strain is challenging, and the success of each seasonal influenza vaccine is dependent on how well the vaccine strains and the circulating viruses match (Webster & Govorkova, 2014). Annual influenza vaccination is the primary prevention and control measure against influenza infection, hospitalisation and mortality, although vaccine effectiveness varies each year (Grohskopf et al., 2015; Nypaver et al., 2021; Osterholm et al., 2012). A meta-analysis on healthy children by Orrico-Sánchez et al. show that the LAIV effectiveness ranges from 27.5% to 41%, while the effectiveness of the inactivated vaccine ranged from 28% to 86% (Orrico-Sánchez et al., 2022). Moreover, the mean overall vaccine efficacy against all influenza strains for children under the age of 5 years was between 25.6% to 87% (Orrico-Sánchez et al., 2023).

The WHO recommends including influenza vaccination in the national immunisation programmes, as a part of their Global Influenza Strategy 2019-2030 (World Health Organization, 2019). Annual influenza vaccination is particularly important for people who are at increased risk of complications (Doherty et al., 2016; Restivo et al., 2018). These people include young children, pregnant women, people aged 65 years and older, health and care workers, and those with

underlying health conditions (World Health Organization, 2019, 2023). Finland, among many other high-income countries, recommends pregnant mothers to be vaccinated against influenza. However, influenza vaccination of mother protects the child only during their first months, as the half-life of maternal antibodies is limited (Mattila et al., 2021). On the other hand, vaccination of children is associated with a decrease in respiratory illness, school and work absenteeism and antibiotic use during influenza epidemics (Heikkinen et al., 2004; Webster et al., 2013).

Despite the benefits of influenza vaccination in children, vaccination uptake is low in Finland. During the influenza season 2023-2024, 38% of children under the age of three and 28% of three to six-year-old children were vaccinated against influenza during the previous autumn or winter (Finnish Institute for Health and Welfare, 2025a). Regional differences in the coverage exist – coverage of influenza vaccinations across different Finnish health centre areas varied from 15% to 52% for children under the age of three, and from 12% to around 40% for three to six-year-old children (Finnish Institute for Health and Welfare, 2025a).

2.4 Human Papillomavirus (HPV)

2.4.1 Clinical features and transmission

Human papillomaviruses (HPVs) belong to the Papillomaviridae family, consisting of more than 200 different viruses infecting human epithelial cells (de Villiers et al., 2004; de Sanjosé et al., 2018; Gheit, 2019; Okunade, 2020; Athanasiou et al., 2020). HPV types are organised into five major HPV genera: alpha, beta, gamma, mu and nu-papillomavirus, and are classified into cutaneous types and mucosotropic types on the basis of their tissue tropism (de Villiers et al., 2004; Scheurer et al., 2005; Accardi & Gheit, 2014; Beltrão et al., 2015). Cutaneous HPV types are commonly found in skin lesions such as warts, while the mucosotropic HPV types affect skin and mucosal membranes (Beltrão et al., 2015; Bzhalava et al., 2013). HPV types are classified into high and low risk, according to their oncogenicity (zur Hausen, 2002; Beltrão et al., 2015). Approximately 40 HPV types are known to affect the anogenital (vulvar, vaginal, penile and anal) area, and of these, 13 are commonly known as high-risk HPV (Muñoz et al., 2006a; Athanasiou et al., 2020; de Martel et al., 2017). HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58 and 59 are classified as high-risk, and HPV 68 is considered probably carcinogenic (Athanasiou et al., 2020; Bouvard et al., 2009; Clifford et al., 2006; M. Lehtinen & Dillner, 2013). HPV type 16 is the most prevalent type in cancer worldwide and HPV types 16 and 18 together account for approximately 70% of all cervical cancers (Bzhalava et al., 2013; Clifford et al., 2006). Most HPV infections are asymptomatic; however, symptoms depend largely on the type of

HPV and the site of infection. Low-risk HPV types cause anogenital condylomas (genital warts) (Garland et al., 2009).

After acquisition, an HPV infection can develop lesions, which are classified as precancerous when severe (Beltrão et al., 2015). Most HPV infections and their lesions, also at the precancerous stage, clear on their own within 1-2 years (Crosbie et al., 2013; de Sanjosé et al., 2018; Franco et al., 1999; Scheurer et al., 2005; zur Hausen, 2002). However, when persisted, lesions can progress to cervical cancer, with the transition from onset of a precancerous stage lesion to cancer taking from several years to even decades (Balasubramaniam et al., 2019; zur Hausen, 2002). In addition to cervical cancer, HPV DNA has been detected in other anogenital cancers such as anal, vulvar, vaginal, penile, and oropharyngeal cancers (Burd, 2003; Chaturvedi, 2012; Giraldi et al., 2021; Szymonowicz & Chen, 2020).

HPV is mainly sexually transmitted, but it does not require penetrative sexual intercourse (Petca et al., 2020; zur Hausen, 2002). Hence, the use of condoms offer limited protection, as HPV can be transmitted from skin and mucosal surfaces (Gheit, 2019; zur Hausen, 2000).

2.4.2 The global epidemiology of HPV and HPV-related malignancies

HPV is one of the most common sexually transmissible infections, and nearly all sexually active humans are infected at least once in their lifetime (Chesson et al., 2014; Crosbie et al., 2013; Gardella et al., 2023). Figure 1 shows the age-standardised incidence rates of cancer cases attributable to HPV (de Martel et al., 2017). The global prevalence of HPV among women with normal cytology findings is estimated as 11.7%, with significantly higher rates in women with abnormal cytology (Clifford et al., 2005; de Martel et al., 2017; Serrano et al., 2018). The causal role of HPV in cancers has well established, particularly in squamous cell carcinomas (SCC) (Muñoz et al., 2006b, p. 1). Cervical cancer, caused almost exclusively by high-risk HPV types, is the fourth most common cancer in women and the fourth leading cause of cancer deaths worldwide (Cohen et al., 2019; Ferlay et al., 2022; Serrano et al., 2018). Globally, HPV accounts for approximately 690 000 cancer cases and over 300 000 deaths annually, with 84% of cervical cancer cases diagnosed in less developed countries (Cohen et al., 2019; de Martel et al., 2017, 2020; Scott-Wittenborn & Fakhry, 2021; Serrano et al., 2018). Cervical cancer alone represents around 80% of HPV-attributable cancer burden, with women bearing approximately 90% of HPV cancer cases worldwide (de Martel et al., 2020). Global geographic variation is substantial: the age-standardised incidence rate (ASIR) of cervical cancer ranges from 7-16 per 100,000 in Europe, 7 per 1000,000 in North America, and 13-15 per 100,00 in Latin America (Arbyn

et al., 2018, 2020; de Martel et al., 2017; Scott-Wittenborn & Fakhry, 2021). Data on cervical cancer in Africa is sparse but it has been established that cervical cancer is the leading cause of cancer-specific mortality in African women – Sub-Saharan Africa having incidence rates seven to ten times those of high and middle income countries (Cohen et al., 2019; Scott-Wittenborn & Fakhry, 2021).

HPV also contributes to other anogenital cancers, though their population-level impact is smaller (de Sanjosé et al., 2014). In 2020, there were an estimate of 50,000 new cases and 19,000 deaths from anal cancer worldwide, with 90% of cases attributed to HPV (de Martel et al., 2017; Mignozzi et al., 2024). HPV is responsible for approximately 8,500 vulvar cancer cases annually, with higher ASIRs in women aged 50-74 than in younger age groups (de Martel et al., 2017; Huang et al., 2023). Penile cancer remains rare, with a global ASIR of 0.80 per 100,000, equating to 36,000 new penile cancer cases, of which approximately 13,000 are HPV-related (de Martel et al., 2017; Fu et al., 2022).

While high-risk HPV types are linked to cancers, low-risk types are associated with anogenital warts (AGWs), commonly benign lesions affecting the genital area (H. Patel et al., 2013). The global annual incidence rate for AGWs ranges between 100 and 200 new cases per 100 000 adult population, and the incidence is highest among 20-29-year-olds (H. Patel et al., 2013).

Figure 1.

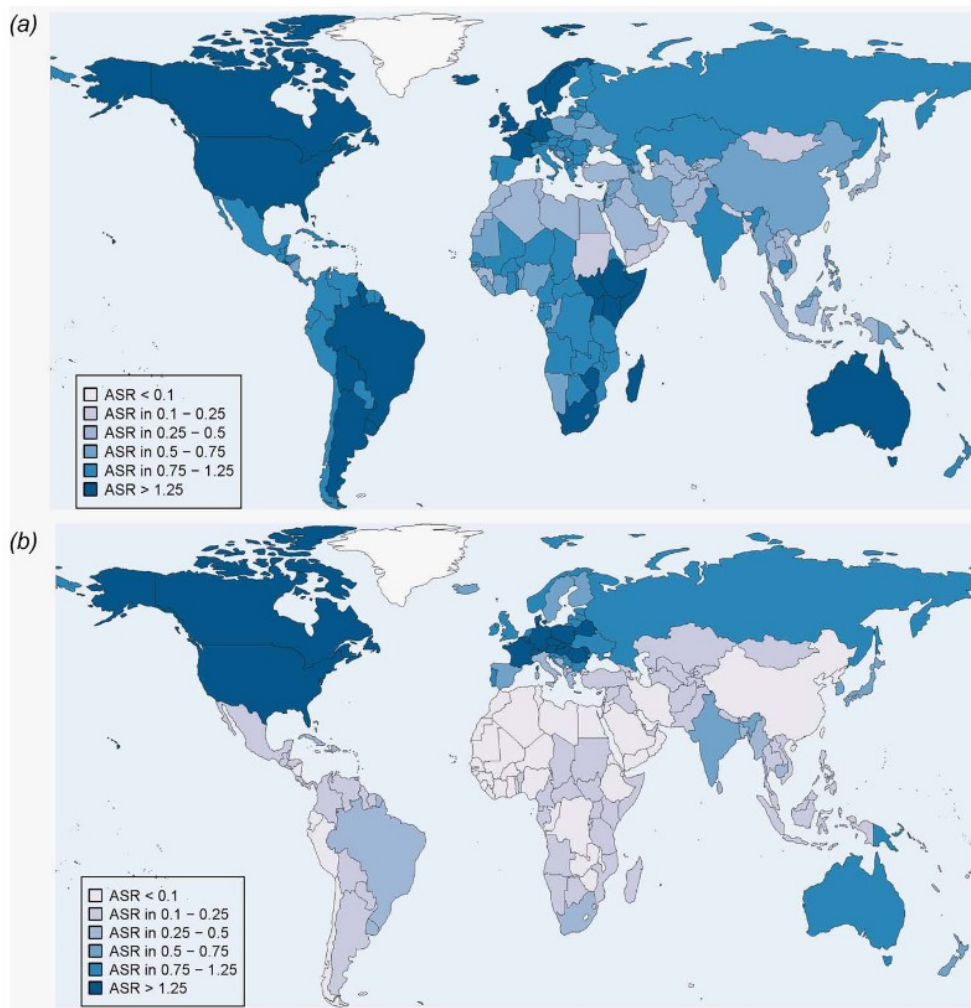


Figure 1. Age-standardised (world) incidence rates (per 100,000) of cancer cases attributable to HPV in 2012, both sexes. Panel (a) anogenital cancer cases (vulvar, vaginal, anal, and penile). Panel (b) head and neck cancer cases (oropharynx, oral cavity, and larynx). Reprinted from “Worldwide burden of cancer attributable to HPV by site, country and HPV type” by C. De Martel, M. Plummer, J. Vignat, and S. Franceschi., 2017. *International journal of cancer* 141.4 (2017): 664-670. CC BY.

In addition to anogenital cancers and warts, HPV is also associated with head and neck cancers (de Martel et al., 2017). These include squamous cell carcinomas of head and neck (SCCHN), arising from the mucosal epithelium in the oral cavity, pharynx, larynx, the paranasal sinuses, and nasal cavity (Argiris et al., 2008; Johnson et al., 2020; Vokes Everett E. et al., 1993). Head and neck squamous cell carcinomas are the sixth most common cancer globally, with over 98 000 new cases worldwide (Lorenzoni et al., 2022). While SCCHN have traditionally been linked to tobacco and alcohol use, HPV is increasingly recognised as a key etiological factor, particularly in oropharyngeal cancers (de Martel et al., 2017;

Johnson et al., 2020; Lorenzoni et al., 2022; Pytynia et al., 2014; Roman & Aragones, 2021). Although oral HPV remains low and most infections are transient, the incidence of HPV-positive oropharyngeal cancer is rising, especially among middle-aged men in high-income countries (Scott-Wittenborn & Fakhry, 2021; Timbang et al., 2019).

In the U.S., the incidence increased by 225% between 1988 and 2004, while Nordic countries, including Finland, have seen threefold rise over the last 30 years (T. Lehtinen et al., 2021). In Denmark, 55% of oropharyngeal SCC are HPV-positive, while in Ireland, HPV has surpassed smoking as the leading cause of oropharyngeal cancer (Cleere et al., 2024; Zamani et al., 2020). Across Europe, the ASIR of HPV-related oropharyngeal cancers ranges from 0.99 to 3.04 (Scott-Wittenborn & Fakhry, 2021).

Finland has the lowest number of cervical cancer cases in the Nordic countries, with approximately 180 new cancer cases diagnosed per year (Danckert & Engholm, 2024). The Nordic age-standardised incidence rate (NASIR) of cervix uteri cancer is 6.6 per 100,000 (Danckert & Engholm, 2024). In total, 197 cancers of vulva, vagina and other female genital organs are diagnosed annually in Finland, with a NASIR of 5.0 per 100,000 (Danckert & Engholm, 2024). In terms of anus and anal cancer, 23 new cases in men and 32 new cases in women are diagnosed annually, with a NASIR of 0.7 for men and 0.9 per 100,000 for women (Danckert & Engholm, 2024). Regarding cancers of the lip, oral cavity, and pharynx, 454 new cancer cases are diagnosed annually in Finland in men, and 275 cases in women. The NASIR of lip, oral cavity and pharynx cancer is 14.2 for men and 7.5 per 100,000 for women (Danckert & Engholm, 2024). A study has been conducted to evaluate the total burden and health care provider costs of the prevention, management, and treatment of HPV-related genital disease outcomes in Finland. The study found that the annual costs of screening, diagnosis and treatment of HPV-related genital disease outcomes was €44.7 million (Salo et al., 2013).

2.4.3 Prevention and vaccination coverage

Cancers caused by HPV are largely preventable (Crosignani et al., 2013; de Martel et al., 2017; La Torre et al., 2007; Schiller et al., 2012). Cervical cancer screening has reduced the incidence of cervical cancer in many countries (Jansen et al., 2020; Peirson et al., 2013). Traditionally, screening has been based on the Papanicolaou test, aiming to detect cytological abnormalities caused by cervical lesions with increased cervical cancer risk (Arbyn et al., 2010). Currently, cervical cancer screening is increasingly based on HPV DNA testing, combined in various ways with cytology (Rerucha et al., 2018). After detection, severe enough lesions

are removed, often by loop electrosurgical excision procedure (LEEP) (Wright et al., 1992).

In Finland, cytological cervical cancer screening was introduced in the 1960s, being one of the earliest cervical cancer screening programmes in the world (Lönnberg et al., 2012). The introduction of the screening programme has contributed to a substantial decrease in age-adjusted cervical cancer incidence as well as mortality rates in the past decades (Anttila & Nieminen, 2000; Lönnberg et al., 2012). In the Finnish cervical cancer screening programme women aged 30 to 60 years are invited for cervical cancer screening every five years (Duodecim, 2023). Primary HPV screening with cytology triage was first implemented in the Finnish screening programme in 2012, and current guidelines outline the use of HPV test with cytology triage (Duodecim, 2023; Veijalainen et al., 2021).

HPV vaccines are among the most effective prophylactic vaccines available, with many countries witnessing a decline in the population prevalence of HPV and HPV-associated cancers after introducing a national HPV vaccination programme (de Martel et al., 2017; M. Lehtinen et al., 2021; Lei et al., 2020; Markowitz & Schiller, 2021; Palmer et al., 2019; C. Patel et al., 2018). HPV vaccines are safe and offer excellent protection against HPV infection, cervical intraepithelial neoplasia (CIN) and adenocarcinoma associated with HPV 16 and 18 infection, and cross-protection against some other types, depending on the vaccine (Arbyn & Xu, 2018; Arnheim-Dahlström et al., 2013; Hviid et al., 2021; Kamolratanakul & Pitisuttithum, 2021; La Torre et al., 2007; Villa et al., 2020). These prophylactic vaccines are nearly 100% efficacious against pre-cancerous lesions caused by high-risk HPV types 16 and 18 in a HPV-naïve population (M. Lehtinen et al., 2021; M. Lehtinen & Dillner, 2013; Markowitz & Schiller, 2021). It is estimated that between 70% and 90% of all HPV-attributable cancer cases could be prevented by universal HPV vaccination (de Martel et al., 2017). However, vaccines cannot clear existing infections, and hence it is of utmost importance to receive the vaccination before coitarche. Currently, WHO recommends a one or two-dose schedule for girls aged 9 to 20 years (World Health Organization, 2022b).

As of 2024, HPV vaccines had been introduced either fully or partially into the vaccination programmes for girls or both sexes in 142 countries (World Health Organization, 2024c). Currently six prophylactic HPV vaccines are available globally: three bivalent, two quadrivalent and one nonavalent vaccine (World Health Organization, 2022a). Although the vaccines differ in terms of valency, all vaccines contain virus-like particles against high-risk HPV types 16 and 18 (World Health Organization, 2022a). Prophylactic HPV vaccines have been available as a school-based programme in the Finnish NVP since 2013 (Finnish Institute for Health and Welfare, 2023b). HPV vaccinations were first given to girls only, however since 2020 boys have been included in the programme for HPV as well (Finnish Institute for Health and Welfare, 2023b). Vaccination of boys protects

them directly from HPV associated cancer, but also helps in achieving herd immunity (Vänskä et al., 2020). As for the time being, bivalent HPV vaccine Cervarix is used in the NVP in Finland, and two doses of the vaccine is offered to pupils aged from 10 to 12 (Finnish Institute for Health and Welfare, 2023b).

Despite the fact that the vaccine is distributed in schools, girls' vaccination coverage for HPV is suboptimal in Finland. In May 2024, the national HPV vaccination coverage for girls born in 2011 was 71.1% (Finnish Institute for Health and Welfare, 2024a). Substantial regional differences exist between Eastern and Western Finland, with vaccination coverage ranging between 82.3% in Eastern Finland and 62.8% in Western Finland (Finnish Institute for Health and Welfare, 2024a). In 2020 the WHO adopted the Global Strategy for cervical cancer elimination, which promotes having 90% of girls fully vaccinated against HPV by the age of 15 (World Health Organization, 2024a). Moreover, to underline the importance of HPV vaccination, in July 2024 the European Commission adopted a recommendation to help combat vaccine-preventable cancers such as HPV by boosting the uptake of HPV vaccinations (Council of the EU, 2024). The recommendation encourages member states to increase efforts to reach the Global Strategy goal of fully vaccinating at least 90% of girls against HPV by 2030 (Council of the EU, 2024). As Finland is currently falling short of this goal, increasing HPV vaccination uptake calls for increasing the understanding of factors associated with HPV vaccination uptake.

2.5 Factors affecting childhood vaccine uptake

Although in most developed countries childhood vaccinations are a widely accepted practice, declining childhood vaccination rates have caused the re-emergence of vaccine-preventable diseases such as measles in Europe and the United States (E. Dubé et al., 2013; Habersaat et al., 2020; Pampaka et al., 2023; Pegorie et al., 2014; Tomljenovic et al., 2020; World Health Organization, 2024b; Zucker et al., 2020). Examining vaccine uptake simply through the national coverage may hide pockets of under-vaccinated individuals. Parental reasons for not having their child vaccinated are diverse, and categorising parental attitudes in terms of vaccination is often difficult due to the complicated interaction of social, cultural, political and personal factors in decision-making (E. Dubé et al., 2013; MacDonald, 2015).

A plethora of studies have been conducted to examine factors affecting childhood vaccine uptake and coverage. Due to the volume of existing studies regarding HPV and influenza uptake and the related factors, many systematic reviews and meta-analyses have been undertaken, to summarise the available evidence and provide a reliable assessment of these studies. In this literature review, I will mainly focus on systematic reviews and meta-analyses, when

possible: firstly, exploring the global studies and then narrowing the focus to Finnish studies related to HPV and influenza vaccine uptake.

2.5.1 Vaccine hesitancy

During the last decade, plenty of research has been conducted on vaccine acceptance, hesitancy and factors associated with vaccine uptake globally. These studies have resulted in several proposed models of acceptance (E. Dubé et al., 2013; MacDonald, 2015). In 2012, the World Health Organization (WHO) Strategic Advisory Group of Experts (SAGE) created the Working Group on Vaccine Hesitancy, for the purpose of recognising the reasons for vaccine hesitancy (MacDonald, 2015). The SAGE Working Group concluded that vaccine hesitancy refers to the “delay in acceptance or refusal of vaccination despite availability of vaccination services, and it is influenced by factors such as complacency, convenience, and confidence” (MacDonald, 2015). The earlier work by SAGE identified three components (3C’s) of vaccination behaviour, which were then expanded to five components, the 5Cs: confidence (trust in the safety and effectiveness of vaccines and in the health authorities), complacency (ignoring vaccines because of low perceived risk of infectious disease), constraints (barriers, i.e. cost, access), calculation (the individual’s engagement in extensive information searching; preference for deliberation) and collective responsibility (the willingness to protect others by one’s own vaccination) (Betsch et al., 2018; MacDonald, 2015). The COVID-19 pandemic suggested that there could be further components relating to vaccination willingness, and the framework was extended to a 7C model, adding on the components of compliance (support for societal monitoring to control adherence to regulations) and conspiracy (the tendency to endorse conspiratorial beliefs about vaccination) (Geiger et al., 2021). Other psychological models have been created to capture the determinants of vaccination uptake. The 5A model further explains the causes of vaccine hesitancy alongside the models created by SAGE, focusing on access, affordability, awareness, acceptance, and activation (Thomson et al., 2016).

Figure 2.

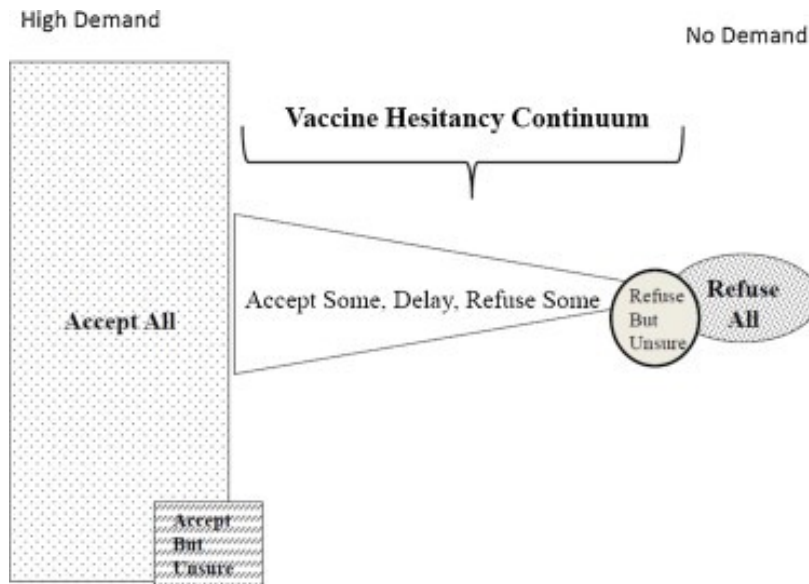


Figure 2. The continuum of vaccine hesitancy between full acceptance and outright refusal of all vaccines. Reprinted from “Vaccine hesitancy: Definition, scope and determinants” by NE. MacDonald. 2015. *Vaccine* (33:34): 4161-4164. CC BY.

Vaccination decision-making is rarely black and white, and hence individual decision-making about vaccination is considered as a continuum, ranging from those that accept all vaccines with no doubts, to those who accept some while refusing some, to those who completely refuse all vaccines with doubts, as shown in figure 2 (E. Dubé et al., 2013; MacDonald, 2015; Salmon et al., 2015). Vaccine hesitancy is an important public health problem, as it can lead to suboptimal vaccine uptake, limiting the full potential of vaccination programmes (Thomson et al., 2016). Factors affecting childhood vaccination uptake are complex, but they can be summarised and divided into factors relating to access and acceptance (Kaufman et al., 2021). These two vast categories include psychological, social and contextual factors such as health perceptions and experiences, vaccine concerns and beliefs, media and communication, knowledge and information, and social and family influence, which are directly associated with vaccine hesitancy and uptake (E. Dubé et al., 2013; Kaufman et al., 2021; Smith, Amlôt, et al., 2017).

Parental vaccine hesitancy directly impacts childhood vaccination uptake. A European systematic literature review of 103 studies examining determinants of HPV vaccine hesitancy found that quality and quantity of available HPV vaccination information was the most commonly reported issue (Karafillakis et al., 2019). Furthermore, concerns about potential adverse effects of vaccinating,

mistrust of health authorities, healthcare workers and new vaccines were reported as determinants of HPV vaccine hesitancy (Karafillakis et al., 2019). A cross-sectional study in fourteen Eastern Mediterranean countries was conducted to explore the determinants of parental influenza vaccine hesitancy (Fadl et al., 2023). The study found that almost half of the parents were hesitant about having their children vaccinated against influenza, although the generalizability of the findings may be affected by the fact that the sample selection was based on a non-probability technique using an online survey (Fadl et al., 2023). Furthermore, vaccine hesitancy was significantly higher among older mothers, rural residents, high-income country residents and mothers with higher educational levels (Fadl et al., 2023).

In Finland, vaccine hesitancy and vaccine-related attitudes have been studied previously (Puumalainen et al., 2015; Sivelä et al., 2018; Väliverronen et al., 2020). The Finnish Science Barometer, which is a study of public opinion and attitudes towards science and technology published every three years since 2001, included questions regarding vaccination attitudes in 2019, for the first time (Tieteen Tiedotus ry, 2022). Vaccine-related attitudes are mainly positive in Finland, and on a global scale, Finns trust the safety and efficiency of vaccines strongly (Tieteen Tiedotus ry, 2022; Väliverronen et al., 2020). Finnish healthcare workers have reported having confidence in vaccinations, although a notable proportion reported low vaccination confidence (Karlsson et al., 2019). Those healthcare workers with low confidence were less likely to recommend vaccines to vaccine-hesitant parents, as 26% of healthcare workers reported that they did not guide influenza vaccine hesitant parents in any direction in terms of vaccinating (Karlsson et al., 2019). More recently, Nurmi et al. conducted a qualitative study to understand vaccine-related attitudes of nurses, public health nurses and midwives (Nurmi et al., 2023). Results showed that although the majority of participating healthcare professionals had positive attitudes, some had worries regarding the safety and necessity of vaccinations (Nurmi et al., 2023). Furthermore, the annual influenza vaccination was a source of hesitancy and criticism (Nurmi et al., 2023). It is possible that a public health professional who may be hesitant of the influenza vaccine would most likely not recommend the vaccine to parents attending the child health clinic for a routine check-up. In the two following subsections of this literature review, the goal is to discuss specific factors associated with HPV and influenza uptake, respectively.

2.5.2 Factors affecting influenza vaccine uptake and coverage

According to research, seasonal influenza vaccination uptake is suboptimal universally. A global study of 68 countries and regions, examining influenza vaccination rates and factors associated with influenza vaccination was conducted (Chen et al., 2022). Global influenza vaccination rates were found to be low overall, and having a free national/regional vaccination policy, perception of influenza vaccine efficacy and disease severity, a recommendation from healthcare worker and having a history of influenza vaccination were positively associated with vaccine uptake (Chen et al., 2022). A systematic review and meta-analysis of 36 studies showed that parental influenza vaccine acceptance was high, with the age of the child being positively associated with vaccine acceptance and uptake while the age of the parents being a significant predictor of vaccine acceptance, hesitancy and uptake (Chan et al., 2023). Furthermore, parental education level, household income level, and ethnicity were associated with parental acceptance and hesitancy (Chan et al., 2023). A systematic review of 30 studies from eight low and middle-income countries showed that childhood influenza vaccination is influenced by caregivers' knowledge of the vaccine, positive vaccine attitudes, self-efficacy (i.e. the sense of having control in one's behaviour), perceived susceptibility and severity of influenza (Han et al., 2024). In addition, believing in the efficacy of the vaccine, the worry of getting sick, previous influenza vaccine experiences and recommendation from a healthcare worker were found to be associated with influenza vaccine intention (Han et al., 2024). On the other hand, safety issues and fear of adverse effects were reported to barriers to influenza vaccination, alongside with poor access to vaccination services (Han et al., 2024).

In the European context, a cohort study from England and Wales found that children living in larger families and in higher deprivation areas were less likely to receive the influenza vaccine (Hardelid et al., 2016). Furthermore, being older and not being in a clinical risk group were significantly associated with a lower probability of vaccination (Hardelid et al., 2016). An English study examining the psychological factors associated with childhood influenza vaccine uptake found that previously being vaccinated against influenza, perceiving the vaccination as effective and perceived susceptibility were positively associated with influenza vaccine uptake and intention (Smith, Webster, et al., 2017). On the other hand, perceiving the vaccination as unsafe, fearing short-term adverse effects and believing that annual vaccination overloads the immune system were negatively associated with vaccination uptake (Smith, Webster, et al., 2017). As noted before, a recommendation from a healthcare professional is crucial for childhood vaccination uptake. In the German context, a study found that 62% of the participants would vaccinate their child against influenza if a physician would recommend the vaccine (Boes et al., 2017). This finding is in line a volume of

previous studies (Han et al., 2024; Lama et al., 2020; Low et al., 2017; Shono & Kondo, 2015). In conclusion, influenza vaccine uptake and coverage are associated with various socio-demographic, behavioural and contextual factors.

2.5.3 Factors affecting HPV vaccine uptake and coverage

The HPV vaccination is a childhood vaccination designed to prevent a sexually transmitted infection, and hence, factors affecting its acceptance may differ from other childhood vaccinations (Dempsey et al., 2006). As HPV vaccination is offered for free in most European countries, the results of the study suggest that ethno-cultural and educational factors play an important role in HPV vaccine uptake (Fernández de Casadevante et al., 2015). In terms of sociodemographic factors, previous childhood vaccinations and higher household income were recognised as factors affecting HPV vaccine acceptance positively (Fernández de Casadevante et al., 2015). A systematic review examined facilitators and barriers to the uptake of HPV vaccination (Loke et al., 2017). The systematic review included 42 studies from North America, Europe, Asia and Australia (Loke et al., 2017). Physician recommendation, parental acceptance, peer encouragement and health insurance coverage were facilitators affecting positively to the vaccine uptake (Loke et al., 2017). Furthermore, maternal level of education was identified as a significant factor for HPV vaccination uptake, albeit this was not consistent across countries (Loke et al., 2017).

Another study examined parents' uptake of HPV vaccines for their children by conducting a global systematic review and meta-analysis of 79 observational studies across 15 countries, including countries from North and South America, Europe, Africa and Asia (Newman et al., 2018). The study found that physician recommendation had the single greatest influence on parents' HPV vaccine uptake for their children (Newman et al., 2018). A systematic review on studies performed in 16 European countries identified up to 80 factors having a statistically significant association with HPV vaccine acceptance (López et al., 2020). In addition, routine child preventive check-up during the past 12 months and parents' belief in vaccines were shown to have a positive influence on parents' HPV vaccine uptake for their children (Newman et al., 2018). The main enabling factors associated with HPV vaccine acceptance identified were perception of efficacy of HPV vaccine and social responsibility (López et al., 2020). Most recently, a study examined factors influencing HPV vaccination uptake in European women and adolescents, and found that those with higher knowledge regarding HPV infection were more likely to be vaccinated against HPV (Jiboc et al., 2024). Receiving a recommendation regarding the HPV vaccine from a healthcare professional was associated with higher vaccine acceptance and initiation in many studies (Dempsey et al., 2006; E. Dubé et al., 2013; Fernández de Casadevante et al., 2015;

Gardella et al., 2023; Loke et al., 2017; Newman et al., 2018; Tung et al., 2016). Furthermore, HPV vaccination acceptance seemed to be dependent on general vaccine acceptance – even more than knowledge of HPV (Kessels et al., 2012; Lenselink et al., 2008; López et al., 2020; Newman et al., 2018; Tung et al., 2016).

Barriers to HPV vaccination are associated with a variety of social, psychological, economic, environmental, and logistical issues, similarly to enablers. A European systematic review found that belonging to ethnic minority groups, having low socio-economic status, and living in higher deprivation areas had a negative effect on HPV vaccination programme initiation (Fernández de Casadevante et al., 2015). A systematic review identified the cost of vaccine, parental concern, lack of information and the preference to wait until the child is older as vaccine acceptance barriers (Loke et al., 2017). In addition, some parents reported concerns regarding safety of the vaccine, while others thought that vaccination would encourage sexual activity (Loke et al., 2017). Furthermore, the results highlighted insufficient information and safety concerns as main barriers to HPV vaccination (López et al., 2020). Safety concerns were reported as a major barrier to refusing vaccination in multiple studies (Jiboc et al., 2024; Loke et al., 2017; López et al., 2020; Newman et al., 2018; Tung et al., 2016).

In the Finnish context, Leivo (2015) examined HPV vaccination-related factors and attitudes of mothers of girls in the 6th to the 9th grade, living in Oulu and Espoo; a low and high vaccination coverage municipality, respectively (Leivo, 2015). The hypothesis was that there will be clear differences in vaccination attitudes, as the municipalities differ in terms of HPV vaccine coverage. However, the results showed that there were very few differences in attitudes between mothers living in high and low coverage municipalities (Leivo, 2015). Furthermore, Leivo found that higher education, higher occupational class, higher income and being less religious contributed to positive HPV vaccination attitudes (Leivo, 2015). Mothers who had positive HPV vaccination attitudes trusted Finnish and European health authorities and healthcare professionals very much, whereas mothers who were critical towards the vaccine trusted health authorities and healthcare professionals less (Leivo, 2015). Despite the differences in attitudes, fear of adverse effects was the most reported negative HPV-vaccine related factor (Leivo, 2015).

2.6 Expertise in vaccinations

As previously noted, vaccinations have had a great impact on public health in reducing disability, morbidity and mortality globally (Andre et al., 2008). Despite this proven success, some parents choose to delay vaccinating or choose to not have their child vaccinated at all (Larson et al., 2014; Smith, Amlôt, et al., 2017). Childhood vaccination rates are dependent on many factors. While access

to vaccinations plays a role in vaccination uptake, acceptance, i.e., parental attitudes, feelings, and beliefs are an important factor affecting uptake (Smith, Amlôt, et al., 2017). One of the factors affecting parental vaccination acceptance is the sources of vaccine-related information (Charron et al., 2020; È. Dubé et al., 2019; Underwood et al., 2016). Trust in experts has been reported to affect the belief in anti-vaccination claims. An American study showed that distrust in medical experts is positively related to believing vaccine misinformation (Stecula et al., 2020). To increase the adherence to vaccination programmes, we must understand who parents consider as childhood vaccination experts.

Expertise has been previously studied from the perspective of sociology and philosophy among other fields, and perhaps most notably in the field of science and technology studies (Collins & Evans, 2007; Eyal, 2019; Jasanoff, 2004). The most common definition of an expert is an individual who has an exceptionally high level of knowledge or performance within a given domain, compared to the lay person (Goldman, 2018). Furthermore, experts are thought to mediate between the production of knowledge and its application (Grundmann, 2017). However, in science and technology studies, there is no collective agreement on what is expertise and who qualifies as an expert. The realist approach to expertise focuses on identifying and emphasising objective knowledge, skills, and qualifications of the expert. According to the realist approach, expertise is defined in terms of expert knowledge and experience (Collins & Evans, 2007). In the realist approach expertise is seen as an internal qualification. On the other hand, the relational approach treats expertise as a social, tangible attribute (Jasanoff, 2004). Watson states that there are normative implications to being an expert, i.e. there is a set of certain values, expectations, and responsibilities one must accept in their role as an expert (Watson, 2021). These normative implications extend beyond the mere possession of knowledge. Expertise is an inherently social concept: one is acknowledged as an expert through the recognition of others (Collins & Evans, 2007; Goldman, 2018; Grundmann, 2017). In conclusion, experts are identified not only on the knowledge they possess, but expertise is a social concept as an individual is branded an expert through the recognition of others as parts of larger regimes (Jasanoff, 2004). Despite the differences between the realistic and relational approaches, it is not necessary to see them as mutually exclusive (Rijswoud, 2012). Instead, they represent different perspectives towards expertise.

Despite the differences between the realist and relationist view of expertise, there seems to be a common agreement that an expert should obtain some sort of qualification, as legitimation of their expertise (Collins & Evans, 2007; Grundmann, 2017). It is also widely supposed that an expert is unbiased and ethical (Grundmann, 2017). Dommett & Pearce list some common expert qualifications, such as academic qualifications, practical experience of working in the area, professional qualifications, impartiality, local knowledge and good

communication skills (Dommett & Pearce, 2019). However, they argue that we know rather little about who qualifies as an experts and what experts are expected to do, in the eyes of the public (Dommett & Pearce, 2019). Existing literature shows that we know even less about who parents of children qualify as a vaccine expert.

Public health topics, such as vaccinations, are increasingly contested in today's environment. During the past decades, the media have become an important forum for the public legitimization of experts (Arnoldi, 2007; Eyal & Medvetz, 2023; Väliverronen, 2021; Väliverronen & Saikkonen, 2021). Hence, communication and interaction have become valuable expert qualifications. Regardless of the important role of experts in building and maintaining trust, infectious disease experts, epidemiologists and other public health experts are increasingly challenged to advocate for their expertise (Blume, 2006; Kata, 2010). Previous surveys on public perceptions of expertise suggest that the public has broadly positive public attituded towards experts (Dommett & Pearce, 2019). However, we know rather little about “who qualifies as an expert, and what are experts expected to do” (Dommett & Pearce, 2019).

The Finnish Science Barometer is a study investigating the attitudes of people living in Finland hold towards science and technology (Tieteen Tiedotus ry, 2022). The 2022 Barometer included a representative sample of 1,085 respondents (Tieteen Tiedotus ry, 2022). The public interest in science is high in Finland, with two thirds of respondents indicating they were interested in science (Tieteen Tiedotus ry, 2022). In addition, science and research are highly trusted in Finland, alongside health authorities – and trust towards science increased during the COVID-19 pandemic (Tieteen Tiedotus ry, 2022). In addition, the results show that the majority of participants trust information about vaccines and vaccinations provided by authorities and experts (Tieteen Tiedotus ry, 2022). Yet, we have little information who these vaccine experts are according to parents.

3 Aims of the study

This thesis aimed to investigate the factors associated with parental childhood vaccination intention regarding HPV and influenza vaccines in Finland. In addition, vaccine expertise was examined by exploring parental attitudes on what kind of qualities they think a vaccine expert should have. The specific aims of the individual studies were:

1. To examine factors associated with parents' intention to have their child vaccinated with influenza vaccine in high and low vaccination coverage municipalities during the influenza season of 2021-2022 in Finland (Study I)
2. To examine what factors are associated with parental intention to have their daughters vaccinated against HPV in high and low vaccination coverage municipalities in 2022 in Finland (Study II)
3. To explore and understand who parents consider an expert in vaccines, and what kind of qualities said expert should have according to parents (Study III)

4 Materials and methods

4.1 Questionnaires and study design

The study was conducted as a cross-sectional mixed method study, employing both qualitative and quantitative data collection methods. The questionnaire was created by combining questions used in the Eurobarometer, which is a tool measuring the public opinion in the European Union since 1974, and the Finnish Science Barometer, which is a study conducted to investigate the attitudes people living in Finland hold towards science (European Commission. Directorate General for Health and Food Safety. et al., 2019; Tieteen Tiedotus ry, 2022). Furthermore, the questionnaire contained questions regarding knowledge and opinions about HPV or influenza and vaccination against them (Appendix 1). The questionnaires were piloted on a small sample of parents outside of the target areas for appropriateness, understandability and general flow. The questionnaires were bilingual, using the two official languages of Finland, Finnish and Swedish. Parents were asked to complete the questionnaire with their youngest child in mind, in case there were multiple age-appropriate children in the family. The questionnaire could be completed only once. No separate consent form was used, as parents consented by completing the questionnaire. Participating parents did not receive any compensation for participating.

The web-based survey consisted of five topics: information sources and trust, expertise, vaccination behaviour, knowledge of influenza or HPV, and background information. Studies I and II used the entire questionnaire, except questions regarding the topic of expertise, to conduct the analysis, while study III used the two questions regarding expertise from the questionnaires. In addition to the collected quantitative data, the studies I and II utilised the National Vaccination Register database to calculate the realisation of parental intention to have their child vaccinated by extracting vaccine uptake data for the children of participating parents.

Vaccine behaviour included questions about HPV or influenza and other childhood vaccines in the NVP. Parents in the influenza study were asked whether their child has or will receive the influenza vaccine during the influenza season 2021-2022, while parents in the HPV study were asked about their intention to vaccinate their daughter against HPV during the academic year of 2021-2022. The

parents were then asked to rank the influence different entities have had on their vaccination decision. To study the reasons for non-vaccination, the parents who indicated no intention to vaccinate their child were asked to expand on the reason(s) for not vaccinating. To conduct the statistical analysis, the intention to vaccinate was dichotomised into two (yes or no), merging the unsure parents into the vaccine refusing parents.

Knowledge scores were computed by assigning one point to each correct answer, and then calculating the points together to create a total score for each participant. In both studies, there were a maximum of 11 points to be collected. After calculating the total score for each participant, the mean score was calculated, and the scores were divided into three categories, respectively: poor, good, and excellent knowledge.

The collected data on expertise was an excerpt of two questions from the questionnaires used in the quantitative part of the study. The two used questions were quantitative (close-ended) and qualitative (open-ended) in nature. In the quantitative question, parents were asked to indicate their agreement with ten expertise statements: i) the expert represents a university or research organisation, ii) the expert represents an authority, iii) the expert is actively in the public eye, iv) the expert has an appropriate scientific education, v) the expert has practical experience on the matter, vi) the expert has good interaction skills, vii) the expert can communicate clearly, viii) when necessary, the expert has the ability to question the views of authorities or scientists, ix) the expert represents the same sex as me, and x) I can relate to the expert. Parents were asked to indicate the level of their agreement using a five-point Likert scale. In addition to the close-ended question, parents were asked whether they can think of any other qualities they think an expert should have.

