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STUDY PROTOCOL: *YARNING ABOUT HPV VACCINATION*, A QUALITATIVE STUDY OF FACTORS INFLUENCING HPV VACCINATION AMONG ABORIGINAL AND TORRES STRAIT ISLANDER ADOLESCENTS IN AUSTRALIA

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ABSTRACT

Introduction

Aboriginal and Torres Strait Islander women experience a higher burden of cervical cancer than non-Indigenous women in Australia. Cervical cancer is preventable partly through human papillomavirus (HPV) vaccination; in Australia, this is delivered through the national school-based immunisation program. While HPV vaccination uptake is high among Australian adolescents, there remain gaps in uptake and completion among Aboriginal and/or Torres Strait Islander adolescents. This study aims to gain a comprehensive understanding of the barriers and facilitators to HPV vaccination uptake and completion among Aboriginal and Torres Strait Islander adolescents in Queensland, Australia.

Methods and analysis

The study will be guided by an Indigenist research approach and an ecological model for health promotion. Yarning, a qualitative Indigenous research method, will be conducted in up to 10 schools. Participants will include Year 7 (12/13-year-old) Aboriginal and/or Torres Strait Islander adolescents; parents/caregivers; and local key informants and immunisation program partners involved in the delivery of school-based HPV immunisation program. Participant sampling will be purposive, convenience, and snowballing, and recruited through School Representatives and investigator networks. Field notes, HPV vaccination clinic observations, and sequential diagramming of the HPV vaccination process will be conducted. Thematic analysis of data will be led by Aboriginal and Torres Strait Islander researchers. Synthesised sequential diagrams of the process of HPV vaccination and qualitative themes summarising key findings will be produced.

Ethics and dissemination

The Aboriginal Health and Medical Research Council of New South Wales Ethics Committee (1646/20), the Australian National University Human Research Ethics Committee (HREC, 2020/478) and the HREC of the Northern Territory Department of Health and Menzies School of Health Research (19-3484) have approved the study. Dissemination will occur via conferences and peer-reviewed publications. Further dissemination will be determined in partnership with the Aboriginal and Torres Strait Islander Steering Committee, including Youth Representatives, and Consultation Network.

KEYWORDS

Aboriginal and Torres Strait Islander people, adolescents, human papillomavirus vaccination, cervical cancer, Indigenous research methods, yarning, qualitative.

ARTICLE SUMMARY

Strengths and limitations of this study

- Using an Indigenist research approach, this study will prioritise the voices of Aboriginal and Torres Strait Islander people.
- Indigenous research methods will be used to triangulate perspectives on HPV vaccination for Queensland Aboriginal and Torres Strait Islander adolescents, parents/caregivers, local key informants, and immunisation program partners.
- The methods will generate a comprehensive understanding of factors and processes affecting HPV vaccination uptake among Aboriginal and Torres Strait Islander adolescents.
- A limitation is that the data is derived from only one Australian jurisdiction, the state of Queensland.

INTRODUCTION

The World Health Organization's vision to eliminate cervical cancer as a public health problem includes three main pillars: prevent, screen and treat.[1] A key target to achieve this vision is to vaccinate at least 90% of females with human papillomavirus (HPV) vaccine by age 15.[1] Australia introduced primary prevention of HPV through a national school-based immunisation program for females in 2007 and males in 2013.[2] Initially the program used a three-dose quadrivalent HPV vaccine (HPV types 6, 11, 16, 18) and in 2018 changed to a two-dose nonavalent HPV vaccine (HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58).[2] The nonavalent prophylactic vaccine now covers seven cancer-causing HPV types including HPV genotypes 16 and 18, which are responsible for 70% of invasive cervical cancer cases.[3] The vaccine also covers HPV types 6 and 11, which are responsible for >90% of anogenital warts.[4] HPV primary prevention through vaccination substantially reduces the risk of cervical cancer [5] and has the potential to prevent up to 93% of cervical cancer cases in Australia.[6]

Despite Australia having one of the world's lowest incidence rates of cervical cancer,[7] Aboriginal and Torres Strait Islander women bear a greater burden of cervical cancer than other Australian women, demonstrated by the higher incidence, hospitalisation, and mortality rates, and lower survival rates.[8, 9] Aboriginal and Torres Strait Islander women experience significant and persistent disparity in cervical screening participation and treatment outcomes.[10-13] This inequity in secondary prevention programs for Aboriginal and Torres Strait Islander women highlights the urgency in ensuring equity in primary prevention via HPV vaccination. It further speaks to the longstanding unacceptable racialized health disparities and disproportionate burden of disease, including cancer outcomes, experienced by Aboriginal and Torres Strait Islander peoples more broadly.[14-16]

National data on HPV vaccination uptake and coverage is not available for Aboriginal and Torres Strait Islander adolescents. Available data from four jurisdictions (New South Wales, Queensland, the Northern Territory, and the Australian Capital Territory) for 2013-2016 indicates that among Aboriginal and Torres Strait Islander adolescents, Dose 1 vaccine coverage among females and males was high, ranging between 82.4% - 95.9%. However, in 2016 course completion rates were generally lower for Aboriginal and Torres Strait Islander adolescents (between 70.9% - 88.7% for females and 60% - 85.7% for males) compared to non-Indigenous adolescents (between 81.6% - 94.4% for females and 79% - 94.8% for males).[17] These data demonstrate successes in Dose 1 uptake among Aboriginal and Torres Strait Islander adolescents. However, disparities in completion rates indicate that Aboriginal and Torres Strait Islander males and females are not receiving the same benefit

from the full vaccination course as non-Indigenous adolescents. Importantly, these estimates represent overall state/territory figures and may mask important geographical differences.

Little is known about: the factors that facilitated the relatively high uptake of Dose 1 and the barriers that impacted on course completion; the reasons for gender-based disparities between Aboriginal and Torres Strait Islander males and other groups; and the availability, use of, and cultural appropriateness of, resources to support Aboriginal and Torres Strait Islander families' HPV vaccination decision-making. Furthermore, the school-based immunisation program's capacity to be resilient to disruption is not documented or well understood – an important issue during the COVID-19 pandemic. These factors impact on the capacity of Queensland's school-based immunisation program to be equitable, resilient, and sustainable.

Barriers to HPV vaccination for Indigenous peoples in Canada, Aotearoa New Zealand and the United States of America (USA) span issues such as low awareness and understanding of HPV vaccination; limited information availability; access to clinics; cost of the vaccination; missing or incomplete data; ongoing impacts of colonisation including distrust of governments and health institutions; and concerns about the needle being painful.[18] The COVID-19 pandemic has stalled HPV vaccination delivery.[19] The factors that facilitate Indigenous peoples' access to HPV vaccination include family and community involvement in decision-making and health promotion materials and an explicit focus on equity in vaccination program implementation.[18] It is unclear if and how these factors feature in the Australian setting for HPV vaccination among Aboriginal and Torres Strait Islander people.

Rationale and aims

Effective and equitable primary prevention of HPV through a school-based immunisation program has the potential to reduce the high incidence and mortality rates from cervical cancer and other HPV-related diseases. However, little is known about the specific barriers or facilitators to the delivery of HPV vaccination for Aboriginal and/or Torres Strait Islander adolescents via the existing school-based immunisation program, nor the program's ability to support access to HPV vaccination when school attendance is disrupted, making it difficult to identify and implement effective strategies to support and sustain equitable HPV vaccination. Focused in the state of Queensland, the aims of this study are to:

1) gain a comprehensive understanding of the barriers and enablers that influence the participation of Aboriginal and/or Torres Strait Islander adolescents in the school-based HPV vaccination program;
2) document the typical procedures through which vaccination of Aboriginal and/or Torres Strait Islander adolescents is achieved; and

3) understand the factors that impact on the resilience of the school-based immunisation model during the COVID-19 pandemic.

