



A RESEARCH REVIEW™
EDUCATIONAL SERIES

Making Education Easy

2019



Human Papillomavirus Vaccination: Hesitancy and Uptake

About the Reviewers



Helen Petousis-Harris

Dr Helen Petousis-Harris is a Senior Lecturer in the Department of General Practice and Primary Health Care at the University of Auckland and the Director of the Vaccine Datalink and Research Group. She has a PhD in Vaccinology and is particularly interested in factors associated with vaccine safety and reactogenicity, and the performance and safety of vaccines. For the past twenty years Helen has been involved in immunisation-related research in New Zealand including clinical, social science, epidemiological and health systems. She is involved in undergraduate and postgraduate teaching on vaccines and vaccination and immunisation related research.

Helen has a blog primarily devoted to vaccines and vaccination where she often discusses vaccine myths and matters of current interest in vaccinology. She is a member of the WHO Global Advisory Committee on Vaccine Safety (GACVS) and the International Brighton Collaboration Science Board.



Lisbeth Alley

Lisbeth Alley is an immunisation advisor for the Northern Region of Immunisation Advisory Centre (IMAC) which is a nationwide organisation based at the School of Population Health at The University of Auckland. IMAC provides independent, factual information based on international and New Zealand scientific research regarding vaccine-preventable diseases and the benefits and risks of immunisation. IMAC also provide information and training for health professionals, national immunisation coordination and policy advice and research into many aspects of vaccines and vaccine-preventable diseases.

This article provides an overview of human papillomavirus (HPV) vaccination hesitancy in NZ. The impact of vaccination hesitancy is discussed and current HPV vaccination uptake rates are reported. The article considers healthcare provider, parental, and patient vaccination hesitancy in the context of a funded national HPV vaccination programme. Proposed strategies to overcome vaccination hesitancy, with the aim of increasing vaccination uptake rates, are also discussed. This review is sponsored by an educational grant from Seqirus New Zealand.

Background

Human papillomavirus (HPV), which infects epithelial cells and is spread via skin-to-skin contact, is the causative agent for almost all cases of cervical cancer and is responsible for a significant proportion of other anogenital (anal, vaginal, vulvar, and penile) cancers as well as oropharyngeal cancers (**Table 1**).^{1,2} HPV infection is also responsible for the development of genital warts, with genital warts being the most commonly reported sexually-transmitted disease in NZ.³

Type of cancer	Crude incidence rates per 100,00 per year	
	Men	Women
Cervical	-	7.9
Anal	0.6-1.0	0.7-1.7
Vulvar	-	1.0-2.4
Vaginal	-	0.7-1.0
Penile	0.1-0.6	-
Oropharyngeal	3.3	0.7

Table 1. Burden of cervical and other HPV-related cancers in NZ.¹

Because 80% of men and women who are sexually active develop some form of HPV infection during their lifetime, HPV infection can be considered to be an almost inevitable consequence of being a sexually-active adult.² Although most HPV infections are cleared by the body within 18 months without adverse health consequences, clearing an infection does not necessarily lead to immunity and re-infection and co-infection with multiple types are possible.^{3,4} Moreover, even individuals who clear the virus without developing an HPV-related cancer can still pass HPV on to others.⁵ With most sexually-active individuals becoming infected with HPV at some point in their lives, the impact of HPV on cancer rates is considerable (**Table 1**).

Although there are multiple ways to reduce cancer risk due to HPV infection, few interventions are more effective than HPV vaccination.⁵ HPV causes many types of cancer and HPV vaccination can safely and effectively prevent infection with HPV types that cause most of these cancers.

Success of HPV vaccination programmes

The success of a vaccination programme is primarily dependent on having a highly effective vaccine coupled with adequate vaccination uptake.⁶

In settings that have an HPV programme with at least moderate uptake, the vaccine is already proving effective in reducing the incidence of persistent HPV infection, genital warts, and cervical dysplasia.^{3,7} More than 70 countries have included the HPV vaccine on their national vaccination programme.

Where vaccination uptake is high, the health impact is greater as evidenced by data indicating that elimination of genital warts is possible.³ In a meta-analysis of studies that reported the effectiveness of HPV vaccination on infection, anogenital warts, and cervical cancer, the greatest impact of vaccination was seen in countries that achieved high vaccine uptake rates and when vaccination occurred prior to the onset of sexual activity and HPV infection.⁷

The current burden of HPV-related disease in NZ includes approximately 190 new cervical cancer cases diagnosed annually (making it the 12th leading cause of female cancers) and 72 cervical cancer deaths annually (making it the 18th leading cause of female cancer deaths).¹ In addition, oropharyngeal cancers



attributable to HPV are increasing in both men and women, with 95 new cases of oropharyngeal cancer and 25 deaths from oropharyngeal cancer estimated for 2018.