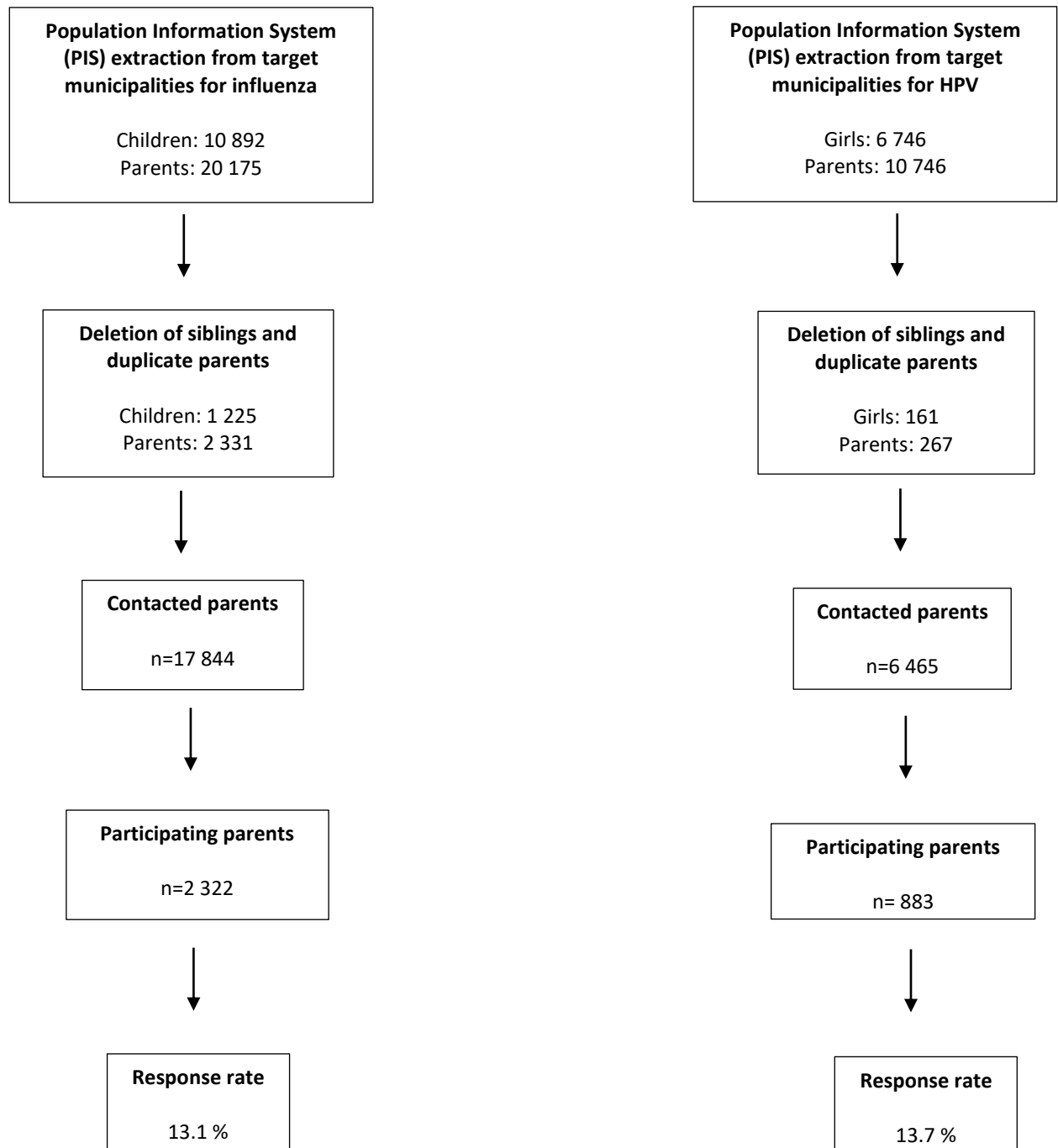
4.2 Participant selection

The study participants were selected from areas with high and low vaccine coverage, to examine whether the factors affecting vaccine coverage differ by municipality. Historically, vaccine coverage differs regionally between Eastern and Western Finland, with Eastern Finland having a higher coverage, while Western Finland is faced with a lower coverage (Finnish Institute for Health and Welfare, 2024c). The selected areas were Espoo (305 274 inhabitants) and Kuopio (122 594 inhabitants) for high vaccine coverage areas, while Oulu (211 848 inhabitants), and Mustasaari (19 662 inhabitants) and Pietarsaari (19 207 inhabitants) combined into one area due to their relatively small size, were selected as low vaccine coverage areas in our study (Kuntaliitto, 2024). The study participants were identified from the Population Information System (PIS), maintained by the

Digital and Population Data Services Agency (Digital and Population Data Services Agency, 2023). The PIS is a computerised national register, containing basic information, such as name, personal identity code and address, about Finnish citizens and foreign citizens living in Finland (Digital and Population Data Services Agency, 2023).

To achieve a response rate of 50%, and 10-50% proportions of non-vaccinated individuals, this would result in 20-100 responses per sex, birth cohort, and study area. Figure 3 shows the selection process of the children and their parents from the pre-selected, high and low vaccination coverage target areas. In terms of influenza, 200 children per age cohort, sex, and area were selected. In conclusion, 31 067 parents were extracted. After removing sibling extractions, we contacted 17 844 parents. In terms of HPV, 200 girls per age cohort per area were selected. Parents were extracted for each girl from the PIS (Digital and Population Data Services Agency, 2023). This resulted in 10 746 parents. To avoid overwhelming the parents with multiple invitations, the aim was to contact each family once, regardless of having multiple age-appropriate children in the family. To achieve this goal, we removed sibling children and their parents from the extracted data. In total, 6 465 parents were contacted.

Figure 3: The selection process of children and their parents for the influenza and HPV studies



4.3 Data collection

Data was collected between February and March 2022. Parents were mailed via post an information letter on THL letterhead, containing the background and aims of the study, and a personal username and password to access the online questionnaire. The letter contained information on how to participate, the rights of the participant and data protection. In addition, the letter informed the participant of their right to drop out at any time. Furthermore, in the first mailed information letter we explained the intention of contacting non-responsive parents after two weeks. After two weeks since the initial letter, participants who had not accessed the questionnaire link received a reminder letter. Two weeks after the reminder letter, data collection was suspended.

4.4 Data analyses and register extraction

4.4.1 Statistical analyses (Study I and II)

Statistical analyses were performed using SPSS for Windows, Version 28 (IBM Corp., Armonk, N.Y., USA). The analyses were done using a unique person identifier for study subjects. Likert-scales were recoded into binomial variables when necessary. Univariable and multivariable logistic regressions were employed to measure the associations between the intention to vaccinate and the sociodemographic factors, knowledge, vaccination behaviour, and trust in information sources. The outcome variable was a dichotomised answer on the intention to vaccinate. Associations were expressed as odds ratios (ORs) and a p-value of <0.05 was considered statistically significant. Variables which were statistically significant in the univariable model were added to the multivariable logistic regression model.

4.4.2 National Vaccination Register extraction analysis (Study I and II)

The Finnish Institute for Health and Welfare maintains the national vaccination register (Baum et al., 2017; Finnish Institute for Health and Welfare, 2023a). The vaccination register covers vaccinations given both in public primary health and specialist medical care and private health care (Finnish Institute for Health and Welfare, 2023a). The data is collected directly from patient records (Baum et al., 2017; Finnish Institute for Health and Welfare, 2023a). To examine the realisation of intention, information regarding the children were linked to the

National Vaccination Register (NVR) by using their personal identity code. The NVR extraction was executed on the 22nd of June 2023 for HPV for girls and on the 8th of May 2023 for influenza. The data extraction period for HPV was any period until the 1st of June 2023. The data extraction period for influenza was between the 1st of October 2021 and the 30th of June 2022. The realisation of intention was calculated by using both Microsoft 365 Excel (Version 2208) and SPSS for Windows, Version 28 (IBM Corp., Armonk, N.Y., USA).

4.4.3 Data analysis of mixed methods (Study III)

For this study, only two questions from the main studies were analysed to determine parental preferences in terms of a vaccine expert. Descriptive analysis was employed to examine parental agreement with the statements in the close-ended question. Chi-square tests of independence were used to explore whether there are differences between parental vaccination intention groups (vaccine-accepting, hesitant and refusing). The statistical analyses were performed using SPSS for Windows, Version 28 (IBM Corp., Armonk, N.Y., USA). The qualitative, open-ended data was inductively analysed following the thematic analysis approach by Braun and Clarke (Braun & Clarke, 2006). To address the research question, participants' responses were read multiple times to ensure familiarity with the data. Responses ranged from single-word entries to multi-sentence statements. As a first step, responses were condensed into concise, content-focused summaries. An exploratory coding approach was applied, without a pre-defined codebook. Individual codes were assigned to each response, after which conceptually similar codes were grouped into broader subcategories. These subcategories were reviewed and organised into overarching main categories through iterative discussion. Data extraction, coding, and categorisation were conducted using Microsoft Excel®.

4.5 Ethical considerations

Prior to starting the project, an ethical permission was sought from the Institutional Review Board (IRB) of the Finnish Institute for Health and Welfare (THL). The study was granted a research permission from the Ethics Committee (THL/868/6.02.01/2020). Furthermore, research permissions were obtained from the municipalities in the study. The study was conducted according to the principles of the Declaration of Helsinki, and the General Data Protection Regulation (GDPR).

5 Results

The results of each article will be discussed in the following subsections. Due to the fact that some of the analysed variables were created as multiple-choice variables, it was not possible to decipher odds ratios and confidence intervals for single aggregate variables. Hence the statistical significance of an aggregate variable containing multiple options (e.g., number of children (1, 2, 3, 4 or more)) is reported only as a p-value, while recognising that confidence intervals and odds ratios provide more information regarding the association of the independent and dependent variable, compared to simply using a point estimate (Lee, 2016). In total, approximately 13% of invited parents participated in the HPV and influenza study, respectively. Figure 3 shows the breakdown from participant selection to response rate for both studies. Regarding expertise, almost all parents answered the close-ended statements on vaccine expert qualities. In addition, 415 parents replied to the open-ended vaccine expert quality question.

5.1 Factors associated with influenza vaccination intention and realisation of intention (article I)

Article I discussed the factors associated with parental influenza uptake intention in Finland. Table 1 shows the sociodemographic characteristics of participating parents. By the end of the data collection period, i.e. 14th of March 2022, we received 2 322 responses. In total, 89.3% (n=2,065) of responding parents indicated that their child has received all offered vaccines in the NVP, while 9.7% (n=252) of parents had vaccinated their child with some of the offered vaccines. 0.8% (n=18) and 0.2% (n=5) parents specified that they have not given their child any vaccinations or do not remember having their child vaccinated, respectively. Although influenza-related knowledge was good, only 74.7% (1,734) of participating parents were aware that children between the ages of 6 months and 6 years were entitled to a free influenza vaccination under the NVP. For comparison, 94.6% (n=2,196) of parents knew that adults over 65 years of age were entitled to an influenza vaccine. When asked with whom does the parent discuss childhood vaccines with, 81.5% percent discussed with the other parent of the child, while 64.6% of parents indicated they discuss vaccines with a healthcare professional.

In the present study, parents were asked two questions regarding sources of vaccine-related information and trust. First, they were asked to rate the perceived importance of various sources of vaccination information on a five-point Likert scale ranging from “very important” to “not at all important”. The sources included official information sources (i.e. authorities), journalistic media, social media, social media influencers, personal contacts, and other sources. Second, parents were asked to evaluate the extent to which they trust vaccine-related information from these same sources. Findings from the influenza study indicated that parents generally perceived information sources as more important than they were trusted – albeit the differences were small. For example, 97% of parents in the influenza study indicated that they found official information sources such as the Ministry of Social Affairs and Wealth as an important source. However, 95.9% of parents indicated they trust official information sources. The greatest discrepancy between perceived importance and trust was observed in relation to social media. In the influenza study, 12.2% of parents identified social media as an important source of vaccination information, whereas only 5.4% indicated that they trusted information obtained from social media. These findings suggest that parents may consult a variety of information sources without necessarily assigning them equal levels of trust, which further highlights the complexity of vaccine-related information-seeking behaviour.

We found that the intention to vaccinate one’s child against influenza was rather high. Overall, 65.8% (n=1,525) of parents indicated intent to vaccinate their child against influenza or that they had already done so. A total of 29.8% (n=691) of parents stated that they will not be having their child vaccinated this season, while 4.4% (n=103) of parents were unsure of their child receiving the influenza vaccine. In total, 34.2% (n=794) of parents indicated no intention to vaccinate or uncertainty regarding having their child vaccinated against influenza. The most commonly reported reason for not vaccinating one’s child against influenza was that the vaccine was not offered (32.9%, n=261) and influenza being a harmless disease (27.1%, n=215). Of the parents who indicated negative intention to vaccinate, 34.5% (n=274) were from Mustasaari/Pietarsaari area, which is a low coverage area. Of these negative intention parents, 33% indicated that the vaccine was not offered to them. When asking for details of the scenario, 58.6% of these parents indicated that the public health nurse did not mention the influenza vaccine. In total, 45.5% and 24.6% of these parents were living in Mustasaari/Pietarsaari and Oulu region, respectively.

Table 1. Sociodemographic characteristics of parents completing the influenza survey, February–March 2022 (n = 2,322)

Characteristics	n	%
Sex of the parent		
Male	900	38.8
Female	1,422	61.2
Age (years)		
20–24	35	1.5
25–29	224	9.6
30–34	696	30.0
35–39	771	33.2
40–44	448	19.3
45–49	125	5.4
50–54	19	0.8
55–59	3	0.1
≥ 60	1	0.0
Mean ± SD, range		
Mother	35.1 ± 5.2	20–51
Other parent ^a	37.4 ± 5.6	23–65
Responding parent's level of education		
Primary school	36	1.6
Vocational school	315	13.6
High school	155	6.7
Bachelor's degree	726	31.3
Master's degree	929	40.0
Doctoral degree	144	6.2
Missing	17	0.7
Other parent's level of education		
Primary school	51	2.2
Vocational school	485	20.9
High school	149	6.4
Bachelor's degree	628	27.0
Master's degree	826	35.6
Doctoral degree	132	5.7
Missing	51	2.2
Occupation ^b		
Executive position	129	5.6
Managerial employee/clerk	854	36.8
Employee	882	38.0
Entrepreneur	114	4.9
Farmer	3	0.1
Student	99	4.3

Stay-at-home parent	138	5.9
Unemployed	29	1.2
Other	47	2.0
Missing	27	1.2
Study area		
Espoo	714	30.7
Oulu	606	26.1
Kuopio	587	25.3
Mustasaari/Pietarsaari	415	17.9
Mother tongue		
Finnish	1,759	75.8
Swedish	347	14.9
Other	168	7.2
Missing	48	2.1
Number of children		
1	702	30.2
2	1,063	45.8
3	368	15.8
4 or more	173	7.5
Missing	16	0.7
Parents' relationship		
Marriage or cohabitation	2,183	94.0
Some other form	123	5.3
Missing	16	0.7
Family's combined annual income (EUR)		
Under 10,000	25	1.1
10–20,000	73	3.1
20–40,000	238	10.3
40–60,000	454	19.6
60–80,000	542	23.4
80–100,000	374	16.1
Over 100,000	466	20.1
Do not want to answer	140	6.0
Missing	10	0.4

^a We collected information on the legal guardians of the child, which were in most cases the parents. The 'responding parent' could either be a mother or a father. The 'other parent' is the father in most pairs (61.2%); however, there were some pairs where both parents were females or males (estimated to be less than 5 pairs in total).

^b Occupational groups were classified according to the classification used by Statistics Finland (Finnish Social Science Data Archive, 2017).

In this study, we found that municipality of residence, maternal level of education, adherence to the national vaccination programme, influenza knowledge, the number of children, trust in official information, and the change in parental attitude towards childhood vaccines after the COVID-19 pandemic were statistically significantly associated with vaccination intention. Table 2 shows the logistic regression analysis of factors associated with the intention to vaccinate. The p-value of the reference category is the p-value for the variable as a whole. Parents living in high vaccination coverage areas were more likely to vaccinate their child against influenza compared to parents living in low vaccination coverage areas. Mothers who had upper secondary education (high school) were less likely to vaccinate their child against influenza compared to mothers with vocational education. In addition, parents with two or three children were more likely to vaccinate their child against influenza, compared to parents who had one child. However, the association with vaccination intention and number of children was not statistically significant in terms of having four or more children. Parents who trusted official information sources were more likely to vaccinate their child against influenza, compared to those who did not trust official sources. Moreover, high influenza knowledge was associated with parental intention to vaccinate their child: parents with excellent influenza knowledge were four times more likely to vaccinate their child compared to those with poor knowledge. Finally, parents whose child had received all recommended childhood vaccinations were more likely to vaccinate their child against influenza.

Table 2. Logistic regression analysis of factors associated with the intention to vaccinate against influenza, February–March 2022 (n = 2,322 parents)

Variable		Univariable analysis			Multivariable analysis		
		OR	95% CI	p value	OR	95% CI	p value
Municipality of residence	Oulu	Ref.		< 0.001	Ref.		< 0.001
	Espoo	1.53	1.21–1.95	< 0.001	1.59	1.19–2.13	0.002
	Kuopio	1.61	1.25–1.95	< 0.001	1.54	1.15–2.13	0.003
	Mustasaari and Pietarsaari	0.26	0.20–0.34	< 0.001	0.31	0.20–0.48	< 0.001
Age		1.01	0.99–1.02	0.491	NA		
Sex	Male	Ref.		0.429	NA		
	Female	0.93	0.78–1.11				
Mother tongue	Finnish	Ref.		< 0.001	Ref.		0.536
	Swedish	0.25	0.19–0.31	< 0.001	0.81	0.52–1.24	0.331
	Other	0.85	0.61–1.19	0.356	1.10	0.70–1.70	0.676
Actively practice religion	No	Ref.		< 0.001	Ref.		0.416
	Yes	0.72	0.56–0.93	0.011	1.10	0.78–1.53	0.621
	Do not want to tell	0.63	0.42–0.95	0.027	1.44	0.82–2.54	0.203
Responding parent's educational level	Vocational education	Ref.		< 0.001	Ref.		< 0.001
	Non-vocational education	1.01	0.70–1.43	0.987	0.46	0.29–0.73	< 0.001
	University-level education	2.06	1.62–2.62	< 0.001	1.04	0.75–1.47	0.776
Other parent's	Vocational education	Ref.		< 0.001	Ref.		0.191

educational levela	Non-vocational education	1.72	1.22–2.43	0.002	1.40	0.91–2.15	0.122
	University-level education	1.88	1.53–2.31	< 0.001	1.24	0.94–1.63	0.121
Number of children	1	Ref.		< 0.001	Ref.		0.002
	2	1.27	1.03–1.55	0.022	1.15	1.10–2.51	0.015
	3	0.76	0.59–0.99	0.040	1.90	1.27–2.84	0.002
	≥ 4	0.72	0.51–1.01	0.055	1.22	0.78–1.90	0.381
Trust in official information sources	Not at all or not much	Ref.		< 0.001	Ref.		0.008
	Very much or rather much	8.12	4.39–15.02	< 0.001	3.08	1.42–6.67	0.004
	Does not know	1.51	0.45–5.00	0.501	1.19	0.27–5.19	0.819
Trust in journalistic media	Not at all or not much	Ref.		< 0.001	Ref.		0.689
	Very much or rather much	1.45	1.20–1.76	< 0.001	1.10	0.86–1.41	0.460
	Does not know	0.96	0.70–1.33	0.828	0.98	0.65–1.47	0.919
Trust in social media	Not at all or not much	Ref.		0.099	NA		
	Very much or rather much	0.72	0.50–1.03	0.074			
	Does not know	0.79	0.55–1.13	0.191			
Trust in influencers	Not at all or not much	Ref.		0.003	Ref.		0.2780

	Very much or rather much	0.56	0.38–0.83	0.003	1.62	0.90–2.95	0.110
	Does not know	0.71	0.51–0.996	0.047	1.02	0.66–1.56	0.943
Trust in personal contacts	Not at all or not much	Ref.		0.009	Ref.		0.146
	Very much or rather much	0.75	0.62–0.90	0.003	0.79	0.62–1.01	0.057
	Does not know	0.88	0.67–1.14	0.325	0.81	0.59–1.11	0.194
Trust in other sources	Not at all or not much	Ref.		0.128	NA		
	Very much or rather much	1.42	0.92–2.19	0.116			
	Does not know	1.46	0.99–2.14	0.054			
Adherence to the national vaccination programme	Yes, all recommended	Ref.		< 0.001	Ref.		< 0.001
	Yes, some of the recommended	0.14	0.10–0.19	< 0.001	0.20	0.14–0.29	< 0.001
	No vaccines at all or does not know	0.02	0.003–0.14	< 0.001	0.02	0.003–0.20	< 0.001
Influenza knowledge	Poor knowledge	Ref.		< 0.001	Ref.		< 0.001
	Good knowledge	3.03	2.42–3.80	< 0.001	2.73	2.73–3.60	< 0.001
	Excellent knowledge	5.49	4.22–7.14	< 0.001	4.08	2.96–5.60	< 0.001
Change in attitudes since COVID-19	No, attitude has not changed	Ref.		< 0.001	Ref.		0.039
	Yes, attitude is more trusting	1.00	0.74–1.35	0.995	1.08	0.75–1.58	0.672

	Yes, attitude is more cautious	0.49	0.39–0.62	< 0.001	0.68	0.49–0.93	0.015
Parents' relationship	Marriage or cohabitation	Ref.		0.013	Ref.		0.073
	Some other form	0.63	0.44–0.91	0.013	0.63	0.38–1.04	0.073

The realisation of vaccine intention was verified from the National Vaccine Register (NVR). For most children (81%), only one parent took part in the study. To calculate the realisation of intention in the case of both parents taking part in the study, we considered only the vaccination intention of the parent who answered first. The realisation of intention was calculated by dividing the number of children who received their vaccination according to the NVR by the number of children whose parent participated in the study. Table 3 shows the breakdown of realisation of influenza vaccination intention. In total, 50.8% (n=956) of children whose parent participated in the study received their influenza vaccination. This realised vaccination uptake was higher than the influenza season 2021/2022 national vaccination coverage of 35.6% for children under the age of 7.

It should be noted that the data collection period coincided with the influenza vaccination season, raising the potential for temporal bias in assessing vaccination uptake. However, an examination of the vaccination register indicated that 98.6% of the children (n=943) whose parents participated in the study had received their influenza vaccination prior to February 1st, 2023.

Table 3. Realisation of influenza vaccination according to the national vaccination register in March 2023, according to parental intention, October 2021–June 2022 (n = 1,879^a children)

Variables	Total	Yes ^b	No	Unsure
Children classified by parental vaccination intention ^c (n)	1,879	1,203	596	80
Children vaccinated by 30 June 2022 according to the register (n)	956	924	18	13
Per cent vaccinated	50.8%	76.8%	3.0%	16.3%

a Of 1,880 children examined in the study, one child was not included in the first variable because the parent did not provide an answer to this particular question in the survey.

b Parents who had already vaccinated their child against influenza and parents who were intending to vaccinate their child against influenza are represented here.

c For children with two responding parents, the answer of the first parent was used.

Furthermore, 76.8% of children whose (first participating) parent indicated positive intention towards vaccinating ended up receiving the vaccination. In total, 64% of children had a parent with a positive vaccination intention, but eventually, only 50.8% of these children received their influenza vaccine after a nine-month follow-up period.

5.2 Factors associated with HPV vaccination intention and realisation of intention (article II)

Article II examined factors associated with parental intention to vaccinate their daughter against HPV. By the end of the data collection period, i.e. 14th of March 2022, we received 883 responses for the HPV study. The HPV study response rate was 13.7% (Figure 3). Table 4 shows the sociodemographic characteristics of participating parents. Almost 91% (n=803) of participating parents indicated that their daughter has received all childhood vaccines offered in the NVP. Approximately 7% (n=61) of parents expressed that their daughter had received some of the offered childhood vaccines, whereas 1.4% (n=12) of parents had refused all childhood vaccinations for their daughter. The majority (72%, n=635) of parents informed that they had reached the decision to vaccinate their daughter against HPV with the daughter's other parent. Only 4% (n=3) of parents indicated their daughter being in charge of the HPV vaccination decision-making. In total, 83.2% (n=734) of parents expressed that their daughter had already received or would receive the vaccination. On the contrary 7.9% (n=69) of parents indicated that their daughter has not or will now receive the vaccine. Nearly 9% (n=77) of parents were unsure whether their daughter will receive the HPV vaccination or not. 31.5% (n=46) of these refusing parents were from Espoo, and 28.8% (n=42) from Kuopio, while 23.3% (n=43) were residents of Mustasaari/Pietarsaari region and 16.4% (n=24) lived in Oulu. Similarly to the influenza study, parents in the HPV study found the sources of vaccine information more important than trustworthy. In terms of HPV, 11.5% of parents ranked social media as an important source of vaccine-related information, although only 4% indicated they trust social media as a source for vaccine-related information.

The most commonly reported reasons for non-vaccination were fear about adverse effects (21.9%) and exposure to negative information about the vaccine (15.1%). Additionally, 12.3% of parents (n=108) indicated that they had chosen to delay HPV vaccination in order to wait until their daughter was older. The majority of parents (86.0%, n=768) did not believe that the HPV vaccine encourages the initiation of sexual activity. When asked with whom they discuss childhood vaccinations, 81.6% of parents reported discussing the matter with the child's other parent, while 64.5% indicated that they consult healthcare professionals.

Table 4. Sociodemographic characteristics of parents completing the HPV survey, February–March 2022 (n = 883)

Characteristics	n	%
Age		
30-34	36	4.1
35-39	122	13.8
40-44	293	33.2
45-49	277	31.4
50-54	112	12.7
55-59	36	4.1
60 >	7	0.8
Mean ±SD, range		
Mother	43.5 ± 5.2	30-58
Other parent ^a	46.3 ± 6.1	31-72
Maternal level of education		
Primary school	10	1.1
Vocational school	134	15.4
Matriculation examination	50	5.8
Bachelor's degree	280	32.3
Graduate degree	327	37.7
Doctoral degree	67	7.7
Missing	10	1.1
Other parents' level of education		
Primary school	27	3.1
Vocational school	179	20.8
Matriculation examination	50	5.8
Bachelor's degree	244	28.4
Graduate degree	301	35.0
Doctoral degree	59	6.9
Missing	9	1.0
Occupation		
Executive position	119	13.7
Managerial employee/clerk	346	39.7
Employee	273	31.3
Entrepreneur	66	7.6

Farmer	4	0.5
Student	17	2.0
Stay-at-home parent	15	1.7
Unemployed	11	1.3
Other	20	2.3
Missing	12	1.4
Study area		
Espoo	264	29.9
Oulu	191	21.6
Kuopio	244	27.6
Mustasaari & Pietarsaari	184	20.9
Mother tongue		
Finnish	671	77.3
Swedish	140	16.1
Other	57	6.6
Missing	15	1.7
Number of children		
1	137	15.6
2	419	47.8
3	218	24.9
4 or above	102	11.6
Missing	7	0.8
Household income (€)		
Under 10 000	2	0.2
10 - 20 000	22	2.5
20 – 40 000	65	7.4
40 – 60 000	111	12.6
60 – 80 000	160	18.2
80 – 100 000	160	18.2
Over 100 000	297	33.8
Do not want to answer	62	7.1
Missing	7	0.8

^a We collected information on the legal guardians of the child, which were in most cases the parents. The ‘other parent’ is the father in most pairs (62.9%); however, there were some pairs where both parents were females or males (estimated to be less than 5 pairs in total).

Overall, we found that 97% of participating parents had heard of HPV, and almost all parents (95%) were aware of the association between HPV and cervical cancer. However, participating parents had poor knowledge of HPV-related conditions. Roughly 40% (n=353) of parents were aware that condyloma is caused by HPV. In addition, only 22% (n=194) and 23% (n=207) of parents were aware that anal and oral cancer, respectively, are associated with an HPV infection. There was a maximum of 11 points to be collected. After calculating the total score for each participant, the mean score was calculated. The mean knowledge score for the HPV study was 5.59 ($\pm$ 2.1). The mean score was used as a cut-off value, with values for respondents' scores being defined and categorised as poor (<5 points), average knowledge (6-8 points) and excellent knowledge (>9 points).

We found that adhering to the national vaccination programme, parents' mother tongue, and trusting in official information sources were associated with the parental intention to vaccinate their daughter. Parents who reported that their daughter had received all previously offered childhood vaccinations were more likely to express an intention to vaccinate against HPV compared to parents whose daughter had not received any childhood vaccines. Parents with a foreign mother tongue were less likely to intend to vaccinate their daughter against HPV compared to Finnish-speaking parents, whereas no significant difference in vaccination intention was observed between Finnish and Swedish speakers. Furthermore, a higher level of trust in official information sources was positively associated with the intention to vaccinate, compared to parents who reported low trust in official sources.

Table 5. Logistic regression analysis of factors associated with the intention to vaccinate against HPV, February–March 2022 (n = 883 parents)

Variable		Univariable analysis			Multivariable analysis		
		OR	95% CI	p value	OR	95% CI	p value
Municipality of residence	Oulu	Ref.		0.425	NA		
	Espoo	0.70	0.40-1.18	0.172			
	Kuopio	0.70	0.40-1-20	0.184			
	Mustasaari and Pietarsaari	0.64	0.36-1.12	0.120			
Age		1.04	1.00-1.07	0.024	1.01	0.97-1.05	0.601
Sex of the parent	Male	Ref.		0.215	NA		
	Female	1.26	0.88-1.81				
Mother tongue	Finnish	Ref.		<0.001	Ref.		0.005
	Swedish	0.97	0.58-1.64	0.922	1.09	0.60-2.10	0.791
	Other	0.20	0.11-0.34	<0.001	0.30	0.14-0.64	0.002
Actively practice religion	No	Ref.		0.002	Ref.		0.377
	Yes	0.51	0.31-0.83	0.008	0.74	0.37-1.50	0.406
	Do not want to tell	0.35	0.15-0.80	0.012	0.50	0.16-1.54	0.228
Mother's educational level ^a	Vocational education	Ref.		<0.001	Ref.		0.215
	Non-vocational education	2.23	1.03-4.82	0.42	2.44	0.86-6.96	0.095
	University-level education	2.91	1.90-4.48	<0.001	1.42	0.77-2.62	0.254
Other parent's educational level	Vocational education	Ref.		<0.001	Ref.		0.112
	Non-vocational education	0.90	0.49-1.65	0.739	0.89	0.41-1.95	0.772
	University-level education	2.34	1.55-3.55	<0.001	1.64	0.94-2.87	0.083
Number of	1	Ref.		0.013	Ref.		0.197

children	2	1.85	1.13-3.01	0.014	1.87	1.02-3.45	0.044
	3	1.81	1.04-3.16	0.036	1.54	0.77-3.06	0.223
	≥ 4	0.95	0.52-1.75	0.870	1.16	0.50-2.66	0.730
Age of daughter	10	Ref.		0.031	Ref.		0.068
	11	1.45	0.87-2.44	0.156	1.69	0.90-3.20	0.104
	12	1.82	1.05-3.16	0.034	1.88	0.95-3.71	0.070
	13	2.09	1.12-3.72	0.012	2.62	1.24-5.53	0.012
	14	2.66	1.42-4.97	0.002	3.00	1.37-6.50	0.006
	15	1.31	0.50-3.45	0.585	2.23	0.59-8.40	0.236
Trust in official information sources	Not at all or not much	Ref.		<0.001	Ref.		0.006
	Very much or rather much	10.30	3.74-28.34	<0.001	8.14	1.91-24.71	0.005
	Does not know	0.79	0.15-4.21	0.778	1.81	0.19-17.42	0.606
Trust in journalistic media	Not at all or not much	Ref.		0.004	Ref.		0.741
	Very much or rather much	1.81	1.20-2.72	0.005	1.09	0.49-2.44	0.832
	Does not know	0.90	0.49-1.67	0.735	1.25	0.71-2.23	0.440
Trust in social media	Not at all or not much	Ref.		0.003			0.785
	Very much or rather much	0.36	0.18-0.74	0.005	1.48	0.36-6.07	0.584
	Does not know	0.49	0.27-0.90	0.022	1.57	0.44-5.60	0.489
Trust in influencers	Not at all or not much	Ref.		<0.001	Ref.		0.896
	Very much or rather much	0.24	0.10-0.52	0.001	0.71	0.15-3.50	0.678
	Does not know	0.41	0.23-0.74	0.003	0.85	0.18-3.92	0.837
Trust in personal	Not at all or not much	Ref.		0.002	Ref.		0.145

contacts	Very much or rather much	0.60	0.39-0.90	0.014	0.64	0.35-1.17	0.145
	Does not know	0.40	0.24-0.67	<0.001	1.22	0.73-2.04	0.457
Trust in other sources	Not at all or not much	Ref.		0.244	NA		
	Very much or rather much	0.47	0.20-1.14	0.095			
	Does not know	0.68	0.31-1.49	0.336			
Adherence to the national vaccination programme	Yes, all recommended	Ref.		<0.001	Ref.		<0.001
	Yes, some of the recommended	0.08	0.04-0.14	<0.001	0.09	0.04-0.18	<0.001
	No vaccines at all or does not know	0.09	0.04-0.23	<0.001	0.17	0.05-0.54	0.003
HPV knowledge	Poor knowledge	Ref.		0.128	NA		
	Good knowledge	1.50	1.00-2.24	0.04			
	Excellent knowledge	1.32	0.74-2.35	0.35			
Change in attitudes since COVID-19	No, attitude has not changed	Ref.		0.002	Ref.		0.937
	Yes, attitude is more trusting	1.00	0.52-1.09	0.992	0.87	0.39-1.95	0.743
	Yes, attitude is more cautious	0.40	0.24-0.67	<0.001	1.05	0.50-1.28	0.904
Parents' relationship	Marriage or cohabitation	Ref.			NA		
	Some other form	0.88	0.53-1.47	0.637			

In total, 83.9% (723/883) of participating parents had the intention to vaccinate their daughter against HPV. For most girls (83.8%), only one parent took part in the study. As 16.2% (143/883) of parents were responding for the same daughter, we selected the answer of the first participating parent to analyse the realisation of parental intention. In total, 83.3% (612/740) of (first participating) parents had the intention to have their daughter vaccinated against HPV. The realisation of intention was calculated by dividing the number of children who received their vaccination according to the NVR by the number of children whose parent participated in the study. We extracted the vaccination status from the NVR on the 22nd of June 2023. The vaccination coverage among the daughters of participating parents was 87.7%. While almost 95% of girls whose parent indicated positive intention ended up receiving their vaccination, surprisingly 29.5% of girls whose first participating parent indicated negative intention to vaccinate eventually did receive her vaccination. Even more surprising, almost 74% of girls whose parent was unsure regarding HPV vaccination ended up receiving their vaccination.

Table 6. Realisation of HPV vaccination according to the national vaccination register on June 22nd, 2023, according to parental intention (n = 735a girls)

Variables	Total	Yes ^b	No	Unsure
Girls classified by parental vaccination intention ^c (n)	735	609	61	65
Girls vaccinated by 22 June 2023 according to the register ^d (n)	644	578	18	48
Per cent vaccinated	87.7	94.9	29.5	73.8

^a Of 740 girls examined in the study, five girls were not included in the first variable because the parent did not provide an answer to this particular question in the survey.

^b Parents who had already vaccinated their daughter against HPV and parents who were intending to vaccinate their daughter against HPV are represented here.

^c For children with two responding parents, the answer of the first parent was used.

^d According to the national vaccination register, the five girls with missing parental intention had received their vaccination, but for the purpose of calculating realisation of intention, they are excluded here.

5.3 What makes an expert in childhood vaccinations? (article III)

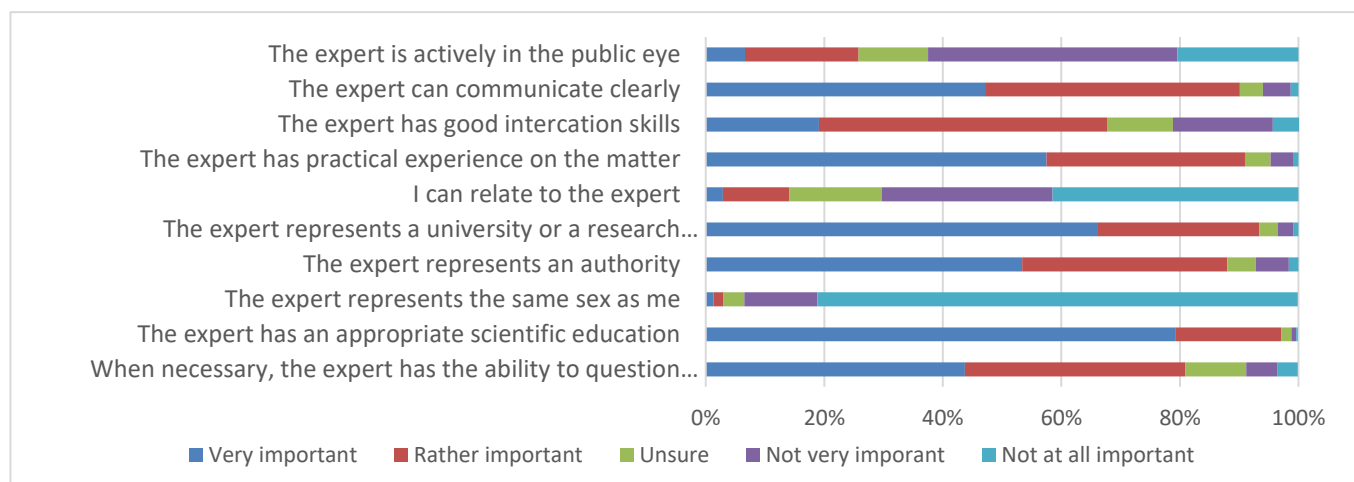
Article III examined parental perceptions of expertise in childhood vaccinations and vaccines, specifically focusing on the qualifications and attributes that parents believe vaccine experts should have. The study utilised a subset of the main questionnaires employed in studies I and II. As participants were not required to respond to every item regarding expert characteristics, there is some variation in the number of responses across the open- and close-ended questions.

Almost all participating parents answered the close-ended statements, with the number of parents indicating their preference for expert characteristics varied between 870 and 878 (total n=883) for the HPV study. In terms of influenza, answering parents varied between 2,291 and 2,314 (total n=2,322). In terms of the open-ended question, 415 parents replied to the open-ended question used in this study: 310 parents (13% of total study participants) in the influenza-study, while 105 parents (12%) in the HPV study. The open-ended question the parents were asked to answer was “Do any other qualities that an expert should have come to your mind?” The results are discussed in two sub-categories, statistical analysis, and thematic analysis.

5.3.1 Characteristics of a vaccine expert: statistical analysis

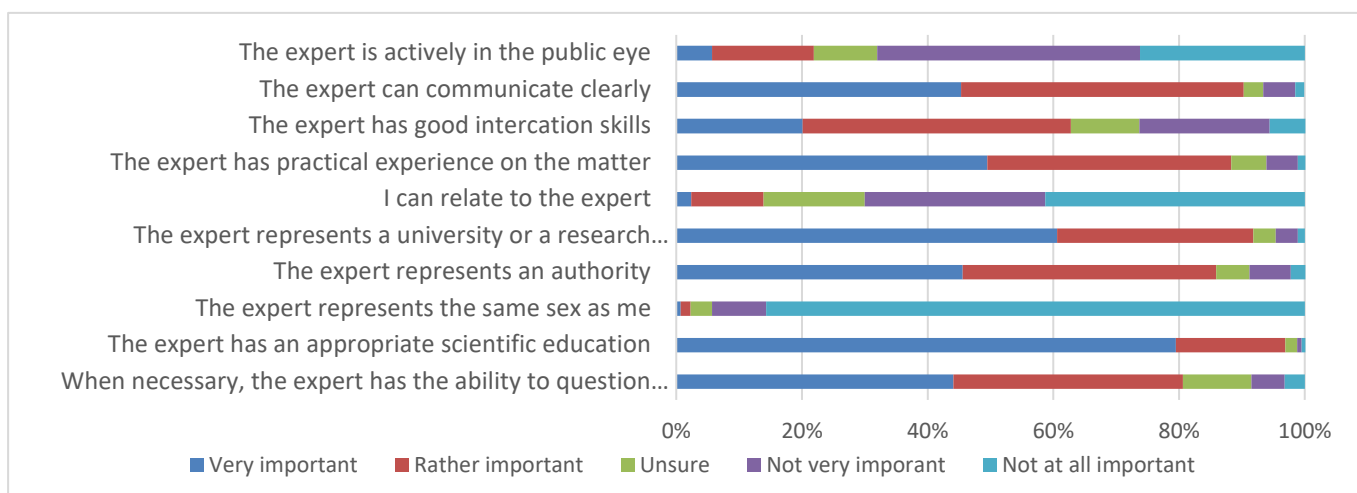
On average 873 parents (99% of total participants) in the HPV-study answered each question on the characteristics of a vaccine expert. Scientific education was the characteristic most frequently rated important for a vaccine expert (97%), while representing a university or a research organisation was considered important by 94% of participating parents.

Table 7. Characteristics of a vaccine expert according to HPV-study parents
(n=883)



In terms of influenza-parents, on average 2,302 parents (99% of total study participants) answered. Scientific education was most commonly considered as an important characteristic a vaccine expert should have by 97% of parents (n=2,236). Communicating clearly and representing a university or research organisation were valued qualities by the parents: 92% of parents indicated representing a university or research organisation was important, while 90% of parents deemed communicating clearly as important.

