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School-based HPV vaccination positively impacts parents' attitudes toward adolescent vaccination

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ABSTRACT

Introduction: This qualitative study aimed to explore parental attitudes, knowledge and decision-making about HPV vaccination for adolescents in the context of a gender-neutral school-based Australian National Immunisation Program (NIP).

Methods: Semi-structured interviews with parents of adolescents eligible for HPV vaccination were undertaken as part of an evaluation of a cluster-randomised controlled trial of a complex intervention in 40 schools (2013–2015). In this qualitative study, we purposively recruited a nested sample of parents from 11 schools across two Australian jurisdictions. Interviews explored parent knowledge and understanding of the HPV vaccine program; HPV vaccination decision-making; their adolescent's knowledge about HPV vaccination; and their adolescent's understanding about HPV vaccination, sexual awareness and behaviour. Transcripts were analysed using inductive and deductive thematic analysis.

Results: Parents' of 22 adolescents had positive attitudes towards the program; the school-based delivery platform was the key driver shaping acceptance of and decision-making about HPV vaccination. They had difficulty recalling, or did not read, HPV vaccination information sent home. Some adolescents were involved in discussions about vaccination, with parents' responsible for ultimate vaccine decision-making. All parents supported in-school education for adolescents about HPV and HPV vaccination. Parents' knowledge about HPV vaccination was limited to cervical cancer and was largely absent regarding vaccination in males.

Abbreviations: HPV, Human papillomavirus; NIP, National Immunisation Program; SBV, School-based vaccination; DST, Decisional Support Tool.

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Conclusions: Parents' positive attitudes towards the NIP and inclusion of the HPV vaccine is central to their vaccine decision-making and acceptance. More intensive communication strategies including school education opportunities are required to improve parents' knowledge of HPV-related disease and to promote vaccine decision-making with adolescents.

1. Introduction

Globally, there is suboptimal uptake of HPV vaccines for eligible adolescents [1]. In countries with gender-neutral HPV vaccination, there are also disparities in uptake by sex of the adolescent, as indicated by lower vaccine coverage for males [1,2]. In Australia, three-dose quadrivalent HPV (4vHPV) vaccine coverage for females (vaccination program commenced from 2007) was 80.2% and for males (vaccination program commenced from 2013) was 75.9% for adolescents turning 15 years in 2017 [3].[2] The two-dose nonavalent HPV (9vHPV) vaccine coverage for adolescents turning 15 years in 2019, was 82.6% in females and 79.9% in males [4].[3] Currently gender-neutral HPV vaccination programs are not universal, given the high costs of the vaccine and global limitations in vaccine supply. In addition, the World Health Organization recommends prioritizing vaccination for females [5]. Given that genital HPV is the most prevalent sexually transmitted infection, with approximately 90% of the population estimated to be infected in their lifetime [6], prophylactic HPV vaccination is most effective if administered to adolescents before sexual debut [7]. Parents and guardians (hereafter referred to as 'parents') play a pivotal role in ensuring vaccine uptake, given that in many countries including Australia, parental consent is required for adolescent vaccination in schools [8]. Parents' knowledge, attitudes and beliefs about vaccines in general, and HPV and HPV vaccination in particular, can influence their decision-making about HPV vaccination for their adolescent [1,9–11]. Key factors influencing parental HPV decision-making include: physician recommendation, government recommendation, parents' perceived benefits of the vaccine for their adolescent, parents' concerns about vaccine safety and for some, worries about sexual risk compensation [1,11–13].

School-based vaccination (SBV) is considered the most effective and efficient means of ensuring high vaccine coverage for adolescents [14–17], especially given the decline in frequency of visits to primary care practitioners in adolescence compared with childhood [18]. In Australia, the school-based immunisation program has strong parental and community support for delivery of adolescent immunisations due to convenience, no cost to families, ease of access, and adolescent peer support on vaccination day [15,19]. Unlike the administration of childhood vaccines, there is generally no direct contact between healthcare providers and parents of adolescent vaccine recipients at the time of consent. Schools distribute parental consent forms and information to students to take home for signing [20]. This limits opportunities for verbal communication regarding vaccine decision-making and provision of information about HPV and its impact on health, also termed HPV vaccine health literacy [21].