A marked reduction in the prevalence of vaccine-type HPV that is correlated with vaccination coverage in the population provides evidence for the impact of a vaccination programme on HPV infection.³ In countries with high HPV vaccination coverage, such as Australia (estimated coverage rate of 73% for 3 doses in 2014), there has been a dramatic reduction in the number of cases of genital warts. Four years after its national vaccination programme was commenced in 2007, a reduction of up to 92.6% in genital warts cases was observed. Even countries with more modest coverage rates, such as NZ (estimated coverage rate of 56% for 3 doses in 2014), have observed significant reductions in cases of genital warts.³ Between the start of the programme in 2008 and 2015 there was a 61% reduction in the rate of genital warts in NZ.²

Cervical cancer registration rates are already declining and registrations for pre-cancers are considerably higher than registrations for cancer due to the success of the cervical screening programme and treatment of these cases.³ It has been estimated that HPV vaccination has the potential to prevent >2300 cases of cervical cancer and cervical pre-cancer per year based on 2012 cancer registry data.

HPV-related disease remains a source of morbidity and mortality in NZ and a primary role for HPV vaccination in reducing this burden is clearly evident, emphasising the need for an HPV vaccination programme that achieves high population coverage and targets boys and girls before HPV infection occurs.⁷

Vaccination uptake rates

NZ's nationally-funded HPV vaccination programme started on 1st September 2008 and provided vaccination for girls and young women born in 1990 and 1991.⁴ It was extended in 2009 to girls and women born from 1992 onwards and in 2017 to males when the programme was extended to all males and females aged ≤26 years.

Since the national programme was started in 2008, HPV vaccination coverage in NZ has gradually increased from approximately 40% in the 1990 birth cohort to about 68% in the 2004 birth cohort (data as of December 2017, **Figure 1**).⁸ The lowest uptake rate is in European/Others (65%), with Māori (68%), Asian (76%), and Pacific peoples (78%) achieving higher rates.

The aim of the HPV vaccination programme is to achieve herd immunity against HPV at a level that reduces the transmission of HPV infections. Although NZ's HPV vaccine uptake rate is trending upwards and is currently 68% (**Figure 1**), modelling studies suggest that the rate of uptake may need to reach at least 80% for herd immunity to be achieved.^{9,10}

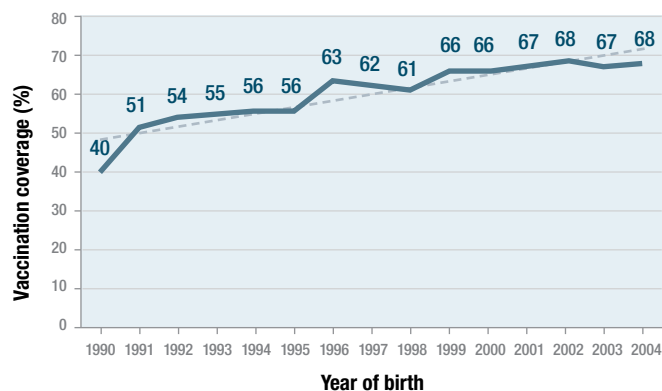


Figure 1. Completed HPV vaccination coverage for females born between 1990 and 2004 (Provisional data).⁸ The HPV vaccination regimen is three doses completed for birth cohorts 1990-2003 and two doses completed for the 2004 birth cohort (on 1st January 2017 the regimen was changed to two doses for individuals aged <15 years, except for those with a high-risk condition).

Vaccination hesitancy

Vaccination hesitancy is a delay in acceptance or refusal of vaccination despite the availability of vaccination services.^{11,12} Vaccination hesitancy impacts directly on vaccination coverage rates.

Parents

In the setting of national vaccination programmes that target adolescent girls and boys, parents are the key decision maker with regard to their child's health and perceive that they should be significantly involved in the decision to have their daughter or son vaccinated against HPV.^{13,14}

Many factors play a role in parental vaccination hesitancy but the key factors associated with HPV vaccination declines are believing their son or daughter is not sexually active or too young to be vaccinated, limited knowledge and understanding of HPV (especially the widespread nature and consequences of HPV infection) and HPV vaccination (especially vaccine safety and that vaccination can benefit male as well as female health), and lack of a healthcare provider HPV vaccination recommendation.^{5,15-17}

Data from a nationally-representative sample of US parents with adolescent children suggest that parental HPV vaccination hesitancy is common.¹⁸ Of the parents surveyed, 28% reported having refused and 8% having delayed getting HPV vaccination for their child. The vaccination beliefs and communication preferences of parents who refused differed from those who delayed. The main difference was that parents who delayed vaccination did so because they needed more information, whereas parents who refused vaccination had specific concerns. Most parents reported that talking to a doctor or reading an information sheet would be helpful in making a decision about HPV vaccination, although these resources were endorsed less often by vaccination refusers (**Figure 2**). Poor or inadequate communication can contribute to increased levels of parental vaccination hesitancy, indicating the need for targeted communication strategies irrespective of the setting.¹¹