Table 8. Characteristics of a vaccine expert according to influenza study parents
(n=2,322)



In addition to the descriptive analysis, a chi-square test of independence was conducted to examine whether there are differences between parental vaccination intention groups (vaccine accepting, i.e. has or will vaccinate their child; vaccine hesitant, unsure whether child will receive vaccination; and vaccine refusing, i.e. no intention to vaccinate) and prioritisation of expert qualities. In terms of HPV, vaccine accepting parents (93%) were more likely to consider representing a university or research organization as an important characteristic compared to vaccine hesitant (67%) and vaccine refusing (55%). This association was statistically significant ($p < 0.001$). Furthermore, vaccine accepting parents (90%) were more likely to consider representing an authority as important compared to vaccine hesitant (57%) and vaccine refusing (46%) parents ($p < 0.001$). Having a scientific education was more important to vaccine accepting (100%) and vaccine hesitant parents (100%) compared to vaccine refusing (82%) parents ($p < 0.001$). Vaccine accepting parents (94%) were more likely to consider the vaccine expert having practical experience more important than vaccine hesitant (86%) and vaccine refusing (82%) parents ($p = 0.045$). Communicating clearly was statistically significantly associated with parental vaccination intention, with vaccine accepting parents (95%) being more likely to prioritise it compared to vaccine hesitant (57%) and vaccine refusing (73%) parents ($p < 0.001$).

Regarding influenza, we found that vaccine accepting parents were more likely to prioritise the vaccine expert representing an authority (81%) compared to vaccine hesitant parents (58%) and vaccine refusing parents (62%). This association was statistically significant ($p < 0.001$). In addition, vaccine accepting parents (92%) and vaccine refusing parents (92%) were more likely to consider communicating clearly important compared to vaccine hesitant parents (75%). Surprisingly, vaccine hesitant parents (8%) were more likely to consider the vaccine expert being the same sex as them important compared to vaccine accepting (0%) and vaccine refusing (1%) parents ($p = 0.012$). However, relatability was not a statistically significant factor in parental vaccination intention groups.

5.3.2 Characteristics of a vaccine expert: thematic analysis

There were 143 codes, and nine subcategories formed from the open-ended answers. They were grouped under four main categories, stemming from previous literature on expert qualifications: 1) Knowledge and experience, 2) institutional authority, 3) ethics and integrity, and 4) communication and interaction. There were no systematic differences between the parents' socio-demographic factors in the two datasets (HPV and influenza), and hence, for the purpose of the study, we combined the parental responses to analyse the preference for expert characteristics. Table 9 shows the breakdown of the main categories, subcategories and examples of codes and answers. In terms of frequencies, honesty (29 mentions), having perspective (28 mentions) the ability to popularise (22), and being fact-based (22) were the most frequently mentioned qualities of an expert. In total, qualities relating to communication were mentioned the most often (347), followed by ethics (147), and knowledge and experience (101).

Table 9. Vaccine expert categories developed from open-ended questions

Example of answer	Example of code	Subcategory	Main category
<i>“Has obtained a PhD. If not, [they’re] not an expert.” – participant 186: female, 38</i>	PhD	Education	Knowledge and experience
<i>“Long experience in their work.” – participant 270: female, age 37</i>	Long-term experience	Experience	
<i>“Possession of facts and understanding of facts” – participant 53: male, age 54</i>	Fact-based	Knowledge	
<i>“The collective trust of the scientific community.” – participant 113: male, age 37</i>	Trust of the scientific community	Support from the scientific community	Institutional authority
<i>“The expert should be impartial, representing a medical company should not be a background factor, or at least these factors should be expressed” – participant 204: female, age 33</i>	Impartial	Ethics	Ethics and integrity
	Independent from medical companies		
	Disclosure of affiliations		
<i>“The ability to justify the matter so that even the dumbest understands the point.” – participant 147: female, age 37</i>	The ability to justify in a popularised manner	Communication skills	Communication and interaction
<i>“Familiar with the media [...]” – participant 98: male, age 39</i>	Familiar with the media	Media activity	
<i>“The expert knows how to control their feelings, e.g., if they encounter doubting or aggressive behaviour against their own opinion.” – participant 346: female, age 46</i>	Emotion regulation	Personal skills	
<i>“Speaks Swedish, most preferably is bilingual.” – participant 348: male, age 41</i>	Bilingual	Language skills	

Knowledge and experience

In the close-ended survey scientific education was seen as an important quality – almost all parents (97%) found that a vaccine expert having an appropriate scientific education was either ‘very important’ or ‘rather important’. In total, 91% of participating parents ranked having practical experience as an important characteristic for a vaccine expert.

In the open-ended questions, qualities relating to knowledge and experience were mentioned 101 times. Many parents considered the training of a vaccine expert an important feature. They expressed the kind of education that is appropriate for an expert by listing either disciplines such as virology and medicine, or degrees such as “*professor*” and “*PhD.*” Thus, parents differentiated between having a general or a specific education: “*the expert has a scientific education from a relevant area (i.e., virology, not astronomy)*” (185: m, 44).

The merits of the expert should also be easily validated. Scientific education brought desirable qualities such as logical and scientific thinking. Education was considered an important feature more frequently than delivery:

“In general, I wish for clearer experts, but of course professionalism and education are more important than their outer demeanour”
(188: f, 35).

In the close-ended question, 91% of participating parents indicated that practical experience was an important quality for a vaccine expert. Many parents expressed the importance of experience with a few words or a very short sentence in the open-ended question. The expert was assumed to have “*long experience and knowledge of the subject*” (273: f, 37). One parent expressed that the expert should be in “*close contact with practical work*” (268: f, 45), while another parent demanded the expert to have “*done clinical work as well*” (271: f, 42). In addition to experience in the Finnish context, some parents specified that the expert should have “*international experience [..]*” (31: f, 52).

Parents implied that knowledge is an essential characteristic of a vaccine expert. However, parents had differentiating opinions on the level and type of knowledge. Some parents simply stated that the expert should “*know of the subject*” (280: m, 35), while some demanded specific “*scientific knowledge from the right field*” (282: f, 39). One parent expressed that “*the most important thing is, that it really is an expert, and not a person who has no expertise in the matter at hand*” (56: f, 49). Some parents rationalised that “*through their education and profession, the expert has fact-based knowledge of the issues they present*” (57: m, 45). One parent thought that having knowledge would fortify the expert’s communication:

“One should have such vast and robust knowledge of the topic that one can justify their point of view without any problems” (190: f, 33).

Institutional authority

Representing a university or a research organisation was deemed as an important quality of a vaccine expert in the close-ended questions by 92% of participating parents. In their responses to the open-ended questions, parents mentioned characteristics relating to institutional authority 16 times. Parents demanded that “*the expert needs to be respected in the science community*” (111: m, 41). Parents also expected the vaccine expert to be peer-reviewed, by having “*recommendations from other experts*” (110: f, 40). Furthermore, parents wished for the expert to have “*a good reputation*” (1: m, 54). A vaccine expert was viewed not only through their education but also through their personal life: “*[...] personal contacts e.g., through work are important*” – (343: f, 42).

In addition to being respected and acknowledged within the Finnish science community, one parent expected the expert to be “*internationally respected*” (108: m, 38). Current employment matters as well:

“The expert should represent a research organisation of this very field” (106: f, 41).

Ethics and integrity

In our study, parents examined aspects of ethics and integrity of the experts from various perspectives. Parents mentioned qualities relating to ethics and integrity 130 times. Multiple participants vehemently expressed that a vaccine expert should be independent from pharmaceutical companies: *“The expert should be completely independent from e.g., drug manufacturers etc.”* (209: m, 49). The vaccine expert was expected to *“[...] not represent any private company that benefits from the sale of vaccinations”* (210: m, 28). Parents indicated that the expert should operate with *“[...] the child’s health as a priority instead of financial gain”* (232: f, 40). Another parent strongly underlined that both the vaccine expert and their research should be independent from non-governmental funding:

“No commercial connections with drug manufacturers!!!! Research funding should come 100% from the government and not a single penny from medical companies” (243: m, 41).

Another frequently mentioned topic was the independence from politics. Parents indicated that the vaccine expert should *“not be susceptible to political steering”* (214: m, 42), and a vaccine expert was thought to have *“non -political purposes”* (36: f, 42). One parent indicated that *“it would be good for an expert to be politically neutral. Science does not ask for a political opinion”* (207: m, 39). Another parent wished that *“the expert is not committed to any political agenda or other (for example, religious) group”* (205: m, 47). One parent stated that an expert should be *“[...] Detached from the political game if possible”* (251: m, 41). Parents indicated that an expert should have integrity and be honest: *“integrity and backbone to defend one’s point of view, and the intellectual honesty to change one’s position if reason arises”* (74: m, 48). An expert was expected to have the bravery to bring up uncertainties:

“Dares to bring forward uncertainties. Of course, this is problematic from the point of view of public discussion, because people, on average, need clear guidance, but I personally

appreciate that if there are clear factual uncertainties, they dare to bring them up as well.” – (349: m, 39).

Some participating parents expressed views that can be classified as being doubtful of expertise. Parents indicated that the vaccine expert should be able to *“challenge the viewpoint, also against the mainstream” (118: f, 33).*

Furthermore, parents implied that the expert should have *“the ability to question authorities” (5: m, 58).* Moreover, some parents were doubtful of vaccine experts who currently frequent the public eye. Parents indicated that a vaccine expert should *“not be a part of the mafia. Unfortunately, that includes all ‘experts’ who get a say” (180: f, 42).* One parent expressed their frustration towards vaccine expertise by explaining that *“this has been one big mess up until now, can there be an expert somewhere who knows what they’re talking about?” (179: m, 45).*

Communication and interaction

In the close-ended question, communicating clearly was deemed important by 90% of parents. Interaction skills were deemed less important than communication skills, as 68% of parents indicated that it was important that a vaccine expert had good interaction skills. Furthermore, only 26% of participating parents deemed being active in the public eye as a very or rather important quality.

In the open-ended question, parents mentioned qualities relating to communication and interaction 347 times. According to the parents *“the expert is able to give clear instructions in public” (129: f, 32).* In addition to being clear, an expert should be able to popularise science. The expert should have *“the ability to explain difficult matters understandably in a manner that leaves those who have more knowledge with something. [...] a simple core issue and in addition, a deeper opening of the topic” (151: m, 51).* Furthermore, the vaccine expert was expected to be convincing but also proportionate in communication: *“they should clearly feel like they know what they’re talking about, but do not force too much information upon you (156: f, 32).* In addition, some parents seemed to understand that experts are going to change their opinions inevitably,

and they only demanded that the expert has *“the ability to justify why their opinion on the matter changed”* (117: m, 43).

Some respondents indicated that the expert should be *“able to explain why certain vaccines are recommended”* (124: f, 43). In addition, participating parents called for calmness, as they indicated that the expert should *“not be provoked, but rather refute even stupid claims coldly and matter-of-factly”* (128: m, 47). Furthermore, the expert was expected to communicate benefits and harms of vaccines and to not have a custodial attitude:

“In case of vaccines, for example, the expert should explain the good and bad sides [...] and relate for example, the probability of potential adverse effects to something (i.e., what is likely and what is not, on an individual level). The expert should be able to talk numbers, figures, and facts, and not think that, for example, speaking about adverse effects of vaccines would increase anti-vaccine attitude or fear. That patronising attitude where we discuss only the benefits of vaccinations “just to be sure,” because we do not want to feed the thoughts of the other extreme, is harmful” (163: f, 40).

Personal qualities in communicating expertise

Parents mentioned multiple characteristics dealing with the inner or outer qualities of a vaccine expert, such as ‘appearance’, ‘common sense’, ‘empathy’, ‘intellectual humility’, ‘kindness’, and ‘calmness’. They discussed concrete, objective characteristics, such as the cleanliness and hygiene of the expert and more abstract ones, such as a radiance exuding from the expert. These qualities cannot be directly linked to the previous categories but many of them are loosely connected to communication and interaction.

For instance, parents indicated that accessibility is an important quality of a vaccine expert by stating that the expert *“should be reachable”* (311: f, 34). One parent emphasised the importance of accountability, as they expect the expert to

“take responsibility for what they do/say and [they] would be held responsible if the matter turns out to be wrong for example” (312: m, 36).

Several parents also indicated that it was important for a vaccine expert to be humble and modest: *“The expert cannot be arrogant or seem arrogant [...]” (65: f, 49).* Some of the mothers voiced the need for the expert to appear as hygienic and clean: *“The cleanliness of [their] appearance, the cleanliness of [their] environment” (55: f, 34).* Another parent had a similar opinion regarding the cleanliness of the expert: *“The outer appearance should be clean, so that it creates an impression of respect towards the listener” (291: f, 33).*

Many parents discussed the importance of honesty and empathy in communicating to the wider audience: *“Honest. One does not think that the audience is stupid and try to talk the matter up” (256: m, 38).* Some participating parents called for honesty and the intellectual humility to admit uncertainties. Furthermore, parents expressed that a vaccine expert should not insult and discredit others: *“[The expert] does not insult those who think differently but knows how to properly justify their own information without downplaying others” (122: f, 33).*

Parents also recognised that within the nature of being an expert, there is an embedded practice of having to repeat oneself, and hence they called for patience: *“Patience; even if you have already answered what you think are the same questions, you have to be able to repeat your justified viewpoint.” (62: f, 49).* One parent pointed out the need for a vaccine expert to be empathic, calm and be able to target and modify their communication based on the situation at hand: *“The expert is capable of an empathetic conversation and a calm process of going through things, without needlessly arguing about what the official process is. That is, the expert first tries to understand the client's situation and only then tells the essential information related to it and does not read direct instructions based on legal provisions from a piece of paper” – (338: f, 34).*

6 Discussion

6.1 Overview of the results

This thesis aimed to explore the factors associated with parental vaccination intention with regards to influenza and HPV. In addition, the study examined the realisation of vaccination intention. Moreover, the aim was to explore who parents regarded as a childhood vaccine expert and what kind of qualities should a vaccine expert have. In the influenza study (Study I), the main finding was that parental vaccination intention was associated with the municipality of residence, maternal level of education, adherence to the NVP, influenza knowledge, the number of children, trust in official information, and the change in parental attitude towards childhood vaccines after the COVID-19 pandemic. In addition, we found that parents had a higher intention to vaccinate compared to the realised vaccination. In the HPV study (Study II), the adherence to the national vaccination programme, parent's mother tongue and trust in official information sources were associated with a positive HPV vaccination intention. Realised HPV vaccination uptake in girls was higher than the parental intention, and the most commonly reported reason for parental vaccination refusal was the fear of adverse effects. In study III, we found that parents preferred the expert to have both intrinsic and extrinsic qualities, with education, experience, knowledge, support from the scientific community, ethics, communication skills, media activity, personal skills and language skills emerging as subcategories. Furthermore, we found that there were some statistically significant differences in expert preferences in vaccination intention groups. In terms of influenza, we found that vaccine-accepting parents were more likely to prefer the vaccine expert to represent an authority. In addition, vaccine-accepting and vaccine-refusing parents were more likely to consider communicating clearly as an important characteristic of a vaccine expert, compared to vaccine-hesitant

parents. In terms of HPV, vaccine-accepting parents were more likely to consider both ‘representing a university or research organisation’ and ‘representing an authority’ as an important characteristic compared to vaccine-hesitant and refusing parents. Furthermore, having a scientific education was more important to vaccine-accepting and hesitant parents compared to vaccine-refusing parents. The following subchapters will discuss the findings and implications in each individual study.

6.2 Parental influenza vaccination intention and uptake (Study I)

We specifically chose high and low vaccination coverage areas to explore potential differences in factors associated with parental vaccination intention. In the influenza study, we observed a statistically significant association between vaccination intention and the municipality of residence. It is worth mentioning that one fourth of participating parents were not aware of the fact that their child is eligible for a seasonal influenza vaccine, free of charge.

We found that the parental intention to vaccine was higher than the actual realisation of vaccination, with the most reported reason for not vaccinating one’s child against influenza being that the public health nurse did not offer the vaccine. This finding suggests that merely having the intention is not enough – public health nurses need to actively remind parents of the influenza vaccination. It is not entirely impossible that influenza vaccination coverage among children could be improved by the public health nurse being more proactive. Our findings are in line with previous studies from Shono and Kondo, Boes et al., Chen et al., and Han et al., showing the importance of healthcare professional recommendation in terms of influenza (Boes et al., 2017; Chen et al., 2022; Han et al., 2024; Shono & Kondo, 2015). Our results reiterate that healthcare professionals are key factors in increasing influenza vaccine uptake.

However, similarly to the general population, healthcare professionals may exhibit doubts regarding childhood vaccines. In the Finnish context, both Karlsson et al. and Nurmi et al. found that while the majority of healthcare professionals had high confidence in vaccinations, a notable share reported low vaccination confidence – especially towards the seasonal influenza vaccine, albeit

the studies excluded public health nurses working in maternal and child health clinics (Karlsson et al., 2019; Nurmi et al., 2023). Our results show that many parents reported that the vaccine was not offered by the healthcare professionals – strengthening professionals’ confidence in the influenza vaccine may have a positive effect on their readiness to offer and discuss the vaccine. Furthermore, strengthening nurses’ confidence in the influenza vaccine is crucial, as healthcare professionals play a key role in vaccine decision-making, and they are considered the most trusted source of vaccine information for parents (Karlsson et al., 2019; Olson et al., 2020).

The COVID-19 pandemic disrupted routine vaccination services globally, while increasing misinformation and vaccine hesitancy, especially among parents of children under the age of 18 (Ebrahimi et al., 2021; He et al., 2022; Kaufman et al., 2021, 2024). Soveri et al. examined the spillover effects of the COVID-19 pandemic on attitudes to influenza and childhood vaccines in Finland in a longitudinal study, and found that people’s attitudes were more positive during the pandemic compared to prior to the pandemic, especially towards influenza vaccines (Soveri et al., 2023). Due to the cross-sectional nature of our data, we could not decipher attitudes in different timepoints. However, the majority (76%) of parents indicated that their attitudes towards childhood vaccines had remained the same. Despite mainly unchanged attitudes, we observed that parents who had become more cautious during the pandemic were less likely to vaccinate their child against influenza, compared to those whose attitude had not changed. Albeit most Finns trust science and vaccines, and the majority of participating parents indicated that they trust vaccine-related information from official sources such as the Ministry of Social Affairs and Health, it is an unavoidable fact that parents encounter vaccine-related information online, in addition to some parents actually considering social media as an important source of information.

6.3 Parental HPV vaccination intention and uptake (Study II)

Although intentionally choosing high and low vaccination coverage areas, municipality of residence was not associated with parental HPV intention. This

finding is in line with Leivo detecting no stark differences in HPV-related attitudes in mothers living in high and low vaccination areas (Leivo, 2015). We found that although nearly all participating parents were aware of HPV and the association between HPV and cervical cancer, overall knowledge of HPV was low. However, knowledge was not associated with vaccination intention in our study, and this finding was replicated in a European systematic review of eighteen studies (Jiboc et al., 2024). Moreover, it has been hypothesised that while it is possible to increase HPV-related knowledge and awareness in parents, it would have minimal effect on HPV vaccine behaviour (Rodriguez et al., 2019).

Religion and religious beliefs are thought to have an effect on HPV vaccine attitudes. For example, Orthodox Protestants in the Netherlands and the Amish in the U.S. are known for rejecting vaccination for religious reasons (E. Dubé et al., 2013). Leivo explored this association but found that in the Finnish context, religion was not the sole reason of HPV vaccine refusal (Leivo, 2015). In our study, we found no statistical association between religion and HPV vaccination intention in the multivariable analysis ($p=0.406$).

In our HPV study, the realisation of vaccination was slightly higher than the parental intention. In addition, we noticed that parental intention did not always translate into action or inaction. For example, nearly 30% (18/61) of girls whose first participating parent reported having no intention to vaccinate, eventually received their HPV vaccine. In terms of unsure parents, 74% (48/65) of their daughters ended up taking their vaccination, further amplifying that girls might potentially have a say in their HPV vaccination uptake, despite only 4% of participating parents indicating that they let their daughter decide on their own. This finding is in line with López et al. who found that adolescents had higher pooled percentage of positive intention to be vaccinated compared to parental intention (64.3% vs. 59.2%) (López et al., 2020). Despite HPV vaccines being proven safe and effective, safety concerns were the most commonly reported reason to refusing to vaccinate in our study. Safety concerns have been reported by parents globally (Jiboc et al., 2024; Loke et al., 2017; López et al., 2020; Newman et al., 2018; Tung et al., 2016). Leivo had encountered the same finding in the Finnish context, with parents reporting fear of adverse effects as the most common reported negative aspect of HPV vaccination (Leivo, 2015). As this is a

persistent fear of parents, hindering parental vaccination intention, efforts to communicate the safety and efficacy of the HPV vaccine should be undertaken, as it has been shown that belief in vaccine efficacy is a driver of HPV vaccination acceptance (López et al., 2020).

We found that the parents' mother tongue was associated with their intention to have their daughter vaccinated, with foreign-origin parents being less likely to vaccinate their daughter against HPV. However, to fully understand the picture, we must examine the breakdown of vaccination intention. In total, 31.6% (n=18) of foreign-origin parents indicated that their daughter has already been vaccinated against HPV. An additional 22.8% indicated that their daughter will receive her HPV vaccination, while 29.8% of foreign-origin parents were unsure. Only 15.8% of foreign-origin parents indicated that their daughter has not and will not receive her HPV vaccination. However, in the statistical analysis, foreign-origin mother tongue was negatively related to vaccination intention. Additionally, we found no difference in vaccination intention between Finnish and Swedish-speaking parents. In total, 6.6% (n=57) of participating parents had a foreign-origin mother tongue. In Finland, 9% of Finnish inhabitants had a foreign-origin mother tongue (Statistics Finland, 2023). We conducted municipal-level analysis to further examine the associations (Appendix 4). Mother tongue persisted as statistically significantly associated factor only in Kuopio (high coverage area, n=244, $p<0.001$), with foreign-origin parents persisting in being less likely to have the intention to vaccinate. However, previous literature does show that belonging to an ethnic minority/race other than White had a negative effect on HPV vaccination initiation (Fernández de Casadevante et al., 2015). In Denmark, Norway and Sweden migrants and descendants of migrants had lower HPV vaccine uptake compared to the natives (Hertzum-Larsen et al., 2020; Van Boetzelaer et al., 2022; J. Wang et al., 2019; Wemrell et al., 2023). In Finland, national studies examining the sociodemographic differences in HPV vaccination uptake have not been conducted. HPV screening attendance has been studied however, and it has been shown that compared to the general Finnish population, migrant-origin women have a lower likelihood of cervical screening participation (Idehen et al., 2020). It is highly likely that, similarly to Nordic countries, girls belonging to ethnic

minorities in Finland have a lower HPV vaccination uptake. Although information on HPV and HPV vaccine being available in six languages in addition to Finnish and Swedish, it is evident that the availability of information is not enough to increase coverage. The available materials may need to be culturally adapted, taking into account potential differences of educational levels, as migrants are not a homogenous group (Finnish Institute for Health and Welfare, 2023c). To achieve a more equitable HPV vaccination coverage, quantitative register-based research is needed to examine the potentially existing differences in vaccination coverages among girls with foreign-origin mother tongue compared to girls with domestic mother tongue in Finland. Further qualitative research is needed to understand the relationship between mother tongue and parental HPV vaccination intention and uptake.

6.4 Parental expert qualifications (Study III)

In existing literature, experts are often thought to be fundamentally different from non-experts: they possess technical skills or knowledge, they are impartial, and they are usually located in the professions and in academia (Goldman, 2018; Grundmann, 2017). Vaccine experts are not only thought to possess knowledge – they are expected to make sense of it and share it (Grundmann, 2017). While existing research differentiates between the relational approach towards expertise (expertise is a social attribute) and the realist approach (expertise is expert knowledge and experience), in our study, participating parents did not see the two approaches as mutually exclusive in terms of vaccine expertise. Parents expected the expert to have conducted scientific studies and have practical experience in addition to theoretical experience and knowledge. Similar findings were evident in the work of Grundmann, who stated that expertise is primarily linked to scientific activity (Grundmann, 2017). Additionally, parents subscribed to the notion of expertise being a social process. Parents raised the point of a vaccine expert having support from the scientific community: an expert should be acknowledged and accepted by their peers. Supposedly, these peers have the capabilities to assess the level of expertise of the individual – the very capabilities parents do not have. This finding is supported by Collins and Evans, Grundmann, and Goldman (Collins &

Evans, 2007; Goldman, 2018; Grundmann, 2017). Furthermore, Dommett and Pearce found in their study that attitudes towards expertise were mainly positive (Dommett & Pearce, 2019). Our findings echo this – parents mentioned qualities and characteristics one would associate with the classical definition of expertise. In our study, parents often mentioned the political and financial independence of the vaccine expert often. In the larger, European context, half of the respondents of the Eurobarometer agreed that they can no longer trust scientists to tell the truth about controversial scientific and technological uses because they depend more and more on money from the industry (European Union, 2021).

Science and politics are deeply intertwined, whether we like it or not. According to Jasanoff, the notion that the scientific component of decision-making can be separated from the political has been dismantled, and the idea that scientists can speak truth to power in a value-free manner is a myth (Jasanoff, 1990). Goldenberg states that science should cut through politics and ensure the best course of action, although it does not always happen (Goldenberg, 2021). The parents participating in our study adamantly stated that science and politics should be kept separate, and that politicians are not vaccine experts. The 2024 Finnish Science Barometer asked Finns about the relationship between science and politics. Results show that Finns strongly support the idea that science is used in political decision-making, with 86% of participants agreeing with scientists participating in public discussions and giving recommendations to decision-makers (Tieteen Tiedotus ry, 2024). On the flipside, 61% of participants indicated that scientists should not meddle in politics (Tieteen Tiedotus ry, 2024). Our findings echo the same: parents wanted the expert to be independent of politics. Some parents outright indicated that they do not want to hear the opinion of politicians on vaccinations unless they are referencing scientific studies or declarations. One parent thought that the pandemic caused science and the government to contradict each other, and that politics was winning.

Trust is an important concept in vaccine acceptance. Larson et al. show that vaccine acceptance involves multiple levels of trust, namely trust in the product (the vaccine), the provider (the healthcare professional) and the policymaker (the health system, government and the researchers involved in the

approving and recommending the vaccine) (Larson et al., 2014, 2018). Although we did not measure parental trust towards these three entities, we asked vaccine-refusing parents why they chose to not have their child vaccinated against HPV or influenza. In terms of HPV, 1.4% (n=12) of parents thought that the vaccine has not been studied enough. 0.8% (n=7) of vaccine-refusing parents indicated they were suspicious of the vaccine. Similarly, 0.8% of parents indicated they did not trust the authorities. An even smaller proportion, 0.5% (n=4) responded that they did not trust healthcare personnel, and hence chose to not have their daughter vaccinated against HPV. In terms of influenza, 1.2% (n=28) of parents had refused the influenza vaccination due to the vaccine not having studied enough. A slightly higher proportion (1.9%) of parents were suspicious of the vaccine, while 1.2% indicated not trusting the authorities. Only 0.2% of parents indicated that they did not trust healthcare professionals and hence refused the influenza vaccine. These results indicated that the majority of participating parents seemed to trust the authorities, and even more so, the healthcare personnel.

It is worth noting that each study is connected to the societal climate it was conducted in. Our data collection was conducted during the first quarter of 2022, with the SARS-CoV-2 pandemic still on-going at the time (Ministry of Social Affairs and Health, 2022). In our study, potentially due to the pandemic, parents adamantly brought forward the notion of a vaccine expert being politically independent. This could be related to the fact that heavy political involvement in the governance of the pandemic showed that the pandemic was not only a biological issue but also a political one (Kihlström et al., 2023; Moisiu, 2020). The COVID-19 media coverage was said to have been dominated by political actors, and compared to the previous influenza A(H1N1) pandemic, less by scientific experts (Leidecker-Sandmann et al., 2022). Suspicion towards scientists and politicians who use science to push an agenda has become widespread (Grundmann, 2017). In our study, we managed to capture parents who were suspicious of expertise. They critiqued the experts in the media and saw experts as dishonest, even going as far as claiming that vaccine experts who currently receive airtime are a part of the mafia. In addition, some parents expressed their frustration to experts due to the COVID-19 pandemic.

Another effect the pandemic potentially had on our study was participating parents naming experts who have been frequenting in the media due to COVID-19 as examples of childhood vaccine experts. Naturally, experts frequenting in the media during the pandemic became known (Moisio, 2020). A similar trend of experts becoming more familiar to Finns was found in the 2024 Science Barometer (Tieteen Tiedotus ry, 2024).

Participating parents mentioned vaccine expert qualities and characteristics relating to communication and interaction the most. The expert was expected to have certain communication skills such as having the ability to popularize scientific concepts or the ability to target their communication depending on the audience. The expert was to be professional, accessible, and clear in their communication. In addition, parents called for certain personal qualities such as being humble or being brave enough to admit uncertainties and own mistakes. In addition, parents demanded the vaccine expert to have intellectual honesty to change their position if reason to do so arises. Similar notions were discussed by Giubilini et al., who concluded that the lack of knowledge in and of itself does not take away the vaccine expert status, but the lack of managing and owning that lack of knowledge does (Giubilini et al., 2023).

As stated before, vaccine hesitancy can be examined as a continuum ranging from those who accept all vaccines without a doubt to those who completely refuse all vaccines (E. Dubé et al., 2013). We wanted to examine whether there were any differences between vaccine-accepting, vaccine-hesitant and vaccine refusing parents in terms of expert preferences. In terms of HPV, vaccine accepting parents were more likely to consider representing a university or research organisation, representing an authority, communicating clearly, and having practical experience more likely compared to vaccine-hesitant and refusing parents. Having a scientific education was more important to vaccine accepting and vaccine hesitant parents. These differences in parental expert preferences in terms of HPV suggest that vaccine accepting parents conform to the “traditional,” literature-driven expert qualities, while vaccine hesitant and vaccine refusing parents may not conform to these qualities. Vaccine accepting parents deem institutional authority, experience, and communication skills as important qualities a vaccine expert should have. We found that in terms of HPV,

vaccine accepting parents more frequently consisted of university-degree holding parents (80% and 73%, respectively). Vaccine refusing parents had a mean knowledge of 5,59 points, while vaccine accepting had a mean knowledge of 5,51 points. Vaccine hesitant parents had the lowest level of HPV-related mean knowledge of 4,51 points. In addition, men seemed to be more HPV vaccine hesitant, with 56% of vaccine hesitant parents being men, while the distribution is 26% men for the vaccine refusing group and 36% men for the vaccine accepting group.

In terms of influenza, vaccine accepting parents were more likely to prioritise the vaccine expert representing and authority. In terms of communicating clearly both vaccine accepting and vaccination refusing parents were more likely to consider it an important quality compared to vaccine hesitant parents. Surprisingly, vaccine hesitant parents were more likely to consider the vaccine expert being the same sex as them as a crucial factor compared to vaccine accepting and vaccine refusing parents. These findings show that there were less scientifically significant associations between preferred vaccine expert qualities and parental vaccination intention groups. We found that in terms of influenza, vaccine accepting parents were university-degree holders (82% and 73%, respectively) more frequently compared to vaccine hesitant and refusing parents. Vaccine hesitant parents had low level of knowledge more frequently and they were more frequently of foreign-origin background. Similarly to the HPV vaccine, influenza vaccine hesitant group had the highest proportion of men (59%) compared to vaccine accepting (39% men) and vaccine refusing (34%). This may echo the notion that mothers are more often the deciding or at least the more aware parent when it comes to childhood vaccinations.

To conclude, parents seemed to support both the realist and relationist approach to expertise by expecting the vaccine expert to have a valid, scientific education, practical experience, and also to have the support of the scientific community and the performative communicational skills to popularise science and convince parents.

6.5 Methodological considerations

To the best of our best knowledge, this study is the first to assess parental childhood vaccination intention and its realisation on a national scale in Finland. Furthermore, to the best of our knowledge, this study is the first study to assess parental preferences regarding vaccine expertise in the Finnish context. Our study has some notable strengths and weaknesses. A major strength of this study was the possibility to examine the transition from the parental vaccination intention to the realisation of said vaccination intention by extracting the children's vaccination status from the National Vaccination Register (NVR). This ability is a methodological strength which brings robustness to the study, while enabling better interpretation of the results.

Albeit the questionnaires used in this study were created using known and reliable sources, and they were validated on a small sample of parents who were outside of the scope of the study, the questionnaires have not been used in another context prior to this study.

Another methodological issue arises in our definition of 'intention.' In the HPV questionnaire, parents reported their intentions by selecting one of the following options: will receive, has received, has not/will not receive, or does not know. In comparison, the influenza questionnaire offered one fewer response category, combining current and future uptake into a single option: has/will receive, alongside has not/will not receive and does not know. In efforts to paint a comprehensive picture and harmonise the questionnaires, we combined past vaccination and the future intention together, to indicate positive intention. The rationale behind this is due to the data collection timing: our data was collected between February and March, due to delays caused by the COVID-19 pandemic. However, by this timepoint many children have received their influenza vaccination already, as influenza vaccination usually starts in autumn, before the influenza season. In addition, public health nurses had six months to vaccinate the girls at school, since schools in Finland open in August. Had we not done this, the number of parents who were yet to vaccinate but had the intention would have ended up being small, compared to the number of parents who had positive intention prior to our study and had already vaccinated their child. It must be acknowledged that due to the majority of parents having vaccinated their child

prior to the data collection (i.e. days or months prior), we might be examining the determinants of uptake instead of pure intention.

While cross-sectional studies offer a quick, inexpensive glimpse of the current situation at a given timepoint, they suffer from two broad categories of biases in associations: information bias, such as measuring, collecting or interpreting key variables inaccurately, and selection bias, such as non-response bias (X. Wang & Cheng, 2020). Moreover, due to the cross-sectional nature of the collected data in our study, we are unable to draw conclusions on causality. Randomised control trials and longitudinal cohort studies are oftentimes used to infer causality, although case-control studies can study causality with limitations.

In our study, expertise was examined with two questions, the first providing the participants with ten closed-question statements depicting qualities a vaccine expert can have, and the second question being an open-ended question, asking participants whether they can think of any other qualities an expert should have. It is worth mentioning, that the first question potentially steered the participants towards specific type of answers, as it provided “classic” examples of an expert, i.e. “the vaccine expert has practical experience” and “the vaccine expert has the ability to question.” However, despite the potentially leading statements, participating parents provided a range of additional characteristics in the open-ended question, including fringe opinions on expertise.

6.5.1 Response rate

In high income countries, cross-sectional health survey response rates have been declining during the past decades (Christensen et al., 2022; Mindell et al., 2015; Mölenberg et al., 2021; Stedman et al., 2019; Tolonen et al., 2006). For example, in the Netherlands, an overall response rate decrease from 47% in 1995 to 15% in 2017 was recorded (Mölenberg et al., 2021). There have been many efforts to counterbalance this decrease in participation by developing new methods of recruiting participants, many of which we employed in our study. Data collection through an online survey has the ability to collect large amounts of data efficiently, economically, and rather quickly (Regmi et al., 2016). One type of online surveys, push-to-web surveys (which we employed), use regular

mail contact to request online participation, and it has been shown to produce a higher response rate than the mailed pen-and-paper protocol (Dillman, 2017; Patrick et al., 2021). However, literature also shows that web-based surveys suffer from lower response rates than mail surveys. In 2020, an updated and extended meta-analysis by Daikeler et al. found that web surveys still yield a 12% lower response rate (Daikeler et al., 2020). Research shows that online survey response rates are moderated by factors such as sample recruitment strategy, target population, pre-notification, web design and incentives (Daikeler et al., 2020; Sammut et al., 2021).

According to research, a successful online survey has a user-friendly design and layout (Regmi et al., 2016). In our study, the questionnaires contained approximately 30 questions, and they took around 25 minutes to complete. Furthermore, the design of the webpage was simplified by using neutral colours (white background, black text) and presenting one question at a time. Research suggests that women and those from higher sociodemographic groups were more active in participating in health-related surveys (Christensen et al., 2022; Van Loon et al., 2003). In our study, over 60% of responding parents were female. In addition, over 35% of the responding women held a graduate degree, while only 9.2% of the general Finnish population has completed a master's degree (Statistics Finland, 2024).

A low response rate plays a role in estimating associations between sociodemographic determinants and outcomes, and non-response can contribute to measurement errors and biased estimates (Mölenberg et al., 2021; Stedman et al., 2019). However, research finds that estimates based on data with a 5%-10% response rate was reliable with a sample size of at least 500 individuals (Wu et al., 2022). Regardless of our best efforts, our response rate remained low ($\approx 13\%$). When considering the low response rate of our study, one must take into account the societal climate. In addition to generally declining health survey response rates, it must be considered that the data collection took place during the COVID-19 pandemic, where web-based survey studies were capitalised on by researchers, leading to survey fatigue (Brown et al., 2024; de Koning et al., 2021). Despite these shortcomings, this study provides a novel and robust insight into what factors affect parental intention to vaccinate their child. Furthermore, this

study sheds light on the notion of vaccine expertise, and the kind of qualities parents appreciate in a vaccine expert.

6.6 Future implications

When examining national vaccination coverages for HPV and influenza vaccines, there are clear regional differences in childhood vaccine uptake. Our study shows that municipality of residence is simply one factor among the plethora of factors associated with childhood vaccine uptake. When looking at practical implications, the findings of this study can be used to guide municipal-level decision-making in terms of raising awareness in healthcare professionals – mainly public health nurses, as the study focused on childhood vaccines. In addition, the results of our study indicate that science communication and strong communicational skills are competences worth investing in for future vaccine experts.

If the child does not have a checkup at the clinic during seasonal influenza season, it is understandable that parents may forget to book an appointment for their child's influenza vaccination. Seasonal advertising campaigns could function as a reminder to these parents. Furthermore, healthcare professionals are at a key position in recommending and reminding parents of the influenza vaccination. With respect to the HPV vaccination, coverages could potentially increase if more emphasis were put to 'marketing' the vaccine as an anti-cancer vaccine, instead of a vaccine against a sexually transmitted disease.

Regarding methodological implications, more qualitative studies are needed to fully grasp the reasons behind vaccine hesitancy in parents living in Finland. Our results show that the relationship between parental vaccination intention and behaviour is not as linear as maybe thought previously. In addition, expertise can be examined deeper by conducting interviews or focus group discussions. Furthermore, it is of utmost importance in future research to consider all the available strategies to increase response rate. Participation in studies seem to be decreasing globally, and in the future, there is a need for novel recruitment strategies, without compromising the integrity of the research.

As our study showed that parental HPV vaccination intention was lower than realised intention, it is important to increase parental vaccination

confidence in terms of HPV. Parents in Finland have yet again expressed that they have safety concerns regarding HPV, and research shows that the number of concerned parents seems can increase (Adjei Boakye et al., 2023). Paradoxically, national studies display the successes routine HPV vaccination has achieved in decreasing the incidence of cervical cancer (Falcaro et al., 2021; Lei et al., 2020; Rasmussen et al., 2020). The findings of this study support local initiatives aimed at increasing parental confidence in HPV vaccination by employing evidence-based information on vaccine safety and the nationwide reduction in cervical cancer incidence attributable to HPV vaccination programmes. These efforts can be effectively supported through the dissemination of information via official public health channels and trusted healthcare professionals.

In April 2024, the Finnish government decreed the expansion of the right to vaccination, allowing even more healthcare professionals such as dentists, pharmacists and laboratory nurses to be able to administer vaccinations (Ministry of Social Affairs and Health, 2024b). The goal is to speed up the administration of seasonal vaccines and alleviate healthcare personnel shortages (Ministry of Social Affairs and Health, 2024b). Our study shows that parents do not only expect the vaccine expert to have an education, but the education needs to be specific and relevant. However, the decree currently applies only to the vaccination of adults. If the right is expanded to include vaccinating children in the future, the findings of this study suggest that simply broadening professional eligibility may not be enough to guarantee public trust. Furthermore, it is essential to ensure that these healthcare professionals possess adequate vaccine-related knowledge and have confidence to discuss childhood vaccines with parents. These considerations should be taken into account when planning future expansions, especially those involving the vaccination of young children.

7 Conclusions

The aims of this thesis were to examine factors associated with parental HPV and influenza vaccination intention. In addition, this thesis aimed to explore the preferences parents held in terms of vaccine experts. The main findings and implications of this work are:

- I. Parental influenza vaccination intention was associated with the municipality of residence, maternal level of education, adherence to the NVP, influenza-related knowledge, the number of children, trust in official information and the change in attitude towards childhood vaccines after the COVID-19 pandemic. Parental vaccination intention was higher than the realized vaccination uptake, suggesting that positive vaccination intention does not always translate to vaccination uptake. More research is needed to understand the barriers affecting influenza vaccination uptake.
- II. We found that the most reported reason for not having one's child vaccinated against influenza was that the vaccine was not offered by the public health nurse. This result points to the importance of public health nurses in the process of increasing vaccination uptake in Finland. It may be worthwhile to consider strategies aimed to raise awareness among public health nurses and to remind parents to schedule a vaccination appointment for their child.
- III. Parental HPV vaccination intention was associated with adherence to the NVP, mother tongue and trusting in official information sources. The realised HPV vaccination was higher than the parental intention, suggesting that parental intention is not the main driver for vaccination behaviour. In addition, we found that the most reported reason for not having one's daughter vaccinated against HPV was the fear of adverse

effects and having heard or read something negative regarding the vaccine. There is a need to broadcast the successes in cervical cancer prevention enabled by the HPV vaccine.

- IV. Parents in the HPV study ranked scientific education and representing a university or a research organisation the most often as important characteristics of a vaccine expert, while parents in the influenza study appreciated scientific education and communicating clearly as important vaccine expert qualities. Parents mentioned expert qualities relating to communication and interaction the most frequently, followed by qualities relating to ethics and integrity.

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In Espoo, May 2025
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Appendix 1. Influenza and HPV questionnaires in Finnish, Swedish, and English

Asiantuntijuuden rakentuminen: Julkinen keskustelu terveydestä

Tervetuloa osallistumaan tutkimukseen 'Asiantuntijuuden rakentuminen: Julkinen keskustelu terveydestä,' jossa on tarkoituksena tutkia vanhempien tietolähteitä ja luottamusta. Vastaamalla seuraaviin kysymyksiin osoitat, että olet perehtynyt tutkimusta koskevaan tiedotteeseen ja saanut riittävän selvityksen tutkimuksesta ja siinä kerättävistä tiedoista, tietojen käsittelystä, yhdistämisestä ja luovuttamisesta. Osallistumisesi tutkimukseen on vapaaehtoista, ja tietojasi käsitellään luottamuksellisesti. Voit halutessasi keskeyttää vastaamisen ja jatkaa myöhemmin. Mikäli sinulla on useampi tutkimuksen piiriin kuuluva tytär, vastaa nuorinta tytärtäsi mielessä pitäen.