METHODS AND ANALYSIS

Study design and approach

Yarning about HPV Vaccination is a multi-component project; only the qualitative component is described here. A second component, not described here, will evaluate the informational and educational resources available to adolescents and parents/caregivers.

Indigenist research approach

The project will use Rigney's Indigenist research approach,[20, 21] which is guided by three principles: 1) resistance as its emancipatory imperative, 2) political integrity in Aboriginal and Torres Strait Islander research, 3) privileging Aboriginal and Torres Strait Islander voices. Essentially, Indigenist research is: "research by Indigenous people whose primary informants are Indigenous people and whose goals are to serve and inform the Indigenous struggle for self-determination."[20, p. 118] This approach ensures that the project aligns with the values of the Aboriginal and Torres Strait Islander communities it is intended to benefit.

Indigenist research principles[20, 21] will be operationalised in the study through strategies including: leadership, governance and yarns conducted by Aboriginal and Torres Strait Islander people; the use of yarning as a qualitative Indigenous research method; prioritising the views and lived experience of Aboriginal and Torres Strait Islander people; and the collaboration, support and partnership of non-Indigenous researchers who uphold Indigenist research principles.

Ecological model for health promotion

This approach is complemented by the ecological model for health promotion.[22] This model views health-related behaviours, such as HPV vaccination, as an outcome of a complex interplay of intrapersonal, interpersonal, institutional, community, and policy factors. This approach avoids victim-blaming when investigating health-related disparities and designing health promotion programs.[22] It has been successfully used as a framework to qualitatively identify and understand the barriers and facilitators to HPV vaccination in other populations.[23]

Governance and consultation

Relevant Population and Public Involvement statement

As this protocol addresses a public health program, no patients are to be recruited. We instead seek involvement of the relevant population for the school-based immunisation public health program and public. Individuals from the relevant population and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans for this study protocol. We intend to involve individuals from the relevant population and public in the design, conduct, reporting and dissemination of the research in the future, described below.

Aboriginal and Torres Strait Islander Steering Committee

We will establish an Aboriginal and Torres Strait Islander Project Steering Committee (henceforth, Steering Committee), in line with the Medical Journal of Australia guidelines[24] and the principles of the Indigenist research approach.[20, 21] The Steering Committee will provide overarching project governance and ensure that the project is culturally safe and meets the needs and priorities of Aboriginal and/or Torres Strait Islander people and communities. Consultation with individual communities and schools will also be conducted to ensure the project is locally acceptable and feasible.

All members of the Steering Committee will identify as Aboriginal and/or Torres Strait Islander people. The Steering Committee will include people with a range of expertise in areas such as Aboriginal and Torres Strait Islander Health, primary health care, vaccination, health workforce development and parents/caregivers and School Representatives from participating schools. A small number of Aboriginal and/or Torres Strait Islander people from other jurisdictions with relevant roles and experiences may also be invited to join the Steering Committee.

In line with the Cancer Australia Framework for Consumer Involvement in Cancer Control,[25] at least two Aboriginal and/or Torres Strait Islander adolescent consumers will be invited to join the group. A Youth Representative Committee will be formed if four or more adolescents want to join the Steering Committee. The adolescent/s will be from previous Year 7 cohorts offered the HPV vaccine to avoid influence over decisions to have the vaccination.

Consultation Network

A Consultation Network will also be established, with the purpose of engaging key bodies involved in HPV vaccination to maximise uptake of the study findings and providing strategic advice in issues such as site recruitment. The research team will inform Consultation Network of study progress and preliminary findings. The Consultation Network will have

Aboriginal and/or Torres Strait Islander representation. Representatives from peak Aboriginal and Torres Strait Islander health organisations and government health and education departments will be invited to join the Consultation Network. It may also include national representatives with expertise in school programs and interests in supporting Aboriginal and Torres Strait Islander adolescents' HPV vaccination from other jurisdictions.

Setting

Approximately 4.6% of the total Queensland population identify as Aboriginal and/or Torres Strait Islander.[26] Approximately 8.2% of 12- and 13-year-old Queensland adolescents identify as Aboriginal and/or Torres Strait Islander.[26]

Up to ten Queensland schools will be recruited into the study. After approval to approach the School Principal about the research is granted by relevant governing body, the schools will be purposively sampled in line with the following eligibility criteria:

(i) The school is in Queensland and has a Year 7 cohort.

(ii) The school has a relatively high proportion of Aboriginal and/or Torres Strait Islander students, defined as schools whose total Aboriginal and/or Torres Strait Islander student enrolment is equal to or greater than 6%. This proportion is slightly lower than the proportion of Queensland 12- and 13-year-old Aboriginal and/or Torres Strait Islander adolescents to increase the pool of eligible schools that can potentially be recruited into the study.

(iii) The overall mix of school sites offers diversity in locations across Queensland, with respect to geographic remoteness (remote, regional, and urban), school sector (Government, Catholic, or Independent), student gender (single or mixed gender) and representation of residential boarding schools.

Special Schools will not be eligible for the study as they provide highly specialised and individualised programs that are not within the scope of the *Yarning about HPV vaccination* project.

Eligible schools will initially be identified using the Australian Curriculum, Assessment and Reporting Authority (ACARA) School Profile data.[27] School eligibility will be confirmed during initial consultation with identified schools.

Participants and Recruitment

Participants are outlined in Table 1. In qualitative research, sampling aims to include information-rich cases and achieve depth of understanding rather than striving to meet a specific (statistically-determined) sample size.[28] Sampling will reach a diverse range of participants and achieve data saturation across themes. The sample size of each group has

also been determined by practical considerations. These include: budgetary limits; practical timeframes of qualitative field work; and reasonable workload requests for the School Representative, particularly in the context of COVID-19 pandemic learning disruptions.[29]

Table 1. Summary of participants, sampling, recruitment, and yarning topics

Participant group	**N (approximate)**	**Sampling and recruitment method**	**Yarning topics**
Year 7 Aboriginal and/or Torres Strait Islander adolescents	8-12 per school	Convenience sampling via School Representative. Additional participants may be recruited via community events outside the school. Purposive sampling, as required, to include under-represented groups (e.g., adolescents who did not receive vaccination)	• HPV vaccination views and awareness • Experience of HPV vaccination (adolescents only) • Decision-making and consent process for the vaccination • Impact of COVID-19 pandemic • Information and education about the vaccine • Improving HPV vaccination
Parents/caregivers of Year 7 Aboriginal and/or Torres Strait Islander adolescents (parents/caregivers may not identify as Aboriginal and/or	8-12 per school	Convenience sampling via School Representative Purposive sampling, as required, to include under-represented	

Torres Strait Islander in all cases)		groups (e.g., parents/caregivers who did not provide consent for vaccination)	
Local key informants (e.g., individuals from the school involved in HPV vaccination program delivery or administering council)	3-6 per school	Purposive via Principal and School Representative, and via local council administering HPV vaccination delivery. Snowball sampling via participants	• Role in HPV vaccination delivery • Creation and discussion of HPV vaccination process sequential diagrams • Information and education about the vaccine • Impact of COVID-19 pandemic • Consent process • School's program delivery • Improving HPV vaccination
Immunisation program partners (e.g., individuals from the state health and education departments involved in HPV vaccination program)	3-6 in total	Purposive via Investigator networks, Consultation Network, local councils administering HPV vaccination, and snowball sampling via participants	• Role in HPV vaccination delivery • Creation and discussion of HPV vaccination process sequential diagram • Improving HPV vaccination

			• Impact of COVID-19 pandemic

School Principals will be invited to discuss the study on behalf of the school. Should the School Principal consent for their school to participate, they will identify a School Representative to facilitate the study. The School Representative will be the main liaison point between the research team and participants and will facilitate recruitment and scheduling of Aboriginal and/or Torres Strait Islander student and parents/caregiver yarns at each site. The School Representative will be an individual working in a role that involves contact and communication with Aboriginal and/or Torres Strait Islander students and community, for example an Aboriginal or Torres Strait Islander Teacher Aide, Education Support Officer or Community Liaison Officer already employed by the school. It could also be an Elder in residence at the school (a community member who is recognised as a holder of knowledge, cultural practice, and lore). Alternatively, the School Principal may nominate a staff member who will fulfil a similar role for the purpose of the study.