Understanding parental attitudes and knowledge about HPV and HPV vaccination for adolescents and their perspectives about logistical barriers in the context of established school-based programs may provide insights into HPV vaccine decision-making and aid in refining vaccine delivery implementation strategies to increase uptake. Here we aimed to explore parental attitudes, knowledge and decision-making about HPV vaccination for adolescents in the context of school-based program delivery.

2. Methods

As part of the process evaluation of a cluster-randomised controlled trial of a complex education and logistical intervention in 40 schools in two Australian jurisdictions (2013–2015), we undertook semi-structured interviews with parents of adolescents eligible for HPV vaccination. This study was undertaken when a three-dose quadrivalent HPV vaccine schedule was in place. The main study (HPV.edu) [20] aimed to examine: 1) student knowledge about HPV vaccination [22]; 2) psycho-social outcomes [23] and 3) vaccination uptake. Intervention schools received an adolescent intervention (education and distraction on the day) [24], a shared decisional support tool (DST) for parents and adolescents, and logistical strategies detailed below. The intervention resulted in large gains in student knowledge in intervention compared to control schools [22].

2.1. Study Intervention

The intervention was designed to promote adolescent knowledge, decision-making involvement and confidence in vaccination, and to reduce vaccination-related anxiety. Logistical strategies were designed to improve vaccination uptake, school vaccination processes and adolescent experience. A DST was sent home with vaccine eligible adolescents at the same time as the vaccination consent form [20]. The development of our intervention was informed by a broad biopsychosocial model including the Health Belief Model, the Theory of Planned Behaviour and Social Cognitive Theory as described in Cooper et. al [24]. These theories allowed for the identification of beliefs about vaccination, underlying health status and previous experiences with vaccine-preventable diseases during resource co-design, development and evaluation phases. In this paper, we employed an ecological framework to understand the psychological, social and organisational levels of influence on parents within an adolescent school vaccination system [25]. Parents were invited to participate in interviews, and we present the findings here.

2.2. Participants and recruitment

The study was conducted in Western Australia (WA) and South Australia (SA) with parents of vaccine eligible adolescents from the nested sample of 11 (5 control; 6 intervention) schools participating in the process evaluation of the main study (HPV.edu).[4] These case study schools were purposively recruited, stratified by government, Catholic, and independent sectors and

[2] Data reported here is from the National HPV Register before data collection changed to the Australian Immunisation Register (AIR) on 9/30/2016.

[3] Data reported here is from the AIR as of 29 February 2020. As documented in the Impact evaluation of Australian national human papillomavirus vaccination program report, cumulative 'HPV vaccine coverage derived from AIR (based on age at 31 December 2019) is broadly consistent with historical data trends from previous coverage estimates derived from the HPV Register' (P.17).

[4] Six intervention and six control groups were recruited from the main study, however in one control school, only observations were conducted not parent interviews due to the school's resource limitations.

geographical location. Schools were provided with study-specific recruitment materials to use at their discretion, and as per their usual communication mechanisms, to invite parental participation in interviews. Purposeful sampling was used to recruit parents of vaccine eligible adolescents who were available and willing to participate in the study. Study promotional materials and interviews were in English language only. Research team members scheduled face-to-face interviews with parents at a mutually convenient time and location.

2.3. Data collection

Members of the research team in each jurisdiction conducted interviews. Interviewers invited parents to respond to questions about their knowledge and understanding of the school-based HPV vaccine program; HPV vaccination decision-making; their adolescent's knowledge about HPV and HPV vaccination; and their adolescent's understanding about HPV vaccination, sexual awareness and behaviour (please see appendix). Parent interviews took place after the time period in which HPV dose two or three had been offered in the school program. To ensure a consistent approach, the first author also participated in some research interviews with parents across jurisdictions. Interviews were digitally recorded, transcribed verbatim, and field notes were taken by researchers involved in the interview. Data collection stopped once data saturation (or data adequacy) was achieved [26,27].