Tiedonlähteet ja luottamus

1. Kuinka tärkeinä pidät seuraavia tietolähteitä rokottamisen kannalta? Sulkeissa esimerkkejä

	Erittäin tärkeä	Melko tärkeä	En osaa sanoa	Ei kovin tärkeä	Ei lainkaan tärkeä
Viranomaisten tuottama tieto (Terveystieteiden tutkimuskeskus, Sosiaali- ja terveysministeriö, neuvolat, Wilma)					
Journalistinen media (Helsingin Sanomat, Hufvudstadsbladet, iltapäivälehdet, televisio)					
Sosiaalinen media (Facebook, Twitter, YouTube, Instagram)					
Mielipidevaikuttajien tuottama tieto (blogit, podcastit, sosiaalisen median profiilit)					
Henkilökohtaiset kontaktit (perhe, tuttavapiiri, muut samanikäisten lasten vanhemmat)					
Muu tietolähde, mikä? _____					

2. Kuinka paljon luotat seuraavista lähteistä saamaasi rokotetietoon? Sulkeissa esimerkkejä

	Erittäin paljon	Melko paljon	En osaa sanoa	En kovin paljon	En lainkaan
Viranomaisten tuottama tieto (Terveystieteiden tutkimuskeskus, Sosiaali- ja terveysministeriö, neuvolat, Wilma)					
Journalistinen media (Helsingin Sanomat, Hufvudstadsbladet, iltapäivälehdet, televisio)					
Sosiaalinen media (Facebook, Twitter, YouTube, Instagram)					
Mielipidevaikuttajien tuottama tieto (blogit, podcastit, sosiaalisen median profiilit)					

Henkilökohtaiset kontaktit (perhe, tuttavapiiri, muut samanikäisten lasten vanhemmat)					
Muu tietolähde, mikä? _____					

Asiantuntijuus

3. Kuinka tärkeänä pidät sitä, että rokoteasiantuntijalla on seuraavia ominaisuuksia?

	Erittäin tärkeää	Tärkeää	En osaa sanoa	Ei tärkeää	Ei lainkaan tärkeää
Asiantuntija edustaa yliopistoa tai tutkimuslaitosta					
Asiantuntija edustaa viranomaistahoa					
Asiantuntija toimii aktiivisesti julkisuudessa					
Asiantuntijalla on asianmukainen tieteellinen koulutus					
Asiantuntijalla on käytännön kokemusta asiasta					
Asiantuntijalla on hyvät vuorovaikutustaidot					
Asiantuntija osaa viestiä selkeästi					
Asiantuntija osaa tarpeen tullen myös kyseenalaistaa viranomaisten tai tieteen edustajien näkemyksiä					
Asiantuntija edustaa kanssani samaa sukupuolta					
Pystyn samaistumaan asiantuntijaan					

4. Tuleeko mieleesi muita ominaisuuksia, joita asiantuntijalla mielestäsi tulisi olla?

Papilloomavirustietämys

5. Oletko koskaan kuullut papilloomaviruksesta (HPV) aikaisemmin?

- ☐ Kyllä
☐ En

6. Onko papilloomavirus sama asia kuin herpes?

- ☐ Kyllä
☐ Ei
☐ En osaa sanoa

7. Aiheuttaako papilloomavirus kohdunkaulan syöpää?

- ☐ Kyllä
☐ Ei
☐ En osaa sanoa

8. Onko papilloomavirus oireeton?

- ☐ Kyllä
- ☐ Ei
- ☐ En osaa sanoa

9. Mitkä seuraavista sairauksista liittyvät mielestäsi papilloomavirukseen? Voit valita useita vaihtoehtoja

- ☐ Ruokatorven syöpä
- ☐ Kohdunkaulan syöpä
- ☐ Penissyöpä
- ☐ Kondylooma/ visvasyyliä
- ☐ Virtsarakon syöpä
- ☐ Ärtävän suolen oireyhtymä (IBS)
- ☐ Peräaukon syöpä
- ☐ Suusyöpä
- ☐ En osaa sanoa

10. Kuinka arvioisit oman tietämyksesi HPV-infektiosta ja sitä ehkäisevästä rokotteesta?

- ☐ Erittäin hyvä
- ☐ Hyvä
- ☐ Kohtalainen
- ☐ Heikko
- ☐ Erittäin heikko
- ☐ En osaa sanoa

Rokotuskäyttäytyminen

11. Onko tyttäresi saanut kansalliseen rokotusohjelmaan kuuluvat (lapsuusajan) rokotteet?

- ☐ Kyllä, kaikki tähän mennessä tarjotut rokotteet
- ☐ Kyllä, osan tähän mennessä tarjotuista rokotteista
- ☐ Ei yhtäkään tarjottua rokotetta
- ☐ En osaa sanoa

11b. Jos vastasit ”kyllä, osan” tai ”ei yhtäkään”, mikä oli ottamatta jättämisen syy? Voit valita useita vaihtoehtoja

- ☐ Halusin odottaa, kunnes tyttäreni on hieman vanhempi
- ☐ En uskonut, että rokote on tehokas/hyödyllinen
- ☐ Rokotteen haittavaikutukset huolestuttivat minua
- ☐ Koronavirusepidemian takia rokotetta ei annettu
- ☐ Lähipiiriini kuuluu henkilö, joka on saanut vakavia haittoja rokotteesta
- ☐ Tyttäreni pelkää neuloja

- ☐ Olin lukenut tai kuullut negatiivisia asioita rokotteista
- ☐ Minulla ei ollut kattavaa ja luotettavaa tietoa rokotteista
- ☐ Mielestäni rokotetta ei ole tutkittu tarpeeksi
- ☐ Olin ylipäänsä epäileväinen rokotteen suhteen
- ☐ Tyttärelleni tarjottu aika ei sopinut omaan aikatauluuni
- ☐ Tyttäreni kieltäytyi
- ☐ Muu, mikä?: _____

12. Kenen kanssa pääasiassa pohdit rokotuksiin liittyviä asioita? Voit valita useita vaihtoehtoja

- ☐ Terveystieteiden ammattilaiset (lääkäri, terveydenhoitaja, neuvola jne.)
- ☐ Lapsen toinen vanhempi
- ☐ Muu perhe kuin toinen vanhempi
- ☐ Tuttavapiiri
- ☐ Muut samanikäisten lasten vanhemmat
- ☐ Sosiaalisen median kontaktit
- ☐ Muu, kuka? _____

13. Kuka päättää lapsesi rokottamisesta viime kädessä?

- ☐ Minä
- ☐ Lapsen toinen vanhempi
- ☐ Päättämme yhdessä lapsen toisen vanhemman kanssa
- ☐ Lapsi itse
- ☐ Muu perhe kuin toinen vanhempi
- ☐ Muu, kuka? _____

14. Tyttäreni saa tai on jo saanut HPV-rokotuksen maksutta osana kansallista rokotusohjelmaa

- ☐ Kyllä, tulee saamaan
- ☐ Kyllä, on jo saanut
- ☐ Ei, ei ole saanut tai ei tule saamaan
- ☐ En osaa sanoa

14a. Jos tyttärenne on saanut HPV-rokotuksen, niin onko hän saanut:

- ☐ 1
- ☐ 2
- ☐ 3 rokoteannosta
- ☐ En tiedä/muista

14b. Kuinka paljon vaikutusta seuraavilla tahoilla on ollut päätökseenne rokottaa tyttärenne HPV:tä vastaan?

	Ei lainkaan vaikutusta	Vähän vaikutusta	Jonkin verran vaikutusta	Hyvin paljon vaikutusta	En osaa sanoa
Terveystenhuollon ammattilaiset (lääkäri, terveydenhoitaja, neuvola jne.)					
Lapsen toinen vanhempi					
Muu perhe kuin toinen vanhempi					
Tuttavapiiri					
Muut samanikäisten lasten vanhemmat					
Media, lehdistö					
Sosiaalisen median kontaktit					
Sosiaalisessa mediassa toimivat vaikuttajat					
Paikallinen vaikuttaja, kuka?					
Muu, mikä/kuka?					

14c. Kuinka paljon vaikutusta seuraavilla tahoilla on ollut päätökseenne jättää tyttärenne rokottamatta HPV:tä vastaan?

	Ei lainkaan vaikutusta	Vähän vaikutusta	Jonkin verran vaikutusta	Hyvin paljon vaikutusta	En osaa sanoa
Terveystenhuollon ammattilaiset (lääkäri, terveydenhoitaja, neuvola jne.)					
Lapsen toinen vanhempi					
Muu perhe kuin toinen vanhempi					
Tuttavapiiri					
Muut samanikäisten lasten vanhemmat					
Media, lehdistö					
Sosiaalisen median kontaktit					
Sosiaalisessa mediassa toimivat vaikuttajat					
Paikallinen vaikuttaja, kuka?					
Muu, mikä/kuka?					

14d. Mikä/mitkä ovat syyt sille, että tyttärenne ei ole saanut tai saa HPV-rokotetta? Voit valita useita vaihtoehtoja

- En usko, että tauti on vaarallinen

- Uskon, että riski saada tauti/sairaus oli pieni
- Haluan odottaa kunnes tyttäreni oli hieman vanhempi
- En uskonut, että rokote oli tehokas/hyödyllinen
- Rokotteen haittavaikutukset huolestuttivat minua
- Rokotteen haittavaikutukset huolestuttivat tytärtäni
- Lähipiiriini kuuluu henkilö, joka on saanut vakavia haittoja rokotteesta
- Tyttäreni pelkää neuloja
- Olin lukenut tai kuullut negatiivisia asioita liittyen rokotteeseen
- Kaipasin kattavaa ja luotettavaa tietoa rokotteista
- Mielestäni rokotetta ei ole tutkittu tarpeeksi
- Olin ylipäänsä epäileväinen rokotteen suhteen
- Tyttärelleni tarjottu aika ei sopinut omaan aikatauluuni
- Meille ei tarjottu rokotetta
 - (avautuva alakysymys, jos valitaan) Mikä kuvaa tilannetta parhaiten:
 - Terveydenhoitaja ei maininnut rokotetta lainkaan
 - Terveydenhoitaja mainitsi rokotteen kantaa ottamatta
 - Terveydenhoitaja sanoi, ettei tyttäreni kannata ottaa rokotetta
 - Muu syy
- En luota terveysviranomaisiin (Sosiaali- ja terveysministeriö, Terveyden ja hyvinvoinnin laitos, Lääkealan turvallisuus- ja kehittämiskeskus Fimea)
- En luota hoitohenkilökunnan ammattitaitoon
- Muu, mikä?: _____

14e. Kuinka paljon vaikutusta seuraavilla tahoilla on ollut HPV-rokotuspäätökseesi?

	Ei lainkaan vaikutusta	Vähän vaikutusta	Jonkin verran vaikutusta	Hyvin paljon vaikutusta	En osaa sanoa
Terveydenhuollon ammattilaiset (lääkäri, terveydenhoitaja, neuvola jne.)					
Lapsen toinen vanhempi					
Muu perhe kuin toinen vanhempi					
Tuttavapiiri					
Muut samanikäisten lasten vanhemmat					
Media, lehdistö					
Sosiaalisen median kontaktit					
Sosiaalisessa mediassa toimivat vaikuttajat					
Paikallinen vaikuttaja, kuka?					

15. Uskotko, että HPV-rokote rohkaisee tyttöjä aloittamaan sukupuolielämän tavallista aikaisemmin?

- ☐ Kyllä
- ☐ Ei
- ☐ En osaa sanoa

16. Mikä on isoin HPV:hen tai sen rokotteeseen liittyvä huolenaiheesi?

17. Suhtautumiseni lapsille annettaviin rokotteisiin on muuttunut koronapandemian ja koronarokotteen myötä

- ☐ Kyllä, suhtautumiseni on muuttunut luottavaisemmaksi lasten rokotteiden suhteen
- ☐ Kyllä, suhtautumiseni on muuttunut varovaisemmaksi lasten rokotteiden suhteen
- ☐ Ei, suhtautumiseni ei ole muuttunut lasten rokotteiden suhteen

Taustatiedot

18. Syntymävuotesi: ____

19. Lapsen syntymäkuukausi ja – vuosi: ____/20____

20. Kuinka monta lasta perheessä tällä hetkellä on yhteensä? _____

21. Tupakoitko?

- ☐ Kyllä
- ☐ En
- ☐ En enää

22. Vanhempien suhde

- ☐ avio- tai avoliitto, vain yhteisiä lapsia
- ☐ avio- tai avoliitto, lapsia useammasta liitosta
- ☐ yksinäinen vanhempi
- ☐ yksinäinen vanhempi, lapsia useammasta liitosta
- ☐ jokin muu

23. Äidinkieli:

- ☐ suomi
- ☐ ruotsi
- ☐ muu, mikä? _____

24. Tyttäreni käy koulua

- ☐ Espoossa

- ☐ Kuopiossa
- ☐ Oulussa
- ☐ Pietarsaaressa
- ☐ Mustasaaressa

25. Millä luokalla peruskoulussa tyttärenne on?

- ☐ Neljännellä
- ☐ Viidennellä
- ☐ Kuudennella
- ☐ Seitsemännellä
- ☐ Kahdeksannella

26. Vastaavan vanhemman koulutustaso (valitse korkein suoritettu)

- ☐ Keski- tai peruskoulu
- ☐ Ammattikoulu
- ☐ Ylioppilastutkinto
- ☐ Alempi korkeakoulututkinto (mm. ammattikorkeakoulututkinnot, yliopistojen alemmat korkeakoulututkinnot)
- ☐ Ylempi korkeakoulututkinto (mm. ammattikorkeakoulututkinnot, yliopistojen ylemmät korkeakoulututkinnot)
- ☐ Tutkijakoulutusaste (mm. lisensiaatti, tohtori)
- ☐ Ei tietoa

27. Lapsen toisen vanhemman koulutustaso (valitse korkein suoritettu)

- ☐ Keski- tai peruskoulu
- ☐ Ammattikoulu
- ☐ Ylioppilastutkinto
- ☐ Alempi korkeakoulututkinto (mm. ammattikorkeakoulututkinnot, yliopistojen alemmat korkeakoulututkinnot)
- ☐ Ylempi korkeakoulututkinto (mm. ammattikorkeakoulututkinnot, yliopistojen ylemmät korkeakoulututkinnot)
- ☐ Tutkijakoulutusaste (mm. lisensiaatti, tohtori)
- ☐ Ei tietoa

28. Mihin ammattiryhmään katsotte lähinnä kuuluvanne?

- ☐ Johtavassa asemassa
- ☐ Ylempi/alempi toimihenkilö
- ☐ Työntekijä
- ☐ Yrittäjä tai yksityinen ammatinharjoittaja
- ☐ Maatalousyrittäjä
- ☐ Opiskelija
- ☐ Kotiäiti-/isä
- ☐ Työtön
- ☐ Muu, mikä?

29. Mihin uskontokuntaan tai elämänkatsomukseen katsotte kuuluvanne? Voit valita useamman vaihtoehdon

- ☐ Evankelis-luterilainen tai ortodoksinen kirkko
 - ☐ Jokin kirkon sisäinen herätysliike
- ☐ Muu kristillinen uskontokunta
- ☐ Jokin muu, mikä? _____
- ☐ Ei uskontoa
- ☐ En halua kertoa

30. Koetko olevasti aktiivinen uskonnon harjoittamisessasi?

- ☐ Kyllä
- ☐ En

31. Perheen yhteenlaskettu vuoden bruttotulo tällä hetkellä (palkat, äitiysraha, vanhempainraha, työttömyyskorvaukset)

- ☐ <10 000 euroa vuodessa yhteensä
- ☐ 10–20 000
- ☐ 20–40 000
- ☐ 40–60 000
- ☐ 60–80 000
- ☐ 80–100 000
- ☐ >100 000
- ☐ En halua kertoa

32. Tämän kyselytutkimuksen jälkeen järjestämme ryhmäkeskusteluja. Niiden tarkoituksena on tarkastella lasten vanhempien rokotuksiin liittyvää mediankäyttöä sekä luottamusta tarkemmin. Olisitko kiinnostunut osallistumaan paikkakunnallasi järjestettäviin ryhmähaastatteluihin?

- ☐ Kyllä
- ☐ En

Expertisens uppbyggnad: Offentlig diskussion om hälsa

Välkommen att delta i undersökningen” Expertisens uppbyggnad: Offentlig diskussion om hälsa”. Syftet med undersökningen är att utreda vilka informationskällor föräldrarna använder och litar på. Genom att svara på följande frågor visar du att du är bekant med forskningsbulletinen och har fått en adekvat förklaring av forskningen och de insamlade uppgifterna, databehandling, aggregering och avslöjande. Ditt deltagande i undersökningen är frivilligt och dina uppgifter hanteras konfidentiellt. Om du vill, kan du pausa och fortsätta senare.

Informationskällor och förtroende

1. Hur viktiga är följande informationskällor gällande vaccinationen? Exempel i parentes

	Mycket viktiga	Ganska viktiga	Vet ej	Inte särskilt viktiga	Inte alls viktiga
Information producerad av myndigheter (Institutet för hälsa och välfärd, Social- och hälsovårdsministeriet, rådgivningsbyråer, Wilma)					
Journalistiska medier (Helsingin Sanomat, Hufvudstadsbladet, eftermiddagstidningar, television)					
Sociala medier (Facebook, Twitter, Youtube, Instagram)					
Information producerad av opinionsbildare (bloggar, podcaster, profiler i sociala medier)					
Personliga kontakter (familj, bekantskapskrets, andra föräldrar till barn i samma ålder)					
Annan informationskälla, vilken? _____					

2. Hur mycket litar du på vaccinationsinformation från följande källor? Exempel i parentes

	Väldigt mycket	Ganska mycket	Vet ej	Inte särskilt mycket	Inte alls
Information producerad av myndigheter (Institutet för hälsa och välfärd, Social- och hälsovårdsministeriet, rådgivningsbyråer, Wilma)					
Journalistiska medier (Helsingin Sanomat, Hufvudstadsbladet, eftermiddagstidningar, television)					
Sociala medier (Facebook, Twitter, Youtube, Instagram)					
Information producerad av opinionsbildare (bloggar, podcaster, profiler i sociala medier)					
Personliga kontakter (familj, bekantskapskrets, andra föräldrar till barn i samma ålder)					
Annan informationskälla, vilken? _____					

Expertis

3. Hur viktigt anser du det är att vaccinexperten har följande egenskaper?

	Mycket viktigt	Viktigt	Vet ej	Inte viktigt	Inte alls viktigt
Sakkunnig representerar universitet eller forskningsinstitut					
Sakkunnig representerar myndighetsinstans					
Sakkunnig är aktiv i offentligheten					
Sakkunnig har lämplig vetenskaplig utbildning					
Sakkunnig har praktisk erfarenhet					
Sakkunnig har goda interaktionsfärdigheter					
Sakkunnig kan kommunicera tydligt					
Sakkunnig kan vid behov också ifrågasätta myndigheternas eller vetenskapsrepresentanternas åsikter					
Sakkunnig representerar samma kön som jag					
Jag kan identifiera mig med sakkunnig					

4. Kommer du att tänka på andra egenskaper som en sakkunnig borde ha?

Kunskap om papillomvirus

5. Har du någonsin tidigare hört talas om papillomvirus (HPV)?

- ☐ Ja
- ☐ Nej

6. Är papillomvirus samma sak som herpes?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

7. Orsakar papillomvirus livmoderhalscancer?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

8. Är papillomviruset symtomfritt?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

9. Vilka av följande sjukdomar anser du har samband med papillomvirus? Du kan välja flera alternativ

- ☐ Malign tumör i esofagus
- ☐ Malign tumör i livmoderhalsen
- ☐ Malign tumör i penis
- ☐ Kondylom/visvasyra
- ☐ Malign tumör i urinblåsan
- ☐ Irriterande tarmsyndrom (IBS)
- ☐ Malign tumör i analöppningen
- ☐ Malign tumör i munnen
- ☐ Vet ej

10. Hur bedömer du dina kunskaper om HPV-infektion och det förebyggande vaccinet?

- ☐ Mycket bra
- ☐ Bra
- ☐ Nöjaktiga
- ☐ Svaga
- ☐ Mycket svaga
- ☐ Vet ej

Vaccinbeteende

11. Har din dotter fått de vaccin som ingår i det nationella vaccinationsprogrammet (under barndomen)?

- ☐ Ja, alla vaccin som hittills erbjudits
- ☐ Ja, en del av de vaccin som hittills erbjudits
- ☐ Inget vaccin som erbjudits
- ☐ Vet ej

11b. Om du svarade nej, varför? Du kan välja flera alternativ

- ☐ Jag ville vänta tills min dotter är lite äldre
- ☐ Jag trodde inte att vaccinet var effektivt/nyttigt
- ☐ Vaccinets biverkningar oroade mig
- ☐ På grund av coronavirusepidemin gavs inget vaccin
- ☐ I min närmaste krets finns en person som fått allvarliga biverkningar av vaccinet
- ☐ Min dotter är rädd för sprutor
- ☐ Jag hade läst eller hört negativa saker om vaccinen
- ☐ Jag hade ingen heltäckande och tillförlitlig information om vaccinen
- ☐ Jag tycker inte att vaccinet har undersökts tillräckligt
- ☐ Jag var överhuvudtaget misstänksam mot vaccinet
- ☐ Min dotters bokade tid passade inte i min egen tidtabell
- ☐ Min dotter vägrade
- ☐ Annat, vad?: _____

12. Med vem funderar du i huvudsak på vaccinationsfrågor? Du kan välja flera alternativ

- ☐ Yrkesutbildade personer inom hälso- och sjukvård (läkare, hälsovårdare, rådgivning osv.)
- ☐ Barnets andra förälder
- ☐ Annan familj än den andra föräldern
- ☐ Bekantskapskrets
- ☐ Andra föräldrar till barn i samma ålder
- ☐ Kontakter i sociala medier
- ☐ Annan, vem? _____

13. Vem beslutar i sista hand om vaccination av ditt barn?

- ☐ Jag
- ☐ Barnets andra förälder
- ☐ Vi beslutar tillsammans med barnets andra förälder
- ☐ Barnet själv
- ☐ Annan familj än den andra föräldern
- ☐ Annan, vem? _____

14. Min dotter får eller har fått HPV-vaccinet gratis som en del av det nationella vaccinationsprogrammet.

- ☐ Ja, kommet at få
- ☐ Ja, har redan fått
- ☐ Nej, har inte fått eller kommer inte at få
- ☐ Vet ej

14a. Om er dotter har fått HPV-vaccin, har hon fått:

- ☐ 1
- ☐ 2
- ☐ 3 vaccindoser
- ☐ Vet ej/minns ej

14b. Hur mycket har följande instanser inverkat på ert beslut att vaccinera er dotter mot HPV?

	Ingen inverkan	Liten inverkan	Inverkat i viss mån	Mycket stor inverkan	Vet ej
Yrkesutbildade personer inom hälso- och sjukvård (läkare, hälsovårdare, rådgivning osv.)					
Barnets andra förälder					
Annan familj än den andra föräldern					
Bekantskapskrets					
Andra föräldrar till barn i samma ålder					
Media, press					

Kontakter i sociala medier					
Påverkare i sociala medier					
Lokal påverkare, vem?					
Annan, vad/vem?					

14c. Hur mycket har följande instanser inverkat på ert beslut att låta bli att vaccinera er dotter mot HPV?

	Ingen inverkan	Liten inverkan	Inverkat i viss mån	Mycket stor inverkan	Vet ej
Yrkesutbildade personer inom hälso- och sjukvård (läkare, hälsovårdare, rådgivning osv.)					
Barnets andra förälder					
Annan familj än den andra föräldern					
Bekantskapskrets					
Andra föräldrar till barn i samma ålder					
Media, press					
Kontakter i sociala medier					
Påverkare i sociala medier					
Lokal påverkare, vem?					
Annan, vad/vem?					

14d. Vilka är orsakerna till att er dotter inte har fått HPV-vaccin? Du kan välja flera alternativ

- ☐ Jag tror inte sjukdomen är farlig
- ☐ Jag tror att risken för att få smittan/sjukdomen var liten
- ☐ Jag vill vänta tills min dotter var lite äldre
- ☐ Jag trodde inte att vaccinet var effektivt/nyttigt
- ☐ Vaccinets biverkningar oroade mig
- ☐ Vaccinets biverkningar oroade min dotter
- ☐ I min närmaste krets finns en person som fått allvarliga biverkningar av vaccinet
- ☐ Min dotter är rädd för sprutor
- ☐ Jag hade läst eller hört negativa saker om vaccinet
- ☐ Jag behövde heltäckande och tillförlitlig information om vaccinet
- ☐ Jag tycker inte att vaccinet har undersökts tillräckligt
- ☐ Jag var överhuvudtaget misstänksam mot vaccinet
- ☐ Min dotters bokade tid passade inte i min egen tidtabell
- ☐ Vi erbjöds inget vaccin
 - ☐ (öppen underfråga om du väljer) Vad beskriver situationen bäst:
 - ☐ Hälsovårdaren nämnde inte vaccinet överhuvudtaget
 - ☐ Hälsovårdaren nämnde vaccinet utan att ta ställning
 - ☐ Hälsovårdaren sa att det inte lönar sig för min dotter att ta vaccinet
 - ☐ Annan orsak
- ☐ Jag litar inte på hälso- och hälsovårdsmyndigheterna (Social- och hälsovårdsministeriet, Institutet för hälsa och välfärd, Säkerhets- och utvecklingscentret för läkemedelsområdet Fimea)

- Jag litar inte på vårdpersonalens yrkeskunskap
- Annat, vad ? : _____

14e. Hur mycket har följande instanser inverkat på ditt beslut om HPV-vaccination?

	Ingen inverkan	Liten inverkan	Inverkat i viss mån	Mycket stor inverkan	Vet ej
Yrkesutbildade personer inom hälso- och sjukvård (läkare, hälsovårdare, rådgivning osv.)					
Barnets andra förälder					
Annan familj än den andra föräldern					
Bekantskapskrets					
Andra föräldrar till barn i samma ålder					
Media, press					
Kontakter i sociala medier					
Påverkare i sociala medier					
Lokal påverkare, vem?					

15. Tror du att HPV-vaccinet uppmuntrar flickor att inleda sexuella kontakter tidigare än vanligt?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

16. Vad är din största oro för HPV eller dess vaccin?

17. Min inställning till vacciner för barn har förändrats med coronapandemin och coronavaccinet

- ☐ Ja, min inställning har blivit mer säker på barns vacciner
- ☐ Ja, min inställning har blivit mer försiktig när det gäller barnvacciner
- ☐ Nej, min inställning till barndomsvacciner har inte förändrats

Bakgrundsinformation

18. Födelseår: _____

19. Barnets födelsemånad- och år: ____/20____

20. Hur många barn har familjen för närvarande? _____

21. Röker du?

- ☐ Ja
- ☐ Nej
- ☐ Inte längre

22. Föräldrarnas förhållande:

- ☐ äktenskap eller samboförhållande, endast gemensamma barn
- ☐ äktenskap eller samboförhållande, barn från andra förhållanden
- ☐ ensamstående förälder
- ☐ ensamstående förälder, barn från andra förhållanden
- ☐ något annat

23. Modersmål:

- ☐ finska
- ☐ svenska
- ☐ annat, vad? _____

24. Min dotter går i skolan i:

- ☐ Esbo
- ☐ Kuopio
- ☐ Uleåborg
- ☐ Jakobstad
- ☐ Korsholm

25. I vilken klass i grundskolan går er dotter?

- ☐ Fjärde
- ☐ Femte
- ☐ Sjätte
- ☐ Sjunde
- ☐ Åttonde

26. Utbildningsnivån för den förälder som svarat på enkäten (välj högsta avlagda examen):

- ☐ Mellan- eller grundskola
- ☐ Yrkesskola
- ☐ Studentexamen
- ☐ Lägre högskoleexamen (bl.a. yrkeshögskoleexamina, lägre högskoleexamen vid universitet)
- ☐ Högre högskoleexamen (bl.a. yrkeshögskoleexamina, högre högskoleexamen vid universitet)
- ☐ Forskarutbildning (bl.a. licentiat, doktor)
- ☐ Ingen uppgift

27. Utbildningsnivån för barnets andra förälder (välj den högsta avlagda examen):

- ☐ Mellan- eller grundskola
- ☐ Yrkesskola
- ☐ Studentexamen
- ☐ Lägre högskoleexamen (bl.a. yrkeshögskoleexamina, lägre högskoleexamen vid universitet)
- ☐ Högre högskoleexamen (bl.a. yrkeshögskoleexamina, högre högskoleexamen vid universitet)
- ☐ Forskarutbildning (bl.a. licentiat, doktor)
- ☐ Ingen uppgift

28. Till vilken yrkesgrupp anser ni att ni närmast hör?

- ☐ Ledande ställning
- ☐ Högre/lägre tjänsteman
- ☐ Arbetstagare
- ☐ Företagare eller enskild yrkesutövare
- ☐ Lantbruksföretagare
- ☐ Studerande
- ☐ Hemmamamma/-pappa
- ☐ Arbetslös
- ☐ Annat, vad?

29. Vilket trossamfund eller vilken livsåskådning anser ni er tillhöra? Du kan välja flera alternativ

- ☐ Evangelisk-lutherska eller ortodoxa kyrkan
 - ☐ Väckelserörelse inom kyrkan
- ☐ Annat kristet trossamfund
- ☐ Något annat, vad? _____
- ☐ Ingen religion
- ☐ Jag vill inte säga

30. Upplever du att du aktivt utövar religion?

- ☐ Ja
- ☐ Nej
- ☐ Jag vill inte säga

31. Familjens sammanlagda bruttoinkomst per år för närvarande (löner, moderskapspenning, föräldrapenning, arbetslöshetsersättning)

- ☐ <10 000 euro per år sammanlagt
- ☐ 10–20 000
- ☐ 20–40 000
- ☐ 40–60 000
- ☐ 60–80 000
- ☐ 80–100 000
- ☐ >100 000
- ☐ Jag vill inte säga

32. Efter denna enkätundersökning ordnar vi gruppdiskussioner. Syftet med dem är att noggrannare granska barns föräldrars medieanvändning och förtroende i samband med vaccinationer. Skulle du vara intresserad att delta i gruppintervjuer som ordnas på din ort?

- ☐ Ja
- ☐ Nej

Constructing Expertise: Public Discourse on Health

Welcome to the study *Constructing Expertise: Public Discourse on Health*, which explores parents' sources of information and trust in those sources. By answering the following questions, you confirm that you have read the participant information sheet and received sufficient information regarding the purpose of the study, the data to be collected, how it will be processed, linked, and disclosed. Participation is voluntary, and your responses will be treated confidentially. You may interrupt the questionnaire and continue at a later time. If you have more than one daughter who falls under the study criteria, please answer with your youngest daughter in mind.

Sources of information and trust

1. How important do you think the following sources of information are in terms of vaccinations?

Examples in brackets

	Very important	Rather important	Does not know	Not very important	Not at all important
Information produced by the authorities (Finnish Institute for Health and Welfare, Ministry of Social Affairs and Health, child health clinics, Wilma (=platform between schools and homes))					
Journalistic media (Helsingin Sanomat, Hufvudstadsbladet, tabloids, television)					
Social media (Facebook, Twitter, YouTube)					
Information produced by influencers) blogs, podcasts, profiles on social media)					
Personal contacts (family, circle of acquaintances, parents of coeval children)					
Other source, what? _____					

2. How much do you trust vaccine information you receive from the following sources? Examples in brackets

	Very much	Rather much	Does not know	Not very much	Not at all
Information produced by the authorities (Finnish Institute for Health and Welfare, Ministry of Social Affairs and Health, child health clinics, Wilma)					
Journalistic media (Helsingin Sanomat, Hufvudstadsbladet, tabloids, television)					

Social media (Facebook, Twitter, YouTube)					
Information produced by influencers) blogs, podcasts, profiles on social media)					
Personal contacts (family, circle of acquaintances, parents of coeval children)					
Other source, what? _____					

Expertise

3. How important do you find that a vaccine expert has the following qualities?

	Very important	Rather important	Do not know	Not very important	Not at all important
The expert represents a university or a research organisation					
The expert represents an authority					
The expert is actively in the public eye					
The expert has an appropriate scientific education					
The expert has practical experience on the matter					
The expert has good interaction skills					
The expert can communicate clearly					
When necessary, the expert has the ability to question the views of the authorities or scientists					
The expert represents the same sex as me					
I can relate to the expert					

4. Do any other qualities that an expert should have come to your mind?

Human papillomavirus knowledge

5. Have you ever heard of human papillomavirus (HPV) before?

- ☐ Yes
☐ No

6. Is human papillomavirus the same as herpes?

- ☐ Yes
☐ No
☐ Do not know

7. Does human papillomavirus cause cervical cancer?

- ☐ Yes
- ☐ No
- ☐ Do not know

8. Is human papillomavirus asymptomatic?

- ☐ Yes
- ☐ No
- ☐ Do not know

9. Which of the following conditions do you believe are associated with HPV? (You may select multiple options)

- ☐ Esophageal cancer
- ☐ Cervical cancer
- ☐ Penile cancer
- ☐ Genital warts/condyloma
- ☐ Bladder cancer
- ☐ Irritable bowel syndrome (IBS)
- ☐ Anal cancer
- ☐ Oral cancer
- ☐ Do not know

10. How would you assess your knowledge of HPV infection and the vaccine that protects against it?

- ☐ Very good
- ☐ Good
- ☐ Moderate
- ☐ Poor
- ☐ Very poor
- ☐ Do not know

Vaccination behaviour

11. Has your daughter received the (childhood) vaccines included in the national vaccination programme?

- ☐ Yes, all offered vaccines so far (jump to question 12)
- ☐ Yes, some of the offered vaccines so far (jump to question 11b)
- ☐ Not a single offered vaccine (jump to question 11b)
- ☐ Do not know (jump to question 12)

11b. If you answered "yes, some of the offered vaccine" or "not a single offered vaccine", what was the reason for not vaccinating? Choose all that apply

- ☐ I wanted to wait until my daughter was a bit older
- ☐ I did not believe the vaccine is efficient/useful
- ☐ The side effects of the vaccine worried me

- ☐ The vaccine was not given due to the COVID-19 pandemic
- ☐ There is a person who has suffered serious harm from the vaccine in my inner circle
- ☐ My daughter is afraid of needles
- ☐ I had read or heard negative things about the vaccine
- ☐ I did not have comprehensive and reliable information of the vaccine
- ☐ The vaccine has not been studied enough in my opinion
- ☐ I was overall suspicious of the vaccine
- ☐ The appointment offered to my daughter did not fit my schedule
- ☐ My daughter refused
- ☐ Other reason, what? _____

12. With whom do you mainly consider vaccine-related issues? Choose all that apply

- ☐ Healthcare professionals (doctor, public health nurse, child health clinic etc.)
- ☐ The child's other parent
- ☐ Family other than the child's other parent
- ☐ Circle of acquaintances
- ☐ Parents of other coeval children
- ☐ Social media contacts
- ☐ Other, who? _____

13. Who ultimately decides on the vaccination of your child?

- ☐ Me
- ☐ The child's other parent
- ☐ We decide jointly with the child's other parent
- ☐ The child herself
- ☐ Family other than the child's other parent
- ☐ Other, who? _____

14. My daughter has or will receive the HPV- vaccine free of charge as per the national vaccination programme

- ☐ Yes, will receive (jump to question 14b)
- ☐ Yes, has received (jump to question 14a and 14b)
- ☐ No, has not received or will not receive (jump to question 14c and 14d)
- ☐ Do not know (jump to question 14e)

14a. If your daughter has received the HPV-vaccination, has she received:

- ☐ 1
- ☐ 2
- ☐ 3 doses
- ☐ Do not know/remember

14b. How much influence the following entities have had on your decision to vaccinate your daughter against HPV?

	No influence at all	Little influence	Somewhat of an influence	Very much influence	Do not know
Healthcare professionals (doctor, public health nurse, child health clinic etc.)					
The child's other parent					
Family other than the child's other parent					
Circle of acquaintances					
Parents of other coeval children					
Media, press					
Social media contacts					
Social media influencers					
Local influencer, who?					
Other, what/who?					

14c. How much influence the following entities have had on your decision to not vaccinate your daughter against HPV?

	No influence at all	Little influence	Somewhat of an influence	Very much influence	Do not know
Healthcare professionals (doctor, public health nurse, child health clinic etc.)					
The child's other parent					
Family other than the child's other parent					
Circle of acquaintances					
Parents of other coeval children					
Media, press					
Social media contacts					
Social media influencers					
Local influencer, who?					
Other, what/who?					

14d. What is/are the reasons that your daughter has not or will not receive the influenza vaccine this season? Choose all that apply

- ☐ I do not think the disease is dangerous
- ☐ I believe that the risk to acquire the condition is small
- ☐ I want to wait until my daughter is a bit older
- ☐ I did not think the vaccine was efficient/useful
- ☐ The adverse effects of the vaccine worry me
- ☐ There is a person in my vicinity who has suffered adverse effects from the vaccine

- ☐ My daughter is afraid of needles
- ☐ I had read or heard negative things about the vaccine
- ☐ I needed comprehensive and reliable information of the vaccine
- ☐ The vaccine has not been studied enough in my opinion
- ☐ I was overall suspicious of the vaccine
- ☐ The appointment offered to my daughter did not fit my schedule
 - (if chosen, more questions appear) What describes your situation the best:
 - The public health nurse did not mention the vaccine at all
 - The public health nurse mentioned it, but did not give an opinion
 - The public health nurse told me that my daughter should not take the vaccine
 - Other reason
- ☐ I do not trust health authorities (Ministry for Social Affairs and Health, Finnish Institute for Health and Welfare, Fimea (Finnish Medical Agency))
- ☐ I do not trust the professional skills of the healthcare professionals
- ☐ Other, what? _____

14e. How much influence do the following entities have had on your HPV vaccination decision?

	No influence at all	Little influence	Somewhat of an influence	Very much influence	Do not know
Healthcare professionals (doctor, public health nurse, child health clinic etc.)					
The child's other parent					
Family other than the child's other parent					
Circle of acquaintances					
Parents of other coeval children					
Media, press					
Social media contacts					
Social media influencers					
Local influencer, who?					
Other, what/who?					

15. Do you believe that the HPV vaccine encourages girls to begin sexual activity earlier than usual?

- ☐ Yes
- ☐ No
- ☐ Do not know

16. Do you believe that the HPV vaccine encourages girls to begin sexual activity earlier than usual?

17. My attitude regarding children's vaccines has changed along the COVID-19 pandemic and its' vaccine

- ☐ Yes, my attitude has become more trusting towards children's vaccines
- ☐ Yes, my attitude has become more cautious towards children's vaccines
- ☐ No, my attitude has not changed towards children's vaccines

Background information

17. Year of birth: ____

18. Child's birth month and year: ____/20____

19. How many children are there in your family currently? _____

20. Do you smoke?

- ☐ Yes
- ☐ No
- ☐ Not anymore

21. Parent's relationship

- ☐ Marriage or cohabitation, only shared children
- ☐ Marriage or cohabitation, children from different parents
- ☐ Lone parent
- ☐ Lone parent, children from different parents
- ☐ Other

22. Mother tongue:

- ☐ Finnish
- ☐ Swedish
- ☐ Other, what? _____

23. The educational level of the responding parent (choose highest completed)

- ☐ Middle or primary school
- ☐ Vocational school
- ☐ Upper secondary school
- ☐ Lower higher education degree (e.g., bachelor's degrees)
- ☐ Higher education degree (e.g., master's degrees)
- ☐ Doctoral degree (e.g., licentiate, PhD)
- ☐ No information

24. The educational level of the child's other parent (choose highest completed)

- ☐ Middle or primary school
- ☐ Vocational school
- ☐ Upper secondary school
- ☐ Lower higher education degree (e.g., bachelor's degrees)
- ☐ Higher education degree (e.g., master's degrees)
- ☐ Doctoral degree (e.g., licentiate, PhD)
- ☐ No information

25. What occupational group would you categorise yourself to?

- ☐ Managerial position
- ☐ Clerk
- ☐ Employee
- ☐ Entrepreneur/freelancer
- ☐ Farmer
- ☐ Student
- ☐ Stay-at-home parent
- ☐ Unemployed
- ☐ Other, what?

26. Which religious group would you categorise yourself to? Choose all that apply

- ☐ Evangelical Lutheran or Eastern Orthodox church
 - ☐ Some revivalist movement within the church
- ☐ Other Christian religion
- ☐ Other, what? _____
- ☐ No religion
- ☐ Do not want to say

27. The combined gross income of the family (salary, parental allowances, unemployment benefit etc.)

- ☐ <10 000 Euros annually
- ☐ 10–20 000
- ☐ 20–40 000
- ☐ 40–60 000
- ☐ 60–80 000
- ☐ 80–100 000
- ☐ >100 000
- ☐ Do not want to say

28. After this questionnaire study we will organise focus group discussions. The aim for the discussions is to further explore parental media use in terms of vaccines and trust. Would you be interested in participating in focus group discussion organized in your municipality?

- ☐ Yes
- ☐ No

Appendix 2. Influenza and HPV study information letters in Finnish and Swedish



Terveyden ja
hyvinvoinnin laitos

Erkki Esimerkki

Esimerkkitie 1

00000 Esimerkkilä

Nettisivun osoite:

thl.fi/mex/vastaa

Käyttäjätunnus:

KUTSU INTERNETIN KAUTTA TOTEUTETTAVAAN MEDIANKÄYTTÖTUTKIMUKSEEN

Hyvä Erkki,

Sinut on valittu osallistumaan tutkimukseen 'Asiantuntijuuden rakentuminen: Julkinen keskustelu terveydestä'. Pyydämme, että osallistut tutkimukseen vastaamalla kyselyyn mahdollisimman pian.

Tutkimuksen tavoitteena on selvittää mitä tiedon lähteitä vanhemmat käyttävät, kun he hakevat tietoa rokotuksista, ja mihin tietolähteisiin he luottavat. Tutkimus tähtää myös asiantuntijuuden määrittelyyn; kuka on vanhemman mielestä asiantuntija? Tämä tutkimus keskittyy erityisesti influenssaan ja koskee 0–6-vuotiaan lapsen vanhempia. Jos sinulla on useampi rokotusikäinen lapsi, vastaa **nuorinta lastasi** mielessä pitäen.

Tutkimustietoa kerätään kyselyn avulla, ja siksi osallistumisesi on tärkeää. Myöhemmin järjestämme myös ryhmähaastatteluja, joiden avulla tutkimme syvemmin median käyttöön ja rokotuspäätökseen vaikuttavia asioita sekä asiantuntijuuteen liitettyjä ominaisuuksia.