Principles of reciprocity and mutual benefit essential to research in Aboriginal and Torres Strait Islander communities[30] will be enacted by negotiating services or activities that will benefit the school and the Aboriginal and Torres Strait Islander students (e.g., presentations at school events or providing light catering at an event). Appropriate activities will be determined as part of the recruitment process.

Adolescents and parents/caregivers

Parents/caregivers and adolescents may participate independently of each other (matched adolescent and parent/caregiver family groups are not required). Adolescents and parents/caregivers will be eligible to participate regardless of whether the parent/caregiver consented for the adolescent to receive the HPV vaccination, or whether the adolescent received two, one or neither scheduled HPV vaccination.

Recruitment via schools may be supplemented with recruitment via community events and activities, such as sporting events, festivals, and health services and land councils. This supplementary recruitment may reach adolescents who may not attend school frequently. Participants recruited in this setting (both adolescents and parents/caregivers) will be directly approached by the research team.

The School Representative may also advertise the study where Aboriginal and/or Torres Strait Islander adolescents and their caregivers/parents may see it e.g., newsletters, online school forums, or mailing/email lists. Finally, the research team will be flexible to the needs

of each individual school regarding information dissemination about the project; for example, we may conduct a short information session prior to the school visit.

Local key informants and immunisation program partners

Local key informants will be initially identified by the School Principal and School Representative. Participants may include individuals involved in HPV vaccination program delivery both inside and outside the school, with additional participants identified via snowball recruitment. Individuals at local councils responsible for administering HPV vaccination at the school site will be invited to participate by the research team. Immunisation program partners will be recruited purposively through Investigator networks, the Consultation Network and snowball sampling. Additional research approvals to interview individuals outside the school setting will be obtained as necessary.

Consent

The School Principal will provide written informed consent for their school to participate in the research, and optionally, for researchers to observe the HPV vaccination clinic in progress. All participants will provide informed consent prior to the yarn or yarning circles. When yarns are conducted over the phone or online, oral informed consent will be audio recorded and transcribed. A parent/caregiver must provide consent for their child to participate in the study, and adolescents must also consent to participate.

Data collection

Several methods of qualitative data collection will be used in this study: yarning, construction of sequential diagrams, and observation.

Yarning

Semi-structured yarns and yarning circles will be used to explore participants' views and experiences in a culturally appropriate and safe manner. Aboriginal and/or Torres Strait Islander researchers will lead the yarns. Yarning involves conversational sharing of stories and information following cultural protocols. Yarning is generally more relaxed and informal than conventional interviews, and establishes relationality between participant and researcher, which forms the basis of accountability and cultural safety between the two parties.[31, 32] If deemed feasible and appropriate by the School Representative, yarning circles may also be conducted, which involves facilitated yarning with a small group of people. Yarning circles are recommended as part of the Queensland Curriculum and Assessment Authority's (QCAA) Resources for Aboriginal and Torres Strait Islander student perspectives.[33] We will also seek the guidance of the School Representative regarding whether yarning circles should be separated by gender.

Yarns may take place any time after Dose 1 or Dose 2 has occurred at the school site to avoid any conflation of the research with consent for vaccination. Yarns may take place in-person, online via virtual meeting software, or over the phone. A semi-structured yarning guide covering the topics listed in Table 1 will be used, but questions will also be informed by observations and new topics raised in prior yarns. Adolescent and parents/caregiver participants will receive a gift card reimbursement for their time and contributions.

All yarns will the audio recorded with the consent of the participant. Yarns will be transcribed verbatim by a transcription company. Participants who decline audio recording will be asked to consent to the researcher writing notes during the yarn.

The School Representative will provide guidance on whether an Aboriginal and/or Torres Strait Islander interpreter will be required to support the yarns. Where appropriate, interpreters may conduct the yarns. The English interpretation of yarns conducted in language will be transcribed and analysed, with timestamps noted for non-English language.

During field work, researchers will take field notes to provide context for analysis.[34] Field notes may include documenting contextual information about the school and research visit, observations of participants' verbal and nonverbal communication, sketches of locations or room layouts, emerging ideas to explore in forthcoming yarns, and insight for data analysis. Other information will be noted as required. Field notes will be integrated with the data corpus to enrich analysis.

Sequential diagramming

During the yarns with local key informants and immunisation program partners, participants and researchers will create sequential diagrams of their involvement in HPV vaccination at the school.[35, 36] Sequential diagrams (informally referred to as "mud maps" with participants) elicit descriptions of processes or actions as chains of events. Initially the participant will lead the construction of the diagram using either pen and paper or virtual meeting software drawing tools (participant-led diagramming[35]), and then the researcher will explore significant events in the sequence and prompt for further information or key events in the process (researcher-led diagramming[35]). Both the physical diagram and the verbal dialogue will be collected as data. The diagrams will both encourage qualitative discussion and contribute to the development of synthesised sequential diagrams of HPV vaccination for Aboriginal and/or Torres Strait Islander students at each school, as well as typical procedures state-wide.

Observation of vaccination

With the consent of the School Principal, researchers will observe the HPV vaccination clinic (Dose 1 or Dose 2). A semi-structured observation guide will be used, whereby researchers can provide both prompted and unstructured observations of how the clinic is conducted. Guided by previous research,[37] observations may include sketches of the building and room layout, weather conditions, interactions between adolescents and staff before, during, and after vaccination, any emotional or physical reactions to the vaccination, descriptions of equipment, measures put in place as a result of COVID-19 (e.g., social distancing), and any supports in place for Aboriginal and/or Torres Strait Islander students.

Analysis

Transcripts, field notes, sequential diagrams, and observations will form the data corpus and will be managed with NVivo software (QSR International Pty Ltd, version 12[38]). Thematic analysis will be used to identify patterns of meaning across the data, through an iterative process of coding, discussion, and re-coding.[39] A constructivist approach will be taken, in which experience and meanings are social reproductions and a product of socio-cultural and structural conditions.[39] In line with the Indigenist research approach, Aboriginal and Torres Strait Islander people will lead the initial coding and interpretation of the data, with support from non-Indigenous researchers. This approach brings a criticality to the interpretation and analysis of data afforded by Aboriginal and Torres Strait Islander people's lived experiences, relationality with participants, and research expertise. Researchers will code the data line-by-line to identify emerging themes. The ecological model for health promotion[22] will guide analysis, ensuring social, structural and environmental factors influencing HPV vaccination uptake are considered alongside individual level factors.

A sequential diagram of typical state-wide HPV vaccination practices will be synthesised by integrating the qualitative analysis findings, sequential diagrams, and observational data and augmented by input from the investigator team, Consultation Network and Steering Committee.