2.4. Data analysis

Participant transcripts were coded in NVivo9. Thematic analysis is a method for identifying, analysing and reporting recurring themes developed from the data [28]. Inductive and deductive approaches were used to generate codes employed across the data set. The first author developed codes with input from the research team and from two research student assistants. The first author participated in and supervised two research students who shared the task of coding the data sentence by sentence across the data set, developing and discussing themes. Conceptual saturation was reached when no new codes were able to be generated [26]. The first author performed an overall analysis to ensure that diverse themes identified from the data set were represented. Thematic analysis was undertaken within the context of an ecological theoretical framework considering different levels of influence [25].

2.5. Ethics and informed consent

We obtained ethical approval from all relevant bodies across research sites. This included the Department of Health WA Human Research Ethics Committee (HREC), Women's and Children's Hospital HREC, and relevant government authorities. Approval for analysis of data was also granted by the University of Sydney, Australia. Parents provided consent for their participation and were invited to review their own transcript at the time of interview.

2.6. Advisory Board

Our study Advisory Board had representatives from the health department and immunisation teams in both study jurisdictions, and the government, Catholic and independent education sectors. The advisory board provided input on all aspects of the study.

3. Results

3.1. Parent demographics

Twenty-two parents participated in interviews across school sectors (19 mothers, 3 fathers). Participants were parents of 21 adolescents (14 females, 7 males) from 14 control and 8 intervention schools.[5] Nineteen parents reported that their adolescent received at least one dose of the three-dose HPV vaccine regime (eight received three HPV vaccine doses, six received two doses, three received one dose), two parents did not know their adolescent's HPV vaccine status, two parents reported that their adolescent had not received the HPV vaccine, and one parent did not provide a response. All doses of HPV vaccine were administered at school except one adolescent who had all doses with a primary care practitioner. Most parents spoke English as their main language at home (n = 19). Seven parents had high school qualifications, four parents had apprenticeship/TAFE qualifications, ten parents had university qualifications, and one parent did not report her education Table 1.

3.2. Key findings

We developed three core themes from this data set: A) Parents' positive attitudes towards the HPV vaccine and the NIP in general (hereafter called "the Program"), B) HPV vaccine inclusion in the Program is central to parents' vaccine decision-making and acceptance, C) Parents' knowledge about HPV and HPV vaccination is limited, especially regarding males. Quotes from parents highlighted below and in tables two to four are illustrative of perceptions, attitudes and experiences of participants in this study.

A. Parents' positive attitudes towards the HPV vaccine and the NIP in general

Parents trusted clinicians, researchers and government regarding vaccine safety and inclusion of well-researched vaccines in the Program, with one parent reporting: *'I know that it would have gone through clinical trials' (PWA015, Intervention).* They highlighted the importance of adolescent peer support on vaccination day within the school-setting:

> *She has got that support of her friends rather than [. . .] getting dragged to the doctor with your mum. (PWA017, Intervention)*

Parents reported that they may be more likely to defer or miss immunisations if they were only administered in traditional clinical settings due to inconvenience. One parent commented, *'most parents work, to take time off at the end of the day it means the parents will lose dollars, they will forget, they will put it off' (PWA005, Control).* They commented on the importance of government subsidisation of vaccines, which made the HPV vaccine more accessible to all adolescents. Parents expressed a strong desire to track their adolescent's vaccine record, and some observed that vaccination consent forms, if couriered by the adolescent, may or may not reach the parent, or designated school vaccination coordinator Table 2.

B. HPV vaccine inclusion in the Program is central to parents' vaccine decision-making and acceptance

The inclusion of the HPV vaccine in the Program is central to parental vaccine decision-making and acceptance, acting as a signal of societal endorsement:

> *I don't need to consciously make that decision. Vaccination programs have been demonstrated over history to be absolutely beneficial. There is no reason that I wouldn't vaccinate her against HPV. Absolutely not. (PWA012, Control)*

[5] Two participants parented the same adolescent; thus, parent observations are made regarding 21 adolescents.

Table 1
Parent information.