Miten ja miksi sinut on valittu tutkimukseen?

Tutkimukseen valitut osallistujat on poimittu viideltä paikkakunnalta Digi- ja väestötietoviraston tiedoista. Sinut on valittu mukaan, koska sinulla on influenssarokotuksen piiriin kuuluva rokotusikäinen lapsi. Tutkimukseen osallistuminen on vapaaehtoista. Osallistumisesi on kuitenkin erittäin tärkeää, sillä mukaan kutsuttua henkilöä ei voida korvata toisella.

Miten tutkimukseen vastataan?

Voit vastata kyselyyn täyttämällä sähköisen kyselylomakkeen osoitteessa
thl.fi/mex/vastaa

Käytä henkilökohtaista tunnustasi, joka löytyy tämän kirjeen yläosasta. Voit halutessasi keskeyttää vastaamisen, ja jatkaa myöhemmin.

Kuinka kauan vastaaminen kestää ja mitä lomakkeessa kysytään?

Kyselyssä on noin 25 kysymystä, ja niihin vastaaminen kestää noin 10–15 minuuttia. Kysymykset käsittelevät mediankäyttöön liittyviä asioita: mitä medialähteitä käyttää ja mihin medialähteisiin luottaa. Lisäksi kysytään influenssaan liittyviä asioita. Kyselylomakkeessa kysytään myös ajatuksiasi asiantuntijuudesta.

Tutkimuksen kulku

Toivomme, että vastaat sähköiseen lomakkeeseen tämän kirjeen saatuaasi. Jos emme saa sinulta vastausta, lähetämme sinulle toisella tavoittelukierroksella tekstiviestin matkapuhelimeesi, mikäli puhelinnumero löytyy Digi- ja Väestötietoviraston tiedoista. Tekstiviesti sisältää lomakkeen sähköiseen täyttämiseen tarvittavat tiedot.

HUOM: Jos et halua osallistua tutkimukseen, ilmoitathan siitä meille, niin poistamme sinut tutkimuksesta. Löydät yhteystietomme tämän tiedotteen lopusta. Sinulla on oikeus peruuttaa osallistumisesi tutkimukseen missä tahansa vaiheessa.

Tietojen luottamuksellisuus, yhdistely, säilytys ja tietosuoja

Terveiden ja hyvinvoinnin laitos on viranomaistaho. Sinusta kerättyä tietoa ja tutkimustuloksia käsitellään luottamuksellisesti tietosuojalain ja EU:n yleisen tietosuojasetuksen (GDPR) edellyttämällä tavalla ja salassapitovelvollisuutta noudattaen. Tutkimustuloksiisi yhdistetään tietoja THL:n ylläpitämästä valtakunnallisesta rokotusrekisteristä, josta saadaan tieto lapsesi rokotusstatuksesta.

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Tutkijoilla on lakiin perustuva vaitiolovelvollisuus. Tutkimustiedostoa ja tutkimuksessa kerättyjä tietoja säilytetään Terveiden ja hyvinvoinnin laitoksen tiloissa enintään 15 vuotta, minkä jälkeen tiedot hävitetään. Sinulla on oikeus vaatia henkilötietojesi poistamista jo ennen tätä määräaika.

Tutkimuksen kustannukset ja rahoitus

Tutkimukseen osallistuminen on ilmaista. Tutkimukseen osallistumisesta ei makseta tutkimuksen osallistujille palkkiota.

Tutkimus rahoitetaan Suomen Akatemian Strategisen tutkimuksen neuvoston Terveiden ja hyvinvoinnin laitokselle myöntämällä Media ja yhteiskunta- hankkeen rahoituksella, ja THL:n omalla rahoituksella.

Tutkimustuloksista tiedottaminen

Mediasta on tullut yhä tärkeämpi, monimutkaisempi ja vaikeammin ennustettava osa yhteiskunnallista toimintaa. Tavoitteenamme on tuottaa tutkimuksen kautta tietoa, arvioita ja innovaatioita, jotka auttavat meitä palvelemaan paremmin kansalaisten ja yhteiskunnan tietotarpeita.

Tutkimuksen tulokset on tarkoitus julkaista vuonna 2023 alan tieteellisissä julkaisuissa ja seminaareissa. Tuloksista tiedotetaan myös terveyden edistämisen paikallisille ja valtakunnallisille toimijoille, jotta tutkimuksesta saatuja tuloksia hyödynnettäisiin mahdollisimman laajasti.

Tutkimuksen tuloksia käytetään ohjaamaan terveydenhuollon ammattilaisten käytännön työtä. Tulokset tulevat myös päättäjien, kuten ministeriöiden, eduskunnan, tartuntatautineuvottelukunnan ja rokotusasiantuntijaryhmän käyttöön. Tutkimustulosten valmistuttua kunnille tiedotetaan tutkimustuloksista. Tuloksista tiedotetaan myös tutkimukseen osallistuneille sosiaalisen median eri kanavissa. Tutkimusryhmää ja tutkimuksen edistymistä voit myös seurata Twitterissä @MEXstudy.

Lisätiedot

Mikäli sinulla on kysyttävää tutkimuksesta, saat lisätietoja ottamalla yhteyttä:

Sähköposti: mex@thl.fi

Puhelinnumero: 029 524 6138, maanantai – perjantai 9–15

Lisätietoa tutkimukseen osallistuvalle

Tutkimuksen toteuttaa Terveiden ja hyvinvoinnin laitos (THL). Tutkimukseen on valittu 22 400 vanhempaa, jolla on 0–6-vuotias lapsi. Tietosi on poimittu Väestötietojärjestelmästä. Tutkimuksessa kerätään tietoa vanhempien tietolähteistä, kun he hakevat tietoa rokotuksista, ja mihin tiedon lähteisiin he luottavat. Lisäksi tutkimuksen tarkoituksena on tarkastella kenet vanhemmat mieltävät asiantuntijaksi.

Tutkimustulokset selkiyttävät median roolia rokotuskäyttäytymisessä ja asiantuntijuuden muodostumisessa. Tulokset tarjoavat uutta tietoa tieteen ja asiantuntijuuden käytöstä terveyteen liittyvissä julkisissa keskusteluissa. Tutkimus luo parempaa ymmärrystä nykyajan asiantuntijuudesta, näin asiantuntijuuden roolin muutosaikana. THL hyödyntää tutkimustuloksia lakisääteisen rokotusohjelmaan liittyvien toimintojen suunnittelussa HPV:n ja influenssan suhteen, sekä vanhempien

kanssa tekemisissä olevien terveydenhuollon ammattilaisten koulutuksessa. Ensimmäiset tulokset julkaistaan vuonna 2023.

Vastauksesi ovat tärkeitä ja luottamuksellisia

Tietojesi käsittely tapahtuu täysin luottamuksellisesti tietosuojalakia ja EU:n yleistä tietosuojaa-asetusta (GDPR) noudattaen kaikissa tutkimuksen vaiheissa.

Tutkimuslomakkeissa ja tiedostoissa ei näy henkilötietoja, vaan niissä on käytössä erillinen tutkimusnumero. Henkilöllisyyttä ei voida tunnistaa kerätyistä tiedoista, ja tutkimuksen tuloksista ei voi tunnistaa yksittäisen vastaajan antamia tietoja eikä kenenkään henkilöllisyyttä. Tutkijoilla on lakiin perustuva vaitiolovelvollisuus.

Tutkimuksen yhteydessä kerättyjä tietoja säilytetään Terveiden ja hyvinvoinnin laitoksen tiloissa enintään 15 vuotta, minkä jälkeen tiedot hävitetään. Tietosi pohjalta ei tehdä säännönmukaisia tietojen luovutuksia, ja tietoja ei koskaan luovuteta EU:n tai ETA:n ulkopuolelle.

Voit myös perua osallistumisesi tutkimukseen milloin tahansa ilmoittamalla siitä yhteystiedoissa näkyvään sähköpostiosoitteeseen.

Tietojen yhdistäminen rekistereihin

Tutkimustuloksiisi yhdistetään tietoja seuraavilta rekisterinpitäjiltä: Terveiden ja hyvinvoinnin laitos (tieto lapsesi influenssarokotuskattavuudesta) ja Digi- ja väestötietovirasto (nimi, syntymäaika- ja paikka, osoitetietoja, siviilisääty, äidinkieli, kansalaisuus). Rekisteritietoja käytetään hankkeelle myönnettyjen tietolupien ja Terveiden ja hyvinvoinnin laitoksesta annetun lainsäädännön määräämällä tavalla. Myös tietosuojavaltuutettua on tiedotettu tutkimuksesta.



Terveyden ja
hyvinvoinnin laitos

Erkki Esimerkki

Exempelvägen 1

00000 Exempelby

Webbadress: ***thl.fi/mex/vastaa***

Användarnamn:

Lösenord:

INBJUDAN TILL ANVÄNDNINGSENDERSÖKNING AV MEDIA PÅ INTERNET

Bästa Erkki,

Du har valts att delta i undersökningen 'Expertisens uppbyggnad: Offentlig diskussion om hälsa'. Vi ber dig delta i undersökningen genom att besvara enkäten så snart som möjligt.

Syftet med undersökningen är att utreda vilka informationskällor föräldrarna använder när de söker information om vaccinationer och vilka källor de litar på. Undersökningen syftar också till att definiera sakkunskapen; vem anser föräldern vara sakkunnig? Denna undersökning fokuserar särskilt på influensa och gäller föräldrar till barn mellan 0–6 år.

Forskningsdata samlas in med hjälp av en enkät och därför är det viktigt att du deltar. Senare ordnar vi också gruppintervjuer med vilkas hjälp vi grundligare undersöker frågor som påverkar användningen av medier och vaccinationsbeslutet samt egenskaper förknippade med expertis. Om du har flera barn som tillhör vaccinationsåldern, svara med ditt **ungsta barn** i åtanke.

Hur och varför har du valts ut för undersökningen?

Deltagarna i undersökningen har plockats från Befolkningsregistercentralens uppgifter från fem orter. Du har valts ut eftersom du har ett barn i vaccinationsåldern som omfattas av vaccination mot influensa.

Det är frivilligt att delta i undersökningen. Det är dock mycket viktigt att du deltar, eftersom en inbjuden person inte kan ersättas med en annan.

Hur besvaras undersökningen?

Du kan besvara enkäten genom att fylla i den elektroniska enkäten på adressen ***thl.fi/mex/vastaa***

Använd ditt personliga användarnamn, finns i övre delen av detta brev. Du kan pausa om du vill och fortsätta senare.

Hur lång tid tar det att svara och vad frågar man på blanketten?

Enkäten innehåller cirka 25 frågor och det tar cirka 10–15 minuter att besvara dem. Frågorna handlar om medieanvändning: vilka mediekällor används och vilka mediekällor litat man på. Dessutom efterfrågas kännedom kring influensa. I frågeformuläret ställs också frågor om dina tankar kring expertis.

Undersökningens förlopp

Vi önskar att du besvarar den elektroniska blanketten efter mottagandet av detta brev. Om inte svar erhålls skickar vi ett sms till din mobiltelefon under den andra ansökningsomgången, om ditt nummer finns i befolkningsinformationssystemets data från Myndigheten för Digitalisering och Befolkningsdata. Sms:et innehåller den information som behövs för att fylla i elektronisk blankett.

OBS! Om du inte vill delta i studien, vänligen meddela oss så tar vi bort dig från studien. Du hittar våra kontaktuppgifter i slutet av detta meddelande. Du har rätt att återkalla ditt deltagande i undersökningen i vilket skede som helst.

Uppgifternas konfidentialitet, sammanställning, förvaring och dataskydd.

Institutet för hälsa och välfärd är en myndighetsinstans. Information och undersökningsresultat som samlats in om dig behandlas konfidentiellt på det sätt som dataskyddslagen och EU:s allmänna dataskyddsförordning förutsätter och med iakttagande av tystnadsplikten. Dina forskningsresultat kombineras med uppgifter från THL:s riksomfattande vaccinationsregister som ger information om ditt barns vaccinationsstatus.

Enskilda forskningspersoner ges en identifikationskod som förvaras i kodad form i forskningsfilen. Resultaten analyseras i kodad form på gruppnivå, enskild persons uppgifter och resultat kan identifieras endast med hjälp av en kodnyckel. Kodnyckeln förvaras av den forskare som ansvarar för undersökningen och av en person eller personer som utsetts av forskaren. De uppgifter som samlas in i undersökningen ges inte till utomstående. De slutliga forskningsresultaten rapporteras på gruppnivå så att enskilda deltagare inte kan identifieras. Dina uppgifter används inte för myndighetsbeslut som gäller individen utan endast för forskningsändamål.

Forskarna har lagstadgad tystnadsplikt. Forskningsfilen och de uppgifter som samlats in i undersökningen förvaras i Institutet för hälsa och välfärds lokaler i högst 15 år, varefter uppgifterna förstörs. Du har rätt att kräva att dina personuppgifter raderas redan före denna tidsfrist.

Forskningskostnader och finansiering

Det är gratis att delta i undersökningen. För deltagande i undersökningen betalas inget arvode till deltagarna.

Undersökningen finansieras genom Finlands Akademis råd för strategisk forskning till Institutet för hälsa och välfärd gällande projektet Media och Samhällsprojekt samt finansiering från THL.

Information om undersökningsresultaten

Medierna har blivit en allt viktigare, mer komplicerad och svårt förutsägbar del av samhällsfunktionen. Vårt mål är att via forskning producera information, bedömningar och innovationer som hjälper oss att bättre tillgodose medborgarnas och samhällets informationsbehov.

Avsikten är att resultaten av undersökningen ska publiceras 2023 i vetenskapliga publikationer och genom seminarier i området. Man informerar också lokala aktörer och aktörer på riksnivå om dessa, för att resultaten av forskningen ska kunna utnyttjas i så stor utsträckning som möjligt.

Resultaten av undersökningen används för att styra hälso- och sjukvårdspersonalens praktiska arbete. Resultaten kommer också att användas av beslutsfattare, såsom ministerierna, riksdagen, delegationen för smittsamma sjukdomar och gruppen för vaccinationsexperten. När forskningsresultaten är klara informeras kommunerna om resultaten. Deltagarna i undersökningen informeras också om resultaten via olika kanaler i sociala medier. Du kan även följa forskningsgruppen och forskningens framskridande på [Twitter@MEXstudy](https://twitter.com/MEXstudy).

Tilläggsuppgifter

Om du önskar tilläggsuppgifter om undersökningen, vänligen kontakta:

E-post: mex@thl.fi

Telefonnummer: 029 524 6138, måndag – fredag 9–15

Tilläggsuppgifter för dem som deltar i undersökningen

Undersökningen genomförs av Institutet för hälsa och välfärd (THL). 22 400 föräldrar med 0–6 åriga barn har valts ut till undersökningen. Dina uppgifter har plockats från Befolkningsdatasystemet. I undersökningen samlar man in information från föräldrarnas informationskällor när de söker information om vaccinationer och vilka källor de litar på. Syftet med undersökningen är dessutom att granska vem föräldrarna uppfattar som sakkunnig.

Forskningsresultaten klargör mediernas roll i vaccinationsbeteendet samt skapandet av expertis. Resultaten ger ny information om användningen av vetenskap och expertis i offentliga diskussioner om hälsa. Forskningen skapar en bättre förståelse för dagens expertis, så här under en förändringstid för expertisrollen. THL nyttjar forskningsresultaten i planeringen av funktioner i anslutning till den lagstadgade vaccinationsprogrammet gällande HPV och influensa samt i utbildningen av

yrkesutbildade personer inom hälso- och sjukvården i anknytning till föräldrarna. De första resultaten publiceras 2023.

Dina svar är viktiga och konfidentiella

Hantering av dina uppgifter sker helt konfidentiellt i enlighet med dataskyddslagstiftningen och EU:s allmänna dataskyddsförordning (GDPR) i alla stadier av studien. I undersökningsblanketterna och filerna syns inga personuppgifter, i dessa används ett separat undersökningsnummer. Din identitet kan inte identifieras utifrån de insamlade uppgifterna och det går inte att identifiera uppgifter från enskilda svarande eller någons identitet i undersökningsresultaten. Forskarna har lagstadgad tystnadsplikt. Uppgifter som erhålls i samband med studien kommer att förvaras vid Institutet för hälsa och välfärd i högst 15 år, varefter uppgifterna förstörs. Det görs inga regelrätta överlåtanden av de uppgifter du lämnat och uppgifterna lämnas aldrig ut utanför EU eller EES.

Du kan återkalla ditt deltagande i undersökningen när som helst genom att meddela det till den e-postadress som syns i kontaktuppgifterna.

Uppgifternas anslutning till register

Dina forskningsresultat kombineras med uppgifter från följande ansvariga för personuppgifter: Institutet för hälsa och välfärd (information om ditt barns influensa-vaccinationstäckning) och Myndigheten för digitalisering och befolkningsdata (namn, födelsedatum och -ort, adressuppgifter, civilstånd, modersmål, medborgarskap). Informationen i registret ska användas i enlighet med informationstillstånden för projektet och den lagstiftning som utfärdats av Institutet för hälsa och välfärd. Även dataombudsmannen har informerats om undersökningen.



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hyvinvoinnin laitos

Erkki Esimerkki

Esimerkkitie 1

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Käyttäjätunnus:

Salasana:

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Miten tutkimukseen vastataan?

Voit vastata kyselyyn täyttämällä sähköisen kyselylomakkeen osoitteessa **thl.fi/mex/vastaa**

Käytä henkilökohtaista tunnustasi, joka löytyy tämän kirjeen yläosasta. Voit halutessasi keskeyttää vastaamisen, ja jatkaa myöhemmin.

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Tutkimustuloksista tiedottaminen

Mediasta on tullut yhä tärkeämpi, monimutkaisempi ja vaikeammin ennustettava osa yhteiskunnallista toimintaa. Tavoitteenamme on tuottaa tutkimuksen kautta tietoa, arvioita ja innovaatioita, jotka auttavat meitä palvelemaan paremmin kansalaisten ja yhteiskunnan tietotarpeita.

Tutkimuksen tulokset on tarkoitus julkaista vuonna 2023 alan tieteellisissä julkaisuissa ja seminaareissa. Tuloksista tiedotetaan terveyden edistämisen paikallisille ja valtakunnallisille toimijoille, jotta tutkimuksesta saatuja tuloksia hyödynnettäisiin mahdollisimman laajasti.

Tutkimuksen tuloksia käytetään ohjaamaan terveydenhuollon ammattilaisten käytännön työtä. Tulokset tulevat myös päättäjien, kuten ministeriöiden, eduskunnan, tartuntatautineuvottelukunnan ja rokotusasiantuntijaryhmän käyttöön. Tutkimustulosten valmistuttua kunnille tiedotetaan tutkimustuloksista. Tuloksista tiedotetaan myös tutkimukseen osallistuneille sosiaalisen median eri kanavissa. Tutkimusryhmää ja tutkimuksen edistymistä voit myös seurata Twitterissä @MEXstudy.

Lisätiedot

Mikäli sinulla on kysyttävää tutkimuksesta, saat lisätietoja ottamalla yhteyttä:

Sähköposti: mex@thl.fi

Puhelinnumero: 029 524 6138, maanantai – perjantai 9–15

Lisätietoa tutkimukseen osallistuvalle

Tutkimuksen toteuttaa Terveiden ja hyvinvoinnin laitos (THL). Tutkimukseen on valittu 8 000 vanhempaa, jolla on 10–14-vuotias tytär. Tietosi on poimittu Väestötietojärjestelmästä. Tutkimuksessa kerätään tietoa vanhempien tietolähteistä, kun he hakevat tietoa rokotuksista, ja mihin tiedon lähteisiin he luottavat. Lisäksi tutkimuksen tarkoituksena on tarkastella kenet vanhemmat mieltävät asiantuntijaksi.

Tutkimustulokset selkiyttävät median roolia rokotuskäyttäytymisessä ja asiantuntijuuden muodostumisessa. Tulokset tarjoavat uutta tietoa tieteen ja asiantuntijuuden käytöstä terveyteen liittyvissä julkisissa keskusteluissa. Tutkimus luo parempaa ymmärrystä nykyajan asiantuntijuudesta, näin asiantuntijuuden roolin muutosaikana. THL hyödyntää tutkimustuloksia lakisääteisen rokotusohjelmaan liittyvien toimintojen suunnittelussa HPV:n ja influenssan suhteen, sekä vanhempien kanssa tekemisissä olevien terveydenhuollon ammattilaisten koulutuksessa. Ensimmäiset tulokset julkaistaan vuonna 2023.

Vastauksesi ovat tärkeitä ja luottamuksellisia

Tietojesi käsittely tapahtuu täysin luottamuksellisesti tietosuojalakia ja EU:n yleistä tietosuoja-asetusta (GDPR) noudattaen kaikissa tutkimuksen vaiheissa.

Tutkimuslomakkeissa ja tiedostoissa ei näy henkilötietoja, vaan niissä on käytössä erillinen tutkimusnumero. Henkilöllisyyttäsi ei voida tunnistaa kerätyistä tiedoista, ja tutkimuksen tuloksista ei voi tunnistaa yksittäisen vastaajan antamia tietoja eikä kenenkään henkilöllisyyttä. Tutkijoilla on lakiin perustuva vaitiolovelvollisuus.

Tutkimuksen yhteydessä kerättyjä tietoja säilytetään Terveiden ja hyvinvoinnin laitoksen tiloissa enintään 15 vuotta, minkä jälkeen tiedot hävitetään. Tietosi pohjalta ei tehdä säännönmukaisia tietojen luovutuksia, ja tietoja ei koskaan luovuteta EU:n tai ETA:n ulkopuolelle.

Voit myös perua osallistumisesi tutkimukseen milloin tahansa ilmoittamalla siitä yhteystiedoissa näkyvään sähköpostiosoitteeseen.

Tietojen yhdistäminen rekistereihin

Tutkimustuloksiisi yhdistetään tietoja seuraavilta rekisterinpitäjiltä: Terveiden ja hyvinvoinnin laitos (tieto lapsesi HPV-rokotuskattavuudesta) ja Digi- ja väestötietovirasto (nimi, syntymäaika- ja paikka, osoitetietoja, siviilisääty, äidinkieli, kansalaisuus).

Rekisteritietoja käytetään hankkeelle myönnettyjen tietolupien ja Terveiden ja hyvinvoinnin laitoksesta annetun lainsäädännön määräämällä tavalla. Myös tietosuojavaltuutettua on tiedotettu tutkimuksesta.

Erkki Esimerkki

Exempelvägen 1

00000 Exempelby

Webbadress: ***thl.fi/mex/vastaa***

Användarnamn:

Lösenord:

INBJUDAN TILL ANVÄNDNINGSUERSÖKNING AV MEDIA PÅ INTERNET

Bästa Erkki,

Du har valts att delta i undersökningen 'Expertisens uppbyggnad: Offentlig diskussion om hälsa'. Vi ber dig delta i undersökningen genom att besvara enkäten så snart som möjligt.

Syftet med undersökningen är att utreda vilka informationskällor föräldrarna använder när de söker information om vaccinationer och vilka källor de litar på. Undersökningen syftar också till att definiera sakkunskapen; vem anser föräldern vara sakkunnig? Denna undersökning fokuserar särskilt på papillomvirus (HPV) och berör föräldrar till flickor i skolåldern. Om du har flera döttrar som tillhör vaccinationsåldern, svara med din **ungsta dotter** i åtanke.

Forskningsdata samlas in med hjälp av en enkät och därför är det viktigt att du deltar. Senare ordnar vi också gruppintervjuer med vilkas hjälp vi grundligare undersöker frågor som påverkar användningen av medier och vaccinationsbeslutet samt egenskaper förknippade med expertis.

Hur och varför har du valts ut för undersökningen?

Deltagarna i undersökningen har plockats från Befolkningsregistercentralens uppgifter från fem orter. Du har valts ut eftersom du har en dotter i vaccinationsåldern som omfattas av HPV-vaccinationen.

Det är frivilligt att delta i undersökningen. Det är dock mycket viktigt att du deltar, eftersom en inbjuden person inte kan ersättas med en annan.

Hur besvaras undersökningen?

Du kan besvara enkäten genom att fylla i den elektroniska enkäten på adressen ***thl.fi/mex/vastaa***

Använd ditt personliga användarnamn, finns i övre delen av detta brev. Du kan pausa om du vill och fortsätta senare.

Hur lång tid tar det att svara och vad frågar man på blanketten?

Enkäten innehåller cirka 25 frågor och det tar cirka 10–15 minuter att besvara dem. Frågorna handlar om medieanvändning: vilka mediekällor används och vilka mediekällor litar man på. Dessutom efterfrågas kännedom kring papillomvirus. I frågeformuläret ställs också frågor om dina tankar kring expertis.

Undersökningens förlopp

Vi önskar att du besvarar den elektroniska blanketten efter mottagandet av detta brev. Om inte svar erhålls, skickar vi ett sms till din mobiltelefon under den andra ansökningsomgången, om ditt nummer finns i befolkningsinformationssystemets data från Myndigheten för Digitalisering och Befolkningsdata. Sms:et innehåller den information som behövs för att fylla i elektronisk blankett.

OBS! Om du inte vill delta i studien, vänligen meddela oss så tar vi bort dig från studien. Du hittar våra kontaktuppgifter i slutet av detta meddelande. Du har rätt att återkalla ditt deltagande i undersökningen i vilket skede som helst.

Uppgifternas konfidentialitet, sammanställning, förvaring och dataskydd.

Institutet för hälsa och välfärd är en myndighetsinstans. Information och undersökningsresultat som samlats in om dig behandlas konfidentiellt på det sätt som dataskyddslagen och EU:s allmänna dataskyddsförordning förutsätter och med iakttagande av tystnadsplikten. Dina forskningsresultat kombineras med uppgifter från THL:s riksomfattande vaccinationsregister som ger information om ditt barns vaccinationsstatus.

Enskilda forskningspersoner ges en identifikationskod som förvaras i kodad form i forskningsfilen. Resultaten analyseras i kodad form på gruppnivå, enskild persons uppgifter och resultat kan identifieras endast med hjälp av en kodnyckel. Kodnyckeln förvaras av den forskare som ansvarar för undersökningen och av en person eller personer som utsetts av forskaren. De uppgifter som samlas in i undersökningen ges inte till utomstående. De slutliga forskningsresultaten rapporteras på gruppnivå så att enskilda deltagare inte kan identifieras.

Forskarna har lagstadgad tystnadsplikt. Forskningsfilen och de uppgifter som samlats in i undersökningen förvaras i Institutet för hälsa och välfärds lokaler i högst 15 år, varefter uppgifterna förstörs. Du har rätt att kräva att dina personuppgifter raderas redan före denna tidsfrist.

Forskningskostnader och finansiering

Det är gratis att delta i undersökningen. För deltagande i undersökningen betalas inget arvode till deltagarna.

Undersökningen finansieras genom Finlands Akademis råd för strategisk forskning till Institutet för hälsa och välfärd gällande projektet Media och Samhällsprojekt samt finansiering från THL.

Information om undersökningsresultaten

Medierna har blivit en allt viktigare, mer komplicerad och svårt förutsägbar del av samhällsfunktionen. Vårt mål är att via forskning producera information, bedömningar och innovationer som hjälper oss att bättre tillgodose medborgarnas och samhällets informationsbehov.

Avsikten är att resultaten av undersökningen ska publiceras 2023 i vetenskapliga publikationer och genom seminarier i området. Man informerar också lokala aktörer och aktörer på riksnivå om dessa, för att resultaten av forskningen ska kunna utnyttjas i så stor utsträckning som möjligt.

Resultaten av undersökningen används för att styra hälso- och sjukvårdspersonalens praktiska arbete. Resultaten kommer också att användas av beslutsfattare, såsom ministerierna, riksdagen, delegationen för smittsamma sjukdomar och gruppen för vaccinationsexperten. När forskningsresultaten är klara informeras kommunerna om resultaten. Deltagarna i undersökningen informeras också om resultaten via olika kanaler i sociala medier. Du kan även följa forskningsgruppen och forskningens framskridande på Twitter@MEXstudy.

Tilläggsuppgifter

Om du önskar tilläggsuppgifter om undersökningen, vänligen kontakta:

E-post: mex@thl.fi

Telefonnummer: 029 524 6138, måndag – fredag 9–15

Tilläggsuppgifter för dem som deltar i undersökningen

Undersökningen genomförs av Institutet för hälsa och välfärd (THL). 8 000 föräldrar, med en dotter i åldern 10–14 år har valts ut till undersökningen. Dina uppgifter har plockats från Befolkningsdatasystemet. I undersökningen samlar man in information från föräldrarnas informationskällor när de söker information om vaccinationer och vilka källor de litar på. Syftet med undersökningen är dessutom att granska vem föräldrarna uppfattar som sakkunnig.

Forskningsresultaten klargör mediernas roll i vaccinationsbeteendet samt skapandet av expertis. Resultaten ger ny information om användningen av vetenskap och expertis i offentliga diskussioner om hälsa. Forskningen skapar en bättre förståelse för dagens expertis, så här under en förändringstid för expertisrollen. THL nyttjar forskningsresultaten i planeringen av funktioner i anslutning till den lagstadgade vaccinationsprogrammet gällande HPV och influensa samt i utbildningen av yrkesutbildade personer inom hälso- och sjukvården i anknytning till föräldrarna. De första resultaten publiceras 2023.

Dina svar är viktiga och konfidentiella

Hanteringen av dina uppgifter sker helt konfidentiellt i enlighet med dataskyddslagstiftningen och EU:s allmänna dataskyddsförordning (GDPR) i alla stadier av studien. I undersökningsblanketterna och filerna syns inga personuppgifter, i dessa används ett separat undersökningsnummer. Din identitet kan inte identifieras utifrån de insamlade uppgifterna och det går inte att identifiera uppgifter från enskilda svarande eller någons identitet i undersökningsresultaten. Forskarna har lagstadgad tystnadsplikt. Uppgifter som erhålls i samband med studien kommer att förvaras vid Institutet för hälsa och välfärd i högst 15 år, varefter uppgifterna förstörs. Det görs inga regelrätta överlåtanden av de uppgifter du lämnat och uppgifterna lämnas aldrig ut utanför EU eller EES.

Du kan återkalla ditt deltagande i undersökningen när som helst genom att meddela det till den e-postadress som syns i kontaktuppgifterna.

Uppgifternas anslutning till register

Dina forskningsresultat kombineras med uppgifter från följande ansvariga för personuppgifter: Institutet för hälsa och välfärd (information om ditt barns HPV-vaccinationstäckning) och Myndigheten för digitalisering och befolkningsdata (namn, födelsedatum och -ort, adressuppgifter, civilstånd, modersmål, medborgarskap). Informationen i register ska användas i enlighet med informationstillstånden för projektet och den lagstiftning som utfärdats av Institutet för hälsa och välfärd. Även dataombudsmannen har informerats om undersökningen.

Appendix 3. Municipal-level analysis on factors related to parental influenza vaccination intention

Variables that are statistically significant in the univariate analysis were included in the multivariate analysis. Results of variables not statistically significant in the univariate model are not written out in the table, when possible.

1. Factors associated with parental intention to have their child vaccinated in Oulu (low coverage) (n=606)

Variable	Univariate analysis		Multivariate model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1.02 (95% CI, 0.99-1.05)	0.287		
Sex	0.86 (95% CI, 0.61-1.21)	0.380		
Mother tongue		0.500		
Finnish	ref.			
Swedish	0.25 (95% CI, 0.22-2.75)	0.255		
Other	0.87 (95%CI, 0.36-2.10)	0.75		
Active in practising religion		0.205		
No	ref.			
Yes	0.79 (95%CI, 0.50-1.27)	0.332		
Do not want to tell	0.51 (95%CI, 0.22-1.19)	1.115		
Mother's educational level		<0.001		0.114
Vocational education	ref.			
Non-vocational education	0.82 (95%CI, 0.41-1.63)	0.57		
University-level education	2.49 (95%CI, 1.57-3.95)	<0.001		
Other parent's educational level		<0.001		0.068
Vocational education	ref.			
Non-vocational education	1.49 (95%CI, 0.75-2.96)	0.260		
University-level education	2.18 (95%CI, 1.46-3.26)	<0.001		
Number of children		0.208		
1	ref.			
2	1.37 (95%CI, 0.91-2.06)	0.134		
3	1.13 (95%CI, 0.66-1.92)	0.667		
>4	0.82 (95%CI, 0.48-1.40)	0.466		

Trust in official information		0.001	0.974	
Not at all or not much	ref.			
Very much or rather much	0.16 (95%CI, 0.02-1.52)	0.110		
Does not know	0.15 (95%CI, 0.05-0.45)	<0.001		
Trust in journalistic media		<0.001	0.010	
Not at all or not much	ref.		ref.	
Very much or rather much	0.48 (95%CI, 0.28-0.83)	0.009	0.50 (95%CI, 0.27-0.95)	0.035
Does not know	0.47 (95%CI, 0.33-0.68)	<0.001	0.55 (95%CI, 0.35-0.85)	0.007
Trust in social media		0.270		
Not at all or not much	ref.			
Very much or rather much	1.22 (95%CI, 0.46-3.21)			
Does not know	1.69 (95%CI, 0.79-3.58)			
Trust in influencers		0.438		
Not at all or not much	ref.			
Very much or rather much	0.64 (95%CI, 0.22-1.87)	0.413		
Does not know	0.96 (95%CI, 0.38-2.38)	0.921		
Trust in personal contacts		0.007	0.022	
Not at all or not much	ref.		ref.	
Very much or rather much	1.59 (95%CI, 0.98-2.58)	0.059	1.84 (95%CI, 1.03-3.26)	0.039
Does not know	1.79 (95%CI, 1.22-2.62)	0.003	1.74 (95%CI, 1.12-2.74)	0.016
Trust in other sources		0.257		
Not at all or not much	ref.			
Very much or rather much	0.57 (95%CI, 0.22-1.49)	0.573		
Does not know	0.40 (95%CI, 0.14-1.19)	0.100		
Adherence to NVP vaccines		<0.001	<0.001	
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.13 (95%CI, 0.06-0.27)	<0.001	0.20 (95%CI, 0.08-0.46)	<0.001
No vaccines at all or does not know	0.00		0.00	
Influenza knowledge		<0.001	<0.001	
Poor knowledge	ref.		ref.	
Good knowledge	4.26 (95%CI, 2.69-6.75)	<0.001	3.78 (95%CI, 2.24-6.36)	<0.001
Excellent knowledge	7.35 (95%CI, 4.33-12.43)	<0.001	6.25 (95%CI, 3.40-11.47)	<0.001
Change in attitudes since COVID-19		<0.001	0.098	
No, attitude has not changed	ref.			
Yes, attitude is more trusting	1.37 (95%CI, 0.66-2.87)	0.401		

Yes, attitude is more cautious	0.32 (95%CI, 0.20-0.51)	<0.001
Parent's relationship		
Marriage or cohabitation	ref.	
Some other form	0.48 (95%CI, 0.23-1.01)	0.054

2. Factors associated with parental intention to have their child vaccinated in Espoo (high coverage) (n=714)

Variable	Univariate analysis		Multivariate model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1,00 (95%CI, 0.97-1.03)	0.970		
Sex	0.99 (95%CI, 0.70-1.40)	0.965		
Mother tongue		0.095		
Finnish	ref.			
Swedish	1.25 (95%CI, 0.57-2.78)	0.578		
Other	0.62 (95%CI, 0.39-0.99)	0.043		
Active in practising religion		0.056		
No	ref.			
Yes	0.65 (95%CI, 0.38-1.10)	0.111		
Do not want to tell	0.49 (95%CI, 0.24-1.01)	0.053		
Mother's educational level		<0.001		0.156
Vocational education	ref.			
Non-vocational education	0.89 (95%CI, 0.43-1.83)	0.753		
University-level education	2.35 (95%CI, 1.31-4.20)	0.004		
Other parent's educational level		0.134		
Vocational education	ref.			
Non-vocational education	1.47 (95%CI, 0.73-2.98)	0.282		
University-level education	1.67 (95%CI, 1.01-2.76)	0.046		
Number of children		0.019		0.898
1	ref.			
2	1.31 (95%CI, 0.88-1.95)	0.185		
3	0.83 (95%CI, 0.48-1.44)	0.515		
>4	0.46 (95%CI, 0.22-0.97)	0.040		
Trust in official information		<0.001		0.972
Not at all or not much	ref.			
Very much or rather much	0.30 (95%CI, 0.04-2.16)	0.234		

Does not know	0.04 (95%CI, 0.01-0.19)	<0.001		
Trust in journalistic media		<0.001		0.188
Not at all or not much	ref.			
Very much or rather much	0.32 (95%CI, 0.18-0.58)	<0.001		
Does not know	0.51 (95%CI, 0.34-0.76)	0.001		
Trust in social media		0.003		0.058
Not at all or not much	ref.			
Very much or rather much	1.45 (95%CI, 0.61-3.41)	0.399		
Does not know	2.56 (95%CI, 1.41-4.63)	0.002		
Trust in influencers		0.002		0.004
Not at all or not much	ref.		ref.	
Very much or rather much	1.34 (95%CI, 0.58-3.12)	0.495	1.22 (95%CI, 0.02-84.44)	0.927
Does not know	2.60 (95%CI, 1.39-4.86)	0.003	0.02 (95%CI, 0.002-0.22)	0.002
Trust in personal contacts		0.242		
Not at all or not much	ref.			
Very much or rather much	0.87 (95%CI, 0.54-1.42)	0.585		
Does not know	1.32 (95%CI, 0.89-1.95)	0.170		
Trust in other sources		0.033		0.020
Not at all or not much	ref.		ref.	
Very much or rather much	2.27 (95%CI, 1.09-4.73)	0.028	3.07 (95%CI, 1.00-9.48)	0.051
Does not know	0.91 (95%CI, 0.43-1.93)	0.801	0.62 (95%CI, 0.21-1.82)	0.383
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.14 (95%CI, 0.08-0.25)	<0.001	0.18 (95%CI, 0.04-0.76)	0.020
No vaccines at all or does not know	0.03 (95%CI, 0.004-0.25)	0.001	0.01 (95%CI, 0.00-0.18)	0.002
Influenza knowledge		<0.001		0.078
Poor knowledge	ref.			
Good knowledge	3.81 (95%CI, 2.46-5.90)	<0.001		
Excellent knowledge	6.03 (95%CI, 3.63-10.03)	<0.001		
Change in attitudes since COVID-19		0.002		0.074
No, attitude has not changed	ref.			
Yes, attitude is more trusting	1.36 (95%CI, 0.74-2.52)	0.323		

Yes, attitude is more cautious 0.49 (95%CI, 0.32-0.77) 0.002

Parent's relationship

Marriage or cohabitation ref.

Some other form 0.47 (95%CI, 0.25-0.89) 0.021 0.141

3. Factors associated with parental intention to have their child vaccinated in Kuopio (high coverage) (n=587)

Variable	Univariate analysis		Multivariate model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	0.99 (95%CI, 0.96-1.03)	0.704		
Sex	0.78 (95%CI, 0.52-1.18)	0.238		
Mother tongue		0.314		
Finnish	ref.			
Swedish	528136006.32 (95%CI, 0.00)	0.999		
Other	2.29 (95%CI, 0.79-6.64)	0.128		
Active in practising religion		0.824		
No				
Yes				
Do not want to tell				
Mother's educational level		<0.001		0.006
Vocational education	ref.		ref.	
Non-vocational education	0.69 (95%CI, 0.34-1.41)	0.311	0.43 (95%CI, 0.19-0.98)	0.044
University-level education	2.03 (95%CI, 1.23-3.35)	0.006	1.29 (95%CI, 0.70-2.39)	0.414
Other parent's educational level		0.012		0.254
Vocational education	ref.			
Non-vocational education	1.51 (95%CI, 0.73-3.13)	0.269		
University-level education	1.89 (95%CI, 1.24-2.87)	0.003		
Number of children		0.003		0.022
1	ref.		ref.	
2	1.16 (95%CI, 0.73-1.85)	0.532	1.09 (95%CI, 0.65-1.83)	0.737
3	0.623 (95%CI, 0.36-1.07)	0.086	0.71 (95%CI, 0.38-1.33)	0.286
>4	0.37 (95%CI, 0.18-0.75)	0.006	0.34 (95%CI, 0.16-0.76)	0.009
Trust in official information		<0.001		0.184
Not at all or not much	ref.			
Very much or rather much	0.15 (95%CI, 0.03-0.80)	0.027		

Does not know	0.15 (95%CI, 0.04-0.49)	0.002		
Trust in journalistic media		0.153		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in social media		0.617		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in influencers		0.257		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in personal contacts		0.955		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in other sources		0.387		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Adherence to NVP vaccines		<0.001		0.005
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.22 (95%CI, 0.11-0.45)	<0.001	0.27 (95%CI, 0.12-0.59)	0.001
No vaccines at all or does not know	0.00		0.00	
Influenza knowledge		<0.001		<0.001
Poor knowledge	ref.		ref.	
Good knowledge	3.07 (95%CI, 1.88-5.00)		3.74 (95%CI, 2.15-6.50)	<0.001
Excellent knowledge	4.71 (95%CI, 2.70-8.23)		4.48 (95%CI, 2.40-8.33)	<0.001
Change in attitudes since COVID-19		0.005		0.042
No, attitude has not changed	ref.		ref.	
Yes, attitude is more trusting	0.92 (95%CI, 0.44-1.93)	0.828	1.42 (95%CI, 0.61-3.29)	0.419
Yes, attitude is more cautious	0.45 (95%CI, 0.28-0.73)	0.001	0.55 (95%CI, 0.31-0.92)	0.025
Parent's relationship				
Marriage or cohabitation	ref.			

Some other form	0.76 (95%CI, 0.34-1.69)	0.50
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4. Factors associated with parental intention to have their child vaccinated in Mustasaari & Pietarsaari (high coverage) (n=415)

Variable	Univariate analysis		Multivariate model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	0.98 (95%CI, 0.95-1.02)	0.362		
Sex	1.01 (95%CI, 0.67-1.53)	0.961		
Mother tongue		0.304		
Finnish	ref.			
Swedish				
Other				
Active in practising religion		0.993		
No	ref.			
Yes				
Do not want to tell				
Mother's educational level		0.980		
Vocational education	ref.			
Non-vocational education				
University-level education				
Other parent's educational level		0.319		
Vocational education	ref.			
Non-vocational education				
University-level education				
Number of children		0.041		
1	ref.			
2	0.98 (95%CI, 0.61-1.56)	0.921		
3	0.51 (95%CI, 0.27-0.95)	0.035		
>4	1.96 (95%CI, 0.78-4.93)	0.154		
Trust in official information		0.249		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in journalistic media		0.309		
Not at all or not much	ref.			

