

An evaluation of Human Papillomavirus vaccination resources available to Aboriginal and Torres Strait Islander adolescents and parents and caregivers in Australia

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ABSTRACT

Objectives: This study aimed to assess the availability, understandability, actionability, readability and cultural relevance of HPV vaccination resources available online for Aboriginal and Torres Strait Islander adolescents and parents/caregivers.

Methods: HPV vaccination resources were collected via Google and website searches. Resources were assessed for readability, understandability, actionability, and cultural relevance.

Results: We found eight resources, most of which were easy to read, understandable and actionable. While several resources met some criteria for cultural relevance, many lacked reporting on consultation and leadership and did not have a specific Aboriginal and Torres Strait Islander contact for further support. Three of four reported up-to-date information about the HPV vaccine schedule. On balance, a short video performed best across all assessment items.

Conclusions: The evaluation highlights the need for HPV vaccination resources that are culturally safe, accurate, and easy for a consumer to understand and act upon.

Practice implications: Further work is required to ensure that resources are developed in partnership with Aboriginal and Torres Strait Islander communities, are sustainable and can be rapidly updated to align with evolving policies. This will support Aboriginal and Torres Strait Islander adolescents and parents/caregivers to make informed decisions about HPV vaccination.

1. Introduction

While Australia has one of the lowest cervical cancer incidence rates worldwide, Aboriginal and Torres Strait Islander people with a cervix in

Australia experience higher incidence, hospitalisation and mortality rates, and lower survival rates from cervical cancer [1,2]. Cervical cancer is a preventable disease and, as such, these disparities in outcomes reflect inequities in the healthcare system [3], and an ongoing

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cycle of colonisation and racism in Australia's healthcare systems [4,5].

Almost all cases of cervical cancer are caused by persistent infection with human papillomavirus (HPV); fortunately, vaccination against HPV is available. In Australia, HPV vaccination is routinely delivered to adolescents through a school-based immunisation program (SBIP). The HPV vaccine was added to the SBIP in 2007 with a three-dose quadrivalent vaccine [6] delivered to girls aged 12–13 years old, with boys included in the program in 2013. In 2018, the nonavalent HPV vaccine was implemented in two doses for adolescents aged 12–14. [6] In February 2023, a one-dose schedule of the nonavalent HPV vaccine was implemented [6,7] as per the advice from the Australian Technical Advisory Group on Immunisation (ATAGI) and the World Health Organization (WHO) Strategic Advisory Group of Experts (SAGE) [7]. Prophylactic HPV vaccines in a one-dose schedule have previously been shown to be effective in preventing cervical pre-cancer in Australia [8].

Australia's National Strategy for the Elimination of Cervical Cancer [3] has a target of 90 % of eligible people to be vaccinated against HPV, with the objective of optimising the delivery of school-based HPV immunisation programs in all jurisdictions. Nationally, HPV vaccination course initiation is already quite high, although falling since the interruption to immunisation programs during the COVID-19 pandemic period. In 2023, 81 % and 75 % of Aboriginal and Torres Strait Islander girls and boys, respectively, initiated the HPV vaccine schedule, compared to 84 % and 82 % of non-Indigenous girls and boys, respectively [9]. However, these statistics mask significant variation within states, territories, geographical regions, school characteristics and within populations [10]. Some barriers to HPV vaccination among Indigenous peoples globally include colonial legacies of mistrust toward governments, vaccine safety concerns, and complex consent procedures [11]. In Australia, it is possible that a trend of declining school attendance may also play a role in uptake of HPV vaccination delivered as a school-based immunisation [12]. Some enablers to HPV vaccination include equity-focused systems and processes, community involvement in decision-making, and a recommendation to vaccinate from trusted health care providers [11]. Further sustained efforts are required to reach the 90 % threshold among all groups of adolescents in Australia. Among these efforts must be a focus on improving HPV vaccination health literacy through information and resources to support informed decision-making within Aboriginal and Torres Strait Islander communities. [3]