Parent code	School Group	Sex of parent	Sex of student	School sector	Adolescent received HPV vaccine[1]	Adolescent HPV doses at time of interview[1]	Parent's country of birth	English main language	Parent's level of education
PWA001	Control	F	F	Catholic	Yes	3	New Zealand	Yes	Postgraduate
PWA002	Control	F	F	Catholic	Yes	2	Australia	Yes	High School
PWA003	Control	M	M	Catholic	Yes	3	New Zealand	Yes	High School
PWA004	Control	F	F	Government	Yes	2	Australia	Yes	High School
PWA005	Control	F	M	Catholic	Yes	1	Australia [2]	Yes	Postgraduate
PWA006	Control	F	F	Catholic	Yes	1	Australia	Yes	High School
PWA007	Control	F	F	Government	Yes	2	UK	Yes	Postgraduate
PWA008	Control	F	M	Government	No	0	USA	Yes	Undergraduate
PWA009[3]	Control	F	F	Government	Yes	3	N/A*	N/A*	N/A*
PWA010[3]	Control	M	F	Government	Yes	3	Indonesia	No	Undergraduate
PWA011	Control	F	F	Government	Don't know	Not Applicable	Iraq	No	Undergraduate
PWA012	Control	F	F	Government	No	0	Australia	Yes	Postgraduate
PWA013	Control	F	F	Government	Yes	2	Mauritius	Yes	High School
PWA014	Intervention	F	M	Government	Yes	Don't know	UK	Yes	High School
PWA015	Intervention	F	M	Government	Yes	3	UK	Yes	Apprenticeship/ TAFE
PWA016	Intervention	F	F	Government	Yes	2	UK	Yes	Apprenticeship/ TAFE
PWA017	Intervention	F	F	Government	Yes	2	Australia	Yes	Apprenticeship/ TAFE
PWA018	Intervention	F	F	Catholic	Yes	Don't know	Australia	Yes	Undergraduate
PWA019	Intervention	F	F	Catholic	Yes	3	Australia	Yes	Apprenticeship/ TAFE
PWA020	Intervention	F	F	Catholic	Yes	3	Australia	Yes	High School
PWA021	Intervention	F	M	Catholic	Yes	3	Australia	Yes	Postgraduate
PSA022	Control	M	M	Government	Yes	1	Australia	Yes	Undergraduate
Total	14 control 8 intervention	19 Female 3 Male	14 Female 7 Male	9 Catholic 13 Government	19 Yes 1 Don't know 2 No	8 Vaccinated 6 2-doses 3 1-dose 2 No doses 2 Don't know 1 Not applicable	10 Australia 4 UK 2 NZ 1 USA 1 Iraq 1 Mauritius 1 Indonesia	19 English 1 Arabic 1 N/A	7 High School 5 Undergraduate 5 Postgraduate 4 Apprenticeship/ TAFE 1 Not reported

[1] Data reported by parent.
[2] Aboriginal or Torres Strait Islander.
[3] Participants PWA009 and PWA010 parent the same child. *N/A = No answer.

Parents reported adolescents trust them to make decisions about vaccination, with some commenting that they discussed vaccination with their adolescent. Parents (primarily mothers) generally made the decision to vaccinate their adolescents alone, or sometimes with a partner. They highlighted the importance of personal experience of HPV infection or of other cancers, and cancer experiences of family or close friends, strongly influencing their decision to offer consent for HPV vaccination for their adolescent: *I don't want her to get HPV or cervical cancer and have scares like I have had' (PWA001, Control).* Parents across study arms had difficulty recalling or did not read HPV vaccination information provided from government sources or the study DST. One parent (PWA008, C), who did not provide consent for her son to be vaccinated, reported that her older daughter had experienced an adverse reaction to the vaccine: however, the parent was a strong supporter of vaccination generally. Another parent (PWA012, C), whose daughter had not been vaccinated, had changed schools and had not yet sought vaccination elsewhere. Some parents suggested that schools host education sessions with parents and adolescents together about vaccination, and that parents could provide vaccination consent at that time Table 3.