Very much or rather much				
Does not know				
Trust in social media		0.440		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in influencers		0.257		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in personal contacts		0.121		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Trust in other sources		0.397		
Not at all or not much	ref.			
Very much or rather much				
Does not know				
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.	ref.		
Yes, some of the recommended	0.19 (95%CI, 0.10-0.38)	<0.001	0.17 (95%CI, 0.09-0.35)	<0.001
No vaccines at all or does not know	0.00		0.00	0.999
Influenza knowledge		0.008		0.014
Poor knowledge	ref.	ref		
Good knowledge	1.14 (95%CI, 0.70-1.87)	0.598	0.99 (95%CI, 0.59-1.66)	0.971
Excellent knowledge	2.35 (95%CI, 1.31-4.23)	0.004	2.14 (95%CI, 1.16-3.96)	0.015
Change in attitudes since COVID-19		0.337		
No, attitude has not changed				
Yes, attitude is more trusting				
Yes, attitude is more cautious				
Parent's relationship		0.504		
Marriage or cohabitation	ref.			
Some other form				

Appendix 4. Municipal-level analysis on factors related to parental HPV vaccination intention

Associations between vaccination intention and sociodemographic and other variables were expressed as odds ratios (ORs), and a p-value of <0.05 was considered statistically significant. Variables which were statistically significant in the univariable model were added to the multivariable model.

1. Factors associated with parental intention to have their daughter vaccinated in Oulu (n=191):

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1.04 (0.97-1.13)	0.260		
Age of daughter	1.14 (0.85-1.53)	0.391		
Sex	2.96 (1.23-7.10)	0.015	2.69 (1.04-6.97)	0.041
Mother tongue	0.14 (0.02-1.01)	0.051		
Active in practising religion		0.341		
No	ref.			
Yes	0.40 (0.12-1.36)	0.142		
Do not want to tell	2153966645,7	0.000		
Mother's educational level		0.095		
Vocational education	ref.			
Non-vocational education	595174942.1 (0.00-)			
University-level education (n=149)	3.06 (1.12-8.41)	0.030		
Other parent's educational level		0.155		
Vocational education	ref.			
Non-vocational education	1.27 (0.23-7.19)	0.775		
University-level education	2.51 (0.96-6.56)	0.060		
Number of children		0.206		
1	ref.			
2	0.30 (0.04-2.54)	0.272		
3	0.20 (0.02-1.71)	0.141		
>4	0.13 (0.02-1.14)	0.066		
Trust in official information		1.00		
Not at all or not much	ref.			

Very much or rather much	0.00 (0.00)	0.99	
Does not know	1.00 (0.00)	1.00	
Trust in journalistic media		0.948	
Not at all or not much	ref.		
Very much or rather much	1.06 (0.38-2.92)	0.910	
Does not know	0.85 (0.19-3.80)	0.832	
Trust in social media		0.518	
Not at all or not much	ref.		
Very much or rather much	0.43 (0.08-2.27)	0.318	
Does not know	1.71 (0.21-13.87)	0.613	
Trust in influencers		0.518	
Not at all or not much	ref.		
Very much or rather much	0.68 (0.08-6.12)	0.731	
Does not know	0.82 (0.17-3.92)	0.800	
Trust in personal contacts		0.541	
Not at all or not much	ref.		
Very much or rather much	0.64 (0.24-1.68)	0.363	
Does not know	0.55 (0.16-1.83)	0.328	
Trust in other sources		0.982	
Not at all or not much	ref.		
Very much or rather much	302901533.0 (0.00)		
Does not know	1.17 (0.23-5.94)	0.848	
Adherence to NVP vaccines		<0.001	<0.001
Yes, all recommended	ref.	ref.	
Yes, some of the recommended	0.10 (0.02-0.44)	0.002	0.09 (0.02-0.43)
No vaccines at all or does not know	0.07 (0.01-0.43)	0.004	0.08 (0.01-0.52)
HPV knowledge		0.275	
Low knowledge	ref.		
Good knowledge	1.78 (0.69-4.60)	0.231	
High knowledge	3.71 (0.46-29.71)	0.217	
Change in attitudes since COVID-19		0.941	
No, attitude has not changed	ref.		
Yes, attitude is more trusting	1.29 (0.28-6.00)	0.747	
Yes, attitude is more cautious	1.14 (0.24-5.35)	0.871	
Parent's relationship			
Marriage or cohabitation	ref.		

Some other form	1.53 (0.33-6.99)	0.585
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2. Factors associated with parental intention to have their daughter vaccinated in Espoo (n=264):

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	0.99 (0.93-1.05)	0.703		
Age of daughter	1.07 (0.86-1.33)	0.555		
Sex	1.84 (0.97-3.50)	0.061	2.73 (1.18-6.33)	0.019
Mother tongue		<0.001		0.387
Finnish	ref.			
Swedish	2.95 (0.38-22.93)	0.302		
Other	0.23 (0.11-0.49)	<0.001		
Active in practising religion		0.046		0.303
No	ref.			
Yes	0.37 (0.15-0.88)	0.024		
Do not want to tell	0.40 (0.10-1.64)	0.204		
Mother's educational level		0.086		
Vocational education	ref.			
Non-vocational education	1.46 (0.39-5.55)	0.577		
University-level education	2.83 (1.00-8.02)	0.050		
Other parent's educational level		0.063		
Vocational education	ref.			
Non-vocational education	1.02 (0.31-3.37)	0.973		
University-level education	2.39 (0.92-6.24)	0.075		
Number of children		0.031		0.217
1	2.19 (0.91-5.32)	0.082		
2	2.57 (0.86-7.71)	0.092		
3	0.54 (0.15-1.95)	0.347		
>4				
Trust in official information		0.018		0.914
Not at all or not much	ref.			
Very much or rather much	5.24 (0.72-38.29)	0.102		
Does not know	0.33 (0.02-6.65)	0.472		
Trust in journalistic media		0.370		

Not at all or not much	ref.			
Very much or rather much	1.44 (0.95-3.18)	0.372		
Does not know	0.68 (0.18-2.62)	0.570		
Trust in social media		0.006		0.903
Not at all or not much	ref.			
Very much or rather much	0.53 (0.14-2.05)	0.355		
Does not know	0.20 (0.07-0.55)	0.002		
Trust in influencers		0.005		0.948
Not at all or not much	ref.			
Very much or rather much	0.17 (0.04-0.73)	0.016		
Does not know	0.30 (0.11-0.81)	0.017		
Trust in personal contacts		0.024		0.066
Not at all or not much	ref.			
Very much or rather much	0.53 (0.24-1.13)	0.099		
Does not know	0.27 (0.10-0.69)	0.006		
Trust in other sources		0.991		
Not at all or not much	ref.			
Very much or rather much	0.00 (0.00)	0.999		
Does not know	0.00 (0.00)	0.999		
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref	
Yes, some of the recommended	0.06 (0.02-0.19)	<0.001	0.05 (0.01-0.21)	<0.001
No vaccines at all or does not know	0.07 (0.02-0.29)	<0.001	0.017 (0.01-0.66)	0.017
HPV knowledge		0.415		
Low knowledge	ref.			
Good knowledge	1.03 (0.52-2.04)	0.933		
High knowledge	2.75 (0.61-12.33)	0.187		
Change in attitudes since COVID-19		0.004		0.486
No, attitude has not changed	ref.			
Yes, attitude is more trusting	0.56 (0.19-1.630)	0.288		
Yes, attitude is more cautious	0.20 (0.08-0.53)	0.001		
Parent's relationship				
Marriage or cohabitation	ref.			
Some other form	1.30 (0.43-3.95)	0.641		

3. Factors associated with parental intention to have their daughter vaccinated in Kuopio (n=244)

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1.10 (1.04-1.18)	0.002		0.123
Age of daughter	1.54 (1.19-2.00)	0.001	2.30 (1.51-3.50)	<0.001
Sex	0.91 (0.44-1.87)	0.797		
Mother tongue				
Finnish	ref.		ref.	
Other	0.06 (0.01-0.31)	<0.001	0.009 (0.001-0.09)	<0.001
Active in practising religion		0.495		
No	ref.			
Yes	0.71 (0.25-2.05)	0.528		
Do not want to tell	0.40 (0.07-2.24)	0.295		
Mother's educational level		0.031		0.165
Vocational education	ref.			
Non-vocational education	1.67 (0.41-6.77)	0.475		
University-level education	2.72 (1.29-5.73)	0.009		
Other parent's educational level		0.057		
Vocational education	ref.			
Non-vocational education	1.68 (0.50-5.59)	0.401		
University-level education	2.42 (1.17-4.97)	0.017		
Number of children		0.228		
1				
2				
3				
>4				
Trust in official information		0.024		<0.001
Not at all or not much	ref.		ref.	
Very much or rather much	22.00 (2.39-202.54)	0.006	3331.42 (20.38-5389.81)	<0.001
Does not know	0.00	0.999	0.00	
Trust in journalistic media		0.081		
Not at all or not much				
Very much or rather much				

Does not know				
Trust in social media		0.079		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in influencers		0.023		0.916
Not at all or not much	ref.			
Very much or rather much	0.18 (0.03-0.91)	0.038		
Does not know	0.35 (0.12-1.00)	0.050		
Trust in personal contacts		0.096		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in other sources		0.231		
Not at all or not much				
Very much or rather much				
Does not know				
Adherence to NVP vaccines		<0.001		0.021
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.13 (0.04-0.39)	<0.001	0.13 (0.03-0.56)	0.006
No vaccines at all or does not know	0.25 (0.04-1.57)	0.140	1.68 (0.09-31.95)	0.731
HPV knowledge		0.252		
Low knowledge				
Good knowledge				
High knowledge				
Change in attitudes since COVID-19		0.043		0.038
No, attitude has not changed	ref.		ref.	
Yes, attitude is more trusting	0.85 (0.27-2.68)	0.786	0.49 (0.12-1.71)	0.239
Yes, attitude is more cautious	0.29 (0.11-0.76)	0.012	0.19 (0.05-0.73)	0.016
Parent’s relationship		0.665		
Marriage or cohabitation				
Some other form				

4. Factors associated with parental intention to have their daughter vaccinated in Pietarsaari and Mustasaari (n=184)

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age		0.613		
Age of daughter		0.214		
Sex		0.116		
Mother tongue		0.320		
Finnish				
Swedish				
Other				
Active in practising religion		0.115		
No				
Yes				
Do not want to tell				
Mother's educational level		0.020		0.105
Vocational education	ref.		ref.	
Non-vocational education	4.87 (0.55-42.84)	0.153		
University-level education	3.12 (1.37-7.11)	0.007		
Other parent's educational level		0.004		0.014
Vocational education	ref.		ref.	
Non-vocational education	0.33 (0.10-1.15)	0.081	0.24 (0.05-1.17)	0.079
University-level education	2.24 (0.96-5.25)	0.062	2.22 (0.70-7.09)	0.177
Number of children		0.099		
1				
2				
3				
>4				
Trust in official information		0.013		0.052
Not at all or not much	ref.			
Very much or rather much	27.04 (3.04-240.60)	0.003		
Does not know	0.00	0.999		
Trust in journalistic media		0.006		0.939
Not at all or not much	ref.			
Very much or rather much	3.77 (1.67-8.50)	0.001		

Does not know	1.78 (0.43-7.40)	0.429		
Trust in social media		0.085		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in influencers		0.119		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in personal contacts		0.132		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in other sources		0.071		
Not at all or not much				
Very much or rather much				
Does not know				
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.06 (0.02-0.16)	<0.001	0.05 (0.02-0.18)	<0.001
No vaccines at all or does not know	0.00 (0.00)	1.000	0.00	1.000
HPV knowledge		0.880		
Low knowledge				
Good knowledge				
High knowledge				
Change in attitudes since COVID-19		0.355		
No, attitude has not changed				
Yes, attitude is more trusting				
Yes, attitude is more cautious				
Parent's relationship				
Marriage or cohabitation	ref.			
Some other form	0.45 (0.16-1.28)	0.13		

Original publications

Factors associated with parental intention to vaccinate their child against influenza, Finland, February to March, 2022: a web-based survey

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Background: Influenza vaccination for children aged 6 months to 6 years is included in the national vaccination programme in Finland. Although all vaccines in the programme are free of charge, national coverage of influenza vaccination among children under 3 years and 3–6 years during 2020/21 was 43% and 35% respectively, with regional differences. **Aim:** To assess factors underlying parental vaccination intention in order to increase influenza vaccine uptake among children. **Methods:** We conducted a web-based survey among parents (n=17,844) of randomly selected eligible children (aged 6 months–6 years) in February–March 2022 in five Finnish municipalities from regions of high and low coverage. Logistic regressions were used to determine associations between vaccination intention and e.g. sociodemographic factors, attitudes and knowledge. Linkage to the national vaccination register was used to confirm realisation of vaccination intention after the study. **Results:** Participation rate was 13% (n=2,322 parents). Influenza knowledge, trust in official information, responding parent's education level, adherence to the vaccination programme, number of children and changes in attitudes towards vaccination since COVID-19 were all associated with intention to vaccinate. Vaccination intention for children was 64%, and realised vaccination 51%. **Conclusion:** Despite the low participation rate, both vaccinated and unvaccinated children were represented. Influenza vaccine uptake is not dependent on a single factor. Our results identified the need for open dialogue between parents and healthcare professionals, as the lack of vaccine being offered by healthcare professionals was the most reported reason for not vaccinating.

Introduction

Vaccinations have had an important contribution to global health, as they greatly reduce disease, disability and inequity [1]. However, parental concerns, among other factors, can lead to delaying or even refusing

vaccination, thereby decreasing overall vaccine coverage [1]. Influenza is an infectious disease affecting the upper and lower respiratory tract, with annual outbreaks being the highest in children [2]. Approximately 870,000 children under 5 years of age worldwide are hospitalised annually because of influenza, and it is estimated that between 28,000 and 111,500 deaths in this age group can be attributed to influenza each year [3]. Certain vulnerable groups are at an increased risk of developing severe illness, complications and mortality [3,4]. The burden of influenza is high, particularly in children under 5 years, and hence the World Health Organization recommends vaccinating all children between the ages of 6 months to 5 years [5]. Influenza vaccination is an effective way to protect children from influenza, and its secondary diseases, such as acute otitis media, bronchitis and pneumonia [6]. Yet, only a few European countries, including Austria and the United Kingdom among others, implement a routine seasonal influenza vaccination for children [7,8].

Influenza vaccine has been a part of Finland's national vaccination programme (NVP) for adult risk groups since the 1980s [9]. The vaccination programme was expanded to include all children between the ages of 6 and 36 months in 2007, and then to all children between the ages of 3 and 6 years in 2018 [9]. However, the uptake is suboptimal, with only 42.9% of children under the age of 3 years and 34.7% of children aged 3–6 years vaccinated against influenza during the 2020/21 season [10]. Vaccine uptake of other childhood vaccines is significantly higher. For example, the national coverage of the measles-mumps-rubella (MMR) vaccine (first dose) in children born in 2021 was 93.4% [11]. Moreover, refusing childhood vaccines is rare in Finland; only ca 1% of children under the age of 3 years are completely unvaccinated [12].

Disparities between influenza vaccine uptake exist across different age groups and across geographical

KEY PUBLIC HEALTH MESSAGE

What did you want to address in this study?

In Finland, childhood vaccines have generally a high uptake of well over 90% for most vaccines. However, influenza vaccine has a suboptimal coverage, with regional differences in uptake. We wanted to address factors affecting influenza vaccine uptake through a survey to parents with young children (≤ 6 years). Furthermore, we wanted to find out whether the children of parents who completed the survey actually did receive their influenza vaccine.

What have we learnt from this study?

Our results show that parental vaccine decision-making is not always driven by intention to vaccinate. Parents who indicated no intention to vaccinate maintained this standpoint, and nearly one fourth of children whose parent had a positive intention did not receive their vaccine. The most commonly reported reason for not vaccinating one's child was that the vaccine had not been offered at the health clinic.

What are the implications of your findings for public health?

Our findings increase the understanding of factors associated with regional influenza vaccine uptake in Finland. Moreover, our findings could help decisionmakers understand the complexity of vaccination uptake, and also serve as a reminder for healthcare professionals to proactively engage in open dialogue with parents regarding the influenza vaccine.

regions in Finland, and coverage is notably higher in eastern Finland compared with western Finland [10]. Regional differences can be caused by both practical and ideological factors [6], and the information sources parents use can affect the decision to vaccinate their children [13]. Furthermore, it has been hypothesised that parents are more hesitant towards influenza vaccine compared with other routine childhood vaccinations [14]. Public health measures implemented during the COVID-19 pandemic led to a sharp decline in influenza incidence during the first 2 years of the pandemic [15]. However, as we encountered the first influenza epidemic since COVID-19 in 2021, there was an increasing need to understand parental willingness to vaccinate children against influenza.

The aim of this study was to examine factors associated with parents' intention to vaccinate their child during the 2021/22 influenza season in Finland. For verification, the influenza vaccine uptake among the children of study participants was extracted from the national vaccination registry after a 9-month follow-up timeframe.

Methods

Study setting and population

We conducted a quantitative web-based survey by randomly sampling eligible children and their parents from the Finnish Population Information System (PIS). The PIS is a computerised national register that contains basic information about Finnish citizens and foreign citizens residing in Finland on a permanent or temporary basis. The sampled children and their parents lived in four study areas and the children were

between the ages of 6 months and 6 years. The study areas were selected based on both their respective vaccination behaviour (high vs. low coverage) and their size [10].

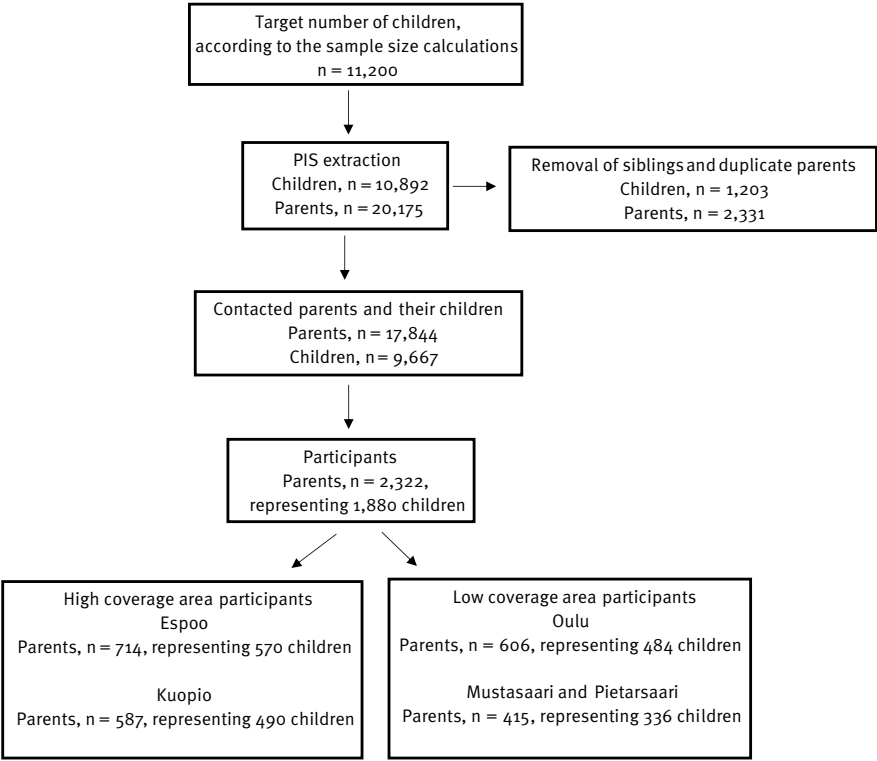
Finland consists of 309 municipalities [16], and the four study areas were comprised of five Finnish municipalities (population data source [17]). Espoo (south, 305,274 inhabitants) and Kuopio (east, 122,594 inhabitants) represented traditionally high vaccine coverage areas, and Oulu (north-west, 211,848 inhabitants), and Mustasaari/Pietarsaari (west, 38,896 inhabitants altogether) were low vaccine coverage areas.

Figure 1 shows the flowchart of participant selection from the study areas. To achieve representativeness, we aimed to extract randomised data from the PIS on 1,400 eligible children per sex (200 children per age group per study area, at most one child per family; seven age groups: 6 months, 1 year, 2 years, 3 years, 4 years, 5 years and 6 years, based on the age of the child at the time of data extraction), resulting in 11,200 children. Because of the smaller size of some study areas, data on a total of 10,892 children were extracted. For those children, we also extracted the name, sex, year of birth, mother tongue and address of their legal guardian(s) (i.e. parent(s)) from the PIS in December 2021.

The inclusion criteria for children were two-fold: living in one of the chosen study areas, and being age-appropriate. As we did not want to overburden families by selecting multiple age-appropriate siblings per family and hence having parents contributing more than once, we decided to remove sibling children. In the

FIGURE 1

Flowchart of participant selection from the four study areas, municipalities of Espoo, Kuopio, Oulu and Mustasaari/Pietarsaari, Finland, December 2021–March 2022



PIS: population information system.

case of having sampled multiple siblings per family, we included the younger sibling while excluding the older sibling(s) from the study. We were able to include 17,844 parents (representing 9,667 children), and 8,177 children had two legal guardians (i.e. parents).

Data collection

The data were collected via a quantitative online survey. The survey was created by combining questions used in the Eurobarometer [18], which is a tool measuring the public opinion in the European Union since 1974, and the Finnish Science Barometer [19], which is a study conducted every 3 years to investigate the attitudes that people living in Finland have towards science. In addition, questions regarding knowledge and perceptions about influenza and vaccination against the disease were included. The survey was bilingual, using the two official languages of Finland, Finnish and Swedish. The survey was piloted first with a small sample of parents (<10), who were not included in this study, to ensure the understandability and user-friendliness of the questionnaire. The full survey in English is provided in the Supplement.

All eligible parents were contacted by post in late January 2022 and invited to participate. The first round of contact included the information letter, explaining the credentials (i.e. website, username and password) required to participate in the study, the aim and objectives of the study and information on the rights of the participant. If the parent had not used their personal credentials and logged on to the questionnaire by the end of the second week of February, the participant was contacted by post for a second time with a short letter, reminding them of the study, and kindly requesting them to take part. The survey results were collected between 31 January and 14 March 2022.

Each questionnaire could be answered only once. Parents had the choice of taking a break from answering, and completing the questionnaire later, within the timeframe of the data collection period, i.e. before 14 March 2022. A large majority of children (76.5%, 1,438/1,880) had one parent participating in the study. For the remaining 23.5% (442/1,880) of children, they had two participating parents. No separate consent form was used, as parents consented by completing the survey.

TABLE 1A

Sociodemographic characteristics of parents completing the survey, Finland, February–March 2022 (n = 2,322)

Characteristics	n	%
Sex		
Male	900	38.8
Female	1,422	61.2
Age (years)		
20–24	35	1.5
25–29	224	9.6
30–34	696	30.0
35–39	771	33.2
40–44	448	19.3
45–49	125	5.4
50–54	19	0.8
55–59	3	0.1
≥ 60	1	0.0
Mean ± SD, range		
Responding parent	35.1 ± 5.2	20–51
Other parent ^a	37.4 ± 5.6	23–65
Responding parent's level of education		
Primary school	36	1.6
Vocational school	315	13.6
High school	155	6.7
Bachelor's degree	726	31.3
Master's degree	929	40.0
Doctoral degree	144	6.2
Missing	17	0.7
Other parent's level of education		
Primary school	51	2.2
Vocational school	485	20.9
High school	149	6.4
Bachelor's degree	628	27.0
Master's degree	826	35.6
Doctoral degree	132	5.7
Missing	51	2.2
Occupation^b		
Executive position	129	5.6
Managerial employee/clerk	854	36.8
Employee	882	38.0
Entrepreneur	114	4.9
Farmer	3	0.1
Student	99	4.3
Stay-at-home parent	138	5.9
Unemployed	29	1.2
Other	47	2.0
Missing	27	1.2

SD: standard deviation.

^a We collected information on the legal guardians of the child, which were in most cases the parents. The 'responding parent' could either be a mother or a father. The 'other parent' is the father in most pairs (61.2%); however, there were some pairs where both parents were females or males (estimated to be less than 5 pairs in total).

^b Occupational groups were classified according to the classification used by Statistics Finland [24].

TABLE 1B

Sociodemographic characteristics of parents completing the survey, Finland, February–March 2022 (n = 2,322)

Characteristics	n	%
Study area		
Espoo	714	30.7
Oulu	606	26.1
Kuopio	587	25.3
Mustasaari/Pietarsaari	415	17.9
Mother tongue		
Finnish	1,759	75.8
Swedish	347	14.9
Other	168	7.2
Missing	48	2.1
Number of children		
1	702	30.2
2	1,063	45.8
3	368	15.8
4 or more	173	7.5
Missing	16	0.7
Parents' relationship		
Marriage or cohabitation	2,183	94.0
Some other form	123	5.3
Missing	16	0.7
Family's combined annual income (EUR)		
Under 10,000	25	1.1
10–20,000	73	3.1
20–40,000	238	10.3
40–60,000	454	19.6
60–80,000	542	23.4
80–100,000	374	16.1
Over 100,000	466	20.1
Do not want to answer	140	6.0
Missing	10	0.4

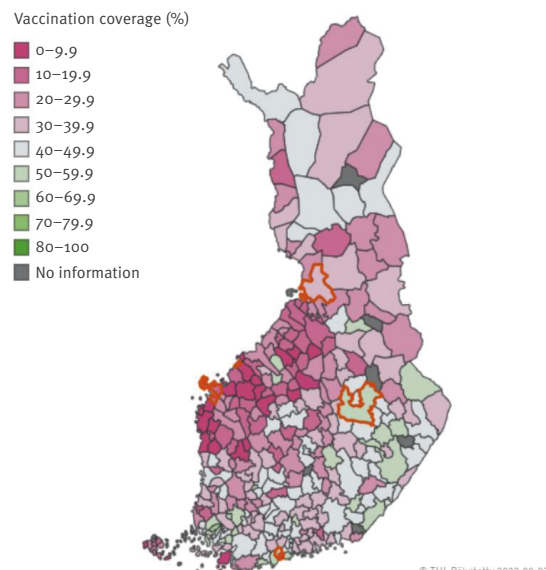
SD: standard deviation.

Survey contents

The web-based survey consisted of 28 questions divided under five topics: information sources and trust, expertise, vaccination behaviour, knowledge of influenza and background information, i.e. education and profession. The first topic, information sources and trust, included two multiple choice questions. The topic of expertise included one multiple choice question and an open-ended question. The vaccine behaviour topic included questions about influenza and other childhood vaccines in the NVP. Parents were asked whether their child has received or will receive the influenza vaccine during the influenza season 2021/22, and they were subsequently asked to rank the influence that different individuals (such as friends, family and healthcare professionals) have had on their vaccination decision. To study the reasons for non-vaccination, the parents who had not vaccinated or intended not to vaccinate their child were asked to expand on the reason(s) for not vaccinating.

FIGURE 2

Influenza vaccination uptake for children aged 6–35 months, Finland, 2021/22 season



Municipal-level influenza vaccination coverage was extracted from THL's vaccination coverage map [10]. The municipalities chosen for the study are outlined with red: Espoo and Kuopio (high coverage), Oulu and Mustasaari/Pietarsaari (low coverage).

Parents' influenza knowledge was measured by using five questions. Knowledge was calculated by assigning one point to each correct answer (including one multiple choice question with each correct answer warranting one point) and then summing up all five questions (maximum score: 11 points). Knowledge levels were then ranked into three categories: excellent (11 points), good (8–10 points) and poor (≤ 7 points) knowledge.

The vaccination status of the children during the 2021/22 influenza season (1 October 2021–30 June 2022) was verified by linking the child's unique social security number with the National Vaccination Register, maintained by the Finnish Institute for Health and Welfare (THL). By extending the examined vaccination period to the end of June, we aimed to catch potential late registrations of vaccinations or delays in data transmission. The verification linkage was done on 9 May 2023.

Statistical analysis

Univariable and multivariable logistic regression were performed to assess the relationships between the intention to vaccinate and various factors such as sociodemographic variables, trust in information sources and vaccination behaviour. Associations were expressed as odds ratios (OR), and a p value of <0.05 was considered statistically significant. Variables which were statistically significant in the univariable

model were added to the multivariable model. All analysis were performed using SPSS for Windows, version 28 (IBM Corp.).

Results

Sociodemographic characteristics and intention to vaccinate

At the end of data collection in March 2022, 2,322 (13%) parents had participated in the survey, representing 1,880 (19.4%) children. The mean age of the children was 2.97 ± 1.99 years, and 50.9% (956/1,880) of the children were male and 49.1% (924/1,880) were female. Table 1 describes the sociodemographic characteristics of the responding parents. Of the responding parents, 38.8% ($n = 900$) were males, 61.2% ($n = 1,422$) were females and 77.5% ($n = 1,755$) had a university-level degree. The majority of parents (90.7%, $n = 2,106$) spoke one of the two official languages, Finnish or Swedish, as mother tongue, with 7.2% ($n = 168$) of parents having another mother tongue. Information on mother tongue was missing for 2.1% ($n = 48$).

The survey questions were not mandatory to answer; hence, some data are missing. Of the responding parents, 89.3% (2,065/2,313) indicated their child has received all offered vaccines in the NVP, while 9.7% (225/2,313) of parents replied they had vaccinated their child with some of the offered vaccines; 0.8% (18/2,313) and 0.2% (5/2,313) of parents indicated they have not given their child any vaccines or do not remember giving their child any vaccines, respectively. When asked about intention, 65.8% (1,525/2,319) of parents indicated intent to vaccinate their child or answered that they had already done so. A total of 29.8% (691/2,319) parents replied they will not be vaccinating their child for influenza this influenza season and 4.4% (103/2,319) of parents were unsure about their child receiving the influenza vaccine this season.

Figure 2 shows the municipal-level vaccine uptake in Finland during the season of 2021/22 for children aged 6 to 35 months. In total, 34.2% (794/2,319) parents indicated no intention to vaccinate or uncertainty regarding vaccinating their child against influenza, of whom 34.5% (274/794) were from the Mustasaari/Pietarsaari area (low coverage). Among the parents who indicated they did not intend to vaccinate their child against influenza or were unsure, the most reported reasons were that the vaccine was not offered (32.9%, 261/794) and influenza being a harmless disease (27.1%, 215/794). Participants were also asked to indicate which groups of people were entitled to a free-of-charge influenza vaccine in their opinion. Among participants, 74.7% (1,734/2,322) were aware that children between the ages of 6 months and 6 years could be immunised against influenza under the NVP, while 94.6% (2,196/2,322) of the participants knew that those belonging to a risk group are entitled to an influenza vaccine.

TABLE 2

Survey responses from participating parents on religious practice, information sources and trust, and vaccination behaviour and knowledge, Finland, 2021/22 season (n = 2,322^a)

Survey topics	n ^a	%
Religious practice		
Actively practice religion	2,304	99.2
No	1,921	82.7
Yes	283	12.2
Do not want to tell	100	4.3
Information sources and trust		
Trust in official information^b	2,310	99.5
Not at all or not much	64	2.8
Very much or rather much	2,228	96.0
Do not know	18	0.8
Trust in journalistic media	2,300	99.1
Not at all or not much	650	28
Very much or rather much	1,442	62.1
Do not know	208	9.0
Trust in social media	2,305	99.3
Not at all or not much	2,043	88.0
Very much or rather much	126	5.4
Do not know	136	5.9
Trust in influencers	2,294	98.8
Not at all or not much	2,031	87.5
Very much or rather much	109	4.7
Do not know	154	6.6
Trust in personal contacts	2,297	98.9
Not at all or not much	803	34.6
Very much or rather much	1,127	48.5
Do not know	367	15.8
Trust in other sources	648	27.9
Not at all or not much	173	7.5
Very much or rather much	171	7.4
Do not know	304	13.1
Vaccination behaviour and knowledge		
Adherence to the national vaccination programme	2,313	99.6
Yes, all recommended	2,065	88.9
Yes, some of the recommended	225	9.7
No vaccines at all or does not know	23	1.0
Influenza knowledge	2,304	99.2
Poor knowledge	444	19.1
Good knowledge	1,163	50.1
Excellent knowledge	697	30.3
Change in attitudes since COVID-19	2,310	99.5
No, attitude has not changed	1,756	75.6
Yes, attitude is more trusting	215	9.3
Yes, attitude is more cautious	339	14.6

^a The n numbers vary in the table because the questions were not compulsory in the questionnaire; parents were able to skip questions.

Factors associated with vaccination intention

Table 2 summarises parents' responses to survey questions on factors associated with vaccination intention, including religion, information sources and attitudes about vaccines.

Table 3 presents the logistic regression analysis of factors associated with parents' intention to vaccinate their child against influenza. Municipality of residence was statistically significant ($p < 0.001$) in the multivariable analysis. Parents living in Espoo and Kuopio were 60% more likely to vaccinate their child against influenza compared with parents living in Oulu (OR: 1.59, 95% CI: 1.19–2.13 and OR: 1.54, 95% CI: 1.15–2.13, respectively). Parents in Mustasaari/Pietarsaari were 70% less likely to vaccinate their child against influenza compared with parents living in Oulu (OR: 0.31, 95% CI: 0.20–0.48).

Level of education was significantly associated with intention to vaccinate, but only in terms of responding parents' education. When comparing to responding parents with a vocational education, those with non-vocational education had 55% lower odds of vaccinating their child against influenza (OR: 0.45, 95% CI: 0.29–0.71). The number of children in the family was also associated with the intention to vaccinate. Parents with two or three children were more likely to vaccinate their child against influenza compared to having one child (OR: 1.66, 95% CI: 1.10–2.51 and OR: 1.90, 95% CI: 1.27–2.84, respectively). However, there was no association between the intention to vaccinate and having four or more children (OR: 1.22, 95% CI: 0.78–1.90).

Participants were asked to indicate their level of trust towards various information sources, and they were given a few examples for each option. Only trust in official information sources (i.e. the Ministry of Social Affairs and Health and the Finnish Institute for Health and Welfare) was significantly associated with vaccination intention in the multivariable analysis ($p < 0.001$). Parents who indicated they trust official information 'Very much' or 'Rather much' were three times more likely to vaccinate their child against influenza (OR: 3.08, 95% CI: 1.42–6.67), when comparing to parents who indicated no trust at all or very little trust. No significant association was found between trusting other sources of information, e.g. social media or personal contacts, and the intention to vaccinate.

High influenza knowledge was positively associated with the intention to vaccinate. Our analyses show that 30.3% (697/2,304) of parents knew all the answers to the 11 knowledge questions, and 50.5% (1,163/2,304) had good influenza knowledge. Poor knowledge was recorded for 19.3% (444/2,304) of participants. In the multivariable analysis, parents with good knowledge were over twice as likely to vaccinate their child against influenza (OR: 2.73, 95% CI: 2.07–3.60). Parents with an excellent level of knowledge were four times more likely to vaccinate their child (OR: 4.10, 95% CI:

TABLE 3

Logistic regression analysis of factors associated with the intention to vaccinate, Finland, February–March 2022 (n = 2,322 parents)

Variable	Univariable analysis				Multivariable analysis		
	OR	95% CI	p value	OR	95% CI	p value	
Municipality of residence	Oulu	Ref.		<0.001	Ref.		<0.001
	Espoo	1.53	1.21–1.95	<0.001	1.59	1.19–2.13	0.002
	Kuopio	1.61	1.25–1.95	<0.001	1.54	1.15–2.13	0.003
	Mustasaari and Pietarsaari	0.26	0.20–0.34	<0.001	0.31	0.20–0.48	<0.001
Age		1.01	0.99–1.02	0.491	NA		
Sex	Male	Ref.		0.429	NA		
	Female	0.93	0.78–1.11				
Mother tongue	Finnish	Ref.		<0.001	Ref.		0.536
	Swedish	0.25	0.19–0.31	<0.001	0.81	0.52–1.24	0.331
	Other	0.85	0.61–1.19	0.356	1.10	0.70–1.70	0.676
Actively practice religion	No	Ref.		<0.001	Ref.		0.416
	Yes	0.72	0.56–0.93	0.011	1.10	0.78–1.53	0.621
	Do not want to tell	0.63	0.42–0.95	0.027	1.44	0.82–2.54	0.203
Responding parent's educational level ^a	Vocational education	Ref.		<0.001	Ref.		<0.001
	Non-vocational education	1.01	0.70–1.43	0.987	0.46	0.29–0.73	<0.001
	University-level education	2.06	1.62–2.62	<0.001	1.04	0.75–1.47	0.776
Other parent's educational level ^a	Vocational education	Ref.		<0.001	Ref.		0.191
	Non-vocational education	1.72	1.22–2.43	0.002	1.40	0.91–2.15	0.122
	University-level education	1.88	1.53–2.31	<0.001	1.24	0.94–1.63	0.121
Number of children	1	Ref.		<0.001	Ref.		0.002
	2	1.27	1.03–1.55	0.022	1.15	1.10–2.51	0.015
	3	0.76	0.59–0.99	0.040	1.90	1.27–2.84	0.002
	≥4	0.72	0.51–1.01	0.055	1.22	0.78–1.90	0.381
Trust in official information ^b	Not at all or not much	Ref.		<0.001	Ref.		0.008
	Very much or rather much	8.12	4.39–15.02	<0.001	3.08	1.42–6.67	0.004
	Does not know	1.51	0.45–5.00	0.501	1.19	0.27–5.19	0.819
Trust in journalistic media	Not at all or not much	Ref.		<0.001	Ref.		0.689
	Very much or rather much	1.45	1.20–1.76	<0.001	1.10	0.86–1.41	0.460
	Does not know	0.96	0.70–1.33	0.828	0.98	0.65–1.47	0.919
Trust in social media	Not at all or not much	Ref.		0.099	NA		
	Very much or rather much	0.72	0.50–1.03	0.074			
	Does not know	0.79	0.55–1.13	0.191			
Trust in influencers	Not at all or not much	Ref.		0.003	Ref.		0.2780
	Very much or rather much	0.56	0.38–0.83	0.003	1.62	0.90–2.95	0.110
	Does not know	0.71	0.51–0.996	0.047	1.02	0.66–1.56	0.943
Trust in personal contacts	Not at all or not much	Ref.		0.009	Ref.		0.146
	Very much or rather much	0.75	0.62–0.90	0.003	0.79	0.62–1.01	0.057
	Does not know	0.88	0.67–1.14	0.325	0.81	0.59–1.11	0.194
Trust in other sources	Not at all or not much	Ref.		0.128	NA		
	Very much or rather much	1.42	0.92–2.19	0.116			
	Does not know	1.46	0.99–2.14	0.054			
Adherence to the national vaccination programme	Yes, all recommended	Ref.		<0.001	Ref.		<0.001
	Yes, some of the recommended	0.14	0.10–0.19	<0.001	0.20	0.14–0.29	<0.001
	No vaccines at all or does not know	0.02	0.003–0.14	<0.001	0.02	0.003–0.20	<0.001
Influenza knowledge	Poor knowledge	Ref.		<0.001	Ref.		<0.001
	Good knowledge	3.03	2.42–3.80	<0.001	2.73	2.73–3.60	<0.001
	Excellent knowledge	5.49	4.22–7.14	<0.001	4.08	2.96–5.60	<0.001
Change in attitudes since COVID-19	No, attitude has not changed	Ref.		<0.001	Ref.		0.039
	Yes, attitude is more trusting	1.00	0.74–1.35	0.995	1.08	0.75–1.58	0.672
	Yes, attitude is more cautious	0.49	0.39–0.62	<0.001	0.68	0.49–0.93	0.015
Parents' relationship	Marriage or cohabitation	Ref.		0.013	Ref.		0.073
	Some other form	0.63	0.44–0.91	0.013	0.63	0.38–1.04	0.073

CI: confidence interval; NA: not applicable; OR: odds ratio; Ref.: reference.

^a Education categories are defined as follows: vocational school, non-vocational school (i.e. high school) and university-level (i.e. Bachelor's, Master's, Doctoral degree).

^b Official information is classified as information produced or provided by the Ministry of Social Affairs and Health, the Finnish Institute for Health and Welfare and maternal and child healthcare clinics.

TABLE 4

Realisation of influenza vaccination according to the national vaccination register on March 2023, according to parental intention, Finland, October 2021–June 2022 (n = 1,879^a children)

Variables	Total	Yes ^b	No	Unsure
Children classified by parental vaccination intention ^c (n)	1,879	1,203	596	80
Children vaccinated by 30 June 2022 according to the register (n)	956	924	18	13
Per cent vaccinated	50.8%	76.8%	3.0%	16.3%

^a Of 1,880 children examined in the study, one child was not included in the first variable because the parent did not provide an answer to this particular question in the survey.

^b Parents who had already vaccinated their child against influenza and parents who were intending to vaccinate their child against influenza are represented here.

^c For children with two responding parents, the answer of the first parent was used.

3.00–5.66). Moreover, adherence to the NVP was significantly associated with the intention to vaccinate one's child. Compared with parents whose children have not missed a single recommended childhood vaccination, parents who have had their children vaccinated with some of the recommended childhood vaccinations were 80% less likely to vaccinate their child against influenza (OR: 0.20, 95% CI: 0.14–0.29). Furthermore, parents who have not given their child any vaccines were even less likely to vaccinate their child against influenza compared with parents whose children received all childhood vaccinations (OR: 0.02, 95% CI: 0.003–0.19).

Mother tongue was not a statistically significant factor in the multivariable analysis. Similarly, no association was observed between religious activity and the intention to vaccinate in the multivariable analysis. In our study, we asked parents whether their attitude towards childhood vaccines has changed during the pandemic. Parents who indicated that their attitude was more cautious towards childhood vaccines were less likely to vaccinate their child compared with parents whose attitude had not changed (OR: 0.68, 95% CI: 0.49–0.93).

We conducted a separate logistic regression analysis of each of the four study areas to examine the factors associated with vaccination intention within the study areas. The association between influenza vaccination intention and other factors of interest varied within each study area when performing univariable and multivariable logistic regressions.