Health literacy refers to an individual's capacity to understand health information and to engage in the health care system in order to make informed decisions about their health [13]. Health literacy is fundamental to managing good health [13], but can be overwhelming given the amount of health information available online with varying degrees of validity and usefulness [14]. Aboriginal and Torres Strait Islander people's health literacy must be understood in the context of colonisation and racism that is embedded in the health care system [5, 15], often leading to fear and mistrust of the medical system [15,16]. To increase participation in the HPV vaccination program, there is a need to improve the availability and accessibility of trustworthy and culturally appropriate cancer resources for Aboriginal and Torres Strait Islander people [17]. A global systematic review focusing on Indigenous people's views of HPV vaccination found that Indigenous communities commonly expressed a need to better understand the virus and vaccination to support education, decision-making, and informed choice. Many Indigenous communities expressed a need for culturally appropriate awareness and education programs [11]. Another systematic review of qualitative research found that a lack of knowledge or incorrect beliefs about the HPV vaccine among Indigenous communities created barriers to consenting to the vaccine [18]. A survey of South Australian Aboriginal and Torres Strait Islander adults identified a need for increased knowledge and awareness of HPV, its link to cancers and HPV vaccination. [19]

Beyond the availability of culturally appropriate information about the vaccine, it is critical that the information about the vaccine is

Table 1

Search terms.

Google search phrases	Targeted website search terms
HPV vaccine Aboriginal and Torres Strait Islanders	HPV
HPV vaccine for our mob	HPV vaccine
Human papillomavirus vaccine First Nations Australia	human papillomavirus vaccine
HPV vaccine Australia information	Gardasil
Human papillomavirus vaccine adolescents Australia	genital warts
Gardasil vaccine school Australia	First Nations HPV
Genital warts vaccine Australia	Aboriginal and Torres Strait Islander Peoples HPV
Cervical cancer immunisation Australia	
Cervical cancer jab school Australia	
HPV vaccination teens Australia information	
HPV vaccine safety teenagers Australia	

readable. A systematic scoping review of HPV vaccination and cervical cancer found that readability assessments were scarce [20]. The readability level of most information on HPV vaccination and cervical cancer-related information was higher than year eight level. Furthermore, no Australian articles nor articles that focused on the needs of Aboriginal and Torres Strait Islander communities were found in this review.

The aim of this study was to assess the availability, understandability, actionability, readability and cultural relevance of HPV vaccination information and educational resources available online for Aboriginal and Torres Strait Islander adolescents and parents/caregivers. This resource evaluation was planned as part of the research activities for the Yarning about HPV vaccination project [21].

2. Methods

2.1. Data collection

Resources were collected from a series of Google searches and targeted searches of known relevant websites. To ensure that search history and existing user preferences did not impact search results, the searches were conducted in a private browser and with a cleared history, cache and cookies. Searches were initially conducted in December 2021 and updated in March 2024. Resources that were no longer available online at the time of the updated search were included in the assessment to inform future resource development.

The Google searches were designed to replicate how adolescents and parents/guardians might search for information. Several phrases were searched (Table 1) and results from the first three search engine result pages were collected and examined for inclusion. Targeted websites that maintained vaccine-relevant online patient education and information were also searched. These included websites maintained by the Australian Government Department of Health, State and Territory Health Departments, primary health networks, and peak bodies pertaining to Aboriginal and Torres Strait Islander health, cancer, immunisation, sexual and reproductive health, and general practice. Each targeted website was searched for keywords (Table 1) using Google's site search function. The first 30 results of each search were examined for inclusion.

2.2. Eligibility criteria and screening

We collected resources that were easily and conveniently accessible to Aboriginal and Torres Strait Islander adolescent and parents and hosted by credible and trustworthy resources (e.g., government, community-controlled and not-for-profit organisations), as per previous research [22,23]. Resources were included if they were in English; freely available to the public; accessible online; intended for Australian

Table 2
Flesch Reading Ease Scores and interpretation.