C. Parents' knowledge about HPV and HPV vaccination is limited, especially regarding males

Most parents knew that HPV is sexually transmitted, and many understood that HPV can cause cervical cancer. Most parents had limited or no knowledge about other HPV-related diseases or the benefits of HPV vaccination for males. Some surmised that males should be vaccinated because they may transmit the virus:

> *I am not quite sure of [. . .] what it causes in boys – if it causes cancer, but at the end of the day you know you want to stop not only someone from getting it but from somebody who can pass it on. (PWA018, Intervention)*

Parents' decision to vaccinate their adolescents, especially males, was largely a result of inclusion of the HPV vaccine in the Program. For example, one parent reported: *'I know nothing about it. I don't know what it is for. I just know that he had it' (PWA003, Control).* While parents did not appear to have knowledge about the relationship between HPV vaccination and cervical screening, some parents surmised that cervical screening would most likely still be recommended regardless of HPV vaccination status. All parents wanted their adolescents educated about HPV, HPV vaccination and vaccination more broadly, at school before adolescent vaccination commenced. Of note, unlike parents from control schools, some parents of adolescents in intervention schools reported that their adolescents were *'clued up'* about HPV vaccination, and that their adolescent initiated discussion about vaccination with parents at home Table 4.

4. Discussion and recommendations

We found that parents had positive attitudes towards the Program in general and that the school delivery platform was the

Table 2
Snapshot of parents' positive attitudes towards school-based vaccination (SBV).

Trust in clinicians, researchers, and government	*If it is coming from the government and the Health Department [. . .] I don't have any issues with yes to that. That it is all official. (PWA003, Control)*
	I know that it would have gone through clinical trials and that yeah, I think it is a good thing to have him vaccinated. So that was an easy decision to make for me really. (PWA015, Intervention)
Parents liked adolescents receiving peer support on vaccination day	*'. . .[at school] she has got that support of her friends rather than you know at that age, getting dragged to the doctor with your mum. . .' (PWA017, Intervention)* *I think it helps when they are older getting it all done with their peers because you try not to look so frightened in front of all your peers. (PWA018, Intervention)*
Parents found the school-based setting for HPV vaccination administration convenient	*I think the advantages are definitely that it is done in school so you haven't got to make extra appointments[. . .]Having it in school it is all in one place [. . .]you have got a captive audience [. . .]And you know that they have done it. (PWA016, Intervention)*
	I think if it is left to parents—you know most parents work, to take time off at the end of the day it means the parents will lose dollars, they will forget, they will put it off. I am one of them [sic.] people that could do that quite easily if it means earning money for my family. So, I think that if it can be done at schools um, yeah, that you are probably going to get 90% turnaround of actually getting them done. Yeah, I think that is a good idea. (PWA005, Control)
	I just think a lot of parents wouldn't do it if they had to do it off their own bat. [. . .] It is definitely better doing it at school. Everyone is there and they all just go and get it [. . .]. And I think if you did it having to go to the doctor people who consented some of them wouldn't go; it is extra effort isn't it? (PWA003, Control).
	Yeah, I mean the main thing for me is that I think about those vaccinations is the time it takes for someone to pull a kid out of school to take them to appointments it means they are missing education and for me, I would rather him have it there so he is not offsite doing other things. Um, and I just think that more of these services need to go into schools rather than pull them out. (PWA005, Control).
Parents want a record of adolescent vaccinations	*An email or a letter home to say that she is up to date would have been a good idea. Because, sometimes people are asked for immunisation records and you just lose track of what your child has had. (PWA001, Control)*
Vaccination consent forms	*A lot of kids I understand, like my younger son, doesn't bring all the stuff home. But [my older son] is a very organised, responsible boy [. . .]. So, it is still the responsibility of the child to hand that stuff over so that might be a bit of a problem. (PWA005, Control)*

Table 3
HPV vaccine inclusion in the SBV is central to parents' vaccine decision-making and acceptance.