Table 4 shows the breakdown of parental vaccination intention and the realised vaccination during the influenza season from 1 October 2021 to 30 June 2022, nearly 3 months after the survey was completed. As 23.5% (442/1,880) of children had two participating parents, we selected the answer of the first participating parent to analyse the realisation of parental intention. Among these parents, 64.0% (1,203/1,879) had the intention to vaccinate their child. We found that 76.8% (924/1,203) of children whose parent had intended for their child to receive the influenza vaccination, were vaccinated in real life. Of children whose parent had

no intention to vaccinate their child, 3.0% (18/596) did receive the vaccine. The realised vaccination uptake (50.8%) is higher than the national coverage of 36.3% among children 6 months to 6 years during the influenza season of 2021/22 [10].

Discussion

In this study conducted in Finland, we describe numerous factors that are associated with parental intention to vaccinate their children against influenza. We found that the intention to vaccinate is associated with influenza knowledge, trust in official information sources, responding parents' education level, adherence to the NVP, number of children and change in childhood vaccination attitudes because of the COVID-19 pandemic. As expected, the choice of high and low vaccine coverage study areas translated to a statistically significant association between the areas and the intention to vaccinate: the intention to vaccinate was higher in the two known high coverage areas compared with the two low coverage areas. This underscores that the responders' municipality of residence reflects existing regional features in vaccination intention.

In Finland, the low vaccine-coverage areas in the western parts of the country, where a high proportion of the population is Swedish-speaking, has been a topic of vaccine-related conversations [20]. In our study, language was not associated with the intention to vaccinate. Thus, mother tongue itself plays no significant role, but more likely reflects other differences between these areas. However, municipal-level analysis shows that adherence to the NVP was the only factor significantly associated with the intention to vaccinate in all study areas.

We found that the most reported reason for not vaccinating one's child against influenza was the simple reason of the vaccine 'not being offered' at the clinic, which could be translated as 'the nurse did not mention the vaccine' or 'I did not ask for the vaccine'. The result is concordant with the observation from the registry linkage that those with intention not to vaccinate maintained their standpoint (only 3% of children being vaccinated), but the vaccination was not realised for

nearly one-fourth of children whose parents had vaccination intention. This underlines the need for public health professionals to proactively remind parents of the vaccination before and during the influenza season, in addition to offering easy access to the vaccine. Furthermore, there is a need for municipalities to promote influenza vaccination campaigns, which may boost awareness and prompt parents to proactively ask the public health nurse for the vaccine for their child. Both strategies are needed as not all children will have their routine check-up at the clinic during the influenza season, and hence the parents will not receive a reminder from the public health nurse.

Our results are consistent with existing evidence of higher influenza-related knowledge being positively correlated with vaccination willingness [21]. We found a clear association between parental intention to vaccinate and influenza-related knowledge. However, only 74.6% of parents in our study were aware that children under the age of 7 years are entitled to a free seasonal influenza vaccine. In contrast, 93% of respondents knew that persons aged 65 years and above were entitled to an influenza vaccine. This finding poses the question whether the fact that parents simply do not know that their children are entitled to receive the vaccine plays a role in the suboptimal influenza vaccine uptake in the population of children in Finland.

In terms of vaccine-related information sources, only trusting official information was significantly associated with parental intention to vaccinate. This finding is in line with an observation that people living in Finland trust state institutions, scientific institutions and science in general [19]. The association between vaccine hesitancy and social media has been established in the literature [22]. However, in our study, trusting social media or influencers as vaccine-related information sources did not seem to affect parental decision to vaccinate one's child against influenza.

It has been hypothesised that routine childhood vaccine hesitancy increased during the COVID-19 pandemic [23]. As parents receive vaccine-related information from many diverse sources, we examined whether parental intention to vaccinate their child against influenza was influenced by COVID-19 pandemic-induced vaccine hesitancy, caused by a potential change in parental risk perception. A recent Finnish study indicated that 66% of respondents felt that their trust towards science and scientists had increased during the pandemic [19]. Even though 14.6% of participants in our study indicated they have become more cautious, the majority (75.7%) indicated that their attitudes had remained the same.

The ability to verify the realisation of influenza vaccination of the participants' children from the national vaccine register is a unique strength of the study. It enabled us to compare the parent's initial vaccination intention and the realisation of said intention. After

evaluating the reliability of parental answers in the survey by extracting the vaccination status for the child, it became evident that nearly all parents had already vaccinated their child against influenza before our data collection, i.e. before our study period February to March. According to the register, 50.8% of children of participating parents received their vaccination. Of these children, 96.2% were vaccinated before 1 February 2022. Hence, we can argue that our study did not substantially affect parental vaccine behaviour. This study is replicable in settings where childhood vaccinations are offered to children free of charge, and there is a chance to verify the actual uptake. It should also be noted that healthcare systems affect vaccination uptake, and healthcare systems vary across countries.

It is noteworthy that 50.8% of children whose parent took part in the study received the vaccination by the end of the 9-month follow-up period. This is lower than the initial vaccination intention for 64.0% of the children, but higher than the national coverage suggests. In contrast, most parents with no intention for the vaccination held firmly to their position, as only 3.0% of their children eventually received the vaccination. Parents who were unsure seemed to eventually accept the vaccine for their child, more so than parents who refused the vaccine, with 16.3% of their children eventually being vaccinated.

Our study has some limitations. Firstly, because of time constraints, our data collection started during the influenza season. An earlier data collection period would have provided us with a truer picture of intention and its realisation. However, by collecting the data during vs before the influenza season, we can exclude the potential effect that the differences in municipal-level influenza vaccine advertisements might have introduced. Secondly, despite receiving a reminder letter, the response rate for parents was only 13%, which is a major limitation. It is possible that parents found participation complicated because of the survey's online format, which led to them to not participate. Furthermore, we cannot exclude potential bias from non-participation. As we collected answers from both parents, we recognise that this complicates the interpretation of the results. Moreover, after data collection, we had no means to differentiate between true intention (i.e. has not vaccinated but will) and realised intention (i.e. has vaccinated their child prior to participation) because of the wording of the survey question. However, the ability to examine the national vaccine register allowed us to verify the actual realisation of intention. Our study population may not be representative of the general population. Lastly, we did not ask parents about their child's current state of health; pre-existing conditions could affect parental intention to vaccinate.

Conclusion

Our study provided insight into the understanding of factors associated with vaccination intentions.

Parental influenza vaccination intention is associated with many factors and, in addition, even the positive intention does not always result in vaccination. To further explore the reasons affecting vaccination uptake, and to improve the communication between healthcare professionals and parents, a qualitative study including focus group discussions needs to be conducted.

Ethical statement

Prior to starting the study, an Ethics approval was obtained from the Institutional review board (IRB) of the Finnish Institute for Health and Welfare (THL) (THL/1084/0.01.00/2020). In addition, a research permit was obtained from the municipalities in the study. No separate consent form was used for participants, as parents consented by completing the survey.

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Conflict of interest

None declared.

Authors' contributions

IH, HN, and SV designed the study. IH and HN lead the data collection. IH performed the analyses and wrote the draft manuscript under the supervision of HN and SV. HN, SV, JS, and TL edited the manuscript. IH, HN, SV, JS, and TL read and approved the final version of the manuscript.

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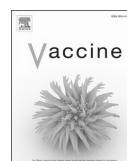
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Factors associated with parental Human Papillomavirus (HPV) vaccination intention of daughter: A national survey in Finland

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ABSTRACT

Background: Human papillomavirus (HPV) vaccines are offered free of charge in Finland to 10–12-year-old children. Nationally about 80% of girls are vaccinated, with regional differences in first dose coverage varying from 62% to 82% in girls born in 2011. This study examined the factors associated with HPV vaccination intention. Furthermore, we assessed the realisation of HPV vaccination among the daughters of the participating parents.

Methods: A web-based survey was conducted for randomly selected parents of girls (N = 6 465) aged 10 to 14 years of age. Data was collected in February and March 2022 in five Finnish high and low coverage municipalities. The national vaccination register was employed to assess realisation of vaccination.

Results: Participation rate was 13.7% (n = 883 parents). Almost all parents were aware of the association between HPV and cervical cancer, but only one fifth was aware of other diseases associated with HPV. Adherence to the national vaccination programme, parents' mother tongue, and trusting in official information were associated with positive vaccination intention. The most often reported reason for non-vaccination was fear of adverse effects (22%). Overall, parental attitudes towards HPV vaccination were positive, with 83% of parents indicating their daughter had received or will receive the vaccination. Vaccination realisation was subsequently examined and 88% of the daughters were vaccinated.

Conclusions: Despite low knowledge of HPV-related diseases overall, majority of parents held a positive intention to vaccinate their daughter. Realisation of intention was high in our study, higher than the national uptake. Foreign-origin parents had lower intention to vaccinate their daughters. As information on HPV and its vaccine is available in 11 languages, there is a need to re-think accessibility. In-depth interviews are needed to better explore the reasons behind non-vaccination.

1. Introduction

Human papillomavirus (HPV) is a very common virus causing mostly transient infections, which in some cases lead to chronic lesions, and eventually, to HPV associated cancers [1,2]. It is estimated that in Finland 80% of adults will acquire the virus at some point in their lives, with ages between 20 and 25 being the most common age for the infection [3]. Globally, cervical cancer is the most common gynaecological cancer [4]. It is currently estimated, that more than 66 000 women are diagnosed with cervical cancer yearly in Europe, and over 30 000 die from the disease [5]. In Finland, around 170 women are diagnosed with cervical cancer annually, consisting of about half of all HPV related cancers in the country [6,7]. In addition, 3 000 women undergo

surgical genital track treatments annually after cervical cancer screening tests, and more than 30 000 women need intensified follow-up [8].

Today, more than 200 HPV types have been sequenced, and only two types, 16 and 18, account for approximately 70% of cancers of the cervix, vagina and anus: [9]. The vaccine protects against these two types of HPV, with cross-protection against other high-risk HPV types [10]. In Finland, the HPV vaccine is offered free of charge to children between age 10 and 12, in accordance with the National Vaccination Programme (NVP) [11]. School-aged girls have been offered the vaccine since 2013, while boys were included in the programme as of 2020 [11]. For the time being, a bivalent vaccine, Cervarix, is used [11].

Despite the HPV vaccination being effective in the prevention of HPV related diseases, HPV remains a significant source of morbidity and

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mortality worldwide [12]. Globally, HPV vaccination programmes had an average coverage of 67% for the first dose [13]. Out of 31 European countries, HPV vaccination coverage was reported as being either moderate, low or very low in 15 countries [12]. Understanding factors affecting HPV vaccination uptake is crucial to improve vaccination coverage not only in Finland, but Europe and in other areas with similar settings.

Factors previously identified in the literature as being associated with HPV vaccine uptake in girls are complex, and include demographic, socioeconomic, and attitudinal factors [14,15]. Parents with overall positive attitude towards HPV vaccinations can still show some degree of vaccine hesitancy [16]. School-based programmes have been considered the most efficient way of reaching high vaccine coverage for adolescents; good examples are Australia, Scotland and Sweden, which have achieved high coverage and positive changes in HPV prevalence [17–19]. Despite HPV vaccination being offered free-of-charge through a school-based programme in Finland, vaccine coverage has remained suboptimal. In addition, a closer look reveals substantial regional differences in vaccine coverage. While HPV vaccine coverage for girls born in 2009 in the Eastern regions of Finland reaches 82%, in the Western regions the coverage is only 63.1% [20]. In some countries, HPV vaccination is contingent on parental consent [21–23]. Hence, the success of the vaccination program often depends heavily on parental-decision making.

The aim of this cross-sectional study was to examine how factors such as trust in media sources, parental education, and municipality of residence affect parental intention to vaccinate their daughter against HPV in the selected municipalities during the school-year of 2021/2022. In our study, we wanted to study parents of daughters, as during the time of creating the study plan, HPV vaccination was recommended for girls only in Finland. In addition to the survey, we verified parental intention to vaccinate by extracting HPV vaccination uptake data from the National Vaccination Register, maintained by the Finnish Institute for Health and Welfare (THL).

2. Methods

2.1. Study population

A quantitative web-based survey was conducted by randomly sampling parents with daughters between the ages of 10 and 14 living in Finland in four study areas. The daughters and parents were randomly sampled from the Finnish Population Information System (PIS), maintained by the Digital and Population Data Services Agency in Finland.

Finland consists of 309 municipalities, and the four study areas were comprised of five municipalities [24]. Espoo (south; 305,274) and Kuopio (east; 122,594) are historically high vaccine coverage areas, while Oulu (north-west; 211,848 inhabitants) and Mustasaari/Pietarsaari (west; 38,896) were traditionally low coverage areas [20,24].

For each study area 200 girls per age cohort (10–14 years of age) were randomly sampled from the PIS. After sampling the girls, the study participants, i.e. their parents, were extracted.

2.2. Data collection

A quantitative questionnaire was created using the Eurobarometer and the Finnish Science Barometer, both of which are tools measuring the public opinion and people's attitude towards science, respectively [25,26]. Furthermore, questions regarding knowledge and opinions about HPV and HPV vaccination were included in the questionnaire. All eligible parents were contacted by post in late January 2022 and invited to participate. Each parent was provided with a personal username and password, and the link to the online questionnaire. Parents could fill out the questionnaire only once, and in case there were multiple HPV vaccine-entitled daughters in the family, the parent was asked to answer the questionnaire while keeping their youngest daughter in mind. The

data was collected until the 14th of March 2022.

The web-based questionnaire consisted of 28 questions divided under five topics: media use and information sources and trust, expertise, vaccination, knowledge of HPV, and background information. Parents were asked to report their agreement with several statements using a five-point Likert scale of varying from “Very important” to “Not at all important” and “Very much” to “Not at all”, with “Do not know” being the intermediate answer. The first topic, information sources and trust, included two multiple choice questions. Parents were given examples of information sources in parenthesis (Appendix A). The second topic of expertise included one multiple choice question and an open-ended question. Vaccine behaviour was assessed using seven main questions regarding both HPV and other childhood vaccines in the NVP, depending on the parents' answers. Parents were asked whether their daughter has or will be vaccinated against HPV during the academic year of 2021–2022. They were then asked to rank the influence different entities have had on their vaccination decision. Parents who indicated no intention of vaccinating their daughter were asked to specify the reasons as to why their daughter has not or will not receive the vaccination, to study the reasons for non-vaccination.

Parents' HPV knowledge was measured by five questions (including one multiple choice question) related to HPV. Knowledge score was calculated by assigning one point to each correct answer and then summing all questions (maximum score 11 points). After examining the mean knowledge score, participants' scores were ranked into three categories: high (≥ 9 points), average (6 to 8 points) and low (≤ 5 points) knowledge. Background information consisted of 13 questions focusing on the family, e.g., parental education level and number of children.

We verified the realisation of vaccination intention by extracting data from the National Vaccination Register (NVR), maintained by THL. The follow-up period consisted of two academic years, August 1st, 2021, to June 1st, 2022, and August 1st, 2022 to June 1st 2023. Information on vaccine uptake was extracted by using the daughters' individual personal identifier. The verification extraction was done on the 22nd of June 2023.

2.3. Statistical analysis

Univariable and multivariable logistic regressions were employed to evaluate the relationship between the intention to vaccinate and sociodemographic factors, and trust in media. Parents were asked whether they have or will vaccinate their daughter against HPV. This outcome variable was dichotomised into either “yes” or “no”. Parents with the intention to vaccinate and those who had already vaccinated their daughter were included in the “yes” group. Associations between vaccination intention and sociodemographic and other variables were expressed as odds ratios (ORs), and a p-value of < 0.05 was considered statistically significant. Variables which were statistically significant in the univariable model were added to the multivariable model. In addition, we analysed the intention to vaccinate and the related factors in each municipality separately to explore potential differences between the municipalities. All analysis were performed using SPSS for Windows, Version 28 (IBM Corp., Armonk, N.Y., USA).

3. Ethical statement

The study protocol was approved by the Institutional review board (IRB) of the Finnish Institute for Health and Welfare (THL) (THL/1084/0.01.00/2020). In addition, a research permit was obtained from the municipalities where the study was carried out. No separate consent form was used for participants, as parents consented by completing the survey.

4. Results

4.1. Sociodemographic characteristics and intention to vaccinate

In total, 6 465 parents of 3 821 daughters were identified and contacted. Fig. 1 describes the participant selection of the study. In total, 883 parents (13.7%) responded to the web-based questionnaire, representing 740 daughters (19.4%). The mean age of the participating parents was 45.5 years (± 5.7), and approximately 70% of the responding parents held either a bachelor's or a master's degree. Respectively 76% and 16% of parents spoke Finnish or Swedish as their mother tongue. 7.7% of participants were of foreign-origin, with a foreign mother tongue. The most common foreign mother tongues of the respondents were Arabic (1%), Estonian (0.8%) and Russian (0.8%).

Table 1 shows the sociodemographic characteristics of the parents. Fig. 2 shows the municipal-level, first dose uptake in Finland in terms of girls born in the year 2011. The data was collected in the municipalities that have been marked with a red outline on the map. The respondents were rather proportionately distributed among the four study areas, with around 30% of respondents living in Espoo, 27% in Kuopio, 22% in Oulu and 21% in Pietarsaari/Mustasaari.

4.2. Vaccine behaviour

Nearly 91% of parents responded that their daughter had received all childhood vaccines offered in the national programme. Around 7% ($n = 60$) indicated that their daughter had received some of the offered childhood vaccines, whereas 1.4% ($n = 12$) of parents had refused all childhood vaccines and 0.9% were unsure whether their daughter had ever received any vaccines. The majority (72.0%) of participating families indicated that they had reached HPV vaccination decision with the

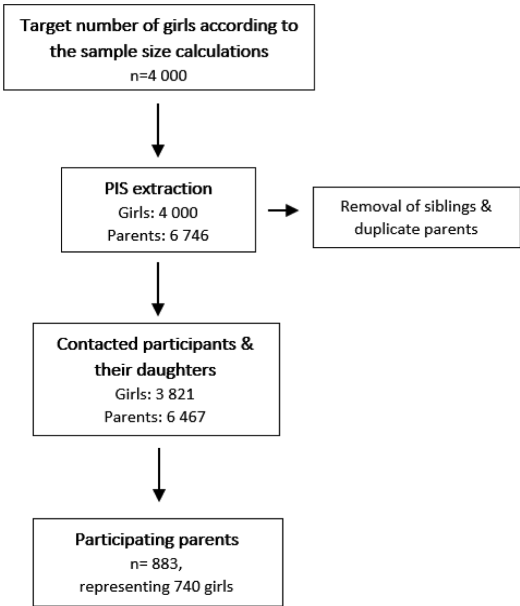


Fig. 1. Flow chart of participant selection from the municipalities of Espoo, Kuopio, Oulu and Mustasaari/Pietarsaari ^{a, b} PIS: population information system. Due to the wording of the PIS extraction, our initial extraction included several families, with for example two or three girls. For each sampled girl, parent(s) were extracted, resulting in two sibling girls having up to four parents in the study. Hence siblings and duplicate parents were removed.

Table 1
Socio-demographic characteristics of parents ($n = 883$).

Variable	Category	Number (n)	Proportion (%)
Mean age ($\pm$ SD)		44.51	± 5.74
Age	30–34	36	4.1
	35–39	122	13.8
	40–44	293	33.2
	45–49	277	31.4
	50–54	112	12.7
	55–59	36	4.1
	60 >	7	0.8
Maternal level of education			
	Primary school	10	1.1
	Vocational school	134	15.4
	Matriculation examination	50	5.8
	Bachelor's degree	280	32.3
	Graduate degree	327	37.7
	Doctoral degree	67	7.7
Other parent's level of education			
	Primary school	27	3.1
	Vocational school	179	20.8
	Matriculation examination	50	5.8
	Bachelor's degree	244	28.4
	Graduate degree	301	35.0
	Doctoral degree	59	6.9
Occupation			
	Executive position	119	13.7
	Managerial employee/clerk	346	39.7
	Employee	273	31.3
	Entrepreneur	66	7.6
	Farmer	4	0.5
	Student	17	2.0
	Stay-at-home parent	15	1.7
	Unemployed	11	1.3
	Other	20	2.3
Study area			
	Espoo	264	29.9
	Oulu	191	21.6
	Kuopio	244	27.6
	Mustasaari & Pietarsaari	184	20.9
Mother tongue			
	Finnish	671	77.3
	Swedish	140	16.1
	Other	57	6.6
Number of children			
	1	137	15.6
	2	419	47.8
	3	218	24.9
	4 or above	102	11.6
Household income (€)			
	Under 10 000	2	0.2
	10–20 000	22	2.5
	20–40 000	65	7.4
	40–60 000	111	12.6
	60–80 000	160	18.2
	80–100 000	160	18.2
	Over 100 000	297	33.8
	Do not want to answer	62	7.1

daughter's other parent. Approximately 20% of parents make the vaccination decision alone. Only 4% indicated the daughter being the only one in charge of the decision-making. When parents were asked whether their daughter had received or would receive the HPV vaccine, 53.2% indicated their daughter already had received the vaccine. 30% of parents indicated their daughter would receive her HPV vaccine, whereas 7.9% ($n = 69$) indicated their daughter has not or would not receive the vaccine. Nearly 9% of the responding parents were unsure whether their daughter would be vaccinated or not. In total, 87% of parents did not think HPV vaccine encourages the initiation of the daughter's sexual life.

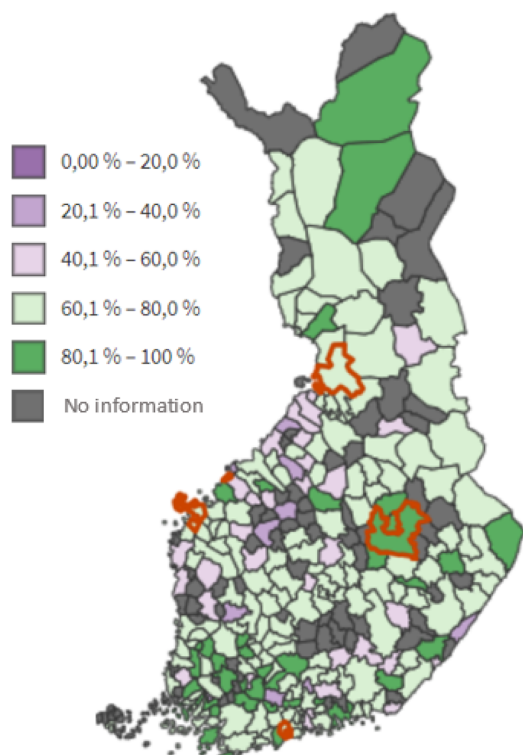


Fig. 2. HPV vaccination uptake for girls born in the year 2011 by municipality, first dose. Of the parents who had adhered perfectly to the NVP, 96% indicated that their daughter had taken or would take the HPV vaccine. Only 1% of parents whose daughter had not received a single childhood vaccine or did not remember ever vaccinating their child, had the intention to vaccinate their daughter against HPV.

4.3. HPV-related knowledge

Approximately 97% ($n = 854$) of parents had heard about HPV, and 94.2% of parents were aware of the association between HPV and cervical cancer. However, only roughly 40% of respondents knew that condyloma is caused by HPV. Furthermore, only 22% ($n = 194$) and 23% ($n = 207$) of parents were aware that anal and oral cancers, respectively, are associated with an HPV infection. In terms of self-reported HPV knowledge, 48% of parents evaluated their level of knowledge as adequate. The mean knowledge score among the respondents was 5.59 points (± 2.1). After examining respondents' knowledge, we divided HPV related knowledge into three categories. The cut-off values for respondents' scores were categorised and defined as low (five or less points: 53.5%), average knowledge (six to eight points: 34.5%) and high knowledge (9 or more points: 12%).

4.4. Factors associated with the intention to vaccinate

Table 2 shows the results of the univariable and multivariable analyses, where the intention to vaccinate one's daughter against HPV was the dependent variable. Adherence to the NVP, mother tongue, and trusting in official information were the only statistically significant variables in the multivariable analysis. Compared to native Finnish-speakers, parents who had a foreign mother tongue were less likely to vaccinate their daughter against HPV (OR 0.30, 95%CI, 0.14–0.64).

There was no statistically significant difference between Finnish and Swedish speakers' intention to vaccinate their daughter (OR 1.09, 95% CI 0.60–2.10). Parents indicated a high level of trust towards official sources of information (such as the Finnish Institute for Health and Welfare and the Ministry of Social Affairs and Health and the Finnish Institute for Health and Welfare) in terms of vaccine-related information sources. Trust in official information regarding HPV was statistically significantly associated with a stronger intention to vaccinate one's daughter: parents who trust official information were over eight times more likely to vaccinate their daughter compared to parents who did not trust official information (OR 8.14, 95%CI, 1.91–34.71).

In addition, we explored the relationship between mother tongue and trust in information sources by employing multinomial logistic regression. We found that Swedish-speakers were more likely to trust official information sources compared to foreign-origin participants (RRR, 0.24, 95%CI, 0.01–0.72). Finnish and Swedish-speakers are more likely to not trust social media as a source of information (RRR 8.31, 95%CI, 3.09–22.35 and RRR 5.18, 95%CI, 1.12–23.99, respectively). In addition, Finnish-speakers are manyfold more likely to report lack of trust towards influencers (RRR, 23.48, 95%CI, 6.42–85.85). There was no statistically significant difference between Swedish-speakers and foreign-origin participants in terms of trusting influencers (RRR, 1.92, 95%CI, 0.30–12.13). Both Finnish and Swedish-speakers are more likely to report that they do not trust their personal contacts as sources of vaccine information (RRR, 2.21, 95%CI, 1.10–4.47 and RRR, 2.65, 95% CI, 1.12–6.30).

4.5. Reasons for non-vaccination

Vaccine refusing (7.8%), and vaccine hesitant (8.7%) parents were asked to report their reasons for not vaccinating their child. The most commonly reported reasons included fear of adverse effects (21.9%) and having heard or read something negative regarding the vaccine (15.1%). 12.3% of responding parents indicated that they wanted to wait until their daughter is older. In addition, all parents were asked to report the biggest worry they had in terms of the HPV vaccination. The most frequently reported reason was adverse effects of the vaccine.

4.6. Verification of HPV-vaccination from the national vaccination register

In our study, 83.2% of parents indicated that their daughter either had or will receive the HPV vaccine. Daughters' vaccination status on the 1st of June 2023 was extracted from the NVR using the daughters' individual person identifier. According to the register, the vaccination uptake among the daughters of our study participants was 87.6%.

5. Discussion

This study examined the factors associated with parental intention to have their daughter vaccinated against HPV. We found that self-reported adherence to the NVP, mother tongue, and trusting in official information were associated with the parental intention to vaccinate one's daughter. The association between adherence to childhood vaccinations and the intention to vaccinate is evident in the literature, where having completed all previous childhood vaccinations is a positive predictor for HPV vaccination initiation [14,27]. In addition, we found that parents who spoke a foreign language as their mother tongue were less likely to vaccinate their daughter. Previous research shows that cultural background or being of foreign origin is associated with lower HPV vaccine uptake [27–29]. Currently, HPV-related information is available in 11 languages in Finland [30]. Hence lower intention to vaccinate is most likely not related to the lack of information, but there may be other underlying issues such as accessibility. Even though our results are in line with current knowledge, it is worth noting that in our study only 7.7% of responding parents spoke a foreign language as their mother

Table 2

Logistic regression analysis of factors associated with the intention to vaccinate.

Variable	Univariable analysis			Multivariable analysis		
	OR	95%CI	p-value	OR	95%CI	p-value
Municipality of residence			0.425			
Oulu	ref.					
Espoo	0.70	0.40–1.18	0.172			
Kuopio	0.70	0.40–1.20	0.184			
Mustasaari and Pietarsaari	0.64	0.36–1.12	0.120			
Age of parent	1.04	1.00–1.07	0.024			0.601
Sex	1.26	0.88–1.81	0.215			
Mother tongue			<0.001			0.002
Finnish	ref.			ref.		
Swedish	0.97	0.58–1.64	0.922	1.09	0.60–2.10	0.791
Other	0.20	0.11–0.34	<0.001	0.30	0.14–0.64	0.002
Active in practising religion			0.002			0.406
No	ref.					
Yes	0.51	0.31–0.83	0.008			
Do not want to tell	0.35	0.15–0.80	0.012			
Mother's educational level			<0.001			0.215
Vocational education	ref.					
Non-vocational education	2.23	1.03–4.82	0.42			
University-level education	2.91	1.90–4.48	<0.001			
Other parent's educational level			<0.001			0.112
Vocational education	ref.					
Non-vocational education	0.90	0.49–1.65	0.739			
University-level education	2.34	1.55–3.55	<0.001			
Number of children			0.013			0.197
1	ref.					
2	1.85	1.13–3.01	0.014			
3	1.81	1.04–3.16	0.036			
>4	0.95	0.52–1.75	0.870			
Age of daughter			0.031			0.068
10	ref.					
11	1.45	0.87–2.44	0.156			
12	1.82	1.05–3.16	0.034			
13	2.09	1.12–3.72	0.012			
14	2.66	1.42–4.97	0.002			
15	1.31	0.50–3.45	0.585			
Trust in official information			<0.001			0.006
Not at all or not much	ref.			ref.		
Very much or rather much	10.30	3.74–28.34	<0.001	8.14	1.91–34.71	0.005
Does not know	0.79	0.15–4.21	0.778	1.81	0.19–17.42	0.606
Trust in journalistic media			0.004			0.741
Not at all or not much	ref.					
Very much or rather much	1.81	1.20–2.72	0.005			
Does not know	0.90	0.49–1.67	0.735			
Trust in social media			0.003			0.785
Not at all or not much	ref.					
Very much or rather much	0.36	0.18–0.74	0.005			
Does not know	0.49	0.27–0.90	0.022			
Trust in influencers			<0.001			0.896
Not at all or not much	ref.					
Very much or rather much	0.24	0.10–0.52	0.001			
Does not know	0.41	0.23–0.74	0.003			
Trust in personal contacts			0.002			0.145
Not at all or not much	ref.					
Very much or rather much	0.60	0.39–0.90	0.014			
Does not know	0.40	0.24–0.67	<0.001			
Trust in other sources			0.244			
Not at all or not much	ref.					
Very much or rather much	0.47	0.20–1.14	0.095			
Does not know	0.68	0.31–1.49	0.336			
Adherence to NVP vaccines			<0.001			<0.001
Yes, all recommended	ref.			ref.		
Yes, some of the recommended	0.08	0.04–0.14	<0.001	0.09	0.04–0.18	<0.001
No vaccines at all or does not know	0.09	0.04–0.23	<0.001	0.17	0.05–0.54	0.003
HPV knowledge			0.128			
Low knowledge	ref.					
Good knowledge	1.50	1.00–2.24	0.04			
High knowledge	1.32	0.74–2.35	0.35			
Change in attitudes since COVID-19			0.002			0.937
No, attitude has not changed	ref.					
Yes, attitude is more trusting	1.00	0.52–1.09	0.992			
Yes, attitude is more cautious	0.40	0.24–0.67	<0.001			
Parent's relationship						
Marriage or cohabitation	ref.					
Some other form	0.88	0.53–1.47	0.637			

tongue. This phenomenon is not uncommon: migrants are often classified as a hard-to-reach population in terms of study participation [31]. In Finland, foreign-language speakers made up 8.9% of the total population [32].

We further explored the relationship between mother tongue and trust and found that foreign mother tongue was associated with lack of trust towards official information sources. On the contrary, participants with a foreign mother tongue were more likely trust influencers compared to Finnish-speakers. Interestingly, we found no statistically significant difference between Swedish-speakers and those with a foreign mother tongue in terms of trusting influencers. The difference in trusting different information sources should be considered when thinking of community information campaigns. However, it is worth noticing that the number of foreign-origin participants in our study is less than 60.

In our study, HPV related knowledge had no association with the intention to vaccinate one's daughter. In addition, we found that 53% of parents had low knowledge of HPV-related diseases. We also have to recognise that as 95% of parents in our study were familiar with the relationship between HPV and cervical cancer, this in and of itself can be enough knowledge to vaccinate their daughter, despite their level of knowledge being classified as "low". This meagre level of HPV knowledge is consistent with previous research [33,34]. However, current literature is inconclusive on whether knowledge of HPV is associated with the intention to vaccinate as some studies found a statistically significant association between the two [29,35], and some found no evidence of HPV-related knowledge being associated with the intention to vaccinate [36,37]. This issue could be related to the lack of a universal agreement of the definition of "good HPV knowledge". Even though knowledge was not significantly associated with the intention to vaccinate in our study, knowledge of other aspects related to HPV could still be greatly improved.

In Finland, HPV vaccination is administered through a school-based programme, and parents and children are provided with an information leaflet regarding HPV and its vaccine. Previous research shows that school-based vaccination programs result to a high vaccine uptake [14,17,19]. The COVID-19 pandemic has had an undeniable effect in disrupting routine immunisation activities. In 2020, the World Health Organisation (WHO) and UNICEF warned against the decline of routine childhood vaccinations due to the pandemic, as school closures halted HPV vaccine delivery in the majority of countries [13]. Alongside many other countries, Finland utilised nationwide school lockdowns to control the pandemic, and hence school-based vaccinations were on hiatus. In Finland, schools were completely closed for two months, from March till May 2020, with periodic school-specific lockdowns based on the epidemiological situation [38]. After examining the vaccination uptake in participants' daughters, we found that 87.6% of daughters had received their HPV vaccination by June 1st, 2023. The potentially accumulated delays in school-based vaccinations are not visible in our target populations' daughters.

In our study, the most cited reasons for non-vaccination were the fear of adverse effects and having heard or read something negative regarding the vaccine. This finding follows previous literature, as vaccine safety and inadequate information have been cited as reasons for non-vaccination [15,27,39]. Previous studies show that some parents find HPV vaccination as an encouragement for sexual activity [28]. However, there is existing evidence that HPV vaccination does not increase sexual activity in young men and women [40]. In our study, a large majority of parents (87%) disagreed with the idea of HPV accelerating sexual debut.

Research on childhood vaccinations show that the decision to vaccinate is a multifaceted issue involving both the individual and societal level. In the case of an underaged child, the parent(s)/legal guardian(s) is responsible for the health and welfare of the child. However, their opinion could clash with the child's opinion. In Finland, the autonomy of the child must be considered. In healthcare services, the

professional is to examine the opinion of the underage patient, as much as possible, taken into account the child's age and level of maturity [41]. The healthcare professional should investigate the will of the child especially in situations where the parent(s) and the child disagree on the treatment, i.e., vaccination [41]. In our study, 81.5% of parents indicated they discuss the topic of vaccinations with the child's other parents, and 73% of parents indicated that the vaccination decision is taken by both parents. Only 4% of parents let their daughters decide on their own.

According to current research, social media has the potential to influence vaccination decision, and the relationship between social media and HPV vaccine hesitancy is one that has been studied in the past. Studies concluded that negative representations of vaccines and anti-vaccine posts have an effect on vaccine acceptance, and at worst, they can decrease adolescent HPV immunisation rates [42,43]. However, among our participants, social media did not seem to be a popular information source for vaccine-related information, as 88% indicated they trust vaccine-related information from social media either 'Not at all' and 'Not very much'. Upon further investigation into differences between vaccine accepting and refusing parents, we found that 81% of parents in our study who chose to not vaccinate their daughter indicated not trusting social media. On the other hand, 91% of parents who chose to vaccinate their daughter expressed no trust toward social media. In addition, only 1.4% of parents indicated they discuss the topic of vaccination with their social media contacts.

After our main analysis, we conducted analyses for each municipality separately to see how these statistically significant variables behaved on a municipal level (Appendix A). We found that even though mother tongue was significantly associated with parental intention to vaccinate one's daughter against HPV in the main analysis, the association was absent in the municipal-level analyses – excluding the municipality of Kuopio (high coverage), where parents who spoke other languages than Finnish had lower intention to vaccinate their daughter. Trusting in official information was also only statistically significant in Kuopio and absent in other municipalities. Adhering to childhood vaccines was statistically significant in all municipalities.

6. Strengths and limitations

An undeniable strength of our study is the possibility to pair each participants' vaccination intention to the vaccine status of their daughter. The possibility to verify the vaccination status from the national vaccination register is a unique strength, and it reduces the potential bias of misclassification should we have used self-reporting only.

As the response rate was only 14%, selection bias as to who responded to the survey may have affected our results. Due to the cross-sectional nature of the collected data, it is impossible to prove causation between the associated variables and the parental intention. Adherence to the NVP was self-reported, and we could not verify this. However, 1.4% of parents replied they had refused all childhood vaccinations, and 0.9% indicated that they do not remember vaccinating their child. This indicates that our study also reached those parents who do not fully agree with vaccinations.

7. Conclusion

High HPV vaccination uptake is necessary to reduce the incidence of cervical cancer and other HPV associated conditions. Awareness of HPV-related cervical cancer was high in our study population, but specific knowledge on other HPV related conditions was low. The findings of our study are in line with the previous observations on HPV knowledge – parental knowledge on HPV and related conditions is modest, but this does not seem to influence vaccine intention.

In our study, even though knowledge of HPV was not significantly associated with parental vaccination intention, we have highlighted some gaps in HPV knowledge. Our study suggests that parental HPV

acceptance is not solely reliant on knowledge about HPV, but parental attitudes and beliefs regarding HPV and its vaccine could be more influential in terms of the vaccine decision. This warrants for in-depth interviews or focus group discussions with parents to explore the reasons for both vaccination and non-vaccination.

Consideration should be given to strategies aimed at reaching population groups such as foreign-origin parents, who were identified as being less likely to vaccinate their daughter. Our study elucidated the need to further study HPV-related attitudes of foreign-born parents. As vaccination decision is influenced by different factors, varying from logistical to ideological, more research is needed to understand the process between intention and realisation of vaccination.

Declaration of Competing Interest

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

Data availability

Data will be made available on request.

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Appendix A. Municipal-level analysis

Associations between vaccination intention and sociodemographic and other variables were expressed as odds ratios (ORs), and a p-value of < 0.05 was considered statistically significant. Variables which were statistically significant in the univariable model were added to the multivariable model.