ETHICS

Ethics approval for this research has been obtained from the Aboriginal Health and Medical Research Council of New South Wales Ethics Committee (1646/20), the Australian National University Human Research Ethics Committee (HREC, 2020/478) and the HREC of the Northern Territory Department of Health and Menzies School of Health Research (19-3484). We will adhere to COVID-19 health and safety guidelines in Queensland current at the time of fieldwork.

Participants will provide voluntary written or verbal informed consent. Adolescents will also require parent/caregiver consent. School Principals will provide consent for the school to participate and, optionally, for observational research. Participants may withdraw from the study at any time before dissemination of the findings, except for yarning circle participants, as it will be difficult to identify individual voices in the recording and transcript. Yarning circle participants will be informed of this before consenting to the study.

Data will be deidentified before publication. Some local key informants and immunisation program partners may be identifiable due to the unique nature of their roles and this will be highlighted when seeking consent to participate. Yarning circle participants will be asked to respect other participants' privacy by not sharing information heard during the study.

Some participants may feel uncomfortable or embarrassed talking about the sexually transmitted nature of HPV or about needles; if this is the case, we will check the participant is happy to continue and/or change the topic. There is minimal risk of distress or harm due to participating in the research.

It will not be feasible to return to school sites to conduct member checking of interpretation with individual participants, however findings will be discussed with the Steering Committee and Consultation Network to ensure they reflect the full range and depth of perspectives. The Steering Committee will include representatives of many communities involved in the research.

DISSEMINATION

Findings will be disseminated through conference presentations and peer-reviewed journal publications. Further dissemination will be determined in partnership with the Steering Committee and Consultation Network. Emphasis will be placed on meeting the Steering Committee Youth Representatives' recommendations. Dissemination will be flexible and responsive to each Committee's recommendations and needs. Expected dissemination formats include newsletters or summaries, short reports for schools and School Principals, and social media.

Publications will adhere to the consolidated criteria for strengthening reporting of health research involving Indigenous Peoples (the CONSIDER statement[40]) and the consolidated criteria for reporting qualitative research (COREQ[41]).

CONCLUSIONS

The *Yarning about HPV vaccination* project will comprehensively explore and document how multiple factors interact across interpersonal, institutional, community, and policy levels to

affect HPV vaccination for Aboriginal and/or Torres Strait Islander adolescents though an Indigenist research lens. This project will provide insights into increasing the resilience of the school-based immunisation program during disruptions to school attendance, such as those caused by the COVID-19 pandemic. The findings may inform implementation strategies for other large-scale programs such as the influenza vaccine and eventual COVID-19 vaccine. The findings will be valuable to other countries seeking to implement equitable, resilient, accessible and sustainable school-based HPV vaccination.

Understanding the factors affecting HPV vaccination uptake among Aboriginal and/or Torres Strait Islander adolescents is a critical step in addressing the burden of cervical cancer among Aboriginal and Torres Strait Islander women. Equitable access to primary prevention through HPV vaccination has the potential to reduce disparities in cervical cancer outcomes for Aboriginal and Torres Strait Islander women in Australia.

DATA AVAILABILITY STATEMENT:

Data sharing is not applicable as no datasets were generated and/or analysed for this article.

AUTHOR CONTRIBUTIONS

All authors contributed to the conception of the study. LJW and TB developed the detailed study methodology. TB drafted the initial manuscript. All authors contributed to developing the study design, provided feedback and reviewed drafts of the manuscript, and approved the final version.

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COMPETING INTERESTS STATEMENT.

None declared.

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Ownership of Aboriginal and Torres Strait Islander knowledges and cultural heritage will be retained by the informant.

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Study protocol: Yarning about HPV vaccination, a qualitative study of factors influencing HPV vaccination among Aboriginal and Torres Strait Islander adolescents in Australia

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STUDY PROTOCOL: *YARNING ABOUT HPV VACCINATION*, A QUALITATIVE STUDY OF FACTORS INFLUENCING HPV VACCINATION AMONG ABORIGINAL AND TORRES STRAIT ISLANDER ADOLESCENTS IN AUSTRALIA

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ABSTRACT

Introduction

Aboriginal and Torres Strait Islander women experience a higher burden of cervical cancer than non-Indigenous women in Australia. Cervical cancer is preventable partly through human papillomavirus (HPV) vaccination; in Australia, this is delivered through the national school-based immunisation program. While HPV vaccination uptake is high among Australian adolescents, there remain gaps in uptake and completion among Aboriginal and/or Torres Strait Islander adolescents. This study aims to gain a comprehensive understanding of the barriers and facilitators to HPV vaccination uptake and completion among Aboriginal and Torres Strait Islander adolescents in Queensland, Australia.

Methods and analysis

The study will be guided by an Indigenist research approach and an ecological model for health promotion. Yarning, a qualitative Indigenous research method, will be conducted in up to 10 schools. Participants will include Year 7 (12/13-year-old) Aboriginal and/or Torres Strait Islander adolescents; parents/caregivers; and local key informants and immunisation program partners involved in the delivery of school-based HPV immunisation program. Participant sampling will be purposive, convenience, and snowballing, and recruited through School Representatives and investigator networks. Field notes, HPV vaccination clinic observations, and sequential diagramming of the HPV vaccination process will be conducted. Thematic analysis of data will be led by Aboriginal and Torres Strait Islander researchers. Synthesised sequential diagrams of the process of HPV vaccination and qualitative themes summarising key findings will be produced.

Ethics and dissemination

The Aboriginal Health and Medical Research Council of New South Wales Ethics Committee (1646/20), the Australian National University Human Research Ethics Committee (HREC, 2020/478) and the HREC of the Northern Territory Department of Health and Menzies School of Health Research (19-3484) have approved the study. Dissemination will occur via conferences and peer-reviewed publications. Further dissemination will be determined in partnership with the Aboriginal and Torres Strait Islander Steering Committee, including Youth Representatives, and Consultation Network.

KEYWORDS

Aboriginal and Torres Strait Islander people, adolescents, human papillomavirus vaccination, cervical cancer, Indigenous research methods, yarning, qualitative.

ARTICLE SUMMARY

Strengths and limitations of this study

- Using an Indigenist research approach, this study will prioritise the voices of Aboriginal and Torres Strait Islander people.
- Indigenous research methods will be used to triangulate perspectives on HPV vaccination for Queensland Aboriginal and Torres Strait Islander adolescents, parents/caregivers, local key informants, and immunisation program partners.
- The methods will generate a comprehensive understanding of factors and processes affecting HPV vaccination uptake among Aboriginal and Torres Strait Islander adolescents.
- A limitation is that the data is derived from only one Australian jurisdiction, the state of Queensland.