FRE Score	Interpretation
91–100	Very easy
81–90	Easy
71–80	Fairly Easy
61–70	Standard
51–60	Fairly Difficult
31–50	Difficult
00–30	Very difficult

Aboriginal and Torres Strait Islander audiences; targeted adolescents and/or parents/caregivers; and focussed on information about HPV vaccination via school-based immunisation programs. We excluded resources in the forms of books, podcasts, news articles, media releases, journal articles, policy and/or strategy documents, position statements, as these formats are generally less likely to target parents and adolescents as an audience for health education and as per previous research [24]. Social media posts were also excluded, as per previous research, [22–24] as they were beyond the scope of this audit and less likely to be posted by credible sources. Sponsored results and advertisements were not included, unless they also appeared in the search results. Duplicates were excluded. No time limit was applied. Resources were screened for eligibility independently by at least two researchers, with any discrepancies resolved by consensus.

2.3. Data extraction and assessment measures

For each included resource, information regarding the date of publication, authors, type of resource, and organisation name and type was extracted. Resources were assessed for: 1) *readability* using the Flesch Reading Ease (FRE) [25], and Simplified Measure of Gobbledygook (SMOG) tools; 2) *understandability* and *actionability* using the Patient Education Materials Assessment Tool (PEMAT) [26], and 3) *cultural relevance* using seven criteria developed by Diaz et al. [23]. The FRE, SMOG, and PEMAT tools have been validated in the context of online health information [27]. We also assessed whether resources reported up-to-date vaccination schedule information, following the change from a two-dose schedule to a one-dose schedule in Australia in February 2023.

2.3.1. Readability

Readability was assessed using the FRE [25] and SMOG tools [28]. The FRE uses sentence length and number of syllables per word to generate a score between 0 and 100, where higher values indicate greater readability (Table 2) [25]. SMOG estimates the number of years of education, in United States grade levels, required to understand a text based on the number of polysyllabic words in the resource. For example, a score of 5 indicates the reader needs to be in grade 5 or higher to understand the text. In Australia, a Grade 8 reading level is generally recommended for health information [29]. For this study, Grade 7 or lower was used to ensure understandability amongst the adolescents aged 12–13, the age at which the HPV vaccine is delivered in the school based program [6]. FRE and SMOG scores were obtained by copying written text into an online readability calculator [30].

Table 3
Cultural relevance assessment developed by Diaz et al. [23].

1. Does the resource include visual aids (photographs, animations, infographics, and charts) that depict or contain information about Aboriginal and Torres Strait Islander people?
2. Does the resource include data about Aboriginal and Torres Strait Islander people?
3. Does the resource include Aboriginal and Torres Strait Islander design/artwork?
4. Does the resource provide evidence of leadership, involvement, and/or governance by Aboriginal and Torres Strait Islander people, communities, and/or organizations?
5. Is the resource available in Aboriginal and Torres Strait Islander languages or is there a translation service available?
6. Is the language used strengths-based and respectful to Aboriginal and Torres Strait Islander people?
7. Does the resource include a contact (phone number, e-mail, and website) for further support and information specifically for Aboriginal and Torres Strait Islander people?

2.3.2. Understandability and actionability

The PEMAT for written materials and the PEMAT for audio/visual materials (PEMAT-A/V) were used to assess resources in the domains of understandability and actionability [26]. Understandability (17 or 13 items for print or audio/visual materials, respectively) relates to whether consumers can comprehend the information in the resource. Topics include content, word choice and style, use of numbers, organization, layout and design, and use of visual aids. Actionability (7 or 4 items for print or audio/visual materials, respectively) relates to whether consumers can easily identify what they can do in response to the information and covers topics such as whether there are actions described that a consumer could take, the inclusion of instructions, and the inclusion of tools to help consumers take actions. For each item, resources were given a score of 0 - 'disagree', 1 - 'agree', or Not Applicable. Understandability and actionability scores were generated by calculating the percentage of total possible points scored, excluding any items scored as not applicable [31]. A score of 70 % or higher indicated an understandable or actionable resource. Two assessors (CS and TB) independently assessed all resources using PEMAT and came to consensus on the application of scoring, with any conflicts resolved through discussion.