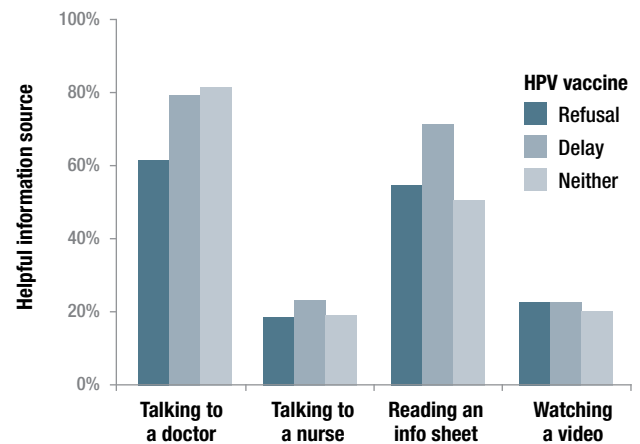


Figure 2. Perceived helpfulness of information sources about HPV vaccination among US parents who refused (n=432), delayed (n=118), or neither refused nor delayed (n=934) HPV vaccination for their child according to an online survey conducted in the US.¹⁸

Healthcare providers

Healthcare providers have an essential role to play in optimising vaccination uptake.⁶ Of the many factors that influence HPV vaccination uptake, the role of healthcare providers is probably the most critical; indeed, a healthcare provider's recommendation is an important predictor of HPV vaccination.¹⁹

However, HPV vaccination hesitancy also exists among healthcare providers.²⁰ For example, in a survey of healthcare providers in Spain, one in four respondents reported having doubts about at least one vaccine in the current recommended childhood vaccination schedule, with there being most doubt about the HPV vaccine (15.5% of respondents).²¹ Similarly, a survey of GPs in France found that



only 83% would recommend HPV vaccination for their patients and even fewer (74%; $p < 0.001$) would recommend HPV vaccination for their own daughters.²² In a US survey, only 76% of healthcare providers reported routinely recommending HPV vaccine for girls (ages 11 to 12 years) and significantly less (46%) did so for boys ($p < 0.001$).¹⁹

The main reasons for HPV vaccination hesitancy among healthcare providers are summarised in **Table 2**. Some of these challenges include time constraints, the prospect of awkward conversations about sexual health, and feeling ill-equipped to address parental vaccination hesitancy.^{5,19-21}

In terms of recommending HPV vaccination to young adolescents, some healthcare providers find it uncomfortable discussing issues of sexual health and behaviour associated with HPV transmission, particularly with younger adolescents, making it less likely that they will strongly recommend HPV vaccination.^{23,24} It is possible that value judgements about HPV vaccination, including values relating to sexual activity, may discourage healthcare providers from routinely recommending the vaccine to young women, hence restricting access to the vaccine.²⁴

Another of the reasons for vaccination hesitancy among healthcare professionals is a lack of understanding of HPV. A recent local study found that, although the overall level of HPV knowledge among NZ healthcare professionals was adequate, significant gaps in knowledge do exist.²⁵ The study authors proposed the need for more provider education to avoid misinformation and stigma being unintended outcomes of conversations between healthcare professionals and the public.

There is also evidence that some physicians consider discussions with parents about adolescent HPV vaccination and sexual health to be burdensome, requiring more time than discussions about other adolescent vaccines and consequently may recommend HPV vaccination less strongly.^{20,26} Indeed, healthcare providers who perceive parents as being opposed to HPV vaccination for their child may be reluctant to recommend the vaccine due to concerns about initiating time-consuming or confrontational discussions.^{5,19}

Reasons for HPV vaccination hesitancy in parents	Reasons for HPV vaccination hesitancy in healthcare providers
<ul style="list-style-type: none"> Lack of an HPV vaccination recommendation from a healthcare provider 	<ul style="list-style-type: none"> Limited understanding of HPV-related diseases, especially in males
<ul style="list-style-type: none"> Concerns about vaccine safety 	<ul style="list-style-type: none"> Concerns about vaccine safety
<ul style="list-style-type: none"> Lack of knowledge about the number and types of cancer that HPV causes 	<ul style="list-style-type: none"> Discomfort talking about sexual behaviour
<ul style="list-style-type: none"> Belief that their child is not sexually active or does not need vaccination 	<ul style="list-style-type: none"> Anticipating parental hesitancy and lack of ability to address hesitancy
<ul style="list-style-type: none"> Lack of information 	<ul style="list-style-type: none"> Lack of time for vaccination discussions

Table 2. Summary of key reasons for HPV vaccination hesitancy in parents of adolescents and healthcare providers.^{5,15-17,19,21,24,25,27}

Overcoming vaccination hesitancy

Vaccination hesitancy is complex, having multiple determinants and involving the beliefs and attitudes of multiple players.^{11,24} Vaccination strategies targeting healthcare providers, parents, and young adolescents that address the main reasons for hesitancy will likely be needed to reduce vaccination hesitancy and increase HPV vaccination uptake.