INTRODUCTION

The World Health Organization's vision to eliminate cervical cancer as a public health problem includes three main pillars: prevent, screen and treat.[1] A key target to achieve this vision is to vaccinate at least 90% of females with human papillomavirus (HPV) vaccine by age 15.[1] Australia introduced primary prevention of HPV through a national school-based immunisation program for females in 2007 and males in 2013.[2] HPV vaccination is recommended by the National Immunisation Program Schedule.[3] The vaccine is free of charge and offered through the school-based immunisation program. The HPV vaccine is offered to all year 7 students (first year of secondary school) along with a vaccine for diphtheria, tetanus and pertussis (dTpa). In general, paper-based consent forms are sent home with adolescents. Parents receive information and complete a consent form for each vaccine. Students who return a completed and signed consent form will be vaccinated. Individuals 10 - 19 years of age are also eligible to receive the HPV vaccine free of charge via a catch-up program outside the school-based immunisation program, however for adolescents >15 years, three doses are required, of which two are funded, and a consultation fee may be charged by the health care provider.[4]

Initially the program used a three-dose quadrivalent HPV vaccine (HPV types 6, 11, 16, 18) and in 2018 changed to a two-dose nonavalent HPV vaccine (HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58).[2] The nonavalent prophylactic vaccine now covers seven cancer-causing HPV types including HPV genotypes 16 and 18, which are responsible for 70% of invasive cervical cancer cases.[5] The vaccine also covers HPV types 6 and 11, which are responsible for >90% of anogenital warts.[6] HPV primary prevention through vaccination substantially reduces the risk of cervical cancer [7] and has the potential to prevent up to 93% of cervical cancer cases in Australia.[8] Australia previously set a target for 70% HPV vaccination coverage which was met in 2016 in both females and males.[9] Subsequently this target was increased to 80%.[10, 11] Recent national data for the cohort of adolescents who turned 15 in 2019 demonstrate HPV vaccination coverage with completed courses in both sexes was 78.2% (79.6% in females and 76.8% in males).[12]

Despite Australia having one of the world's lowest incidence rates of cervical cancer,[13] Aboriginal and Torres Strait Islander women bear a greater burden of cervical cancer than other Australian women, demonstrated by the higher incidence, hospitalisation, and mortality rates, and lower survival rates.[14, 15] In 2011-2015 Aboriginal and Torres Strait Islander women had twice the incidence of cervical cancer compared to non-Indigenous women (19.3 per 100,000 vs 10.0 per 100,000 women, respectively). Mortality rates in 2014-2018 are more than three times higher for Aboriginal and Torres Strait Islander women than non-Indigenous women (7.7 per 100,000 vs 2.2 per 100,000 women).[16] Aboriginal and Torres

Strait Islander women experience significant and persistent disparity in cervical screening participation and treatment outcomes.[17-20] While national screening data is not available for Aboriginal and Torres Strait Islander women, localised studies have demonstrated that Aboriginal and Torres Strait Islander women participation in cervical screening is significantly lower than non-Indigenous women.[17, 21-23] In Queensland, 2-year participation rate was more than 20 percentage points lower for Aboriginal and Torres Strait Islander women than for non-Indigenous women for all reporting periods examined from 2000–2001 to 2010–2011. In 2010–2011, 2-year participation was 33.5% for Aboriginal and Torres Strait Islander women and 55.7% for non-Indigenous women.[17] This inequity in secondary prevention programs for Aboriginal and Torres Strait Islander women highlights the urgency in ensuring equity in primary prevention via HPV vaccination. It further speaks to the longstanding unacceptable racialized health disparities and disproportionate burden of disease, including cancer outcomes, experienced by Aboriginal and Torres Strait Islander peoples more broadly.[24-26]

National data on HPV vaccination uptake and coverage is not available for Aboriginal and Torres Strait Islander adolescents. Available data from four jurisdictions (New South Wales, Queensland, the Northern Territory, and the Australian Capital Territory) for 2013-2016 indicates that among Aboriginal and Torres Strait Islander adolescents, Dose 1 vaccine coverage among females and males was high, ranging between 82.4% - 95.9%. For the 2019 cohort, there was minimal variation in HPV vaccine uptake of Aboriginal and Torres Strait Islander adolescents by socioeconomic status and or remoteness areas, with all groups exceeding 80% initiation rates, except for uptake rates among Aboriginal and Torres Strait Islander males in the lowest socioeconomic group (79.8%).[12] In 2016 course completion rates in the three dose quadrivalent schedule were generally lower for Aboriginal and Torres Strait Islander adolescents (between 70.9% - 88.7% for females and 60% - 85.7% for males) compared to non-Indigenous adolescents (between 81.6% - 94.4% for females and 79% - 94.8% for males).[27] These data demonstrate successes in Dose 1 uptake among Aboriginal and Torres Strait Islander adolescents. However, disparities in completion rates indicate that Aboriginal and Torres Strait Islander males and females are not receiving the same benefit from the full vaccination course as non-Indigenous adolescents. Importantly, these estimates represent overall state/territory figures and may mask important geographical differences.

Little is known about: the factors that facilitated the relatively high uptake of Dose 1 and the barriers that impacted on course completion; the reasons for gender-based disparities between Aboriginal and Torres Strait Islander males and other groups; and the availability, use of, and cultural appropriateness of, resources to support Aboriginal and Torres Strait

Islander families' HPV vaccination decision-making. Furthermore, the school-based immunisation program's capacity to be resilient to disruption is not documented or well understood – an important issue during the COVID-19 pandemic. These factors impact on the capacity of Queensland's school-based immunisation program to be equitable, resilient, and sustainable.

Barriers to HPV vaccination for Indigenous peoples in Canada, Aotearoa New Zealand and the United States of America (USA) span issues such as low awareness and understanding of HPV vaccination; limited information availability; access to clinics; cost of the vaccination; missing or incomplete data; ongoing impacts of colonisation including distrust of governments and health institutions; and concerns about the needle being painful.[28] The COVID-19 pandemic has stalled HPV vaccination delivery.[29] The factors that facilitate Indigenous peoples' access to HPV vaccination include family and community involvement in decision-making and health promotion materials and an explicit focus on equity in vaccination program implementation.[28] It is unclear if and how these factors feature in the Australian setting for HPV vaccination among Aboriginal and Torres Strait Islander people.

Rationale and aims

Effective and equitable primary prevention of HPV through a school-based immunisation program has the potential to reduce the high incidence and mortality rates from cervical cancer and other HPV-related diseases. However, little is known about the specific barriers or facilitators to the delivery of HPV vaccination for Aboriginal and/or Torres Strait Islander adolescents via the existing school-based immunisation program, nor the program's ability to support access to HPV vaccination when school attendance is disrupted, making it difficult to identify and implement effective strategies to support and sustain equitable HPV vaccination. HPV vaccination was identified as a key priority in the *National Aboriginal and Torres Strait Islander cancer framework 2015* which was underpinned by Aboriginal and Torres Strait Islander leadership and community consultation.[30] In line with these identified priorities, Aboriginal and Torres Strait Islander researchers (Whop, Garvey, Butler) led the development of the study aims. Focused in the state of Queensland, the aims of this study are to:

1) gain a comprehensive understanding of the barriers and enablers that influence the participation of Aboriginal and/or Torres Strait Islander adolescents in the school-based HPV vaccination program;
2) document the typical procedures in the school based-immunisation program through which vaccination of Aboriginal and/or Torres Strait Islander adolescents is achieved; and

3) understand the factors that impact on the resilience of the school-based immunisation model during the COVID-19 pandemic.

METHODS AND ANALYSIS

Study design and approach

Yarning about HPV Vaccination is a multi-component project; only the qualitative component is described here. A second component, not described here, will evaluate the informational and educational resources available to adolescents and parents/caregivers.

Indigenist research approach

The project will use Rigney's Indigenist research approach,[31, 32] which is guided by three principles: 1) resistance as its emancipatory imperative, 2) political integrity in Aboriginal and Torres Strait Islander research, 3) privileging Aboriginal and Torres Strait Islander voices. Essentially, Indigenist research is: "research by Indigenous people whose primary informants are Indigenous people and whose goals are to serve and inform the Indigenous struggle for self-determination."[31, p. 118] This approach ensures that the project aligns with the values of the Aboriginal and Torres Strait Islander communities it is intended to benefit.