2.3.3. Cultural relevance

No validated tool to assess the cultural relevance of health promotion resources for Aboriginal and Torres Strait Islander people currently exists. However, a 7-item tool [23] (Table 3) was developed under the guidance of Aboriginal and Torres Strait Islander people and has been implemented in similar health promotion resource audits [23,32]. TB and AMD, both Aboriginal and Torres Strait Islander women, assessed the resources against the criteria independently, compared assessments and came to a consensus decision on any criterion where their initial assessment conflicted. Assessments were 0 – not met or relevant information not available, or 1 – criteria met. The number of criteria met were summed to provide a cultural relevance total out of a possible 7.

3. Results

A total of eight resources were eligible for assessment (Table 4). There were three brochures, two comics, one poster, one video and one webpage. Three of the resources included up-to-date information regarding the one-dose schedule and one included information about the outdated two-dose schedule. The remaining four resources were no longer available online at the time the search was updated so the vaccine schedule information was not assessed.

3.1. Readability

Readability was assessed for seven of the eight resources (one resource was a video and not eligible for readability assessment). The mean FRE score was 72 and the median was 71; both considered 'fairly easy'. All resources had SMOG reading levels of eighth grade or below, with seven of the eight resources requiring Grade 7 reading level or below. The two comics targeting adolescents [36,37] scored highest on readability, achieving FRE scores of 88 and 87 respectively, considered 'easy', and SMOG scores of 4.62 and 4.94 respectively, well below Grade 7 reading level.

Table 4
Resource characteristics and assessment.

No.	Resource	Source	Type of Resource	FRE	SMOG	PEMAT: Understandability %	PEMAT: Actionability %	Vaccination schedule*
1	HPV vaccine - brochure for Aboriginal and Torres Strait Islander Peoples (2018) [33]	Australian Government Department of Health	Brochure	Fairly Easy	Grade 5	92 [#]	80 [#]	Resource no longer available
2	Help Keep Our Mob HPV free (2020) [34]	Cancer Council Victoria	Brochure	Standard	7	88 [#]	80 [#]	One dose
3	Help Keep Our Mob HPV Free (2020) [35]	Cancer Council Victoria	Poster	Fairly Easy	5	85 [#]	80 [#]	One dose
4	HPV vaccination comic for young men: HPV and Me, My Health, My Future (2013) [36]	Australian Government Department of Health, Immunise Australia Program	Comic	Easy	5	53	40	Resource no longer available
5	HPV vaccination comic for young women: HPV and Me, My Health, My Future (2013) [37]	Australian Government Department of Health, Immunise Australia Program	Comic	Easy	5	53	40	Resource no longer available
6	HPV Brochure for Aboriginal and Torres Strait Islander Parents (2013) [38]	Australian Government Department of Health, Immunise Australia Program	Brochure	Fairly Easy	7	88 [#]	60	Resource no longer available
7	The HPV vaccine for Aboriginal and Torres Strait Islander children (2023) [39]	Australian Government Department of Health and National Immunisation Program	Video	NA	NA	91 [#]	100 [#]	One dose
8	HPV (2022) [40]	Our Mob and Cancer website, Cancer Australia	Webpage	Fairly Difficult	8	77 [#]	60	Two doses

Note: FRE: Flesch Reading Ease; SMOG: Simplified Measure of Gobbledygook; HPV: human papillomavirus; PEMAT: Patient Education Materials Assessment Tool

indicates this resource met or surpassed the 70 % PEMAT threshold for a resource to be sufficiently understandable or actionable

*assessed if the resource was available online in March 2024

3.2. Understandability and actionability

Six of the eight resources scored higher than 70 % in the understandability criteria of the PEMAT assessment. The mean understandability score was 78.4 % and median was 86.5 %. The resource with the highest understandability score (92 %) was the HPV vaccine brochure for Aboriginal and Torres Strait Islander Peoples [33] (Fig. 1), closely followed by the video (91 %) [39] (Fig. 2). The two comic book resources scored the lowest understandability PEMAT score, each scoring 53 % [36,37]. The resources performed poorly in the use of visual aids domain (see Supplementary table 1).