Healthcare provider recommendation

A convincing HPV vaccination recommendation by a healthcare provider is associated with improved parental vaccination attitudes and acceptance,^{17,28} and does not seem to negatively affect the provider-parent encounter or the parents' trust in the information provided, even among parents who are vaccination hesitant.²⁸ Physicians who take an approach that presupposes a parent will

vaccinate their child or directs a parent to have their child vaccinated is more likely to be successful in ensuring that child is vaccinated against HPV than physicians who take a collaborative approach or merely inform a parent of the availability of the vaccine.^{29,30} For example, a qualitative analysis of US healthcare provider conversations with HPV vaccination-hesitant parents found that, even in discussions with parents who were assertive in their initial hesitancy, providers who were persistent rather than acquiescent in addressing their concerns were successful in getting teenagers vaccinated against HPV.³¹

Examples of healthcare provider-parent conversation messages

Provider: "I know there are stories in the media and online about vaccines, and I can see how that could concern you. However, I want you to know that HPV vaccine has been carefully studied for many years by medical and scientific experts. Based on all of the data, I believe HPV vaccine has a very good safety profile."

Parent: "Could HPV vaccine cause my child to have problems with infertility?"

Provider: "There is no data to suggest that the HPV vaccine will have an effect on future fertility. However, women who develop cervical cancer could require treatment that would limit their ability to have children. Starting the HPV vaccine series today could prevent that from happening and protect your daughter's ability to bear children."

It is possible that healthcare providers may overestimate parental vaccination hesitancy.¹⁶ Having determined via an online survey that many parents who refuse or delay HPV vaccination subsequently have their child vaccinated anyway, a group of US researchers has suggested that healthcare providers who encounter parental hesitancy should persist in offering vaccination recommendations.¹⁸

In addition, a recent Cochrane review of randomised controlled trials found that face-to-face interventions to inform or educate parents about childhood vaccination have the potential to improve parents' vaccination knowledge, parents' intention to vaccinate, and improve children's vaccination status.³²

There is a need to develop tools that support and enable healthcare providers to deal with HPV vaccination hesitancy.¹⁹ Potentially useful tools for counselling hesitant parents include HPV information sheets or brochures, especially those tailored to specific parent concerns or to parents' cultural background.^{19,33} Training on delivering a presumptive vaccination recommendation and to help healthcare providers to address vaccination hesitant parents' questions is likely to be valuable.^{20,33}

In terms of non-parent consultations, having a healthcare provider as a source of factual information and positive vaccination attitudes has been cited as being associated with higher vaccination uptake among teenage girls.³⁴ In an Australian survey, a majority (61%) of unvaccinated adolescent girls and young adult women not yet having received the HPV vaccine reported that a recommendation from a GP would increase their HPV vaccination acceptance.¹³ According to a US study, young adult women and men who received a recommendation from a physician or healthcare provider were >35-times more likely to receive at least one dose of HPV vaccine relative to those who did not receive a recommendation.³⁵

These findings suggest that healthcare providers should make the effort to inform and strongly recommend HPV vaccination to parents and adolescent and young adult patients.

Recall/reminder systems

Substantial evidence exists that parent/patient reminder or recall systems can improve vaccination uptake rates,^{36,37} including for HPV vaccination and especially for vaccine series completion.³⁸⁻⁴¹ The recall-reminder tools typically used have been phone calls, mailed postcards or brochures and letters, and text messages. The results of one study suggest that allowing parents to choose their preferred recall method for HPV vaccination is effective in increasing vaccination series completion rates.⁴⁰



Social media

There now exists the potential for vaccination attitudes to be informed and influenced by online and social media sources,^{42,43} and vaccine hesitancy to be monitored and addressed.^{44,45} Analysis of health-related debates and sentiment expressed on social media may help to direct the targeting and design of strategies to improve health communication and facilitate vaccine uptake.^{43,45}

Examples of using social media to raise awareness and help to increase vaccination uptake include Facebook and Twitter accounts devoted to adolescent health, including HPV infection and vaccination, and a dedicated HPV vaccination web site designed for anyone to access evidence-based information, materials, and FAQs.⁴⁶

Currently, however, there is a lack of systematic and rigorous research examining the effects of social media on HPV-related knowledge, attitudes, and behaviours.⁴⁷ Further research is required to better determine how social media can be utilised to reduce vaccine hesitancy and increase HPV vaccine uptake.

Multi-component strategies

In terms of HPV vaccination strategies, there is increasing evidence that no single intervention is effective in mitigating vaccination hesitancy and facilitating vaccination uptake and that multi-component interventions are more effective (and may even work synergistically), resulting in increased healthcare provider vaccine support, improved parental/patient attitudes toward HPV vaccination, and increased vaccination uptake.^{38,48,49} In particular, healthcare provider education and training that support strong healthcare provider recommendation and parent/patient reminder or recall systems should be the basis of any multicomponent strategy.