HPV vaccine inclusion in SBIP central to acceptance	*I don't know a huge amount about it. [. . .] I just tick yes . . . and let them go for it. (PWA003, Control)*
Most adolescents trust parents to make best decision. Some parents discuss decision with their adolescent.	*It was my decision. I told her right from an early stage that when she got to Grade 8 that is what she would be doing. (PWA002, C)*
	No, it was just you are going to get it [the HPV vaccine]. (PWA003, Control) *Yeah, he was definitely for this [. . .]– I made a decision about his having the injections and I sort of talked to him through about why that was. He was okay with it, but I still think at his age um, you need to give them a little bit more information about why that is so. (PWA005, Control)*
	I asked him, you know, what he understood about it and why, you know, the reasons why I thought it was being given and he understood, and he was quite happy to go forward with it. (PWA015, Intervention)
Some parents made decision to vaccinate based on personal experience, or experience of family and close friends, of HPV infection or cancer more broadly.	*I had already made that decision prior to getting the information when I first heard what it is about. I have had friends who have the HPV and I know how prevalent it can be and how easy it can be to get. So, I had already made up my mind that once she was at school that she would get whatever was on offer. (PWA018, Intervention)*
	I would have taken her because I don't want her to get HPV or cervical cancer and have scares like I have had. (PWA001, Control)
	I think anything that can have any opportunity to prevent anything I am all for because I have lost you know my mum and dad to cancer. So yeah, I will take whatever I can get to help my kids have a better opportunity with not being predisposed to a lot of health issues. (PWA005, Control)
Parents from intervention schools observed adolescents appeared educated about HPV vaccination, and initiated discussion at home.	*My daughter seems very clued up about it, so she has also discussed it at home [. . .] [she] has mentioned other benefits of the vaccine. (PWA016, Intervention)*

key driver shaping acceptance of and decision-making about HPV vaccination for their adolescent. Parents' trust in advice from health experts who are informed by evidence-based research underpins their acceptance of HPV vaccine safety [29]. The importance of the vaccine was signalled by inclusion in the government subsidised Program (NIP), thereby acting as a behavioural cue prompting parents to vaccinate their adolescent. Our study, undertaken from 2013 after males were included in the Program, showed that parents' knowledge about HPV and HPV vaccination was primarily focused on cervical cancer and prevention. Their knowledge was limited regarding other HPV-related diseases and benefits of the vaccine for males. However, we also discovered that the provision of gender-neutral HPV vaccination signals to parents the

Table 4
Parents' knowledge about HPV and HPV vaccination is limited, especially regarding males.

Many parents knew that HPV is sexually transmitted	*I think it is transmitted through sexual contact. (PWA005, Control)*
Most understood the link to cervical cancer	*I know that in women it can be a sort of [be] a triggering thing that can lead to cervical cancer. (PWA005, Control)*
Limited/no knowledge about HPV vaccination and boys.	*I don't know, I mean, can it -it can lead to diseases in boys, that boys get? (PWA001, Control)*
	Um, and I don't really know how that translates to something for the boys. (PWA005, Control)
	I think at the moment they are developing one [vaccine] for boys too aren't they, a different vaccine. (PWA002, Control)
	I know nothing about it. I don't know what it is for. I just know that he had it. (PWA003, Control)
	I guess that the thing that stands out for me is that I don't really have much of an idea of about what it is all – what the issues are for boys. Is that about warts for them, or something like that? (PWA005, Control)
	It just brought to my attention that I don't have as much information about the prevalence of that for boys. (PWA005, Control)
Parents wanted their adolescents educated about HPV and HPV vaccination at school	*I can't remember if she said they did have a discussion or not. But if they didn't, I feel that would be a valuable thing at the school— perhaps as a prior thing to have that discussion with them. (PWA002, Control)*
	We got the form so in that way you could say it was successful but as I said it comes back to whether the prior information was given. (PWA002, Control)
	I don't think there was any proper education on it. (PWA002, Control). It is a good thing to talk about. We talk about that sort of thing quite a bit, so we have no worries. (PWA003, Control)
Parents suggested different ways of information about HPV vaccination being shared with them.	*I mean you could try offering parents an information evening where parents and children come along and you do something altogether in that respect. (PWA002, Control)*

importance of HPV vaccination for *all* adolescents. Given that trust is a key element of vaccine confidence [30], monitoring parents' trust and attitudes towards HPV vaccination may assist in identifying vaccine safety concerns should they arise.