In the actionability domain, four resources scored higher than the 70 % threshold. The mean score was 68 % and median score of 68 %. The video [39] scored highest at 100 %, with The Cancer Council Victoria brochure and poster and the Australian Government Department of Health brochure following, each with scores of 80 %. All resources identified at least one action the user could take, but were lacking in tangible tools to help a person take the action and the use of visual aids to assist a person to act. (see Supplementary table 1)

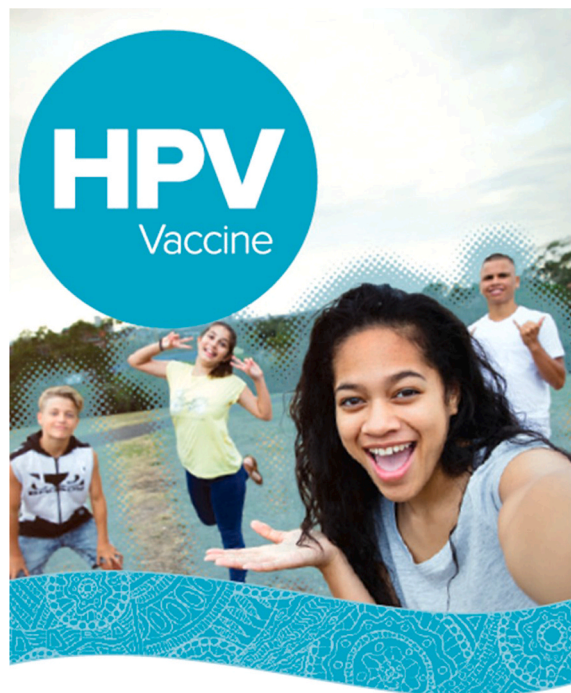
3.3. Cultural relevance

Results of the cultural relevance assessment are presented in Table 5. The resources with the highest cultural relevance totals (total of 5 out of a possible 7) were the comics for adolescents [36,37] (Fig. 3) and the Our Mob and Cancer website [40]. All the resources met the criteria for including Aboriginal and Torres Strait Islander artwork or design elements and using respectful, strengths-based language. Most included visual aids and data relevant to Aboriginal and Torres Strait Islander peoples. Only one resource, the Our Mob and Cancer website, clearly described Aboriginal and Torres Strait Islander leadership in the development of the resource or provided an Aboriginal and Torres Strait Islander-specific contact for further information. Aboriginal and Torres Strait Islander people contributed to the development of the website content and creation, and there were links to further culturally relevant information about cancer and immunisation provided. Most resources included data or content specific to Aboriginal and Torres Strait Islander people in the resource. At the time of their publication in 2013, two of the resources had been translated into multiple Aboriginal and Torres Strait Islander languages: however, these translated versions were not available online at the time of assessment.

4. Discussion and conclusion

4.1. Discussion

This study assessed the availability, actionability, understandability, readability and cultural relevance of online HPV vaccination information and educational resources for Aboriginal and Torres Strait Islander adolescents and parents/caregivers. A total of eight HPV vaccination resources were found, of which most (available in March 2024) were aligned with the current vaccination schedule. In general, most resources were rated as easy to read, understandable and actionable. This is an important outcome considering the potential harm caused by misleading or confusing health information, including deficit-based language. The vast majority were of a “standard” or below reading level, faring better on readability than other studies [20] and at an age appropriate reading level for 12–13 year olds. On balance, the video [39] was the “best” currently available resource, scoring highly on understandability (91 %), actionability (100 %) and performing moderately well on the cultural relevance tool (4 of 7 criteria met) and provided current vaccine schedule information. A reading assessment was not conducted as it was audio-visual material, however a video may increase accessibility of the material to people with a diverse range of literacy levels. Although not assessed in this audit, the visual format of the video and comics may be preferable in some Aboriginal and Torres



Let's keep our kids HPV free

Getting the human papillomavirus (HPV) vaccine in school helps protect our kids from a range of cancers and diseases

health.gov.au/immunisation



The HPV vaccine protects

You can prevent HPV related cancers and diseases by making sure your kids get the HPV vaccine.