Indigenist research principles[31, 32] will be operationalised in the study through strategies including: leadership, governance and yarns conducted by Aboriginal and Torres Strait Islander people; the use of yarning as a qualitative Indigenous research method; prioritising the views and lived experience of Aboriginal and Torres Strait Islander people; and the collaboration, support and partnership of non-Indigenous researchers who uphold Indigenist research principles.

Ecological model for health promotion

This approach is complemented by the ecological model for health promotion.[33] This model views health-related behaviours, such as HPV vaccination, as an outcome of a complex interplay of intrapersonal, interpersonal, institutional, community, and policy factors. This approach avoids victim-blaming when investigating health-related disparities and designing health promotion programs.[33] It has been successfully used as a framework to qualitatively identify and understand the barriers and facilitators to HPV vaccination in other populations.[34]

Governance and consultation

Patient and Public Involvement statement

As this protocol addresses a public health program, no patients are to be recruited. We instead seek involvement of the relevant population for the school-based immunisation public health program and public. Individuals from the relevant population and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans for this study protocol. However, Aboriginal (Garvey, Butler) and Torres Strait Islander (Whop) researchers led the development of the study aims, study design and protocol all of whom are living in the state of Queensland at the time of inception. Furthermore, HPV vaccination was identified as a key priority in the *National Aboriginal and Torres Strait Islander cancer framework 2015* which was underpinned by Aboriginal and Torres Strait Islander leadership and community consultation.[30] We intend to involve individuals from the relevant population and public in the design, conduct, reporting and dissemination of the research in the future, described below.

Aboriginal and Torres Strait Islander Steering Committee

We will establish an Aboriginal and Torres Strait Islander Project Steering Committee (henceforth, Steering Committee), in line with the Medical Journal of Australia guidelines[35] and the principles of the Indigenist research approach.[31, 32] The Steering Committee will provide overarching project governance and ensure that the project is culturally safe and meets the needs and priorities of Aboriginal and/or Torres Strait Islander people and communities. Consultation with individual communities and schools will also be conducted to ensure the project is locally acceptable and feasible.

All members of the Steering Committee will identify as Aboriginal and/or Torres Strait Islander people. The Steering Committee will include people with a range of expertise in areas such as Aboriginal and Torres Strait Islander Health, primary health care, vaccination, health workforce development and parents/caregivers and School Representatives from participating schools. A small number of Aboriginal and/or Torres Strait Islander people from other jurisdictions with relevant roles and experiences may also be invited to join the Steering Committee.

In line with the Cancer Australia Framework for Consumer Involvement in Cancer Control,[36] at least two Aboriginal and/or Torres Strait Islander adolescent consumers will be invited to join the group. A Youth Representative Committee will be formed if four or more adolescents want to join the Steering Committee. The adolescent/s will be from previous

Year 7 cohorts offered the HPV vaccine to avoid influence over decisions to have the vaccination.

Consultation Network

A Consultation Network will also be established, with the purpose of engaging key bodies involved in HPV vaccination to maximise uptake of the study findings and providing strategic advice in issues such as site recruitment. The research team will inform Consultation Network of study progress and preliminary findings. The Consultation Network will have Aboriginal and/or Torres Strait Islander representation. Representatives from peak Aboriginal and Torres Strait Islander health organisations and government health and education departments will be invited to join the Consultation Network. It may also include national representatives with expertise in school programs and interests in supporting Aboriginal and Torres Strait Islander adolescents' HPV vaccination from other jurisdictions.

Setting

The state of Queensland is the second largest state in Australia and is situated in the north east of Australia. It is geographically vast and includes the islands of the Torres Strait. The second largest number of Aboriginal and Torres Strait Islander people live in Queensland. Approximately 4.6% of the total Queensland population identify as Aboriginal and/or Torres Strait Islander.[37] Approximately 8.2% of 12- and 13-year-old Queensland adolescents identify as Aboriginal and/or Torres Strait Islander.[37]

Up to ten Queensland schools will be recruited into the study. After approval to approach the School Principal about the research is granted by relevant governing body, the schools will be purposively sampled in line with the following eligibility criteria:

(i) The school is in Queensland and has a Year 7 cohort.

(ii) The school has a relatively high proportion of Aboriginal and/or Torres Strait Islander students, defined as schools whose total Aboriginal and/or Torres Strait Islander student enrolment is equal to or greater than 6%. This proportion is slightly lower than the proportion of Queensland 12- and 13-year-old Aboriginal and/or Torres Strait Islander adolescents to increase the pool of eligible schools that can potentially be recruited into the study.

(iii) The overall mix of school sites offers diversity in locations across Queensland, with respect to geographic remoteness (remote, regional, and urban), school sector (Government, Catholic, or Independent), student gender (single or mixed gender) and representation of residential boarding schools.

Special Schools will not be eligible for the study as they provide highly specialised and individualised programs that are not within the scope of the *Yarning about HPV vaccination* project.

Eligible schools will initially be identified using the Australian Curriculum, Assessment and Reporting Authority (ACARA) School Profile data.[38] School eligibility will be confirmed during initial consultation with identified schools.

Participants and Recruitment

Participants are outlined in Table 1. In qualitative research, sampling aims to include information-rich cases and achieve depth of understanding rather than striving to meet a specific (statistically-determined) sample size.[39] Sampling will reach a diverse range of participants and achieve data saturation across themes. The sample size of each group has also been determined by practical considerations. These include: budgetary limits; practical timeframes of qualitative field work; and reasonable workload requests for the School Representative, particularly in the context of COVID-19 pandemic learning disruptions.[40]

Table 1. Summary of participants, sampling, and recruitment

Participant group	**N (approximate)**	**Sampling and recruitment method**
Year 7 Aboriginal and/or Torres Strait Islander adolescents	8-12 per school	Convenience sampling via School Representative. Additional participants may be recruited via community events outside the school. Purposive sampling, as required, to include under-represented groups (e.g., adolescents who did not receive vaccination)
Parents/caregivers of Year 7 Aboriginal and/or Torres Strait Islander adolescents	8-12 per school	Convenience sampling via School Representative Purposive sampling, as required, to include under-

(parents/caregivers may not identify as Aboriginal and/or Torres Strait Islander in all cases)		represented groups (e.g., parents/caregivers who did not provide consent for vaccination)
Local key informants (e.g., individuals from the school involved in HPV vaccination program delivery or administering council)	3-6 per school	Purposive via Principal and School Representative, and via local council administering HPV vaccination delivery. Snowball sampling via participants
Immunisation program partners (e.g., individuals from the state health and education departments involved in HPV vaccination program)	3-6 in total	Purposive via Investigator networks, Consultation Network, local councils administering HPV vaccination, and snowball sampling via participants

School Principals will be invited to discuss the study on behalf of the school. Should the School Principal consent for their school to participate, they will identify a School Representative to facilitate the study. The School Representative will be the main liaison point between the research team and participants and will facilitate recruitment and scheduling of Aboriginal and/or Torres Strait Islander student and parents/caregiver yarns at each site. The School Representative will be an individual working in a role that involves contact and communication with Aboriginal and/or Torres Strait Islander students and community, for example an Aboriginal or Torres Strait Islander Teacher Aide, Education Support Officer or Community Liaison Officer already employed by the school. It could also be an Elder in residence at the school (a community member who is recognised as a holder of knowledge, cultural practice, and lore). Alternatively, the School Principal may nominate a staff member who will fulfil a similar role for the purpose of the study.

Principles of reciprocity and mutual benefit essential to research in Aboriginal and Torres Strait Islander communities[41] will be enacted by negotiating services or activities that will benefit the school and the Aboriginal and Torres Strait Islander students (e.g., presentations

at school events or providing light catering at an event). Appropriate activities will be determined as part of the recruitment process.