While there has been important work undertaken on identifying the nuances between individual HPV vaccine decision-making styles amongst parents, enabling key groups to be identified and targeted in communication strategies [9,10,31–33], our study has elucidated that HPV vaccine decision-making for parents is heavily influenced by program inclusion and delivery platforms. An ecological framework is very useful to understand complex systems of influence that go beyond individual behaviours and attitudes to incorporate organisational and public policy contexts. These factors are critical elements shaping parent HPV vaccine decision-making. Effective, timely and accurate communication about HPV vaccination remains a challenge for HPV vaccination programs, regardless of program platform [22,34–36]. While most parents in this study did not read or could not recall the HPV vaccination information sent home, it was of interest that parents with adolescents in intervention schools observed that their adolescent appeared well informed, positive, and initiated discussions about having the vaccine. While studies, including ours, show that adolescents generally trust their parents' HPV decision-making and that adolescents become more involved in vaccination decisions as they mature [37], we found that ultimate HPV decision-making is generally the domain of parents for adolescents aged 12–14 years.

Our study showed that cancer prevention resonates strongly with parent decision-making, which relates to general attitudes to cancer in society as frightening and a common experience. As cervical cancer becomes less common with increased HPV vaccination coverage and cervical screening, experiences of cancer may remain an important driver of HPV vaccine decision-making because of the common experience of cancer generally. Even though this may suggest that we should frame the HPV vaccine as a cancer-prevention vaccine, it does not preclude explaining that the virus is sexually transmitted [22,38,39]. Most parents in this study understood that HPV is sexually transmitted and because they lacked knowledge about the benefits of vaccination for males—a finding consistent with other studies [9,10,33]—some surmised that males should be vaccinated because they may transmit the virus. At the time this study was undertaken, males were new to the Program and messaging to females had dominated. HPV vaccine coverage for males turning 15 years old in 2014 (the first year after their inclusion in the Program) was 62.4% and continued to rise for females at 74.8% [3]. Given that some parents unaware of the risk of HPV in males have been less likely to accept HPV vaccination for their sons, and that requiring more information about HPV vaccination for males has served as a barrier to parent decision-making [33], it may be prudent to implement good communication strategies through existing mechanisms in schools and through health providers.

Schools are ideally positioned to integrate positive public health messages such as educating adolescents about HPV, HPV vaccination, screening, and vaccination more broadly and to implement effective communication strategies about the benefits of HPV vaccination to parents [22]. All parents in this study supported in-school education about HPV and HPV vaccination before adolescents are vaccinated and adolescent involvement in their own healthcare. In-school education about HPV vaccination can assist in the development of adolescents' knowledge and understanding, thus improving their HPV vaccination health literacy [22]. Parents should also be informed that younger adolescents achieve a better immune response to vaccination, are more likely to be HPV naïve, and that completion of HPV vaccination can be undertaken without needing to restart the course regardless of the length of time since the previous dose [36,40]. Parents may also benefit from instruction on how to access their adolescent's vaccination records in a consumer friendly way, which alongside other strategies [35,41–43], may assist with HPV vaccine initiation and completion.

Australia has a long record of delivering vaccines through a school-based platform, resulting in rapid decline in vaccine preventable diseases and uptake consistently higher in adolescents than other strategies [17,44]. The transformation of the school-setting into a temporary clinical space for vaccination has some organisational challenges, such as consent form non-return, catch-up doses resulting from student absenteeism, effective communication to parents and adolescents, and managing student anxiety [4,22,34,35,43]. However, this public health intervention has

the benefit of assembling institutional practices and social norms inherent in healthcare settings with those in educational settings. Parents were cognisant of the social norms inherent in the school-setting, in which descriptive norms (behaviour of relevant others by example) and injunctive norms (how important others influence behaviour through informal reinforcement) are already firmly established, and therefore impact the administration of vaccination and adolescent behaviour [45]. Subjective norms (the extent to which people important to the adolescent want them to be vaccinated), which correspond to injunctive norms have also been correlated with intention to vaccinate and associated with vaccination behaviour [45]. Parents recognised the benefits of adolescent peer support on vaccination day, a mode of care enabled through the school-setting without visiting a doctor (often associated with a specific health need or illness) suited to the majority of adolescents at their developmental stage. Time-poor parents benefit from the convenience of having their adolescent's preventative healthcare needs met in the very place where the young person is generally mandated to receive their education. School-based programs also assist in addressing inequity of access to HPV vaccination for marginalised adolescents and there is continued focus on identifying implementation strategies to further reduce these gaps [17,35,46–49].