HPV is short for human papillomavirus, a very common virus that can cause cervical, vulval, vaginal, penile and anal cancer as well as some cancers of the mouth and throat.

The HPV vaccine protects against HPV related cancers. It also protects against almost all cases of genital warts.

The HPV vaccine is safe

HPV vaccines have been offered in Australia since 2007 and are proven to be very safe. The most common reactions from the HPV vaccine are mild and are like those of other vaccines. If you are concerned speak to your doctor, nurse, or health care worker.

Getting vaccinated

The HPV vaccine is provided free in schools for kids aged approximately 12–13 years. It's two shots six months apart.

Your child's best protection is making sure they are vaccinated before they are exposed to an infection.

How can I find out if my child is immunised?

The Australian Immunisation Register keeps a record of vaccinations given in Australia.

Immunisation history statements can be accessed at any time by using your Medicare online account through myGov (my.gov.au).

How can I prepare my child for vaccination?

- ✓ Talk to your child about the vaccine
- ✓ Complete and return the consent form provided by your child's school
- ✓ On the day:
 - give them a good breakfast
 - make sure they wear a loose shirt
 - check that they are feeling well
 - make sure they let the teacher or nurse know if they are feeling nervous and they will help support your child.
- ✓ Talk to your doctor, nurse, or health care worker if you need more information.
- ✓ Visit our website: www.health.gov.au/immunisation

Fig. 1. HPV vaccine - brochure for Aboriginal and Torres Strait Islander Peoples [33].

Strait Islander communities where verbal and visual styles of communication and education are often preferred over written formats.

The comic resources [36,37] were rated the highest on the cultural relevance tool but were found to be the least understandable and actionable. The sequencing of the comics and large amount of text spread over several pages reduced the ease of understanding the key messages and, in some instances, the accompanying cartoon images distracted from, rather than reinforced, the key health messages. Our evaluation clearly highlights the need for resources that are *both* culturally safe and easy for a consumer to understand and take further action.

Information and resources play an important role in health decisions, ensuring that individuals and their carers are informed about their health choices and are empowered to take action. Resources for HPV vaccination should support parents to make informed decisions regarding their adolescent's vaccination and encourage communication with their child, while also providing information to the adolescent about the HPV vaccine. The cultural relevance, and hence

appropriateness, is particularly important to ensure relevance to Aboriginal and Torres Strait Islander adolescents. Our evaluation of resources found that, while the resources often appeared relevant to Aboriginal and Torres Strait Islander audiences through the use of artwork, design elements or visual aids, it was unclear if the resources had been developed in partnership with Aboriginal and Torres Strait Islander leadership. The use of Aboriginal and Torres Strait Islander artwork and design in resources without the essential consultation, input, and support of Aboriginal and Torres Strait Islander people in its use and implementation runs the risk of appearing tokenistic and inauthentic. The lack of evidence of Aboriginal and Torres Strait Islander involvement, culturally-specific contact information for further support, and the lack of resources available in multiple languages is similar to previous studies using this tool (21, 28) Ultimately, resources can only be effective if they are culturally relevant and appropriate.