1. OULU (n = 191):

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1.04 (0.97–1.13)	0.260	2.69 (1.04–6.97)	0.041
Age of daughter	1.14 (0.85–1.53)	0.391		
Sex	2.96 (1.23–7.10)	0.015		
Mother tongue	0.14 (0.02–1.01)	0.051		
Active in practising religion		0.341		
No	ref.			
Yes	0.40 (0.12–1.36)	0.142		
Do not want to tell	2153966645,7	0.000		
Mother's educational level		0.095		
Vocational education	ref.			
Non-vocational education	595174942.1 (0.00-)			
University-level education (n = 149)	3.06 (1.12–8.41)	0.030		
Other parent's educational level		0.155		
Vocational education	ref.			
Non-vocational education	1.27 (0.23–7.19)	0.775		
University-level education	2.51 (0.96–6.56)	0.060		
Number of children		0.206		
1	ref.			
2	0.30 (0.04–2.54)	0.272		
3	0.20 (0.02–1.71)	0.141		
>4	0.13 (0.02–1.14)	0.066		
Trust in official information		1.00		
Not at all or not much	ref.			
Very much or rather much	0.00 (0.00)	0.99		
Does not know	1.00 (0.00)	1.00		
Trust in journalistic media		0.948		
Not at all or not much	ref.			
Very much or rather much	1.06 (0.38–2.92)	0.910		
Does not know	0.85 (0.19–3.80)	0.832		
Trust in social media		0.518		
Not at all or not much	ref.			
Very much or rather much	0.43 (0.08–2.27)	0.318		
Does not know	1.71 (0.21–13.87)	0.613		
Trust in influencers		0.518		
Not at all or not much	ref.			
Very much or rather much	0.68 (0.08–6.12)	0.731		
Does not know	0.82 (0.17–3.92)	0.800		
Trust in personal contacts		0.541		
Not at all or not much	ref.			
Very much or rather much	0.64 (0.24–1.68)	0.363		
Does not know	0.55 (0.16–1.83)	0.328		
Trust in other sources		0.982		
Not at all or not much	ref.			
Very much or rather much	302901533.0 (0.00)			
Does not know	1.17 (0.23–5.94)	0.848		

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Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.10 (0.02–0.44)	0.002	0.09 (0.02–0.43)	
No vaccines at all or does not know	0.07 (0.01–0.43)	0.004	0.08 (0.01–0.52)	
HPV knowledge		0.275		
Low knowledge	ref.			
Good knowledge	1.78 (0.69–4.60)	0.231		
High knowledge	3.71 (0.46–29.71)	0.217		
Change in attitudes since COVID-19		0.941		
No, attitude has not changed	ref.			
Yes, attitude is more trusting	1.29 (0.28–6.00)	0.747		
Yes, attitude is more cautious	1.14 (0.24–5.35)	0.871		
Parent's relationship				
Marriage or cohabitation	ref.			
Some other form	1.53 (0.33–6.99)	0.585		

2. ESPOO (n = 264):

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	0.99 (0.93–1.05)	0.703		
Age of daughter	1.07 (0.86–1.33)	0.555		
Sex	1.84 (0.97–3.50)	0.061	2.73 (1.18–6.33)	0.019
Mother tongue		<0.001		0.387
Finnish	ref.			
Swedish	2.95 (0.38–22.93)	0.302		
Other	0.23 (0.11–0.49)	<0.001		
Active in practising religion		0.046		0.303
No	ref.			
Yes	0.37 (0.15–0.88)	0.024		
Do not want to tell	0.40 (0.10–1.64)	0.204		
Mother's educational level		0.086		
Vocational education	ref.			
Non-vocational education	1.46 (0.39–5.55)	0.577		
University-level education	2.83 (1.00–8.02)	0.050		
Other parent's educational level		0.063		
Vocational education	ref.			
Non-vocational education	1.02 (0.31–3.37)	0.973		
University-level education	2.39 (0.92–6.24)	0.075		
Number of children		0.031		0.217
1	2.19 (0.91–5.32)	0.082		
2	2.57 (0.86–7.71)	0.092		
3	0.54 (0.15–1.95)	0.347		
>4				
Trust in official information		0.018		0.914
Not at all or not much	ref.			
Very much or rather much	5.24 (0.72–38.29)	0.102		
Does not know	0.33 (0.02–6.65)	0.472		
Trust in journalistic media		0.370		
Not at all or not much	ref.			
Very much or rather much	1.44 (0.95–3.18)	0.372		
Does not know	0.68 (0.18–2.62)	0.570		
Trust in social media		0.006		0.903
Not at all or not much	ref.			
Very much or rather much	0.53 (0.14–2.05)	0.355		
Does not know	0.20 (0.07–0.55)	0.002		
Trust in influencers		0.005		0.948
Not at all or not much	ref.			
Very much or rather much	0.17 (0.04–0.73)	0.016		
Does not know	0.30 (0.11–0.81)	0.017		
Trust in personal contacts		0.024		0.066
Not at all or not much	ref.			
Very much or rather much	0.53 (0.24–1.13)	0.099		
Does not know	0.27 (0.10–0.69)	0.006		
Trust in other sources		0.991		
Not at all or not much	ref.			
Very much or rather much	0.00 (0.00)	0.999		

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Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Does not know	0.00 (0.00)	0.999		
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref	
Yes, some of the recommended	0.06 (0.02–0.19)	<0.001	0.05 (0.01–0.21)	<0.001
No vaccines at all or does not know	0.07 (0.02–0.29)	<0.001	0.017 (0.01–0.66)	0.017
HPV knowledge		0.415		
Low knowledge	ref.			
Good knowledge	1.03 (0.52–2.04)	0.933		
High knowledge	2.75 (0.61–12.33)	0.187		
Change in attitudes since COVID-19		0.004		0.486
No, attitude has not changed	ref.			
Yes, attitude is more trusting	0.56 (0.19–1.630)	0.288		
Yes, attitude is more cautious	0.20 (0.08–0.53)	0.001		
Parent's relationship				
Marriage or cohabitation	ref.			
Some other form	1.30 (0.43–3.95)	0.641		

3. KUOPIO (n = 244)

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	1.10 (1.04–1.18)	0.002		0.123
Age of daughter	1.54 (1.19–2.00)	0.001	2.30 (1.51–3.50)	<0.001
Sex	0.91 (0.44–1.87)	0.797		
Mother tongue				
Finnish	ref.		ref.	
Other	0.06 (0.01–0.31)	<0.001	0.009 (0.001–0.09)	<0.001
Active in practising religion		0.495		
No	ref.			
Yes	0.71 (0.25–2.05)	0.528		
Do not want to tell	0.40 (0.07–2.24)	0.295		
Mother's educational level		0.031		0.165
Vocational education	ref			
Non-vocational education	1.67 (0.41–6.77)	0.475		
University-level education	2.72 (1.29–5.73)	0.009		
Other parent's educational level		0.057		
Vocational education	ref.			
Non-vocational education	1.68 (0.50–5.59)	0.401		
University-level education	2.42 (1.17–4.97)	0.017		
Number of children		0.228		
1				
2				
3				
>4				
Trust in official information		0.024		<0.001
Not at all or not much	ref.		ref.	
Very much or rather much	22.00 (2.39–202.54)	0.006	3331.42 (20.38–5389.81)	<0.001
Does not know	0.00	0.999	0.00	
Trust in journalistic media		0.081		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in social media		0.079		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in influencers		0.023		0.916
Not at all or not much	ref.			
Very much or rather much	0.18 (0.03–0.91)	0.038		
Does not know	0.35 (0.12–1.00)	0.050		
Trust in personal contacts		0.096		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in other sources		0.231		
Not at all or not much				
Very much or rather much				

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Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Does not know				
Adherence to NVP vaccines		<0.001		0.021
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.13 (0.04–0.39)	<0.001	0.13 (0.03–0.56)	0.006
No vaccines at all or does not know	0.25 (0.04–1.57)	0.140	1.68 (0.09–31.95)	0.731
HPV knowledge		0.252		
Low knowledge				
Good knowledge				
High knowledge				
Change in attitudes since COVID-19		0.043		0.038
No, attitude has not changed	ref.		ref.	
Yes, attitude is more trusting	0.85 (0.27–2.68)	0.786	0.49 (0.12–1.71)	0.239
Yes, attitude is more cautious	0.29 (0.11–0.76)	0.012	0.19 (0.05–0.73)	0.016
Parent's relationship		0.665		
Marriage or cohabitation				
Some other form				

4. PIETARSAARI & MUSTASAARI (n = 184)

Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Age		0.613		
Age of daughter		0.214		
Sex		0.116		
Mother tongue		0.320		
Finnish				
Swedish				
Other				
Active in practising religion		0.115		
No				
Yes				
Do not want to tell				
Mother's educational level		0.020		0.105
Vocational education	ref.		ref.	
Non-vocational education	4.87 (0.55–42.84)	0.153		
University-level education	3.12 (1.37–7.11)	0.007		
Other parent's educational level		0.004		0.014
Vocational education	ref.		ref.	
Non-vocational education	0.33 (0.10–1.15)	0.081	0.24 (0.05–1.17)	0.079
University-level education	2.24 (0.96–5.25)	0.062	2.22 (0.70–7.09)	0.177
Number of children		0.099		
1				
2				
3				
>4				
Trust in official information		0.013		0.052
Not at all or not much	ref.			
Very much or rather much	27.04 (3.04–240.60)	0.003		
Does not know	0.00	0.999		
Trust in journalistic media		0.006		0.939
Not at all or not much	ref.			
Very much or rather much	3.77 (1.67–8.50)	0.001		
Does not know	1.78 (0.43–7.40)	0.429		
Trust in social media		0.085		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in influencers		0.119		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in personal contacts		0.132		
Not at all or not much				
Very much or rather much				
Does not know				
Trust in other sources		0.071		
Not at all or not much				

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Variable	Univariable analysis		Multivariable model	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Very much or rather much				
Does not know				
Adherence to NVP vaccines		<0.001		<0.001
Yes, all recommended	ref.		ref.	
Yes, some of the recommended	0.06 (0.02–0.16)	<0.001	0.05 (0.02–0.18)	<0.001
No vaccines at all or does not know	0.00 (0.00)	1.000	0.00	1.000
HPV knowledge		0.880		
Low knowledge				
Good knowledge				
High knowledge				
Change in attitudes since COVID-19		0.355		
No, attitude has not changed				
Yes, attitude is more trusting				
Yes, attitude is more cautious				
Parent's relationship				
Marriage or cohabitation	ref.			
Some other form	0.45 (0.16–1.28)	0.13		

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What makes an expert in childhood vaccinations? Perceptions of parents in Finland

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ABSTRACT

In Finland, trust in science and research organisations is high. This correlates with the fact that childhood vaccination uptake is generally good in Finland, with vaccine refusal being rare. However, there are differences between vaccines and regions in terms of uptake. Influenza and HPV vaccinations are two childhood vaccinations with suboptimal coverages in Finland. Although science and scientists are generally trusted in Finland, public health experts have been increasingly contested, and their expertise challenged. Little is known about parental vaccination expert preferences. This study explored what makes an expert in childhood vaccinations, according to parents of children aged between 6 months and 14 years of age. The study utilized both quantitative and qualitative data. In total, 415 parents took part in the study. The identified vaccine expert categories were “knowledge and experience”, “institutional authority”, “ethics and integrity” and “communication and interaction”. We also found statistically significant differences between vaccine accepting, hesitant and refusing parents in terms of expert preferences. In conclusion, parents did not grant the expert the status of an authoritarian vaccine expert solely due to their qualifications and knowledge, but the expert was also needed to be accessible and actively engage and convince the parent.

1. Introduction

Alongside clean water, vaccinations have had the greatest impact on public health in reducing disability, morbidity and mortality globally [1]. Despite this proven success, some parents choose to delay vaccinating or choose to not have their child vaccinated at all [2,3]. Childhood vaccination rates are dependent on many factors. While access to vaccinations plays a role in vaccination uptake, acceptance, i.e., parental attitudes, feelings, and beliefs are an important factor affecting uptake [3]. Parental vaccination acceptance is affected by the sources of vaccine-related information [4]. Trust in experts has been reported to affect the acceptance of anti-vaccination claims. A study by Stecula et al. [5] showed that distrust in medical experts is positively related to believing vaccine misinformation. Parents are sometimes expected to take (or withhold taking) a trusting leap of faith in the face of incomplete knowledge [6]. To increase the adherence to vaccination programmes, we must understand who parents consider as childhood vaccination experts.

Expertise has been studied most notably in the field of Science and Technology Studies (e.g. [7–10]). According to the most common definition of an expert is someone who has knowledge or skills the lay person does not have – within a given domain [11]. Experts are usually located in the professions and in academia, and they “mediate between the production of knowledge and its application” [12]. Nevertheless, in Science and Technology Studies, there is no shared definition on what actually makes an expert. On the one hand, those representing a normative or realist approach to the matter define expertise in terms of expert knowledge and experience [7]. According to this approach, expertise is an internal qualification of the expert [7]. On the other hand, those representing relational approach towards expertise see it more as a social, tangible attribute. Experts in the society are identified not only on the basis of the specific knowledge they possess, but also in their capacity as institutionally constituted parts of larger regimes (Jasanoff, 2004). The credibility of experts is also a relational concept, subject to constant negotiations between actors in particular situations.

It is not necessary to see realistic and relational approaches as

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mutually exclusive (e.g. [13], 20). Instead, they represent different perspectives towards expertise. Furthermore, there is common agreement that an expert should obtain some sort of qualification, acting as a legitimization of their expertise [12]. Also, it is commonly supposed that an expert is unbiased and ethical [12]. In addition, expertise is an inherently social concept: one is acknowledged as an expert through the recognition of others [7,11,12]. Recently, the media have become an important forum for the public legitimization experts (e.g. [14,15,16,17,18]). Thus, communication and interaction have become important expert qualifications. In terms of childhood vaccinations, communication and popularisation of science plays a role, as most often, parents of children are interested in the risk-benefit ratio of vaccines [19].

Here we approach expertise from a broad relational perspective, building on previous studies on the public perceptions of expertise. For instance, Dommett & Pearce [20] list some common expert qualifications, such as academic qualifications, practical experience of working in the area, professional qualifications, impartiality, local knowledge and good communication skills. Regardless of the important role of experts in building and maintaining trust, infectious disease experts, epidemiologists and other public health experts have been increasingly contested and challenged to advocate for their expertise [21,22]. However, Dommett and Pearce [20] argue that based on previous surveys on public perceptions of expertise, we know rather little about “who qualifies as an expert, and what are experts expected to do”. Understandably, identifying an expert in childhood vaccinations might be difficult at times, as non-experts do not necessarily possess the capacity to assess the relevant facts defining whether someone is an expert [19]. In this paper, we explore parental preferences in vaccine expertise in terms of two childhood vaccines that have a suboptimal uptake.

In accordance with the national vaccination programme in Finland, childhood vaccines are given free of charge [23]. In Finland, childhood vaccination coverage is generally speaking good, but regional differences and differences between vaccines in terms of uptake exist. We chose to examine two childhood vaccines, influenza and Human Papillomavirus (HPV) vaccine. Influenza causes significant disease burden annually – especially in children under the age of 5, which is why the World Health Organization (WHO) recommends vaccinating all children between the ages of 6 months to 5 years [24]. In Finland, influenza vaccination is offered to all children between the ages of 6 months to 6 years [23]. Regardless, influenza vaccination coverage is among the lowest childhood vaccination coverages in Finland with 37 % of children between the ages of 6 to 35 months, and only 27 % of children between the ages of 3 and 6 years receiving their influenza vaccine during the 2022–2023 [23].

HPV is a very common virus causing mostly transient infections, which in some cases may lead to HPV-related cancers, such as cancers of the cervix, vagina and anus [25]. Cervical cancer is the most common gynaecological cancer in the world, causing significant morbidity and mortality globally [26]. The WHO has urged Member States to commit to eradicating cervical cancer by 2030 by having at least 90 % of girls fully vaccinated with the HPV vaccine (WHO, 2022). Currently, Finland is falling behind of that goal, with 79 % of girls born in 2011 receiving their first dose of the HPV vaccine ([23]). The vaccine is offered to children between the ages of 10 and 12 [23]. Due to the comparatively low vaccination coverages and the regional differences, the influenza vaccine and the HPV vaccine were chosen as the childhood vaccines of interest in this study.

Previous literature shows that parental intention to have their child vaccinated is a complex issue, with many factors affecting parents' decision and the realisation of intention. However, little is known about vaccine expertise in the context of parents. The aim of this article is to analyse parents' perceptions of experts and expertise. We asked parents of vaccine-eligible children what makes an expert in childhood vaccinations and what qualifications experts should have. The results of the study help us to improve existing tools and potentially create new ones

to increase the confidence parents have in experts, and thus increase vaccination coverage.

2. Materials and methods

The material used in this study is an excerpt of two vaccination surveys conducted in 2022 [27,28]. They were quantitative web-based surveys conducted among two sets of parents: parents of girls aged between 10 and 14 for HPV, and parents of children aged between 6 months and 6 years for influenza. Children and their parents were randomly sampled from the Population Information System, which is a database maintained by the Finnish Digital Agency. The data was collected between February and March 2022. The study areas consisted of five Finnish municipalities from Southern, Eastern, and Western Finland: Espoo, Kuopio, Oulu, Pietarsaari and Mustasaari, and these areas include both high and low vaccine uptake areas. In total, 3205 parents took part in the surveys (HPV and influenza), with 415 parents replying to the excerpt used in this study.

The surveys were similar, with both surveys dealing with the topics of information sources and trust, expertise, knowledge, vaccine behaviour and background questions. The questionnaires were created by merging questions from the Eurobarometer (a tool measuring the public opinion in the European Union since 1974), the Finnish Science Barometer (a study conducted every three years to investigate the attitudes people living in Finland hold towards science), and some context-specific questions regarding HPV and influenza [29,30]. The questionnaire was piloted with a small number of parents, who were excluded from the study.

The excerpt we used to examine parental preferences on vaccine expertise was the results of two questions discussing expertise – one close-ended and open-ended question. In the surveys, expertise was explored by using ten closed-question statements depicting characteristics and qualities a vaccine expert can have. The characteristics were i) being active in public, ii) communicating clearly, iii) interaction skills, iv) scientific education, v) practical experience, vi) relatability, vii) representing a university, viii) representing an authority, ix) being of the same sex, x) having the ability to question. The battery of statements was based mainly on existing literature on expertise, but some statements were added to explore the beliefs of parents further. Parents were asked to indicate their agreement or disagreement regarding these statements on a five-point Likert scale. In addition to the close-ended question, parents were asked, using an open-ended question, whether they can think of any other qualities an expert should have.

This study is a mixed method study, utilising qualitative (open-ended question) and quantitative (close-ended question) data collected through a questionnaire. For this study, only two questions from the main studies were analysed to determine parental preferences in terms of a vaccine expert. Participants were not required to answer all expert characteristic statements, and hence there is slight variation in the numbers of responses to each characteristic. However, almost all participating parents answered the statements, with the number of parents indicating their preference for expert characteristics varied between 870 and 878 (total $n = 883$). In terms of influenza, answering parents varied between 2291 and 2314 (total $n = 2322$).

All in all, 105 HPV survey parents and 310 influenza survey parents answered the open-ended question used as the qualitative material in this study. For analysing purposes, the HPV and influenza survey answers were combined. In total, 3205 parents replied to the close-ended question regarding the characteristics a vaccine expert should have. Descriptive analysis was employed to examine parental agreement with the statements in the close-ended question. In terms of the open-ended question, an inductive, exploratory thematic analysis was conducted. The data was extracted, coded, and grouped using Microsoft Excel®. As our coding strategy was exploratory by nature, there was no pre-determined codebook. The questionnaire was available either in the two official languages of Finland, Finnish and Swedish, and all

participants replied either in Finnish, Swedish or English.

The data was inductively analysed following the thematic analysis approach by Braun and Clarke and Braun [31]. To answer the research question, participating parents' answers were read and re-read. The length of the answers varied from one-word answers to three-sentence answers, and hence the first step was to condense the answers into simplified, to-the-point versions. Then, the answers were given a code. The codes with similar meanings and concepts were then grouped under broader, more general subcategories. The main researcher (IH) coded and categorised the data, and the coding was double-checked for consistency with the second researcher (RL). The subcategories were discussed and grouped under the developed main categories. There were 143 codes and nine subcategories formed from the open-ended answers.

3. What makes an expert: parents' reflections

3.1. Characteristics of a vaccine expert: Statistical analysis

Table 1 shows the preferred expert qualities of the parents in the HPV-study. On average 873 parents in the HPV-study answered each question on the characteristics of a vaccine expert. Scientific education was deemed as the most important characteristic a vaccine expert should have (97 %), while representing a university or a research organisation was important to 94 % of participating parents.

Table 2 shows the preferred expert qualities of the parents in the influenza-study. In terms of influenza-parents, on average 2302 parents answered. In total, 97 % of parents ($n = 2236$) deemed scientific education as the most important vaccine expert characteristic. Communicating clearly and representing a university or research organisation were valued qualities by the parents: 92 % of parents indicated representing a university or research organisation was important, while 90 %

of parents deemed communicating clearly as important.

In addition to descriptive analysis, a chi-square test of independence was conducted to examine whether there are differences between parental vaccination intention (vaccine-accepting, vaccine-hesitant, and vaccine-refusing) and prioritisation of expert qualities in terms of HPV and influenza. In terms of HPV, vaccine accepting parents (93 %) were more likely to consider representing a university or research organisation as an important characteristic compared to vaccine hesitant (67 %) and vaccine refusing (55 %). This association was statistically significant ($p < 0.001$). Furthermore, vaccine accepting parents (90 %) were more likely to consider representing an authority as important compared to vaccine hesitant (57 %) and vaccine refusing (46 %) parents ($p < 0.001$). Having a scientific education was more important to vaccine accepting (100 %) and vaccine hesitant parents (100 %) compared to vaccine refusing (82 %) parents ($p < 0.001$). Vaccine accepting parents (94 %) were more likely to consider the vaccine expert having practical experience more important than vaccine hesitant (86 %) and vaccine refusing (82 %) parents ($p = 0.045$). Communicating clearly was statistically significantly associated with parental vaccination intention, with vaccine accepting parents (95 %) being more likely to prioritise it compared to vaccine hesitant (57 %) and vaccine refusing (73 %) parents ($p < 0.001$).

Regarding influenza, we found that vaccine accepting parents were more likely to prioritise the vaccine expert representing an authority (81 %) compared to vaccine hesitant parents (58 %) and vaccine refusing parents (62 %). This association was statistically significant ($p < 0.001$). In addition, vaccine accepting parents (92 %) and vaccine refusing parents (92 %) were more likely to consider communicating clearly important compared to vaccine hesitant parents (75 %). Surprisingly, vaccine hesitant parents (8 %) were more likely to consider the vaccine expert being the same sex as them important compared to

Table 1

Characteristics of a vaccine expert according to HPV-study parents ($n = 883$).

	Very important	Rather important	Unsure	Not very important	Not at all important
When necessary, the expert has the ability to question the views of the authorities or scientist	43.7 %	37.2 %	10.3 %	5.3 %	3.4 %
The expert has an appropriate scientific education	79.2 %	17.9 %	1.7 %	0.8 %	0.3 %
The expert represents the same sex as me	1.3 %	1.7 %	3.5 %	12.3 %	81.1 %
The expert represents an authority	53.4 %	34.6 %	4.8 %	5.6 %	1.6 %
The expert represents a university or a research organisation	66.0 %	27.4 %	3.1 %	2.7 %	0.8 %
I can relate to the expert	2.9 %	11.2 %	15.6 %	28.8 %	41.5 %
The expert has practical experience on the matter	57.5 %	33.5 %	4.3 %	3.8 %	0.9 %
The expert has good interaction skills	19.1 %	48.6 %	11.1 %	16.9 %	4.4 %
The expert can communicate clearly	47.1 %	43.0 %	3.9 %	4.7 %	1.3 %
The expert is actively in the public eye	6.6 %	19.2 %	11.7 %	42.1 %	20.4 %

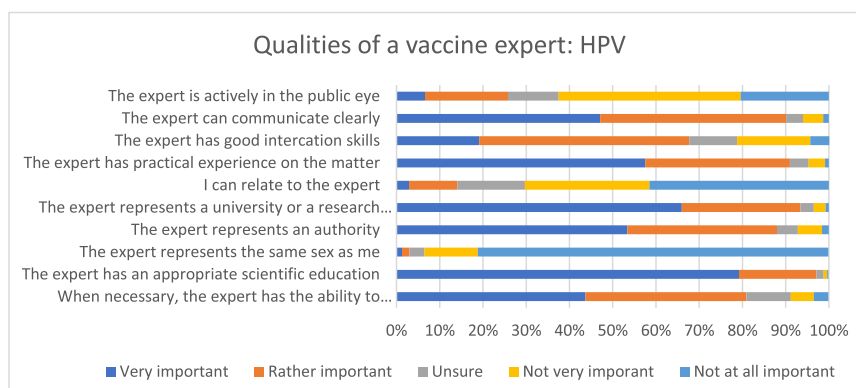
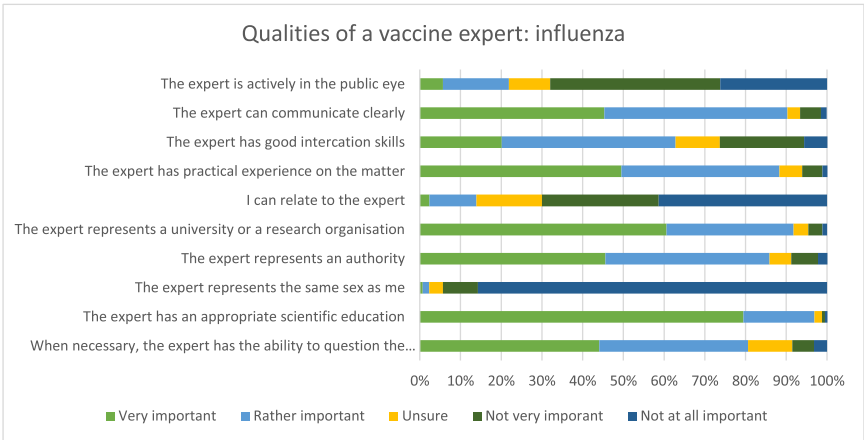


Table 2
Characteristics of a vaccine expert according to influenza study parents (n = 2322).

	Very important	Rather important	Unsure	Not very important	Not at all important
When necessary, the expert has the ability to question the views of the authorities or scientist	44.1 %	36.5 %	10.9 %	5.3 %	3.2 %
The expert has an appropriate scientific education	79.5 %	17.4 %	1.9 %	0.7 %	0.6 %
The expert represents the same sex as me	0.7 %	1.6 %	3.4 %	8.6 %	85.7 %
The expert represents an authority	45.6 %	40.3 %	5.3 %	6.6 %	2.3 %
The expert represents a university or a research organisation	60.6 %	31.2 %	3.6 %	3.5 %	1.1 %
I can relate to the expert	2.4 %	11.5 %	16.1 %	28.7 %	41.3 %
The expert has practical experience on the matter	49.5 %	38.8 %	5.6 %	5.0 %	1.2 %
The expert has good interaction skills	20.1 %	42.7 %	10.9 %	20.7 %	5.7 %
The expert can communicate clearly	45.3 %	45.0 %	3.1 %	5.1 %	1.4 %
The expert is actively in the public eye	5.7 %	16.2 %	10.1 %	41.8 %	26.2 %



vaccine accepting (0 %) and vaccine refusing (1 %) parents ($p = 0.012$). However, relatability was not a statistically significant factor in parental vaccination intention groups. In addition, being active in the public eye, representing a university or a research organisation, having a scientific education, having practical experience, having interaction skills, and the ability to question did not statistically differ in vaccination intention groups.

3.2. Characteristics of a vaccine expert: Thematic analysis

There were no systematic differences between the parents in the two datasets (HPV and influenza), and hence, for the purpose of the study, we combined the parental responses to analyse the preference for expert characteristics. The developed themes are discussed under four main categories, reflecting previous literature on expert qualifications: 1) knowledge and experience, 2) institutional authority, 3) ethics and integrity, and 4) communication and interaction. Table 3 shows the vaccine expert categories developed from the open-ended questions.

3.2.1. Knowledge and experience

In their reflections to the open-ended questions, the respondents often mentioned education and experience as the most important attributes of a vaccine expert. In the close-ended survey scientific education was ranked as the most important quality – almost all parents (97 %) found that a vaccine expert having an appropriate scientific education was either ‘very important’ or ‘rather important’. In total, 91 % of participating parents ranked having practical experience as an important characteristic for a vaccine expert.

Furthermore, many parents considered the training of a vaccine expert an important feature. They expressed the kind of education that is appropriate for an expert by listing either disciplines such as virology and medicine, or degrees such as “*professor*” and “*PhD*”. Thus, parents differentiated between having a general or a specific education: “*the expert has a scientific education from a relevant area (i.e., virology, not astronomy)*” (185: m, 44).

The merits of the expert should also be easily validated. Scientific education brought desirable qualities such as logical and scientific thinking. Training was considered a more important feature than delivery:

“In general, I wish for clearer experts, but of course professionalism and education are more important than their outer demeanour” (188: f, 35).

In the close-ended question, 91 % of participating parents indicated that practical experience was an important quality for a vaccine expert. Many parents expressed the importance of experience with a few words or a very short sentence in the open-ended question. The expert was assumed to have “*long experience and knowledge of the subject*” (273: f, 37). One parent expressed that the expert should be in “*close contact with practical work*” (268: f, 45), while another parent demanded the expert to have “*done clinical work as well*” (271: f, 42). In addition to experience in the Finnish context, some parents specified that the expert should have “*international experience [...]*” (31: f, 52).

Parents implied that knowledge is an essential characteristic of a vaccine expert. However, parents had differentiating opinions on the level and type of knowledge. Some parents simply stated that the expert should “*know of the subject*” (280: m, 35). However, some parents

Table 3
Vaccine expert categories developed from open-ended questions.

Example of answer	Example of code	Subcategory	Main category
"Has obtained a PhD. If not, [they're] not an expert." – participant 186: female, 38	PhD	Education	
"Long experience in their work." – participant 270: female, age 37	Long-term experience	Experience	Knowledge and experience
"Possession of facts and understanding of facts" – participant 53: male, age 54	Fact-based	Knowledge	
"The collective trust of the scientific community." – participant 113: male, age 37	Trust of the scientific community	Support from the scientific community	Institutional authority
"The expert should be impartial, representing a medical company should not be a background factor, or at least these factors should be expressed" – participant 204: female, age 33	Impartial Independent from medical companies		
"The ability to justify the matter so that even the dumbest understands the point." – participant 147: female, age 37	Disclosure of affiliations	Ethics	Ethics and integrity
"Familiar with the media [...]" – participant 98: male, age 39	The ability to justify in a popularised manner	Communication skills	
"The expert knows how to control their feelings, e.g., if they encounter doubting or aggressive behaviour against their own opinion." – participant 346: female, age 46	Familiar with the media	Media activity	
"Speaks Swedish, most preferably is bilingual." – participant 348: male, age 41	Emotion regulation	Personal skills	Communication and interaction
	Bilingual	Language skills	

demandated that the vaccine expert does not only have general information, but they have specific “scientific knowledge from the right field” (282: f, 39). One parent expressed that “the most important thing is, that it really is an expert, and not a person who has no expertise in the matter at hand” (56: f, 49). Some parents rationalised that “through their education and profession, the expert has fact-based knowledge of the issues they present” (57: m, 45). One parent thought that having knowledge would bring the expert more credibility in their communication:

“One should have such vast and robust knowledge of the topic that one can justify their point of view without any problems” (190: f, 33).

3.2.2. Institutional authority

In the close-ended questions, representing a university or a research organisation was the second most important quality of a vaccine expert, as 92 % of participating parents deemed this quality important.

In the open-ended questions some parents indicated the importance of the social aspect of expertise by demanding that “the expert needs to be respected in the science community” (111: m, 41). Parents also expected the vaccine expert to be peer-reviewed, by having “recommendations from other experts” (110: f, 40). Furthermore, parents wished for the expert to have “a good reputation” (1: m, 54). A vaccine expert was viewed not only through their education, personal skills and abilities but also through their personal life. Parents seemed to think that the past and the connections the expert has affects their expertise. One parent stated that in terms of the vaccine expert “[...] personal contacts e.g., through work are important” – (343: f, 42).

In addition to being respected and acknowledged within the Finnish science community, one parent called for international recognition and respect by stating that the expert was expected to be “internationally respected” (108: m, 38). Current employment matters as well:

“The expert should represent a research organisation of this very field” (106: f, 41).

3.2.3. Ethics and integrity

In our study, parents examined aspects of ethics and integrity of the experts from various perspectives. Parents indicated the importance of a vaccine expert being independent and impartial. Parents demanded independence from the medical and pharmaceutical industry, politics and financial benefits.

Multiple participants vehemently expressed that a vaccine expert should be independent from pharmaceutical companies: “The expert should be completely independent from e.g., drug manufacturers etc.” (209: m, 49). The vaccine expert was expected to “[...] not represent any private company that benefits from the sale of vaccinations” (210: m, 28). Parents indicated that the expert should operate with “[...] the child’s health as a priority instead of financial gain” (232: f, 40). Another parent strongly emphasised that a vaccine expert and their research should be independent from non-governmental funding:

“No commercial connections with drug manufacturers!!!! Research funding should come 100% from the government and not a single penny from medical companies” (243: m, 41).

Some respondents demanded that a vaccine expert should be independent from politics altogether. They indicated that the vaccine expert should “not be susceptible to political steering” (214: m, 42). An expert was thought to have “non-political purposes” (36: f, 42). One parent indicated that “it would be good for an expert to be politically neutral. Science does not ask for a political opinion” (207: m, 39). Another parent wished that “the expert is not committed to any political agenda or other (for example, religious) group” (205: m, 47). One parent stated that an expert should be “[...] Detached from the political game if possible” (251: m, 41). Parents indicated that an expert should have integrity and be honest: “integrity and backbone to defend one’s point of view, and the intellectual honesty to change one’s position if reason arises” (74: m, 48). Moreover, an expert was expected to have the bravery to bring up uncertainties:

“Dares to bring forward uncertainties. Of course, this is problematic from the point of view of public discussion, because people, on average, need clear guidance, but I personally appreciate that if there are clear factual uncertainties, they dare to bring them up as well.” – (349: m, 39).

Some participating parents expressed views that can be classified as being doubtful of expertise, as they expected a vaccine expert to “challenge the viewpoint, also against the mainstream” (118: f, 33). Furthermore, parents implied that the expert should have “the ability to question authorities” (5: m, 58). Moreover, some participating parents expressed doubtful thoughts regarding a vaccine expert, and those experts who

frequent the public eye. Parents indicated that a vaccine expert should “*not be a part of the mafia. Unfortunately, that includes all ‘experts’ who get a say*” (180: f, 42). One parent expressed their frustration towards current vaccine expertise by explaining that “*this has been one big mess up until now, can there be an expert somewhere who knows what they’re talking about?*” (179: m, 45).

3.2.4. Communication and interaction

In the close-ended question, communicating clearly was the third most important quality a vaccine expert should have. In total, 90 % of parents deemed this characteristic as either ‘very important’ or ‘rather important’. Interaction skills were deemed less important than communication skills, as 68 % of parents indicated that it was important that a vaccine expert had good interaction skills. Furthermore, only 26 % of participating parents deemed being active in the public eye as an important quality.

According to the parents “*the expert is able to give clear instructions in public*” (129: f, 32). In addition to being clear, an expert should be able to popularise science. The expert should have “*the ability to explain difficult matters understandably in a manner that leaves those who have more knowledge with something. [...] a simple core issue and in addition, a deeper opening of the topic*” (151: m, 51). Furthermore, parents expressed the importance of the expert being convincing but also proportionate in communication: “*they should clearly feel like they know what they’re talking about, but do not force too much information upon you*” (156: f, 32). In addition, some parents seemed to understand that experts are going to change their opinions inevitably, and they only demanded that the expert has “*the ability to justify why their opinion on the matter changed*” (117: m, 43).

Some respondents indicated that the expert should be “*able to explain why certain vaccines are recommended*” (124: f, 43). In addition, participating parents called for calmness, as they indicated that the expert should “*not be provoked, but rather refute even stupid claims coldly and matter-of-factly*” (128: m, 47). Furthermore, the expert was expected to communicate the harms and benefits of vaccines and to not have a custodial attitude:

“In case of vaccines, for example, the expert should explain the good and bad sides [...] and relate for example, the probability of potential adverse effects to something (i.e., what is likely and what is not, on an individual level). The expert should be able to talk numbers, figures and facts, and not think that, for example, speaking about adverse effects of vaccines would increase anti-vaccine attitude or fear. That patronising attitude where we discuss only the benefits of vaccinations ‘just to be sure’, because we do not want to feed the thoughts of the other extreme, is harmful” (163: f, 40).

The skill of taking both sides of the topic into consideration was mentioned by multiple parents: “*above all, the expert must know how to consider both sides of the issue in their statements and know how to bring out the facts in a calm, non-frantic manner*” (350: m, 37). An expert was thought to be able to regulate their emotions: “*the expert is able to control their own feelings e.g., if you are faced with questioning or attacking behaviour towards your own opinion or evidence*” (346: f, 46).

Language skills were mentioned by parents as an important quality to have as a vaccine expert. Finland is a bilingual country, with Finnish and Swedish as official languages. Parents stressed that a vaccine expert should be bilingual in contrast to speaking only Finnish: “*Speaks Swedish, preferably fully bilingual*” – (348: m, 41). However, speaking only Finnish and Swedish was not enough for all parents. Finland is growing to become more multicultural, and the need for a vaccine expert to be knowledgeable in other languages is growing as well:

“What is important for me is that the person can communicate well also in English. As a mom who doesn’t know how to speak Finnish, it’s always hard for me to understand everything” (315: f, 33).

3.2.4.1. Personal qualities in communicating expertise. Parents mentioned multiple characteristics dealing with the inner or outer qualities of a vaccine expert, such as ‘appearance’, ‘common sense’, ‘empathy’, ‘intellectual humility’, ‘kindness’, and ‘calmness’. They discussed concrete characteristics, such as the cleanliness and hygiene of the expert and more abstract ones, such as a radiance exuding from the expert. These personal qualities cannot be directly linked to the previous categories but many of them are loosely connected to communication and interaction.

For instance, parents indicated that accessibility is an important quality of a vaccine expert by stating that the expert “*should be reachable*” (311: f, 34). One parent emphasised the importance of

accountability, as they expect the expert to “*take responsibility for what they do/say and [they] would be held responsible if the matter turns out to be wrong for example*” (312: m, 36).

Several parents also indicated that it was important for a vaccine expert to be humble and modest: “*The expert cannot be arrogant or seem arrogant [...]*” (65: f, 49). Some of the younger female parents voiced.

the need for the expert to appear as hygienic and clean: “*The cleanliness of [their] appearance, the cleanliness of [their] environment*” (55: f, 34). Another parent had a similar opinion regarding the cleanliness of the expert: “*The outer appearance should be clean, so that it creates an impression of respect towards the listener*” (291: f, 33).

Many parents discussed the importance of honesty and empathy in communicating to the wider audience: “*Honest. One does not think that the audience is stupid and try to talk the matter up*” (256: m, 38). Furthermore, the parents expressed that an expert does not insult and discredit others: “*[The expert] does not insult those who think differently but knows how to properly justify their own information without downplaying others*” (122: f, 33).

Parents also recognised that within the nature of being an expert, there is an embedded notion of having to repeat oneself: “*Patience; even if you have already answered what you think are the same questions, you have to be able to repeat your justified viewpoint.*” (62: f, 49). One parent emphasised that: “*The expert is capable of an empathetic conversation and a calm process of going through things, without needlessly arguing about what the official process is. That is, the expert first tries to understand the client’s situation and only then tells the essential information related to it and does not read direct instructions based on legal provisions from a piece of paper*” – (338: f, 34).

4. Discussion

In this study, we examined what parents of children aged 6 months to 6 years and parents of girls aged from 10 to 14 years thought were important qualities and skills an expert in vaccines should have. This was achieved by analysing parents’ answers to a close-ended and an open-ended question. Parents deemed scientific education and practical experience as important, while appreciating the personal skills of the expert. Furthermore, institutional authority and communication skills were of importance, along with ethics and integrity. We found that there were some statistically significant differences in expert preferences in vaccination intention groups. In terms of influenza, we found that vaccine-accepting parents were more likely to prefer the vaccine expert to represent an authority. In addition, vaccine-accepting and vaccine-refusing parents were more likely to consider communicating clearly as an important characteristic of a vaccine expert, compared to vaccine-hesitant parents. In terms of HPV, vaccine-accepting parents were more likely to consider both ‘representing a university or research organisation’ and ‘representing an authority’ as an important characteristic compared to vaccine-hesitant and refusing parents. Furthermore, having a scientific education was more important to vaccine-accepting and hesitant parents compared to vaccine-refusing parents.

Our findings illustrate that parents think of expertise in vaccines as both internal and external attributes. They expected the expert to both have the knowledge and experience, as well as being respected by the

scientific community. Our findings are in line with previous literature on expertise (e.g. [20,12]). However, our findings also point to the important role of communication and interaction in building trust on experts and expert institutions (e.g. [32,16,17]). Good communication skills and the ability to engage with lay people were highly valued. Although our analysis shows a high level of trust in traditional expert institutions, we managed to catch parents, who were rather doubtful of mainstream experts. Some parents called for the expert to be able to challenge the mainstream views, where others indicated that a vaccine expert was inherently a liar. Thus, integrity and ethical conduct was discussed and valued by both critics and supporters of traditional expert institutions. Previous research on vaccination attitudes in Finland shows that the Finns' trust in science and expert institutions has remained high, and that trust has partly increased during the COVID-19 pandemic (Science [33,30]).

The data collection of our study took place against the backdrop of the COVID-19 pandemic. Leidecker-Sandmann et al. [34] showed that contrary to previous pandemics, the COVID-19 pandemic saw more political actors than scientific experts in the media. In our study, parents recognised the existing relationship between politics and vaccine expertise. The respondents expressed criticism towards politicians by stating that politicians are not experts in vaccines. The pandemic increased the visibility of experts, as they frequented the media and shared the latest scientific developments. In our study, parents mentioned some of these frequenting experts by name as examples of either good or bad vaccine experts. By extension, increased visibility of experts has made expert disagreements more visible to the general public. In our study, parents expressed frustration regarding the current vaccine expertise, exclaiming that "everything has been one big mess so far". Giubilini et al. [19] highlighted how expert disagreement, or the lack of acknowledging it, can undermine trust in vaccination and public health experts – especially because parents cannot assess the true level of expertise the expert claims to have. Parents did however mention the need for the acceptance of the scientific community for the legitimisation of the vaccine expert. Even though only a few parents mentioned the role and responsibility of the media, it is evident that the media plays a role in who parents conceive as an expert, as they decide who will be given a platform.

Potentially due to the pandemic, parents highlighted the importance of a vaccine expert not having any ties to the pharmaceutical industry. Previous research shows that having distrust of the motives behind vaccination is one underlying factor leading to vaccine hesitancy [35]. Nurmi and Harman [36] found that vaccine-refusing Finnish parents criticised the ties between the pharmaceutical industry and health officials. In the same study, 13 % of participants agreed that vaccines are given to children because it is profitable for the pharmaceutical industry [36]. The race to develop a COVID-19 vaccine to avoid morbidity and mortality might have been an important factor enabling the topic of pharmaceutical companies to frequent in public discussion around vaccines.

Although parents participating in our study indicated to trust official information sources, a study by Suarez-Lledo and Alvarez-Galvez identified health misinformation issues on social media and found that 43 % of health misinformation online was about vaccines, and mainly about the HPV vaccine (2021). In our study parents underlined the importance of the expert being up to date. The expert was expected to know what the public is discussing about. Parents highlighted the need for the vaccine expert to be aware of parental concerns by exploring both social media and mainstream media. This idea of prebunking, addressing circulating mis- and disinformation before it has a chance to stick, is hence a valuable tool for a vaccine expert [37,38].

The results of the study show that parents value different expert characteristics, depending on the vaccine and their vaccination intention. However, we cannot draw conclusions regarding causality. The results of the study show that parents expect a vaccine expert to have both intrinsic and extrinsic qualities. Overall, parents did not grant the

expert the status of an authoritarian vaccine expert only due to their qualifications and knowledge, but the expert was also needed to be accessible and actively engage and convince the parent. Furthermore, parents indicated the importance of a vaccine expert to both produce and communicate knowledge. In the Finnish context, it is fair to assume there are many experts who fulfil the parental criteria resulting from our study. The results of this study should encourage experts to own their expertise and portray themselves as experts in their own field.

5. Strengths and limitations

To our knowledge, this is the first study aiming to understand the opinions of parents regarding vaccine-related expertise. To catch the most representative sample of parents, random sampling was employed. Another strength is the study design of first asking parents a close-ended question on expert qualities, and then allowing the parents to describe the characteristics of an expert in their own words. In addition, the mixed-method perspective of the study allowed the further probing of what vaccine expertise looks like to the parents.

While this analysis provides insight into parental views on vaccine expertise, it has several limitations. Although the original sample sizes for the two sub-studies were large, not all invited parents took part in the study. Furthermore, as there was no technical compulsion to answer each survey question, not every participant answered the open-ended question, which led to some missing data. We checked whether there were any differences between parents who answered the open-ended question and those who did not. In terms of influenza, there were no statistically significant differences between the parents who answered the open-ended question and those who did not. In terms of HPV, two factors were statistically significant: level of education and municipality of residence. The participating parents who answered the open-ended question were more likely to be university-educated ($p = 0.036$ and $p = 0.039$, respectively). Furthermore, Espoo (high vaccination coverage) had a disproportionately high proportion of parents answering the open-ended question (44 %) compared to its' share of total participants in the study (30 %), while Oulu (low vaccination coverage) had a lower proportion of parents answering the open-ended question compared to its' total share of participants (28 %). Kuopio (high coverage) showed a similar trend, as the total share of participants from Kuopio was 28 %, but only 19 % answered the open-ended question. This may introduce non-response bias to the study.

Moreover, due to the different lengths of the open-ended answers (ranging from one-word answers to three-sentence answers), we were faced with the limitation of being unable to conduct deeper qualitative analysis, as one would be able to do in the case of interview data. All in all, this is a unique study in the Finnish context, and the results shed light on who parents qualify as an expert in vaccinations.

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CRedit authorship contribution statement

Idil Hussein: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Esa Väliörronen:** Writing – review & editing, Writing – original draft, Funding acquisition, Data curation, Conceptualization. **Hanna Nohynek:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Riikka Lämsä:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis.

Declaration of competing interest

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

Data availability

The authors do not have permission to share data.

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