5. Limitations

Parents who responded to the study invitation to take part in an interview may have been more likely to be interested in vaccination and research. The length of time between parents receiving the DST/standard information and the interview, which took place either after HPV dose two or three meant that parents experienced difficulty recalling reading materials. The majority of parents reported not reading materials sent home with consent forms. Due to limited resources, study promotional materials were not translated into other languages. Further research with parents from culturally and linguistically diverse communities would be valuable to understand parental attitudes, knowledge and decision-making about HPV vaccination for adolescents in the context of school-based program delivery. Three male parents from the control group were available to participate in interviews, making it difficult to draw comparisons between male and female parents' attitudes, perceptions and experiences. Further research with male parents of HPV vaccine eligible adolescents involved in the SBV Program may be of value to better understand the role of fathers in HPV vaccination decision-making for their adolescent. Due to the small numbers of parents in the intervention group, identifying differences and drawing conclusions about differences between control and intervention groups is not possible. A larger sample across both groups would be required.

6. Conclusions

Parents' positive attitudes towards the Program and inclusion of the HPV vaccine in the national vaccine schedule (NIP) is central to parents' vaccine decision-making and acceptance. Decision-making for most parents appears to be heavily influenced by SBV and a fully funded Program, alongside trust in health experts and government. Implementing an accessible and convenient HPV vaccination program with good processes and social reinforcements contributes to program resilience, which may help assuage a vaccine safety scare. While it is important to attend to the smaller percentage of parents who are HPV vaccine hesitant, it is critical that we understand parental experiences of school-based vaccination so that we can identify successful strategies and understand barriers to implementation of adolescent vaccine programs. More intensive communication strategies, including the use of already existing communication mechanisms and parent engagement strategies in schools, are likely to yield the most impact in improving parents' HPV vaccine knowledge, consent form completion regardless of decision, and to promote vaccine decision-making with adolescents. Informing parents about the benefits of vaccination for adolescents may assist in addressing limited health literacy about HPV-related disease and may impact parents' understanding of the importance of HPV vaccination of males. Monitoring parents' attitudes towards HPV vaccination may assist in identifying any vaccine concerns to mitigate any reduction in vaccination uptake, particularly as misinformation about HPV vaccine is regularly promoted.

Declaration of Competing Interest

SRS's institution received funding from Seqirus and Merck for her contribution to educational activities for the general public and professionals. HM is an investigator on clinical vaccine trials sponsored by Industry. Her institution receives funding from GSK, Pfizer and Sanofi-Pasteur for Investigator led studies. She does not receive any personal payments from Industry. TS has received a consultancy services fee from GSK Biologicals for review of a new simplified informed consent form. She has received travel support to attend investigator meetings conducted by GSK Biologicals, Novavax Inc., Janssen Cilag Pty Ltd and Merck Sharp & Dohme. She has been an investigator on clinical vaccine trials sponsored by Industry (GSK Biologicals, Novavax, Merck Sharpe & Dohme, Janssen Cilag Pty Ltd, MedImmune, Pfizer) for which her institution received funding. GZ has received honoraria from Sanofi Pasteur for work on the Adolescent Immunization Initiative and honoraria and travel support from Merck for consultations on HPV vaccination. GZ has received research funding from Merck, administered by his institution, related to HPV vaccination.

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Authorship

All authors attest that they meet the ICMJE criteria for authorship. SRS, CD, KMc, JB, JL, MK, HM, TS and the HPV.edu Study Group designed the study and developed the study protocol. TS and HSM led the study in their respective jurisdictions. CD designed the

interview guide with input from SRS and the HPV.edu Study Group. HH, AP and CD interviewed the study participants. CD conducted the data analyses and drafted the manuscript, to which all authors subsequently reviewed and contributed. All authors: CD, TS, HH, AP, MK, KMa, JL, KMc, GZ, JB, HSM, SRS approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Trial registration

Australian and New Zealand Clinical Trials Registry [ACTRN12614000404628], 14.04.2014.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2021.05.051.

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