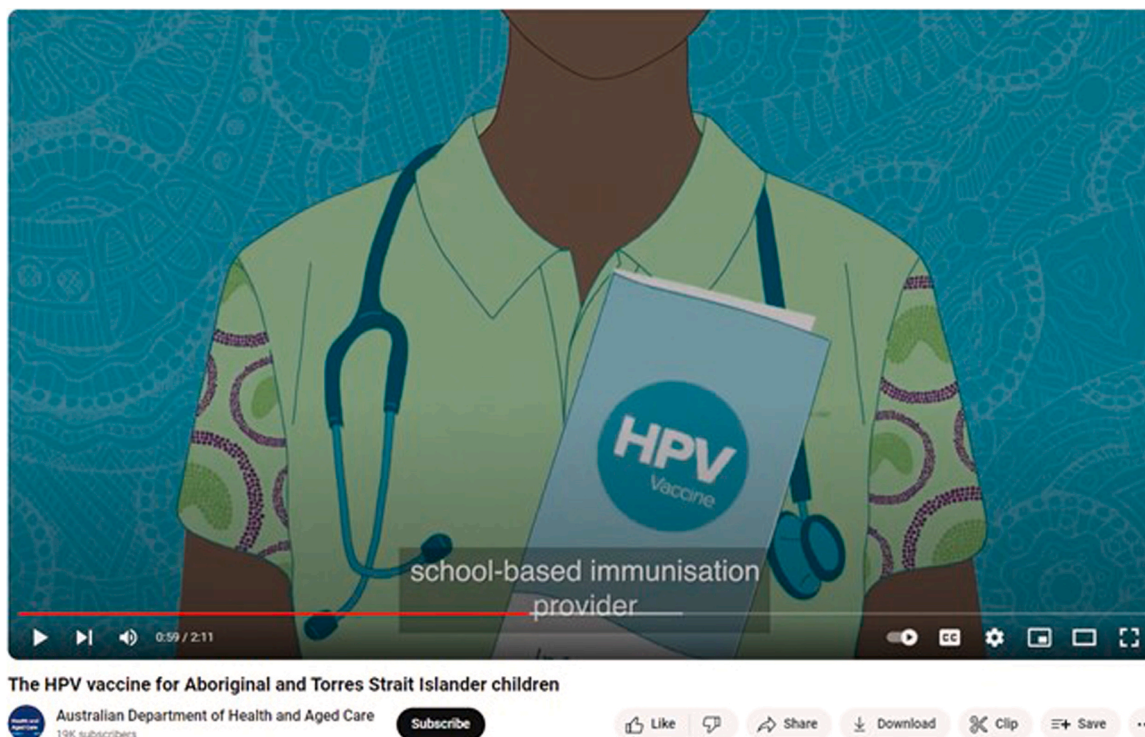


Fig. 2. Screenshot from “The HPV vaccine for Aboriginal and Torres Strait Islander children” video [39], resource #7 in Table 4.

Table 5
Cultural relevance assessment.

No.*	Cultural relevance assessment items (Diaz et al.2023) **							Total
	1. Visual aids	2. Data	3. Design/ artwork	4. Leadership	5. Language/ translation	6. Strengths- based	7. Contact for support	
1	✓		✓			✓		3
2	✓	✓	✓			✓		4
3	✓	✓	✓			✓		4
4	✓	✓	✓		✓	✓		5
5	✓	✓	✓		✓	✓		5
6	✓	✓	✓			✓		3
7	✓	✓	✓			✓		4
8		✓	✓	✓		✓	✓	5
Total	7	6	8	1	2	8	1	

* The resource numbers (No.) correspond to the resource numbers in Table 4, which contains the full title and reference. ** The cultural relevance assessment items have been abbreviated. The full item descriptions can be found in Fig. 1. ^ Available documentation [41] indicated that these resources were available in multiple Aboriginal and Torres Strait Islander languages at the time they were created; however, these could not be found during the assessment.

4.2. Limitations

Before considering the implications of this research, it is important to understand the limitations. This study focused on resources available online and as the internet is ever changing, the search results and content will vary with time. Further, these searches were conducted in a private browser with cleared cache and cookies but this likely does not reflect parents’ and adolescents’ approach to searching for information, which will be influenced by their previous searches of any online content. This study did not include a search of resources or posts made on social media platforms, thereby not including resources from a likely information source for many adolescents and parents/caregivers. This could be assessed in future research. We also did not assess the standardised information sheet and consent form for the school-based immunisation program provided by the state or territory health authority and sent to parents/caregivers via the school. For example, in Queensland, a 4 page- information sheet and separate consent form is sent home with adolescents in advance of the scheduled immunisation clinic [42]. This was primarily because they are not tailored to

Aboriginal and Torres Strait Islander audiences. This information is very dense and it is unclear if this is meeting the needs of First Nations families and communities at the critical point of deciding whether to consent to the vaccine. However, this search provides a useful snapshot of available resources in an ever-changing internet and HPV vaccination environment. A final limitation is the subjective nature of the assessment tools, with one resource [35] receiving a slightly lower PEMAT understandability score when compared to a prior evaluation [32]; however the interpretation of the findings remains unaffected as the resource still exceeded the 70 % threshold for understandability.