For example, a pragmatic trial of a five-component healthcare provider communication training intervention on adolescent HPV vaccination, which was implemented in 16 primary care practices in the US, found that it significantly improved HPV vaccination uptake and completion among adolescent patients.³³ Healthcare providers reported that the communication training and customised patient information fact sheets were the most used and useful intervention components.³³ They considered communication training that taught a presumptive approach to be most beneficial component for introducing the HPV vaccine and motivational interviewing to be the most beneficial component for countering HPV vaccine hesitancy.⁵⁰

School-based vaccination

The most rapid declines in HPV-related outcomes have occurred in countries with school-based vaccine delivery (e.g., the UK, Australia, and NZ), suggesting that this strategy achieves faster introduction and higher vaccination uptake than community-based vaccine programmes.⁵¹ Moreover, higher and more equitable uptake of HPV vaccination is generally achieved with school-based compared with community-based vaccination programmes.^{52,53} Indeed, a retrospective analysis of school-based HPV vaccination in the Auckland region identified high rates of uptake overall (71.5%) with uptake being highest for Pacific (88%) and Māori (78%) sub-populations.⁵⁴

School-based vaccination is also an effective strategy because vaccination targets can be reached directly, there is no need for a healthcare provider's recommendation, and parents are easily contacted for consent. Because written parental consent is required in this setting, reaching disengaged or vaccination hesitant parents is important.²⁴ However, schools are ideal channels for health promotion and education and school-based HPV vaccination supported by school-based HPV education for parents and students can be effective in increasing acceptability of HPV vaccination.^{55,56} HPV vaccine uptake in school-based HPV vaccination can be further increased by sending text message reminders to parents or guardians, as demonstrated in a recent randomised controlled Australian study.⁵⁷

IMMUNISATION ADVISOR COMMENTS – LISBETH ALLEY

The positive impact of preventing infection with cancer-causing types of HPV has been well demonstrated and the evidence for the safety of HPV vaccines is impressive. There is global evidence of a decline in vaccine type HPV infections, cervical pre-cancers, and genital warts in countries that are offering HPV vaccine, and vaccine effectiveness has been demonstrated even with moderate vaccine coverage.

A health provider's skills and confidence around vaccine conversations can have a significant impact on parental confidence and acceptance. A positive recommendation by a trusted health professional has been shown to strongly influence the likelihood of children receiving childhood vaccines, including acceptance of HPV vaccination. Social media plays a significant role in spreading myths and misinformation about HPV vaccines, which can undermine community confidence. Health professionals need to be aware of circulating myths and be able to respond confidently to any concerns encountered on social media.

Health provider strategies that have been shown to be effective at improving HPV vaccine uptake are:

- Actively recommending the vaccine, using motivational interviewing techniques and taking a persistent and presumptive approach to vaccine discussions.
- Using current resources, accessing health professional education and updates around the safety and effectiveness of HPV vaccines to increase knowledge and confidence.
- Ensuring pre-calls and recalls are enabled and actioned using the client's nominated preferred method, e.g. texting/emailing/phoning.
- Addressing vaccine hesitancy by creating a trusting relationship, having an ongoing conversation, and proactively offering accurate, supportive and encouraging information whenever opportunities present.
- If parents/patients initially decline or delay vaccines, continuing to offer all subsequent vaccine events when due, so that they are aware the vaccines continue to be recommended and relevant, and that catch-ups are available.

We need to ensure that parents and young people in NZ are aware of the benefits provided by HPV vaccines and can access the protection they provide. Health professionals have a responsibility to ensure their knowledge around HPV vaccines is up to date so they can confidently recommend HPV vaccine to parents and young people, and to employ strategies to encourage access to, and uptake of HPV vaccines.

ABOUT RESEARCH REVIEW

Research Review is an independent medical publishing organisation producing electronic publications in a wide variety of specialist areas. Research Review publications are intended for New Zealand medical professionals.

Educational Series are a summary of the most important international and local literature which impacts on treatment of a specific medical condition. These Reviews provide information on a disease, current treatment and local /international guidelines. They are intended as an educational tool.

Publications are free to receive for health care professionals, keeping them up to date with their chosen clinical area.

Privacy Policy: Research Review will record your email details on a secure database and will not release them to anyone without your prior approval. Research Review and you have the right to inspect, update or delete your details at any time.

New Zealand Research Review subscribers can claim CPD/CME points for time spent reading our reviews from a wide range of local medical and nursing colleges. Find out more on our [CPD page](#).



EXPERT'S CONCLUDING COMMENTS – HELEN PETOUSIS-HARRIS

Despite the impressive impact on disease HPV vaccines have made, along with the notable safety profile, there has been considerable opposition to the vaccine since its introduction. The HPV vaccines are some of the best vaccines ever developed in terms of form and function, so much so that it might be possible to eliminate cervical cancer. So, why have these remarkable vaccines been plagued by such active obstruction and hesitancy?