Adolescents and parents/caregivers

School Representatives will determine the most appropriate method of informing adolescents and parents/caregivers of the study and seeking consent. We anticipate that most participants will be recruited via a study information and consent pack sent home to parents/caregivers with students. The option for information and consent provided to be provided via email and/or online survey will also be offered. Parents/caregivers and adolescents may participate independently of each other (matched adolescent and parent/caregiver family groups are not required). Adolescents and parents/caregivers will be eligible to participate regardless of whether the parent/caregiver consented for the adolescent to receive the HPV vaccination, or whether the adolescent received two, one or neither scheduled HPV vaccination.

Recruitment via schools may be supplemented with recruitment via community events and activities, such as sporting events, festivals, and health services and land councils. This supplementary recruitment may reach adolescents who may not attend school frequently. Participants recruited in this setting (both adolescents and parents/caregivers) will be directly approached by the research team.

The School Representative may also advertise the study where Aboriginal and/or Torres Strait Islander adolescents and their caregivers/parents may see it e.g., newsletters, online school forums, or mailing/email lists. Finally, the research team will be flexible to the needs of each individual school regarding information dissemination about the project; for example, we may conduct a short information session prior to the school visit.

Local key informants and immunisation program partners

Local key informants will be initially identified by the School Principal and School Representative. Participants may include individuals involved in HPV vaccination program delivery both inside and outside the school, with additional participants identified via snowball recruitment. Individuals at local councils responsible for administering HPV vaccination at the school site will be invited to participate by the research team. Immunisation program partners will be recruited purposively through Investigator networks, the Consultation Network and snowball sampling. Additional research approvals to interview individuals outside the school setting will be obtained as necessary.

Consent

The School Principal will provide written informed consent for their school to participate in the research, and optionally, for researchers to observe the HPV vaccination clinic in progress. All participants will provide informed consent prior to the yarn or yarning circles. When yarns are conducted over the phone or online, oral informed consent will be audio recorded and transcribed. A parent/caregiver must provide consent for their child to participate in the study, and adolescents must also consent to participate.

Data collection

Several methods of qualitative data collection will be used in this study: yarning, construction of sequential diagrams, and observation.

Yarning

Semi-structured yarns and yarning circles will be used to explore participants' views and experiences in a culturally appropriate and safe manner. Male and female Aboriginal and/or Torres Strait Islander researchers trained and/or experienced in yarning methodology will lead yarns with participants. Yarning involves conversational sharing of stories and information following cultural protocols. Yarning is generally more relaxed and informal than conventional interviews, and establishes relationality between participant and researcher, which forms the basis of accountability and cultural safety between the two parties. A relationship between researcher and participant will be formed during the Social Yarning phase of the research.[42, 43] If deemed feasible and appropriate by the School Representative, yarning circles may also be conducted, which involves facilitated yarning with a small group of people. Yarning circles are recommended as part of the Queensland Curriculum and Assessment Authority's (QCAA) Resources for Aboriginal and Torres Strait Islander student perspectives.[44] We will also seek the guidance of the School Representative regarding whether yarning circles should be separated by gender.

Yarns may take place any time after Dose 1 or Dose 2 has occurred at the school site to avoid any conflation of the research with consent for vaccination. Yarns may take place in-person, online via virtual meeting software, or over the phone. Yarns recruiting adolescents who may not attend school may also take place at community events and activities, such as sporting events, festivals, health services and land councils. A semi-structured yarning guide covering the topics listed in Table 2 will be used, but questions will also be informed by observations and new topics raised in prior yarns. Where necessary and appropriate to the participant group, comparisons with other vaccination programs, such as the concurrent dTpa vaccination, will be made to discern common and unique factors relating to HPV

vaccination uptake and completion. Adolescent and parents/caregiver participants will receive a gift card reimbursement for their time and contributions. At the conclusion of the yarn, researchers will provide adolescent and parent/caregiver participants brief information about HPV and the vaccination, and a brochure produced by the Australian Government and National Immunisation Program with links to reliable information.[45]

Table 2. Yarning topics

Participant group	**Yarning topics**
Year 7 Aboriginal and/or Torres Strait Islander adolescents	• HPV vaccination views and awareness • Experience of HPV vaccination (adolescents only) • Decision-making and consent process for the vaccination • Impact of COVID-19 pandemic • Information and education about the vaccine • Improving HPV vaccination
Parents/caregivers of Year 7 Aboriginal and/or Torres Strait Islander adolescents	
Local key informants (e.g., individuals from the school involved in HPV vaccination program delivery or administering council)	• Role in HPV vaccination delivery • Creation and discussion of HPV vaccination process sequential diagrams • Information and education about the vaccine • Impact of COVID-19 pandemic • Consent process • School's program delivery • Improving HPV vaccination
Immunisation program partners (e.g., individuals from the state health and education departments involved in HPV vaccination program)	• Role in HPV vaccination delivery • Creation and discussion of HPV vaccination process sequential diagram • Improving HPV vaccination

	• Impact of COVID- 19 pandemic

All yarns will the audio recorded with the consent of the participant. Yarns will be transcribed verbatim by a transcription company. Participants who decline audio recording will be asked to consent to the researcher writing notes during the yarn.

The School Representative will provide guidance on whether an Aboriginal and/or Torres Strait Islander interpreter will be required to support the yarns. Where appropriate, interpreters may conduct the yarns. The English interpretation of yarns conducted in language will be transcribed and analysed, with timestamps noted for non-English language.

During field work, researchers will take field notes to provide context for analysis.[46] Field notes may include documenting contextual information about the school and research visit, observations of participants' verbal and nonverbal communication, sketches of locations or room layouts, emerging ideas to explore in forthcoming yarns, and insight for data analysis. Other information will be noted as required. Field notes will be integrated with the data corpus to enrich analysis.

Sequential diagramming

During the yarns with local key informants and immunisation program partners, participants and researchers will create sequential diagrams of their involvement in HPV vaccination at the school.[47, 48] Sequential diagrams (informally referred to as "mud maps" with participants) elicit descriptions of processes or actions as chains of events. Initially the participant will lead the construction of the diagram using either pen and paper or virtual meeting software drawing tools (participant-led diagramming[47]), and then the researcher will explore significant events in the sequence and prompt for further information or key events in the process (researcher-led diagramming[47]). Both the physical diagram and the verbal dialogue will be collected as data. The diagrams will both encourage qualitative discussion and contribute to the development of synthesised sequential diagrams of HPV vaccination for Aboriginal and/or Torres Strait Islander students at each school, as well as typical procedures state-wide.

Observation of vaccination

With the consent of the School Principal, researchers will observe the HPV vaccination clinic (Dose 1 or Dose 2). A semi-structured observation guide will be used, whereby researchers can provide both prompted and unstructured observations of how the clinic is conducted. Guided by previous research,[49] observations may include sketches of the building and

room layout, weather conditions, interactions between adolescents and staff before, during, and after vaccination, any emotional or physical reactions to the vaccination, descriptions of equipment, measures put in place as a result of COVID-19 (e.g., social distancing), and any supports in place for Aboriginal and/or Torres Strait Islander students.