4.3. Practice implications

Insights from this evaluation can significantly enhance the development or refinement of HPV vaccination resources by ensuring they are clear, actionable, and culturally relevant. Understanding the use of resources by whom, when, how and on what platform is an important consideration. Currently it is unclear how the resources found in this evaluation are implemented, if at all, into practice such as to promote



Fig. 3. HPV vaccination comic for young men: HPV and Me, My Health, My Future [36], resource #4 in Table 4).

school immunisation programs. It is important that the implementation of the resources is responsive to the varying circumstances and literacy needs of communities and that the intended outcomes are evaluated appropriately. This is particularly important given the shift to online consent processes for school-based immunisation programs in several Australian jurisdictions and essential for understanding how information resources are supporting informed consent for the vaccine. Furthermore, it is critical that the resources are routinely updated for alignment with current policy and with Aboriginal and Torres Strait Islander communities' needs. Heeding calls from prior research, resources must be transparent, accurate and easily accessible [43]. Ensuring Aboriginal and Torres Strait Islander people have high quality, accessible and culturally relevant information to support informed decision making regarding HPV vaccine, is important to protect future generations from HPV related disease including cervical cancer.

Furthermore, the findings indicate a critical need to develop HPV vaccination resources that are culturally relevant to, and appropriate for, diverse Aboriginal and Torres Strait Islander audiences. This can be achieved through Aboriginal and Torres Strait Islander-led initiatives to create and adapt resources to suit their individual communities' needs. Aboriginal and Torres Strait Islander people's leadership has proven to be an effective way to achieve meaningful and sustained health benefits; for example, in response to the COVID-19 pandemic [44]. In addition, the development of tailored implementation models may be required to ensure responsiveness to the varying literacy needs of families and settings in which adolescents may receive HPV vaccination (e.g., via primary health care clinics or school-based immunisation clinics).

4.4. Conclusion

To date, no other studies assessing HPV vaccination resources for Aboriginal and Torres Strait Islander peoples have been published. The findings of the current study are important given the need for culturally appropriate education and awareness of HPV vaccination among

Aboriginal and Torres Strait Islander populations [19] and Indigenous populations globally [11]. This review has identified several gaps and opportunities for further development of HPV vaccine resources for Aboriginal and Torres Strait Islander adolescents and parents/caregivers to support participation in the school-based immunisation program. While several resources have been developed, in some cases these have not been maintained and are no longer available, nor do these resources meet all criteria for understandability, actionability, readability, and cultural appropriateness. There is a clear need for resources designed in collaboration with Aboriginal and Torres Strait Islander people, potentially with the use of more visual aids or delivered in short video format. When delivered and implemented effectively and sustainably, such resources will ensure that Aboriginal and Torres Strait Islander adolescents and their parents and caregivers engage with the health promotion material, ultimately leading to informed-decision-making regarding the HPV vaccine.

CRediT authorship contribution statement

Tamara L. Butler: Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision, Project administration, Funding acquisition. **Ami Morseu-Diop:** Formal analysis, Investigation, Writing - Review & Editing. **Julia M. L. Brotherton:** Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing, Supervision, Funding acquisition. **Leticia Peart:** Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing. **Inosha Jayasekara:** Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing. **Amelia Peart:** Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing. **Maya Morton Ninomiya:** Formal analysis, Investigation, Data Curation, Writing - Review & Editing. **Kate Anderson:** Conceptualization, Methodology, Writing - Review & Editing, Funding acquisition. **Joan Cunningham:** Conceptualization,

Methodology, Writing - Review & Editing, Funding acquisition. **Gail Garvey**: Conceptualization, Methodology, Writing - Review & Editing, Funding acquisition. **Allison Jaure**: Conceptualization, Methodology, Writing - Review & Editing, Funding acquisition. **Lisa J. Whop**: Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration, Funding acquisition.

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Declaration of Competing Interest

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.pec.2025.108820](https://doi.org/10.1016/j.pec.2025.108820).

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