The answer is simple or complex, depending how you want to break it down. The simple answer is the money trail. The more complex answer involves the interplay between the opportunities offered by litigious societies, cognitive biases and motivated reasoning, together with the unprecedented penetration of an uncensored social media. The result of all this is a problem of such monumental significance that the World Health Organization signalled vaccine hesitancy as one of the top ten public health challenges for 2019. This issue is up there with climate change, pollution, and pandemic flu. What does this mean for HPV vaccination?

While it might all seem overwhelming, there are ways forward. Some of the countries that have been most affected by HPV vaccine hesitancy have fought their way back. Denmark watched their HPV vaccine coverage dive from 79% in the 2000 birth cohort to 17% in the 2003 cohort. After some research to ascertain knowledge, attitudes, and decision patterns it was found that nearly all parents who doubted whether to vaccinate their daughters had heard stories about the suspected side-effects, primarily through media and online. A campaign (Stop HPV, Stop Cervical Cancer) was launched using a network comprised of medical and patient organisations and support from the WHO Europe. Various media were used, in particular Facebook where most of the debate occurred. The result? By early 2018 uptake had doubled. The lessons from Denmark were shared with other countries in Europe, such as Ireland, who as a result of a similar collaborative campaign, are seeing a rapid return to higher coverage.

These successful approaches drew the collective health organisations, such as nurses, paediatricians, public health, pharmacies, cancer societies ... etc together to provide a loud unified voice about the diseases and the vaccine. Parents were offered and encouraged to seek the facts about the diseases and the vaccines through social media and other channels. The response to these efforts was immediate and positive with dramatic increases in coverage.

The case of HPV vaccine hesitancy illustrates that with a collective effort we can overcome the rising tide of vaccine hesitancy and take control of the communication environment. However, this takes commitment and leadership. Should we wait for a crisis to occur, like Denmark, Japan, Ireland, Columbia and many other countries have experienced, or should we focus on building resilience and trust in our community so that when a vaccine scare hits town we are prepared?

What can you do as an individual healthcare professional or small organisation?

- Have good science-based resources on hand (many sources).
- Be up to date with knowledge and confident.
- Have example stories to discuss.
- Promote the vaccine confidently – cancer prevention and the vaccine are extremely safe.

TAKE-HOME MESSAGES

- HPV vaccination has the potential to substantially reduce rates of HPV-related cancer and the associated disease burden.
- The success of a national HPV vaccination programme is dependent on an effective vaccine achieving high vaccination coverage.
- NZ's HPV coverage rate is 68% (in females) and increasing; vaccination rates may need to be >80% for herd immunity to be achieved.
- Low HPV vaccination uptake is at least partly driven by vaccination hesitancy, especially parental hesitancy.
- HPV vaccination is more likely to occur if it is healthcare provider directed.
- Perceived parental hesitancy and time constraints discourage some healthcare providers from routinely recommending HPV vaccination.
- A strong healthcare provider recommendation and parent/patient reminder or recall systems are key components for increasing HPV vaccination uptake.
- Multicomponent HPV vaccination strategies are likely to be more effective than single-component strategies for increasing HPV vaccination uptake.
- School-based vaccination programmes generally achieve higher and more equitable uptake of HPV vaccination than community-based strategies.

Gardasil Funding

Human papillomavirus (6, 11, 16, 18, 31, 33, 45, 52 and 58) vaccine [HPV] is funded for any of the following:

1. Maximum of two doses for children aged 14 years and under; or
2. Maximum of three doses for patients meeting any of the following criteria:
 1. People aged 15 to 26 years inclusive; or
 2. Either:
 - People aged 9 to 26 years inclusive
 1. Confirmed HIV infection; or
 2. Transplant (including stem cell) patients: or
3. Maximum of four doses for people aged 9 to 26 years inclusive post chemotherapy