Analysis

Transcripts, field notes, sequential diagrams, and observations will form the data corpus and will be managed with NVivo software (QSR International Pty Ltd, version 12[50]). Thematic analysis will be used to identify patterns of meaning across the data, through an iterative process of coding, discussion, and re-coding.[51] A constructivist approach will be taken, in which experience and meanings are social reproductions and a product of socio-cultural and structural conditions.[51] In line with the Indigenist research approach, Aboriginal and Torres Strait Islander people will lead the initial coding and interpretation of the data, with support from non-Indigenous researchers. This approach brings a criticality to the interpretation and analysis of data afforded by Aboriginal and Torres Strait Islander people's lived experiences, relationality with participants, and research expertise. Researchers will code the data line-by-line to identify emerging themes. The ecological model for health promotion[33] will guide analysis, ensuring social, structural and environmental factors influencing HPV vaccination uptake are considered alongside individual level factors.

A sequential diagram of typical state-wide HPV vaccination practices will be synthesised by integrating the qualitative analysis findings, sequential diagrams, and observational data and augmented by input from the investigator team, Consultation Network and Steering Committee.

ETHICS

Ethics approval for this research has been obtained from the Aboriginal Health and Medical Research Council of New South Wales Ethics Committee (1646/20), the Australian National University Human Research Ethics Committee (HREC, 2020/478) and the HREC of the Northern Territory Department of Health and Menzies School of Health Research (19-3484). We will adhere to COVID-19 health and safety guidelines in Queensland current at the time of fieldwork.

Participants will provide voluntary written or verbal informed consent. Adolescents will also require parent/caregiver consent. School Principals will provide consent for the school to participate and, optionally, for observational research. Participants may withdraw from the study at any time before dissemination of the findings, except for yarning circle participants,

as it will be difficult to identify individual voices in the recording and transcript. Yarning circle participants will be informed of this before consenting to the study.

Data will be deidentified before publication. Some local key informants and immunisation program partners may be identifiable due to the unique nature of their roles and this will be highlighted when seeking consent to participate. Yarning circle participants will be asked to respect other participants' privacy by not sharing information heard during the study.

Some participants may feel uncomfortable or embarrassed talking about the sexually transmitted nature of HPV or about needles; if this is the case, we will check the participant is happy to continue and/or change the topic. There is minimal risk of distress or harm due to participating in the research.

It will not be feasible to return to school sites to conduct member checking of interpretation with individual participants nor to seek participants' comment on yarning transcripts, however findings will be discussed with the Steering Committee and Consultation Network to ensure they reflect the full range and depth of perspectives. The Steering Committee will include representatives of many communities involved in the research.

DISSEMINATION

Findings will be disseminated through conference presentations and peer-reviewed journal publications. Further dissemination will be determined in partnership with the Steering Committee and Consultation Network. Emphasis will be placed on meeting the Steering Committee Youth Representatives' recommendations. Dissemination will be flexible and responsive to each Committee's recommendations and needs. Expected dissemination formats include newsletters or summaries, short reports for schools and School Principals, and social media. While this study will directly inform HPV vaccination knowledge and policy within the Queensland setting, we will disseminate findings to other relevant state/territory groups beyond Queensland to ensure applicable national-level strategy can be shared.

Publications will adhere to the consolidated criteria for strengthening reporting of health research involving Indigenous Peoples (the CONSIDER statement[52]) and the consolidated criteria for reporting qualitative research (COREQ[53]).

CONCLUSIONS

The *Yarning about HPV vaccination* project will comprehensively explore and document how multiple factors interact across interpersonal, institutional, community, and policy levels to affect HPV vaccination for Aboriginal and/or Torres Strait Islander adolescents though an Indigenist research lens. This project will provide insights into increasing the resilience of the

school-based immunisation program during disruptions to school attendance, such as those caused by the COVID-19 pandemic. The findings may inform implementation strategies for other large-scale programs such as the influenza vaccine and eventual COVID-19 vaccine. The findings will be valuable to other countries seeking to implement equitable, resilient, accessible and sustainable school-based HPV vaccination.

Understanding the factors affecting HPV vaccination uptake among Aboriginal and/or Torres Strait Islander adolescents is a critical step in addressing the burden of cervical cancer among Aboriginal and Torres Strait Islander women. Equitable access to primary prevention through HPV vaccination has the potential to reduce disparities in cervical cancer outcomes for Aboriginal and Torres Strait Islander women in Australia.

DATA AVAILABILITY STATEMENT:

Data sharing is not applicable as no datasets were generated and/or analysed for this article.

AUTHOR CONTRIBUTIONS

LJW, TB, JB, KA, JC, AT and GG contributed to the conception of the study. LJW and TB developed the detailed study methodology. TB drafted the initial manuscript. LJW, TB, JB, KA, JC, AT and GG contributed to developing the study design, provided feedback and reviewed drafts of the manuscript, and approved the final version.

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COMPETING INTERESTS STATEMENT.

None declared.

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Ownership of Aboriginal and Torres Strait Islander knowledges and cultural heritage will be retained by the informant.

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Table 1
Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Relevant line/page number
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?	Page 13, second sentence under Yarning heading
2.	Credentials	What were the researcher's credentials? *E.g. PhD, MD*	Not reported - Not a requirement of the journal
3.	Occupation	What was their occupation at the time of the study?	Page 13, second sentence under Yarning heading
4.	Gender	Was the researcher male or female?	Page 13, second sentence under Yarning heading
5.	Experience and training	What experience or training did the researcher have?	Page 13, second sentence under Yarning heading
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	Page 13, sentence 5 under Yarning heading

No	Item	Guide questions/description	Relevant line/page number
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? e.*g. personal goals, reasons for doing the research*	Page 12, first sentence under "Adolescents and parent/caregivers"
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. *Bias, assumptions, reasons and interests in the research topic*	N/A – protocol paper
Domain 2: study design			
Theoretical framework			
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? *e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis*	From page 7 – "Study design and approach"
Participant selection			
10.	Sampling	How were participants selected? *e.g. purposive, convenience, consecutive, snowball*	From page 10 – Participants and recruitment

No	Item	Guide questions/description	Relevant line/page number
11.	Method of approach	How were participants approached? e.*g. face-to-face, telephone, mail, email*	From page 10 – Participants and recruitment
12.	Sample size	How many participants were in the study?	From page 10 – Participants and recruitment
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	N/A – protocol paper
Setting			
14.	Setting of data collection	Where was the data collected? e.g. *home, clinic, workplace*	See page 13 under heading “Yarning”
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	N/A – protocol paper
16.	Description of sample	What are the important characteristics of the sample? *e.g. demographic data, date*	N/A – protocol paper
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	See Page 14 – Table 2

No	Item	Guide questions/description	Relevant line/page number
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	N/A
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	See page 14 under heading “Yarning”
20.	Field notes	Were field notes made during and/or after the interview or focus group?	See page 15 under heading “Yarning”
21.	Duration	What was the duration of the interviews or focus group?	N/A – protocol paper
22.	Data saturation	Was data saturation discussed?	See page 10 under “Participants and recruitment”
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	See page 17 under “Ethics”
Domain 3: analysis and findings			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	See page 16 under “analysis” – noting that because it is a protocol the exact

No	Item	Guide questions/description	Relevant line/page number
			number of coders is still to be determined
25.	Description of the coding tree	Did authors provide a description of the coding tree?	N/A -protocol paper
26.	Derivation of themes	Were themes identified in advance or derived from the data?	see page 16 under “analysis”
27.	Software	What software, if applicable, was used to manage the data?	see page 16 under “analysis”
28.	Participant checking	Did participants provide feedback on the findings?	see page 17 under “Ethics”
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.*g. participant number*	N/A -protocol paper
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	N/A -protocol paper
31.	Clarity of major themes	Were major themes clearly presented in the findings?	N/A -protocol paper

No	Item	Guide questions/description	Relevant line/page number
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	N/A -protocol paper