<https://www.pharmac.govt.nz/wwwtrs/ScheduleOnline.php?osq=Gardasil>



REFERENCES

1. Bruni L, et al. Human papillomavirus and related diseases in New Zealand. Summary report. 2018. Barcelona, Spain: ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre). Available from: <https://hpvcentre.net/statistics/reports/NZL.pdf?1=1550459372765>
2. Anonymous. Guidelines for the management of genital, anal and throat HPV infection in New Zealand (9th Edition). 2017. Auckland: Sexually Transmitted Infections Education Foundation. Available from: <https://www.hpv.org.nz/application/files/3415/1555/8255/HPV-Guidelines-2017.pdf>
3. Anonymous. Antigen literature review for the New Zealand national immunisation schedule, 2016: Human papillomavirus. 2016. Auckland: Immunisation Advisory Centre. Available from: http://www.immune.org.nz/sites/default/files/publications/HPV%20Acdm%20Rev_2016_reviewedfinal.pdf
4. Anonymous. Human papillomavirus (HPV). Immunisation Handbook 2017 (2nd edn, March 2018). Wellington: New Zealand Ministry of Health. 2017. Available from: <https://www.health.govt.nz/system/files/documents/publications/immshandbook-9-human-papillomavirus-mar18-v3.pdf>
5. Anonymous. Call to action: HPV vaccination as a public health priority. 2014. Bethesda, MD: National Foundation for Infectious Diseases; August 2014. Available from: <http://www.nfid.org/publications/cta/hpv-call-to-action.pdf>
6. Hardt K, et al. Vaccine strategies: Optimising outcomes. *Vaccine*. 2016;34(52):6691-9.
7. Garland SM, et al. Impact and effectiveness of the quadrivalent human papillomavirus vaccine: A systematic review of 10 years of real-world experience. *Clin Infect Dis*. 2016;63(4):519-27.
8. Anonymous. Completed HPV immunisation coverage for individuals born between 1990 and 2005 (Provisional data). Wellington: New Zealand Ministry of Health; 2018.
9. Brisson M, et al. Population-level impact, herd immunity, and elimination after human papillomavirus vaccination: a systematic review and meta-analysis of predictions from transmission-dynamic models. *Lancet Public Health*. 2016;1(1):e8-e17.
10. Malagon T, et al. Human papillomavirus vaccination and the role of herd effects in future cancer control planning: a review. *Expert Rev Vaccines*. 2018;17(5):395-409.
11. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. *Vaccine*. 2015;33(34):4161-4.
12. Tiro J. Reaching and informing: Effective engagement methods to support HPV vaccine uptake (Public health workshop 1: Moving forward with HPV vaccination in HIC). 32nd International Papillomavirus Conference (IPVC 2018); 2-6 October 2018; Sydney, Australia. 2018. IPVC8-0974. Available from: <https://ipvc2018.org/abstract-information/ipvc-2018-submitted-abstracts>. [Date accessed: 04/06/19].
13. Tung IL, et al. Attitudes, knowledge and factors associated with human papillomavirus (HPV) vaccine uptake in adolescent girls and young women in Victoria, Australia. *PLoS One*. 2016;11(8):e0161846.
14. Perez S, et al. Parents' involvement in the human papillomavirus vaccination decision for their sons. *Sex Reprod Healthc*. 2017;14:33-9.
15. Sherman SM, et al. Attitudes towards and knowledge about Human Papillomavirus (HPV) and the HPV vaccination in parents of teenage boys in the UK. *PLoS One*. 2018;13(4):e0195801.
16. Bratic JS, et al. Update on barriers to human papillomavirus vaccination and effective strategies to promote vaccine acceptance. *Curr Opin Pediatr*. 2016;28(3):407-12.
17. Holman DM, et al. Barriers to human papillomavirus vaccination among US adolescents: a systematic review of the literature. *JAMA Pediatr*. 2014;168(1):76-82.
18. Gilkey MB, et al. Parents who refuse or delay HPV vaccine: Differences in vaccination behavior, beliefs, and clinical communication preferences. *Hum Vaccin Immunother*. 2017;13(3):680-6.
19. McRee AL, et al. HPV vaccine hesitancy: findings from a statewide survey of health care providers. *J Pediatr Health Care*. 2014;28(6):541-9.
20. Paterson P, et al. Vaccine hesitancy and healthcare providers. *Vaccine*. 2016;34(52):6700-6.
21. Picchio CA, et al. Knowledge, attitudes and beliefs about vaccination in primary healthcare workers involved in the administration of systematic childhood vaccines, Barcelona, 2016/17. *Euro Surveill*. 2019;24(6).
22. Killian M, et al. Vaccine hesitancy among general practitioners: evaluation and comparison of their immunisation practice for themselves, their patients and their children. *Eur J Clin Microbiol Infect Dis*. 2016;35(11):1837-43.
23. Soon R, et al. A survey of physicians' attitudes and practices about the human papillomavirus (HPV) vaccine in Hawai'i. *Hawaii J Med Public Health*. 2015;74(7):234-41.
24. Ferrer HB, et al. Barriers and facilitators to HPV vaccination of young women in high-income countries: a qualitative systematic review and evidence synthesis. *BMC Public Health*. 2014;14:700.
25. Sherman SM, et al. Knowledge, attitudes and awareness of the human papillomavirus among health professionals in New Zealand. *PLoS One*. 2018;13(12):e0197648.
26. Gilkey MB, et al. Physician communication about adolescent vaccination: How is human papillomavirus vaccine different? *Prev Med*. 2015;77:181-5.
27. Wilson L, et al. Barriers to immunization among newcomers: A systematic review. *Vaccine*. 2018;36(8):1055-62.
28. Dempsey AF, et al. Parent report of provider HPV vaccine communication strategies used during a randomized, controlled trial of a provider communication intervention. *Vaccine*. 2019;37(10):1307-12.
29. Opel DJ, et al. The influence of provider communication behaviors on parental vaccine acceptance and visit experience. *Am J Public Health*. 2015;105(10):1998-2004.
30. Jacobson RM. Making the C.A.S.E. for the human papillomavirus vaccine: how to talk to parents and adolescents. *Minn Med*. 2014;97(2):38-42.
31. Shay LA, et al. Parent-provider communication of HPV vaccine hesitancy. *Pediatrics*. 2018;141(6).
32. Kaufman J, et al. Face-to-face interventions for informing or educating parents about early childhood vaccination. *Cochrane Database Syst Rev*. 2018;5:CD010038.
33. Dempsey AF, et al. Effect of a health care professional communication training intervention on adolescent human papillomavirus vaccination: A cluster randomized clinical trial. *JAMA Pediatr*. 2018;172(5):e180016.
34. Kessels SJ, et al. Factors associated with HPV vaccine uptake in teenage girls: a systematic review. *Vaccine*. 2012;30(24):3546-56.
35. Gerend MA, et al. Predictors of provider recommendation for HPV vaccine among young adult men and women: findings from a cross-sectional survey. *Sex Transm Infect*. 2016;92(2):104-7.
36. Jacobson Vann JC, et al. Patient reminder and recall interventions to improve immunization rates. *Cochrane Database Syst Rev*. 2018;1:CD003941.
37. Jaca A, et al. A systematic review of strategies for reducing missed opportunities for vaccination. *Vaccine*. 2018;36(21):2921-7.
38. Jarrett C, et al. Strategies for addressing vaccine hesitancy - A systematic review. *Vaccine*. 2015;33(34):4180-90.
39. Rand CM, et al. Effectiveness of centralized text message reminders on human papillomavirus immunization coverage for publicly insured adolescents. *J Adolesc Health*. 2015;56(5 Suppl):S17-20.
40. Kempe A, et al. Parental choice of recall method for HPV vaccination: A pragmatic trial. *Pediatrics*. 2016;137(3):e20152857.
41. Henrikson NB, et al. Outreach and Reminders to Improve Human Papillomavirus Vaccination in an Integrated Primary Care System. *Clin Pediatr (Phila)*. 2018;57(13):1523-31.
42. Yaqub O, et al. Attitudes to vaccination: a critical review. *Soc Sci Med*. 2014;112:1-11.
43. Radzikowski J, et al. The measles vaccination narrative in twitter: A quantitative analysis. *JMIR Public Health Surveill*. 2016;2(1):e1.
44. Stahl JP, et al. The impact of the web and social networks on vaccination. New challenges and opportunities offered to fight against vaccine hesitancy. *Med Mal Infect*. 2016;46(3):117-22.
45. Rosselli R, et al. The old and the new: vaccine hesitancy in the era of the Web 2.0. Challenges and opportunities. *J Prev Med Hyg*. 2016;57(1):E47-50.
46. Vorsters A, et al. Overcoming barriers in HPV vaccination and screening programs. *Papillomavirus Res*. 2017;4:45-53.
47. Ortiz RR, et al. A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination. *Hum Vaccin Immunother*. 2019 Feb 19 [Epub ahead of print].
48. Vollrath K, et al. Meaningful methods for increasing human papillomavirus vaccination rates: An integrative literature review. *J Pediatr Health Care*. 2018;32(2):119-32.
49. Holloway GL. Effective HPV vaccination strategies: What does the evidence say? An integrated literature review. *J Pediatr Nurs*. 2019;44:31-41.
50. Lockhart S, et al. Provider and parent perspectives on enhanced communication tools for human papillomavirus vaccine-hesitant parents. *Acad Pediatr*. 2018;18(7):776-82.
51. Drolet M, et al. Population-level impact and herd effects following human papillomavirus vaccination programmes: a systematic review and meta-analysis. *Lancet Infect Dis*. 2015;15(5):565-80.
52. Musto R, et al. Social equity in Human Papillomavirus vaccination: a natural experiment in Calgary Canada. *BMC Public Health*. 2013;13:640.
53. Sinka K, et al. Achieving high and equitable coverage of adolescent HPV vaccine in Scotland. *J Epidemiol Community Health*. 2014;68(1):57-63.
54. Poole T, et al. Human papillomavirus vaccination in Auckland: reducing ethnic and socioeconomic inequities. *Vaccine*. 2012;31(1):84-8.
55. Loke AY, et al. The uptake of human papillomavirus vaccination and its associated factors among adolescents: A systematic review. *J Prim Care Community Health*. 2017;8(4):349-62.
56. Reiter PL, et al. HPV and HPV vaccine education intervention: effects on parents, healthcare staff, and school staff. *Cancer Epidemiol Biomarkers Prev*. 2011;20(11):2354-61.
57. Tull F, et al. Short Message Service Reminders to Parents for Increasing Adolescent Human Papillomavirus Vaccination Rates in a Secondary School Vaccine Program: A Randomized Control Trial. *J Adolesc Health*. 2019 Mar 14 [Epub ahead of print].